Document Set up Data

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Client Name	Lend Lease
Client Address	UTS Broadway Building 81 Broadway Ultimo NSW 2007
Manual Type	Operation and Maintenance Manual
Service	
Volume	
Section	
First Issue Date	
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Divider Level 2 Colour	Blue
Divider Level 3 Colour	
PDF File password	
Notes:	All Modified text should be in black. To update Table of Contents Page - right click, update field, update entire table.

Solar Thermal TriGen System

OPERATION AND MAINTENANCE MANUAL
FOR

UTS Broadway Building

NEP Solar Pty Ltd

1 INTRODUCTION

1.1 Warnings and Precautions

1.1.1 General

- The Solar Thermal TriGen system installed at UTS FEIT Broadway contains specialised equipment and should only be worked on by Licensed and Qualified technicians.

1.1.2 High Temperatures

- The Solar Thermal TriGen System operates at temperatures up to 180 ^{o}C.
- **Some equipment should not be isolated without prior arrangements so always ensure consultation with NEP Solar otherwise the Solar Thermal TriGen System will be compromised**

1.1.3 Systems Under Pressure

- The Solar Thermal TriGen System operates at pressures of up to 14 Bar and combined with temperatures up to 180 ^{o}C.
- **Some equipment should not be isolated without prior arrangements so always ensure consultation with NEP Solar otherwise the Solar Thermal TriGen System will be compromised**

1.1.4 Power Supplies

- Dangerous voltages exist in the Distribution Board and Control Cabinet so ensure circuits are isolated prior to commencing any work

1.1.5 Earthing

- Do not disconnect or remove any earth connections without fully isolating the equipment the earth connection is terminated on.

1.2 Directory

1.2.1 Solar Thermal TriGen System Contractor

NEP Solar Pty Ltd		Johan Dreyer
		20, 14 Jubilee Ave Warriewood, NSW 2102
		+ 61 2 9998 4700
		-
		johan.dreyer@nep-solar.com
		www.nep-solar.com

1.2.2 Construction Manager

Lend Lease Project Management and Construction Pty Ltd		Nicholas Carnevale
		30 The Bond, 30 Hickson Road, Millers Point NSW 2000
		+ 61 2 9236 6111
		+ 61 2 9383 8133
		www.lendlease.com

1.2.3 Architect

Denton Corker Marshall		
		49 Exhibition Street, Melbourne, Victoria
		+ 61 3 9012 3600
		+ 61 3 9012 3601
		www.dentoncorkermarshall.com

1.2.4 Hydraulic / Fire Consultant

Arup		Greg Kalisz
		Level 10, 201 Kent Street, Sydney NSW 2000
		+61 2 9320 9320
		+61 2 9320 9321
		www.arup.com

1.2.5 Mechanical Consultant

Waterman		Scott Brown
		Level 4, 10 Help Street, Chatswood NSW 2067
		+61 2 9411 9900
		+61 2 9415 1717
		www.watermangroup.com

1.2.6 Electrical Consultant

Waterman		Colin Shum
		Level 4, 10 Help Street, Chatswood NSW 2067
		+61 2 9411 9900
		+61 2 9415 1717
		www.watermangroup.com

1.3 Volume Details

Volume 1	Contains introductions, and descriptions, general maintenance, asset register and manufacturers user manuals Intended to provide an overview of the project and how the sites and systems integrate.
Volume 2	Contains manufacturers' user manuals.
Volume 3	Contains manufacturers' user manuals, data sheets and installation manuals.
Volume 4	Contains manufacturers' installation manuals, commissioning and warranties.
Volume 5	Contains drawings.

1.4 Abbreviations

Area	A section or a site which is specific to this trade.
LL	Lend Lease
WAHW	Waterman Consulting
BCA	Building Code of Australia
AS/NZ	Australian / New Zealand Standard
kW	Kilowatt
W	Watt
kWh	Kilowatt hour
MWh	Megawatt hour
COP	Coefficient of performance
HX	Heat exchanger
ORC	Organic Rankin Cycle
PLC	Programmable Logic Controller
SCADA	Supervisory Control and Data Acquisition
HMI	Human Machine Interface
PC	Personal Computer
DHW	Domestic Hot Water
CHW	Chilled Water
R&D	Research and Development

2 SYSTEM DESCRIPTION

2.1 General Overview

With reference to the schematic below.

The supply comprises:

- 4 PolyTrough 1200 solar collectors delivering hot water (supply by Nilsen)
- One Eneftech ENEFCOGEN GREEN ORC turbine.
- One Pink PC19 absorption chiller
- A “heat dump” heat exchanger
- A “domestic hot water (DHW)” heat exchanger
- A “chilled water (CHW)” heat exchanger.
- A hot water buffer tank.
- A pressurisation and expansion tank system.
- Pumps
- Bypass valves
- Instrumentation
- PLC based control system
- SCADA system and HMI PC to operate system.

- Solar Thermal Loop
- Distribution Loop
- Heat Dump/Domestic Hot Water Loop
- Organic Rankine Cycle/Heat dump loop
- Absorption chiller chilled water supply and return loop

SOLAR FIELD

NEP SOLAR PolyTrough 1200 Collector 2

NEP SOLAR PolyTrough 1200 Collector 1

NEP SOLAR PolyTrough 1200 Collector 4

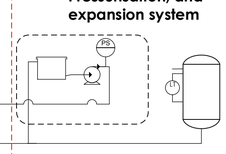
NEP SOLAR PolyTrough 1200 Collector 3

buffer tank 2000L

1. SOLAR FIELD PUMP

2. SOLAR DISTRIBUTION PUMP

Pressurisation, and expansion system



HEAT DUMP HEAT EXCHANGER

3. HEAT DUMP PUMP

Eneftech Enefcogen Green Organic Rankine Cycle

Pink PC 19 Absorption chiller

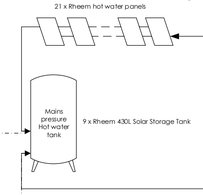
4. CONDENSOR WATER PUMP

DOMESTIC HOT WATER HEAT EXCHANGER

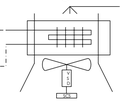
6. DOMESTIC HOT WATER PUMP

Rheem Solar Hot Water System

21 x Rheem hot water panels

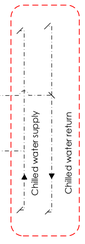


Hybrid Cooling tower



CHILLED WATER HEAT EXCHANGER

5. CHILLED WATER PUMP



SYMBOLS

- Isolation valve
- Ball valve (full bore)
- Needle valve
- Check valve
- Globe valve
- 3 way valve (motor driven)
- Butterfly valve
- Safety relief valve
- Temperature Transmitter
- Temperature gauge
- Pressure Transmitter
- Pressure gauge
- Pump
- Variable speed drive
- Solar control system
- Heat exchanger
- Nitrogen Supply
- Strainer
- Backflow preventer
- Differential pressure transmitter
- Done by NEP / Done by others
- Future previsions
- Straight pipe for Flow meter
- Manual bleed valve
- Air and dirt filter
- Flow meter

FOR CONSTRUCTION

Drawing:

SOLEM CONSULTING

Email: info@solem-consulting.com
Web: www.solem-consulting.com

Project: UTS solar thermal trigeneration

Client: NEP solar

Title: MECHANICAL SERVICES EQUIPMENT AND PIPING LAYOUT

Created	19 Dec 11	JO	Modified	16 Aug 2013	JO	
Approved			Modified	13 Jan 2014 Rev R	JD	

Scale: NTS

Size: A1

Location: Broadway, Sydney, Australia

Drawing no.: UTS2013-212-PID-1 (Simplified V3)

Rev.: R

2.1.1 Solar Circuit

Pump 01: Solar pump. Circulates water from the buffer tank through the solar field where it is heated. The speed of the pump is controlled via VSD from the PLC such to control the volume flow of water through the field. The flow is used to control the supply temperature from the solar collectors.
Valve 01 diverts fluid into the buffer tank or circulates the fluid around the solar field during the heat-up mode.

2.1.2 Solar Collectors

Four PolyTrough 1200 parabolic trough concentrating solar collectors are installed on the roof. The collectors track the sun and heat up the water flowing through the collectors back to the buffer tank.

2.1.3 Buffer tank

The 2,000l buffer tank is used to store the heat generated by the solar field so that the system can operate through brief cloudy periods.
The buffer tank is also equipped with 3 by 20kW electro-thermal heaters which allow the water to be heated for commissioning, test and experimentation purposes.

2.1.4 Expansion and pressurisation system

The expansion system is used to fill the system, pressurise the system and allow for the thermal expansion of the fluid.
The expansion allowance is filled with nitrogen.

2.1.5 Distribution Circuit

Pump 02 circulates water from the buffer tank around the distribution circuit. A mixing valve is used to mix fluid form the tank with fluid being circulated in order to achieve and maintain a set point temperature.
A series of bypass valves are used to divert flow from the distribution circuit to the ORC, chiller or heat dump (for dumping heat or generating DHW).

2.1.6 Organic Rankine Cycle Turbine and Electric Generator

The Eneftech ENEFCOGEN GREEN ORC turbine uses the heat from the solar field via the distribution circuit to heat an organic fluid as a working fluid for a Rankin cycle turbine. The turbine spins an electrical generator to create electrical power. The electrical power is sent to the PECC system. The reject heat from the unit is used to generate low temperature domestic hot water (up to 45C max) or is rejected to the hybrid cooling tower.

2.1.7 Absorption Chiller

The Pink absorption chiller uses the heat from the solar field via the distribution circuit to heat the ammonia based working fluid. Through a process of absorption the chiller creates coolth which in turn is passed onto the building medium-temperature cold water system through a heat exchanger. The turbine spins an electrical generator to create electrical power. The reject heat from the unit is used to generate

low temperature domestic hot water (up to 45C max) or is rejected to the hybrid cooling tower.

2.1.8 Hot Water Generation System

Reject heat from the ORC or chiller can be used to generate low temperature domestic hot water by pumping water from the DHW storage tanks through a heat exchanger. Heat can also be taken from the buffer tank, through the distribution circuit into the heat-dump heat exchanger. The recooling water on the other side of the heat exchanger is them pumped to the DHW heat exchanger and high temperature DHW can be delivered to the DHW tanks.

2.1.9 Cooling (condenser) water circuit

The recooling water is either sent to the hybrid cooling tower or the DHW heat exchanger through a series of pumps and control valves.

2.2 Control

2.2.1 Overview

The system is controlled via a PLC and SCADA system. The HMI is located on a PC which is located in the plant room.
The PLC interfaces externally to the system with:

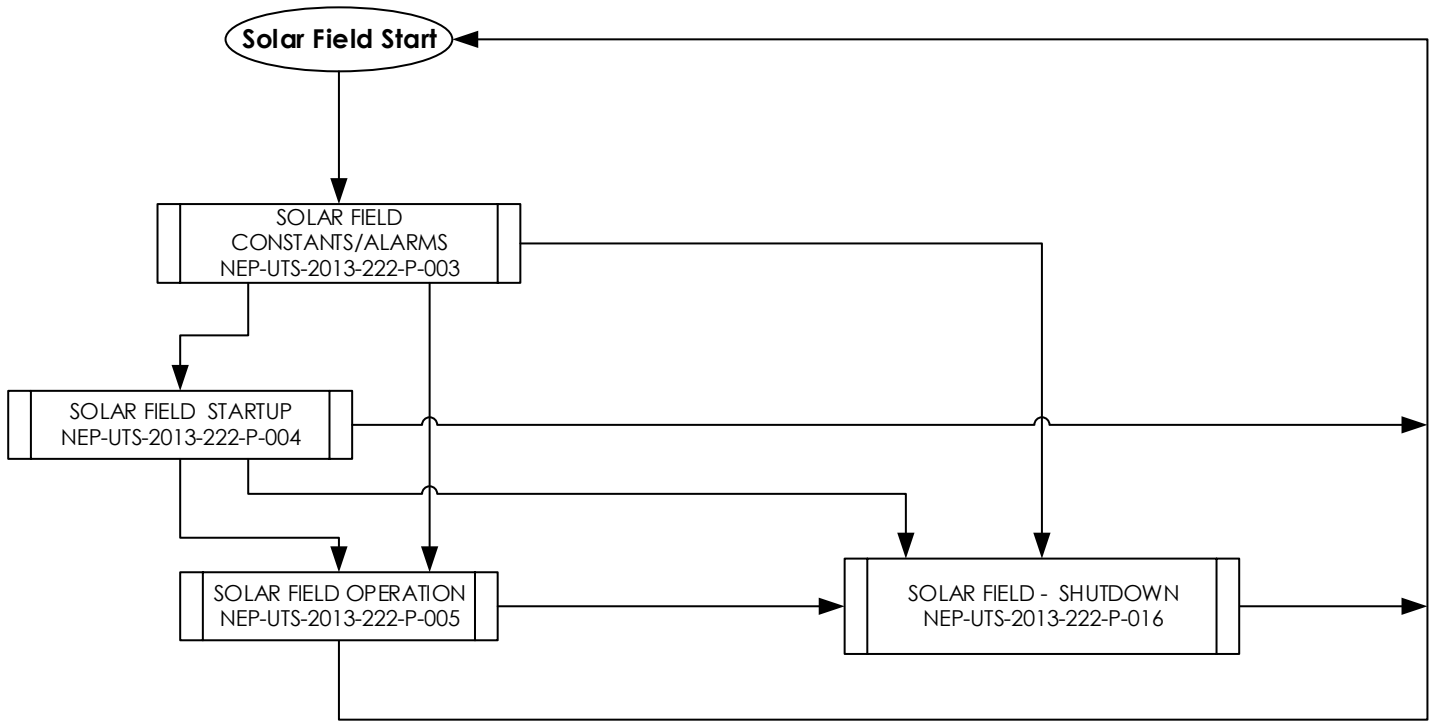
- The BMS and via the BMS to the EMS
- The hybrid cooling tower (the control of the hybrid cooling tower will be programmed in future and is intended for learning and R&D purposes)
- The internet for remote logon and support.

The system is designed to operate automatically with an interface to the BMS. The BMS provides an “OK to operate” signal and on receipt of that signal the system operates automatically. When a critical alarm condition is encountered the system will shut down and send an alarm signal to the BMS. This will prompt the operator to investigate and correct the fault.

The system can also be operated in a manual fashion where trained and experienced operators can operate individual pieces of equipment or sections of equipment. This is only intended for commissioning and testing and future learning ad R&D.

2.2.2 Control logic

With reference to the P&ID (Drawing CB1113ES-24483) the system control is shown in the flow charts:



Legend:

: Decision

: Timer

: Sub-Program

: Flag Warning/Alarm

: Manual Input

: Manual Confirmation

Red color refers to a fault during operation and alarm/warning flagged

Drawing:

SOLEM CONSULTING
PO Box 19, Avalon NSW 2107 Australia
Mobile: +61 421 914 516
Email: info@solem-consulting.com
Web: www.solem-consulting.com
ABN 98 150 985 890

Created	13-Jun-13	JO
Modified	21-Aug-13	JO
Modified	23-Aug-13	JK
Modified	24-Sept-13	JK
Modified	4-Oct-13	JO
Modified	1-Nov-13	JO

Project: UTS SOLAR TRIGENERATION

Client: NEP SOLAR

Title: OVERVIEW – SOLAR FIELD

Size: **A3**

Scale: NTS

Location: SYDNEY, NSW

Drawing no. NEP-UTS-2013-222-P-001

Rev. 6.2

3 EQUIPMENT SCHEDULE

3.1 Scope of Works Items

Quantity	Item Description	Supplier	Location
4	PolyTrough 1800 Solar Collectors	NEP Solar	Roof
1	2000l Buffer Tank	Automatic Heating	L13 EIF 2
1	Pump 01 – Grundfos CRIE 5-5	Automatic Heating	L13 EIF 2
1	Pump 02 – Grundfos CRIE 5-4	Automatic Heating	L13 EIF 2
1	Pump 03 – Grundfos CRE 15-2	Automatic Heating	L13 EIF 2
1	Pump 04 – Grundfos CRE 15-3	Automatic Heating	L13 EIF 2
1	Pump 05 – Grundfos CRE 15-2	Automatic Heating	L13 EIF 2
1	Pump 06 – Grundfos CRE 15-2	Automatic Heating	L13 EIF 2
3	Magnetic Flow Meter – DN65 Yokogawa - AXF065G + AXFA14G	Yokogawa	L13 EIF 2
3	Magnetic Flow Meter – DN50 Yokogawa - AXF050G + AXFA14G	Yokogawa	L13 EIF 2
4	Magnetic Flow Meter – DN40 Yokogawa - AXF040G + AXFA14G	Yokogawa	L13 EIF 2
1	Vortex Flow Meter – DN40 – Yokogawa DY040 + DYA-E4D/X1	Yokogawa	L13 EIF 2
1	TSU400-16 High Pressure Nitrogen Expansion System Automatic Heating	Automatic Heating	L13 EIF 2
4	Diverting Valve - Samson 3323 V2001 with Electric Actuator 3374-11. DN65	Samson Controls	L13 EIF 2
1	Diverting Valve - Samson 3323 V2001 with Electric Actuator 3374-11. DN50	Samson Controls	L13 EIF 2
4	Diverting Valve - Samson 3323 V2001 with Electric Actuator 3374-11. DN40	Samson Controls	L13 EIF 2
1	Diverting Valve - Samson Type 3323 with 3372-120 actuator with 3725 positioner	Samson Controls	L13 EIF 2
31	RTD Temperature Sensors	ECE Fast	L13 EIF 2
6	RTD Temperature Sensors and Transmitters	ECE Fast	L13 EIF 2
1	Distribution Board – 160A	King & Martin	L13 EIF 2
2	Control Cabinet including collector controller and PLC	Weidmuller / Yokogawa	L13 EIF 2

Quantity	Item Description	Supplier	Location
1	PC based SCADA	Weidmuller	L13 EIF 2
1	Eneftech ENEFCOGEN GREEN ORC turbine	Eneftech	L13 EIF 2
1	Pink PC19 absorption chiller	Pink	L13 EIF 2
3	Heat exchangers	Teralba Industries	L13 EIF 2

4 SUPPLIERS AND SUBCONTRACTORS

4.1 List of Suppliers

eneftech Generate your Heat & Power	Eneftech Innovation SA Route de Champ-Colin, 2C CH-1260 Nyon - Switzerland	☎	+41 22 994 04 20
		🖷	+41 22 566 27 43
		✉	info@eneftech.com
	Customer Support	🌐	www.eneftech.com

PINK ENERGIE- & SPEICHERTECHNIK	PINK GmbH Energie- und Speichertechnik Bahnhofstraße 22, A-8665 Langenwang	☎	+43 (0) 3854 / 3666
		🖷	+43 (0) 3854 / 3666-4
		✉	info@pink.co.at
	Customer Support	🌐	www.pink.co.at

Automatic Heating efficiency performance solutions	Automatic Heating Pty Ltd PO Box 35, Epping Victoria 3076 Australia	☎	1800 337 959
		🖷	+61 3 9310 5655
		✉	sales@automaticheating.com.au
	Customer Support: Jeremy Plaisted +61 438 018 575	🌐	www.automaticheating.com.au

Weidmüller	Weidmuller Pty Ltd 43 Huntingwood Drive NSW, 2148 Huntingwood	☎	+61 2 9671 9999
		🖷	+61 2 9671 9900
		✉	express@weidmuller.com.au
	Customer Support: Rick West +61 404 480 811	🌐	www.weidmuller.com.au

SAMSON	Samson Controls Pty Ltd Units 13A, 14A and 15A Port Botany Industrial Park 61-71 Beauchamp Road Matraville NSW 2036	☎	+61 2 9316-7800
		🖷	+61 2 96665963
		✉	sales@samsoncontrols.com.au
	Customer Support: Fred Azzi +61 4 0888-1727	🌐	www.samson.de

ECEFast	Samson Controls Pty Ltd Level 1, Unit 51 - 5 Inglewood Place, Norwest Business Park, Baulkham Hills, NSW 2153	☎	+61 2 8805 7500
		🖷	+61 2 8805 7599
		✉	sales@ecefast.com.au
	Customer Support: Steven "Roky" Rokfalussy +61 418 960 475	🌐	www.ecefast.com.au

YOKOGAWA	Yokogawa Australia Pty. Ltd. 112-118 Talavera Road MACQUARIE PARK NSW 2113	☎	+61 2 8870-1100
		🖷	+61 2 8870-1111
		✉	Mark.Biggin@au.yokogawa.com
	Customer Support: Mark Biggin +61 439 482 028	🌐	www.yokogawa.com/au/index.htm

Teralba INDUSTRIES	Teralba Industries Pty Ltd 15-19 Kialba Road Campbelltown NSW 2560	☎	+61 2 4629 3000
		🖷	+61 2 4625 4591
		✉	sales@teralba.com
	Customer Support: Karl Ovenden +61 2 4629 3016	🌐	www.teralba.com

4.2 List of Subcontractors

Paragon	Paragon Plumbing Pty Ltd Unit 8/2-14 Atkinson Rd Taren Point NSW 2229		+61 2 9525 9955
			+61 2 9525 9903
			info@paragonplumbing.com.au
	Customer Support: Brett Atkinson		www.paragonplumbing.com.au

YOKOGAWA	Yokogawa Australia Pty. Ltd. 112-118 Talavera Road MACQUARIE PARK NSW 2113		+61 2 8870-1100
			+61 2 8870-1111
			Mark.Biggin@au.yokogawa.com
	Customer Support: Mark Biggin +61 439 482 028		www.yokogawa.com/au/index.htm

King & Martin Electrical	KING AND MARTIN ELECTRICAL 3/1 Samantha Place Smeaton Grange , NSW 2561		+61 400354429
			+61 2 46481148
			admin@kingandmartinelectrical.com.au
	Customer Support: Russell King +61 414 445 066		www.kingandmartinelectrical.com.au/

5 SYSTEM OPERATION

5.1 Fasttools SCADA

5.1.1 Overview

The Yokogawa Fasttools SCADA software is utilised in the project to provide the integrated Human Machine Interface (HMI) for each of the solar elements (Collectors) together with the Stardom BOP PLC.

The Solar field and Stardom BOP PLC entirely controls the field and energy supply to the plant from the field. While the Fasttools SCADA constitutes a key element of the project from a visual and human interface point of view, should the PC running the Fasttools SCADA fail at any time, the solar field will continue to operate the field normally. In such an event the Emergency Shutdown Input (DI4) of the Stardom can be activated to shut-down the field.

Please refer to the Fasttools technical overview specifications for more detailed information on the Fastools SCADA total capabilities: TII50A01A20-01EN

5.1.2 Functions

5.1.2.1 PC IP Address and Functions

The IP of the PC is manually configured to be 172.24.11.101. This PC address is also used by the Stardom PLC for obtaining the Time Synchronisation for the field collector tracking modules. The PC requires internet access to enable time synchronisation to the internet time clocks.

5.1.2.2 PC IP Address and Functions

IP Addresses for all elements in the Solar Field (note, this excludes the Plant PLC)

Fasttools Server PC:	172.24.11.101
Stardom PLC	172.24.11.102
HXS10 Controller 1	172.24.11.103
HXS10 Controller 2	172.24.11.104
HXS10 Controller 3	172.24.11.105
HXS10 Controller 4	172.24.11.106
GPS Clock	172.24.11.107
Pink Chiller	172.24.11.108
Eneftech ORC	172.24.11.109

5.1.2.3 Starting Fasttools Server

From the Windows Start Menu, Select START FAST TOOLS. This will start the Fasttools Server in the background.

5.1.2.4 Start the OPERATOR INTERFACE

From the Windows Start Menu, select OPERATOR INTERFACE.

Note starting the Fasttools Server and Operator Interface can be automated as part of the PC start-up routine as required.

When the Operator start menu opens, it will request a Name and Password. There are three levels of login available: Operator, Administrator and Engineer.

Figure 1: Operator Interface Login Screen

The **Operator login** (Name: operator Password: operator) is the general logon that allows basic interface with the solar field. This level does not allow changing of parameters. Alarms can be acknowledged and trends viewed.

The **Administrator login** (Name: ADMIN Password: ADMIN) is the normal level for end user supervisor logon that allows all the privileges of the operator level, with the additional permissions of being able to change system parameters such as wind speed and flow rates.

The **Engineer login** (Name: ENGINEER Password: ENGINEER) is a special level for NEP Solar to allow for full manual override on valves and solar elements to allow for field commissioning. This mode provides all of the privileges of the Administrator level plus override capability. This mode should not be used by the end user.

All passwords can be changed in the field.
Unlimited additional Operator and Administrator users can be added, to provide for individual log-on by users.

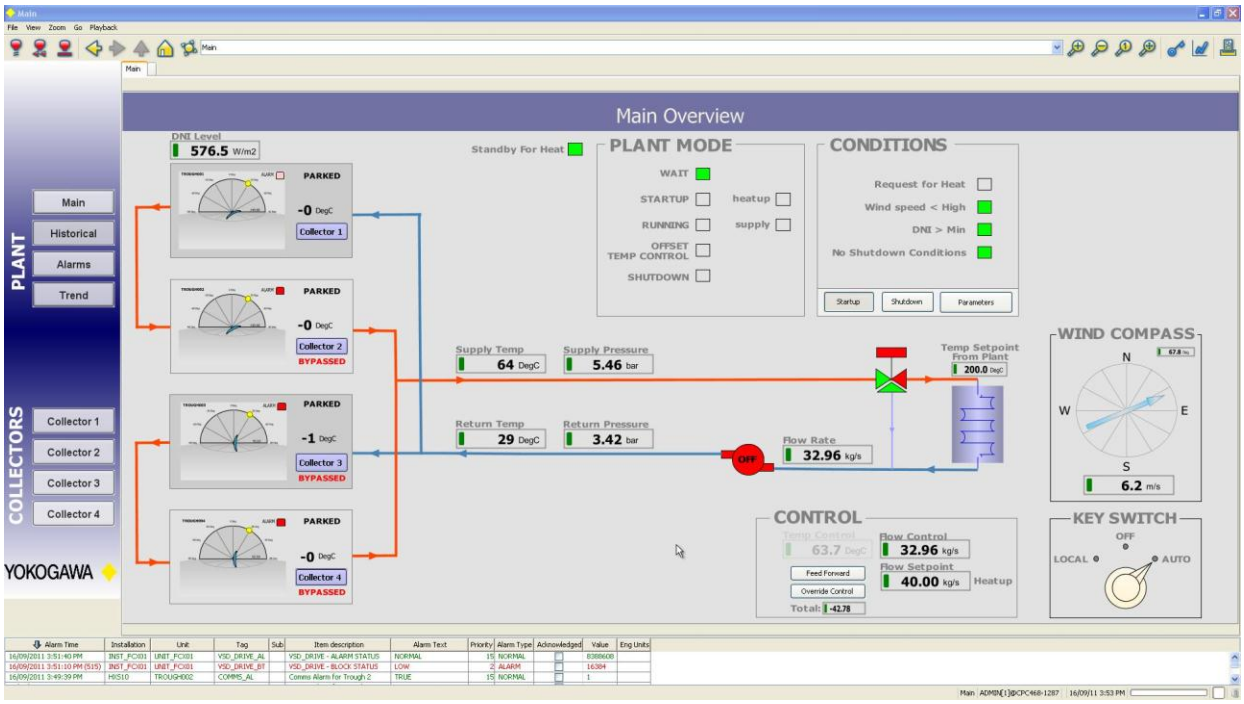
Log-on can be switched during normal operation for shift change or at the end of a shift.

Note Administrators are required to log-out at the end of their session.

5.2 Operation: Main Screen

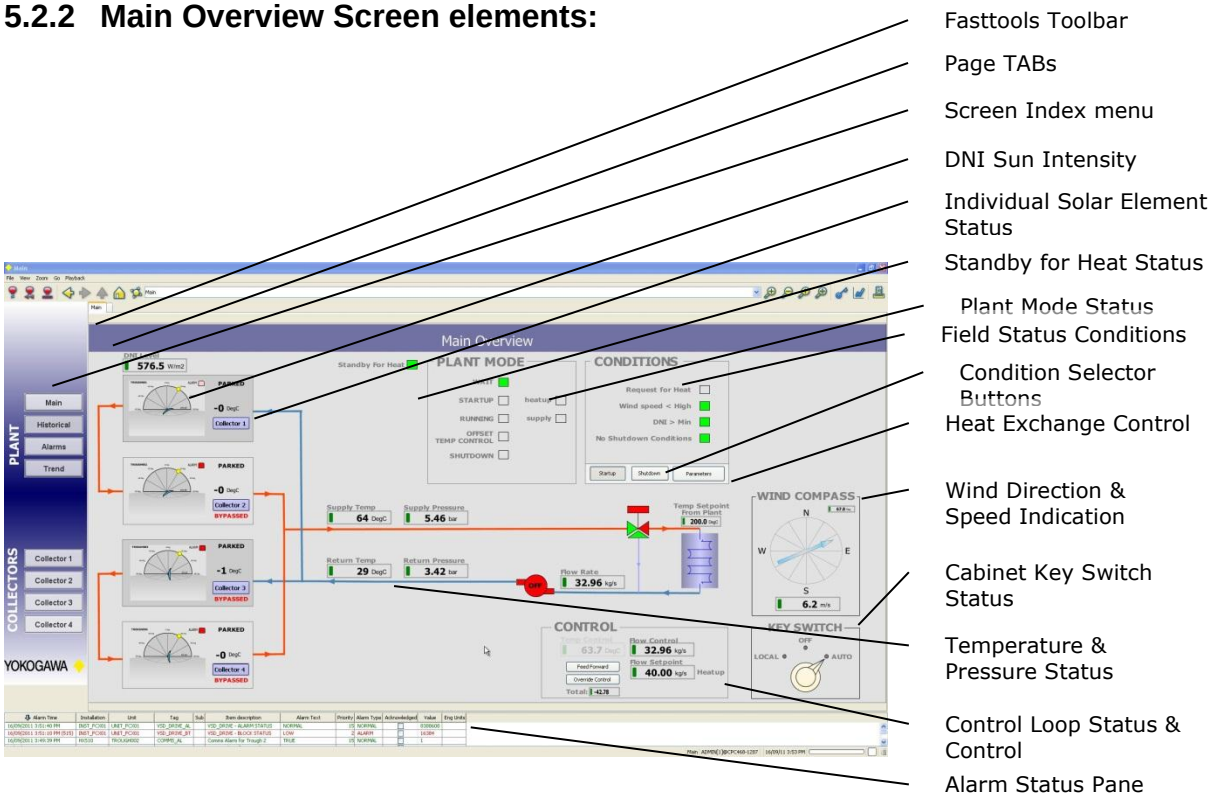
5.2.1 Overview

The Main Overview screen is the default or home screen.
This screen can be viewed when the Operator Interface program is initially opened, by selecting the toolbar “home” button or the “MAIN” index button is selected from the left side index menu.



The screen provides the overview of the 4 solar field elements together with the balance of plant (BOP) status, including the solar field environmental sensors.

5.2.2 Main Overview Screen elements:



5.2.3 Fasttools Toolbar

The Toolbar provides a simple to navigate tool bar allowing the operator to quickly access alarm pages, home page, zooming functions, user log in and from the TAB menu select from a list of favourite pages. Which would be typically the main page and the 4 solar elements.
Please refer to the included Fasttools technical overview specifications for more detailed information: TII50A01A20-01EN

5.2.4 Screen Index Menu & Page TABs

The menu provides a simple means to access all available screens in the system. Note that if a new TAB is selected from the page TAB line, then multiple pages can be continually open for fast operator access.

5.2.5 DNI Sun Intensity

This read only status displays the current sun intensity level in W/m2

5.2.6 Solar Element Status

A general read only status for each solar collector is provided. Basic KPI (Key Process Indicators) are provided for operator overview. For detailed information on a particular collector, click on the collector and the detailed screen will be opened for that collector.

5.2.7 Standby for Heat Status

This read only status indicates the Standby for heat digital Input supplied from the Plant PLC. For Operator information only.

Plant Mode Status

The read only Plant Mode Status notifies the operator of the current field status. Modes include:

Wait — Field is parked awaiting valid start up conditions

Startup — The field is in the startup sequence

Running — Normal field operation

During Startup and Running two modes are possible

Heatup — Flow control operation bringing field to temperature

Supply — Normal at temperature control mode

Offset Temp Control — Field is offset tracking due to over temperature detection in normal operation.

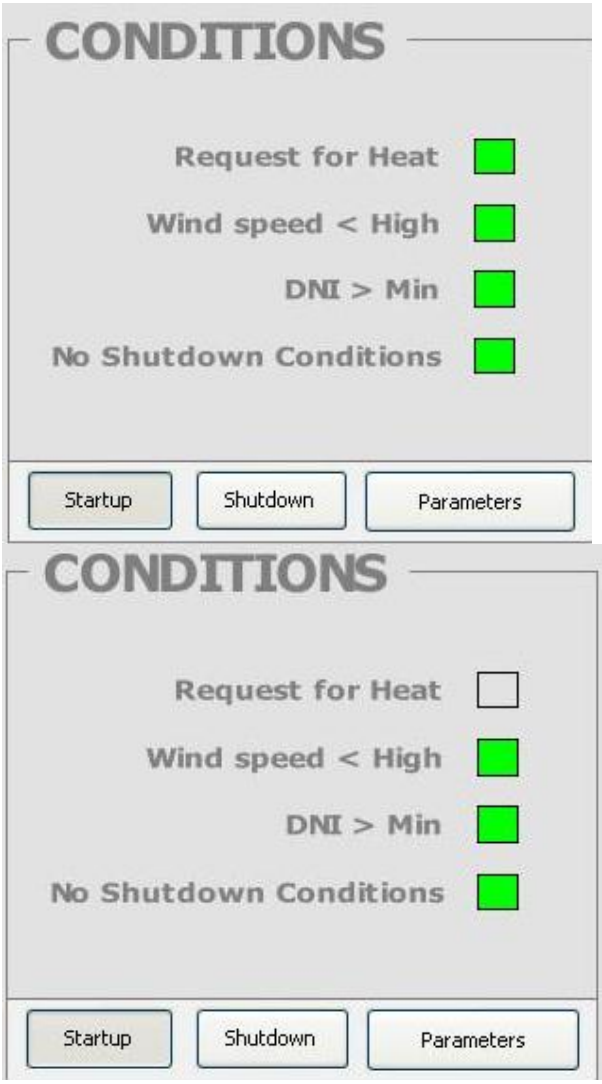
Shutdown — The solar field and flow control system is in the shutdown mode.

5.2.8 Field Status Conditions

The Field Status Conditions provides the operator with three simple to understand views of the current field status from the main screen. These screens can be each viewed by selecting the Startup, Shutdown and Parameters buttons at the bottom of the conditions box.

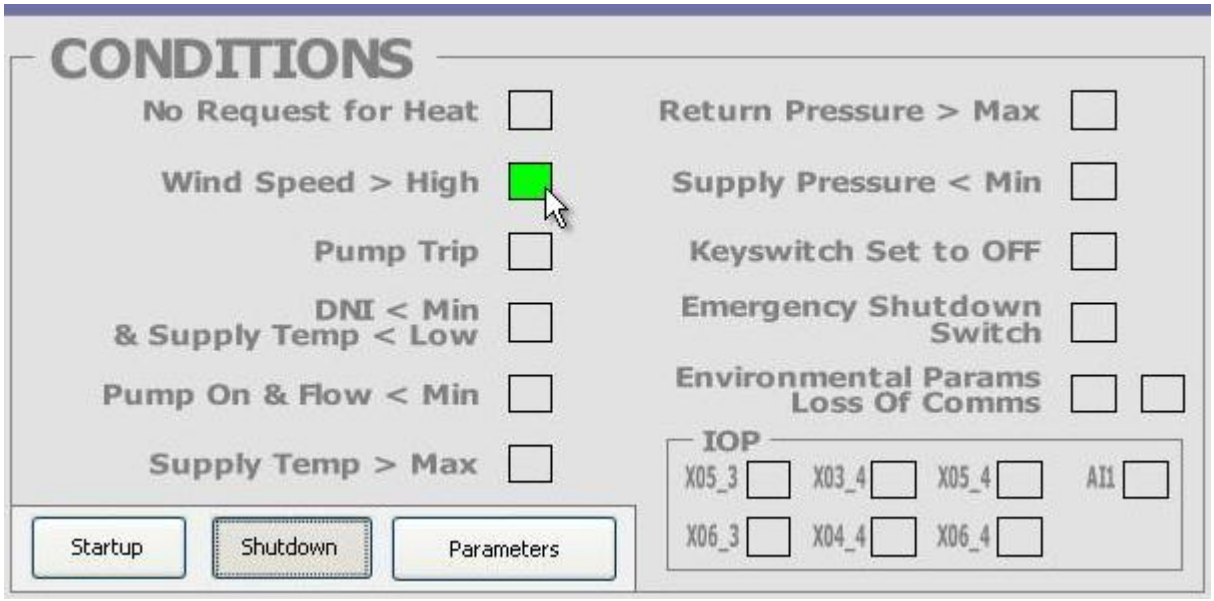
5.2.8.1 STARTUP

The default selection when the main screen is viewed is the STARTUP conditions. This view outlines the current status for a startup condition to occur.
If all 4 of the startup conditions are met, indicated by a GREEN filled status box for each condition as shown below, then the field will begin its startup sequence.



Should any condition become invalid, then the status indicator will change from Green to Grey. As shown above, where the Request for heat status has changed to not required.

5.2.8.2 SHUTDOWN



When the Shutdown button in the Conditions box is selected, the view changes to display the current status conditions for any shutdown.

In this view a valid shutdown condition will be indicated by a green status box. In the above view the Wind Speed > High status is indicated. Any shutdown condition indicated in this view will automatically initiate a field shutdown.

Indicated conditions:

No request for Heat

The Plant PLC has removed the request for heat to be provided to the plant

Wind Speed > High

The wind speed meter has detected a wind speed above the safe operating maximum

Pump Trip

The pump failed to start. Indicating possibly pump failure.
Note in the event of a pump trip, to clear the fault, a manual RESET button will appear allowing the operator to confirm the pump has been checked and is clear for a restart.

DNI < Min & Supply Temp < Low

If the available sun intensity is lower than a preset min for a defined period of time AND the Supply Temp has subsequently fallen below the defined Low temperature,

then the conditions are defined to shut the field down. This is to not waste energy operating the field in conditions, such as on an overcast day where by heat cannot be obtained.

Pump On & Flow < Min

Should a pipe break occur a loss of pressure will occur. To protect the pump should this occur an alarm is triggered.

Return Pressure > Max

Alarm on over pressure detection.

Supply Pressure < Min

Alarm on low pressure detection.

Key Switch set to Off

The keyswitch on the cabinet in the field is set to OFF. This is a safety feature in the event of a field operator detecting a condition that requires the field to be stopped.

Emergency Shutdown Switch

An emergency shutdown input is provided (Stardom FCJ DI4) to allow for a shutdown condition to be activated at the control room. This may be as a result of a PC failure on the SCADA server, or should the operator note a safety issue in the plant room requiring immediate system shutdown.

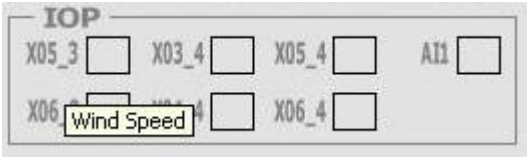
Environmental Parameters: Loss of Comms

The environmental parameter status is transmitted to the Stardom PLC from the field collectors. In the event of a loss of comms to the field devices transmitting this information, a field shutdown will be initiated. This is to prevent possible damage to the field during from invalid environmental sensor information.

IOP

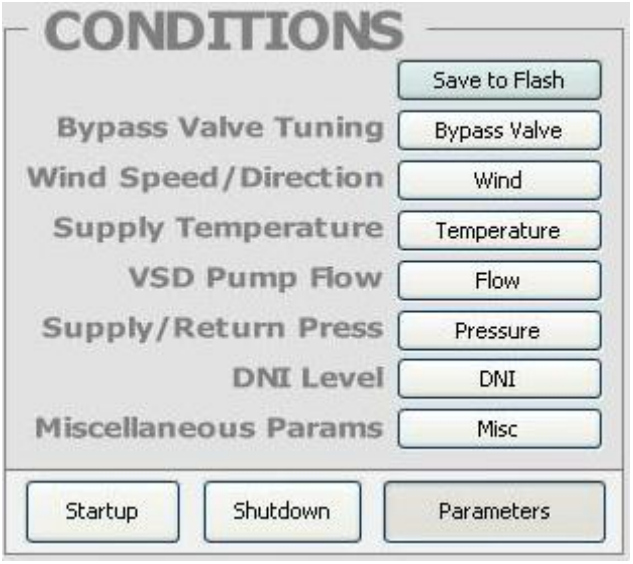
Should a field sensor fail, then the particular sensor will be indicated providing the operator with information about which sensor has failure, allowing for immediate repair. The descriptions indicate the particular sensor involved.

Note that hovering the mouse over the item will provide further information of the sensor to be displayed.



X05_3	Wind Speed
X06_3	Wind Direction
X03_4	Return Pressure
X04_4	Supply Pressure
X05_4	Supply Temperature
X06_4	Return Temperature
AI1	Flow Rate

PARAMETERS

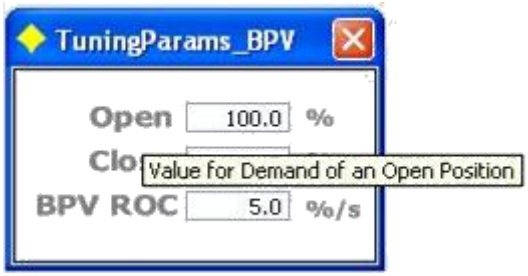


Note this section only applies to supervisors and administrators. Access is restricted to operator level users. To enable these functions please log on as an Administrator or Engineer level user.

When the Parameters button in the Conditions box is selected, the view changes to display enable viewing of the parameter conditions for the system.

If changes are made to the parameters then the Save to Flash procedure should be followed to ensure these are saved to the PLC memory for use after any subsequent start-up of the field.

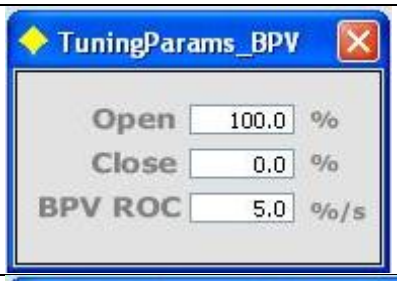
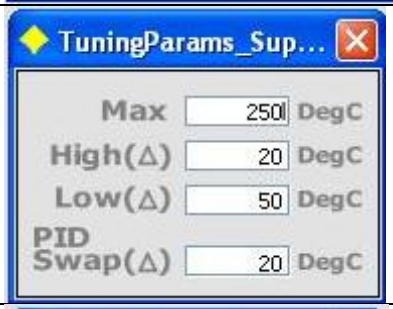
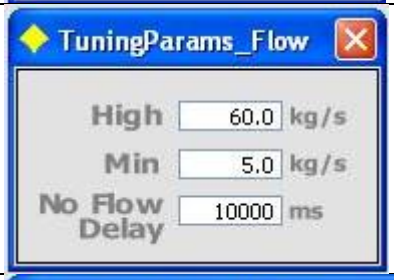
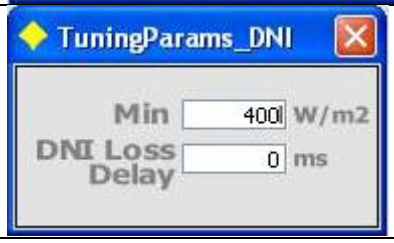
Pressing any of the available buttons will display a pop-up window enabling the current parameters to be viewed. Select the  to close the window.

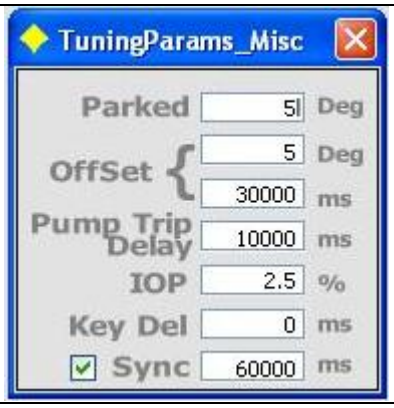


As previously noted, hovering the mouse over a parameter will provide the user with further information.

NOTE: Caution, changing of values will alter field operation.

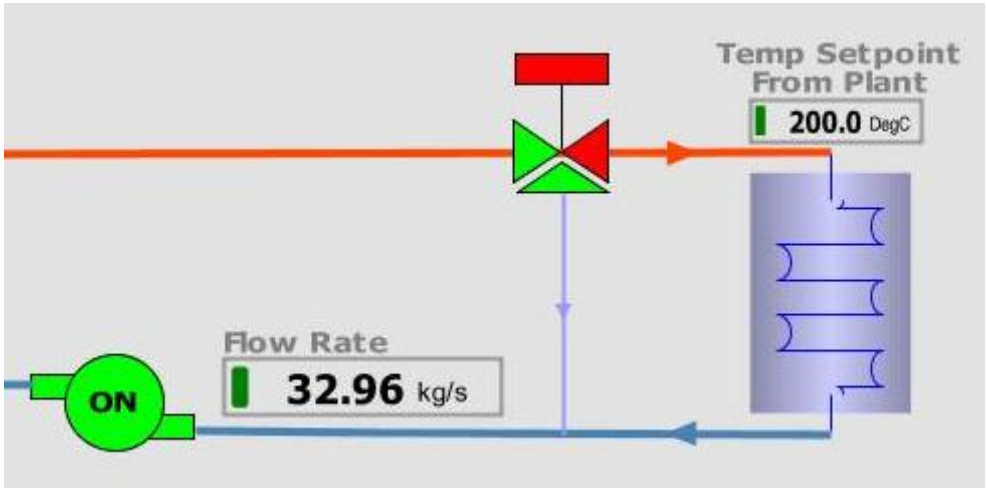
TUNING VALUE POP-UP DISPLAYS

Bypass Valve Tuning	
Wind Speed and Direction	
Supply Temperature	
VSD Pump Flow	
Supply & Return Pressure	
DNI Level	

Miscellaneous Parameters Including Parking Angle, Offset Tracking Angle & Timeout (in mS) IOP sensor out of range limit Time Synchronisation update time.	

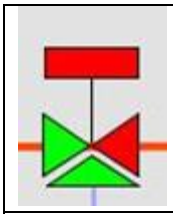
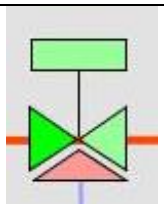
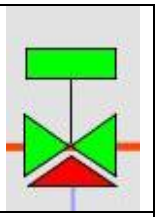
5.2.9 Heat Exchange Control

The Heat Exchange control diagram outlines the read only Temperature required by the Plant, which is sent via Modbus communications to the Solar Field PLC. This can change constantly depending on the plant requirements. This value can change even when the Plant is not calling for heat.

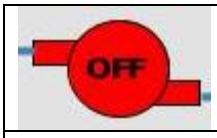
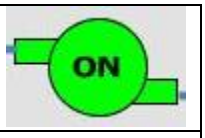


The read only Flow rate indicates the current flow rate in kg/s.

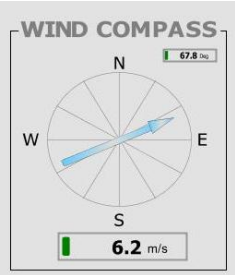
The Flow valve provides a visual representation of the valve state, being either closed (bypassed), in transition or open. While the Flow Value is transitioning from open to closed and vise versa, the value colour will show the transition.

		
BYPASS / CLOSED	TRAVEL	OPEN

Pump Status is also provided by a visual and text change as noted below.

	
PUMP STOPPED	PUMP RUNNING

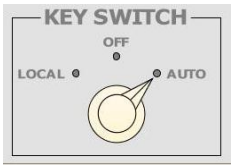
5.2.10 Wind Direction & Speed Indication



Wind speed and direction indication is visualised on the main screen in the form of a compass indicating the current wind direction. The actual direction is noted in the top right corner of the square in deg.

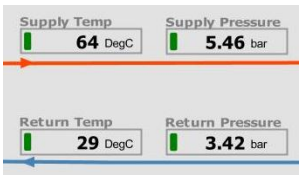
The wind speed in m/s is noted below the compass. The Green status indicator beside the speed indicates the alarm status. If the speed increases above the warning and alarm levels, this green indicator will change to orange and then red for the shutdown alarm condition.

5.2.11 Cabinet Key Switch Status



The status of the key switch located on the front of the field cabineted is displayed on the main screen. This provides the operator with a simple status of the switch for times when maintenance is occurring.

5.2.12 Temperature & Pressure Status



The Supply and Return Temperature and Pressure for the field is displayed as shown.

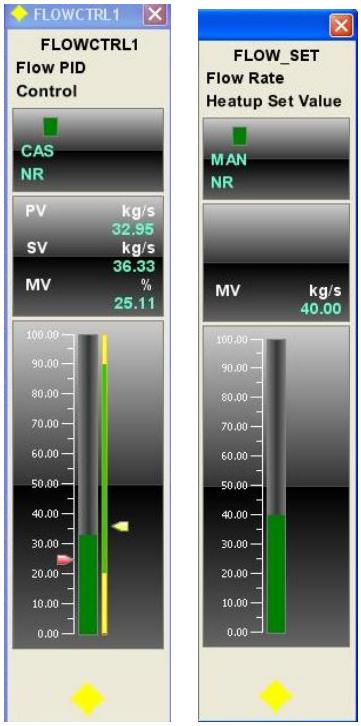
5.2.13 Control Loop Status & Control

The control strategy operating at any time during startup and normal running operation depends on the a number of criteria. The stragety is detailed inflow Charts. The information is read only to operators. As the control changes between Flow and temperature control the displayed information will highlight the appropriate information.

When in Flow Control, the system also notes whether the system is in heat-up or shutdown mode.

5.2.13.1 Faceplate Pop-up.

Additional information is also available for operators and supervisors in the form or pop-up faceplates. If the user clicks on for example the Flow Control or Flow Setpoint parameters then an automatically generated faceplate



Click on the yellow logo at the bottom of a faceplate to open the local trend window for the parameter.

Alarm Status Pane

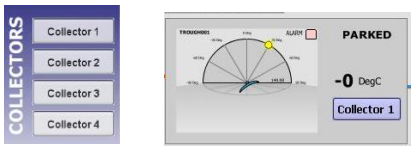
Alarm Time	Installation	Unit	Tag	Sub	Item description	Alarm Text	Priority	Alarm Type	Acknowledged	Value	Eng Units
16/09/2011 3:51:40 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL		VSD_DRIVE - ALARM STATUS	NORMAL	15	NORMAL	☐	8388608	
16/09/2011 3:51:10 PM (515)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT		VSD_DRIVE - BLOCK STATUS	LOW	2	ALARM	☐	16384	
16/09/2011 3:49:39 PM	HX510	TROUGH002	COMMS_AL		Comms Alarm for Trough 2	TRUE	15	NORMAL	☐	1	

The Alarm pane at the bottom of the screen shows the latest alarms. The alarm list can be scrolled thru from here, or for a whole page alarm list refer to the ALARM menu button or the Alarm buttons from the toolbar.

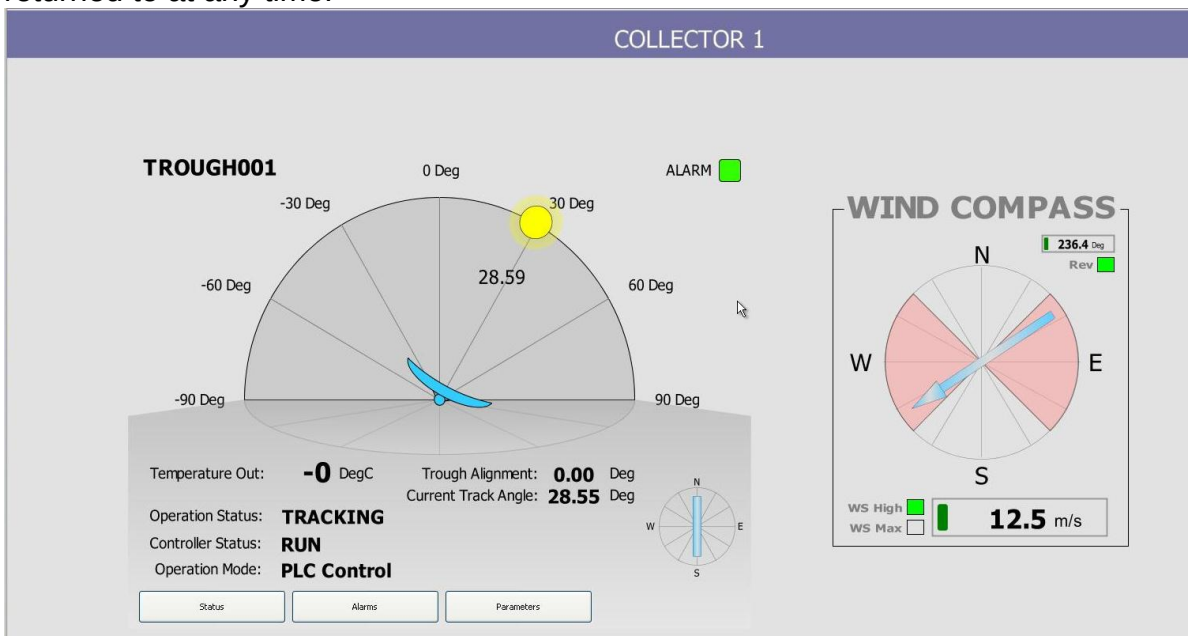
For detailed information on the alarm windows please refer to the included Fasttools technical overview specifications for more detailed information: TII50A01A20-01EN

5.3 Solar Collector Displays

Details information for Individual Solar Elements can be accessed from the main screen by selecting the particular solar element from either the screen index menu or by pressing the Collector button on the required status box.

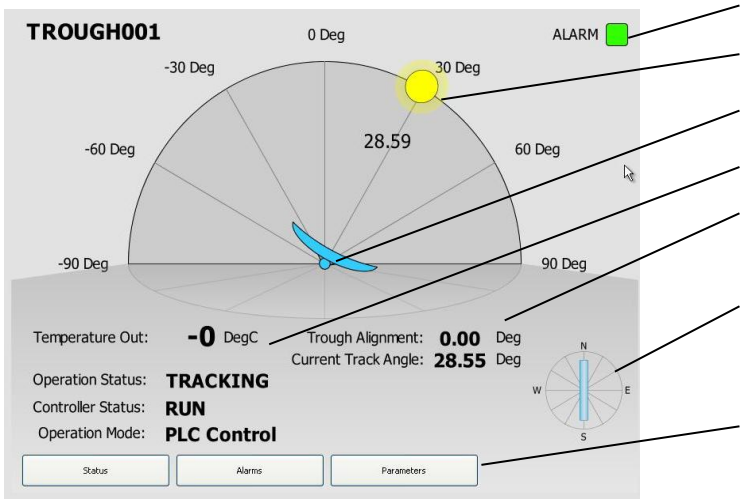


When selected the central screen will display the detailed Collector information. The toolbar, alarm pane and screen index menu will remain. The main screen can be returned to at any time.



The main display provides the operator with a larger image of the main page image with additional information on the status of the particular collector.

The default screen shows the STATUS, with additional buttons to select further information on the collector ALARMS and PARAMETER settings.



Alarm Status indication (Green – No Alarm)

Sun Position (Image & Angle)

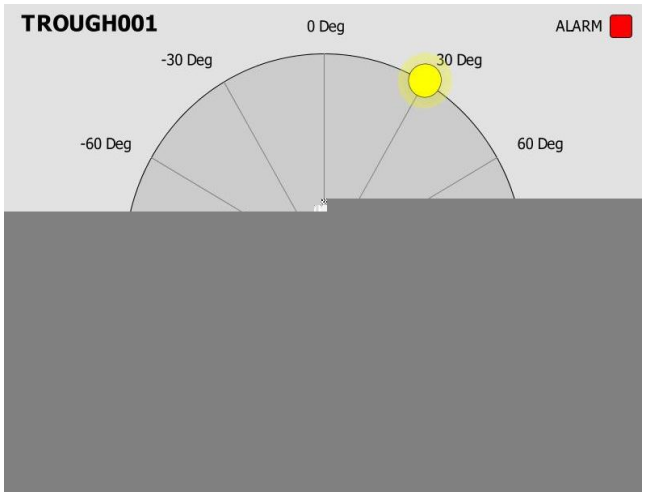
Collector Image of position

Collector Status & Temperature

Collector North-South Alignment Angle
Collector current tracking angle

Visual representation of NS Alignment

Selector buttons for additional information



When the ALARM button is pressed, the display shows individual information for all alarms on the particular collector. In this case a loss of comms has been initiated.

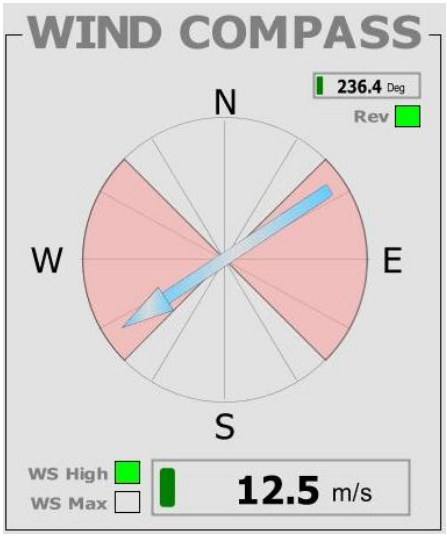
Note the ALARM Status icon in the top right corner is also activated.

Once an alarm clears it will change from Red to Green.
A special case is the HXS10 Comms error. Press the Reset button to release the alarm once cleared.

Pressing the parameter button displays the read only parameters for the particular collector including park angle, reverse park, cleaning angle and temperature alarm settings.

The Wind Speed and Direction information is repeated on each collector with additional information. The Wind Speed High and Max status indicators are displayed, and are displayed green if activated.

The wind direction compass shows shaded areas corresponding to the areas for activating the park and reverse-park commands in high wind situations.



The orientation of the area is dependent on the North-South misalignment of the individual collector.
A status indication is provided for whether the collector is parked for reverse parked. Here the REV status is green indicating the collector is reverse parked

5.4 Alarming

5.4.1 Alarm Overview

The FAST/TOOLS SCADA has a current alarm overview with all alarms that are active or yet not acknowledged and a historical alarm overview with all alarm status changes over time.
Current alarms can be presented in a scalable frame with scrollbar controls that for example can be defined as a separate current alarm display or a three line banner at the bottom or top (in the status bar) of the page. This overview is dynamic by nature; if an alarm no longer exists and is acknowledged (manually or automatically) then the alarm disappears from the screen. If there are no alarms active, this display or banner is empty. Every column of the alarm text line can be used to sort the alarm list so that current alarms can be sorted in:

- Priority base order
- Time base order
- Alarm status order
- Etc.

Every alarm status (Alarm, acknowledged alarm, repeated alarm, delayed alarm, normal, etc) can have its own distinct fore and background color or no background colour. Furthermore definition of alarm line columns can be freely organized and represented.

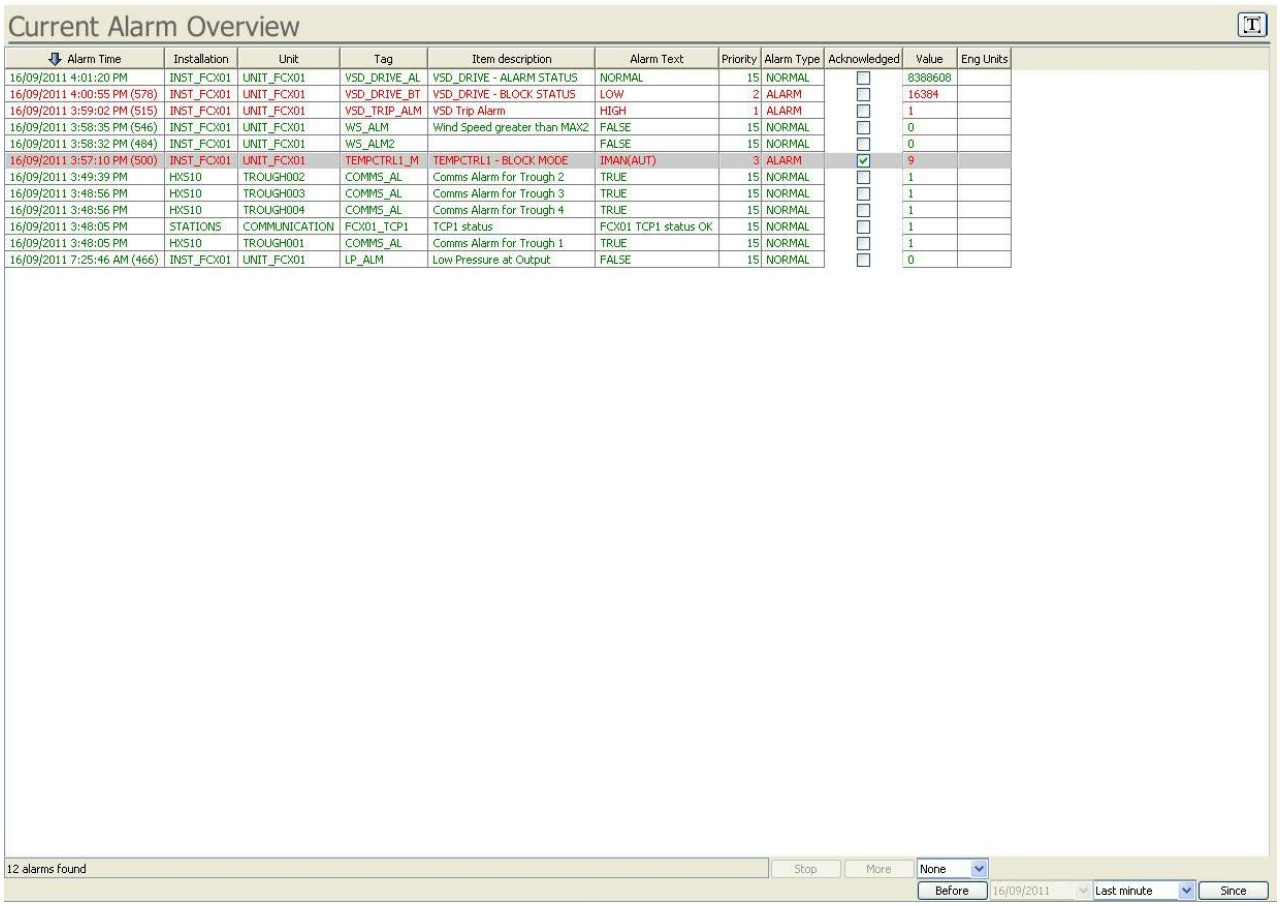
The historical alarm overview has the same functionality as described above for the current alarm overview. All status changes of alarms are represented in a fully scrollable historical alarm overview table with scroll bars and fast keys (page-up/down, etc.).

For detailed information on the alarm windows please refer to the included Fasttools technical overview specifications for more detailed information: TII50A01A20-01EN or the online help guides included with the installed Fasttools software.

The toolbar provides links to standard alarm lists:

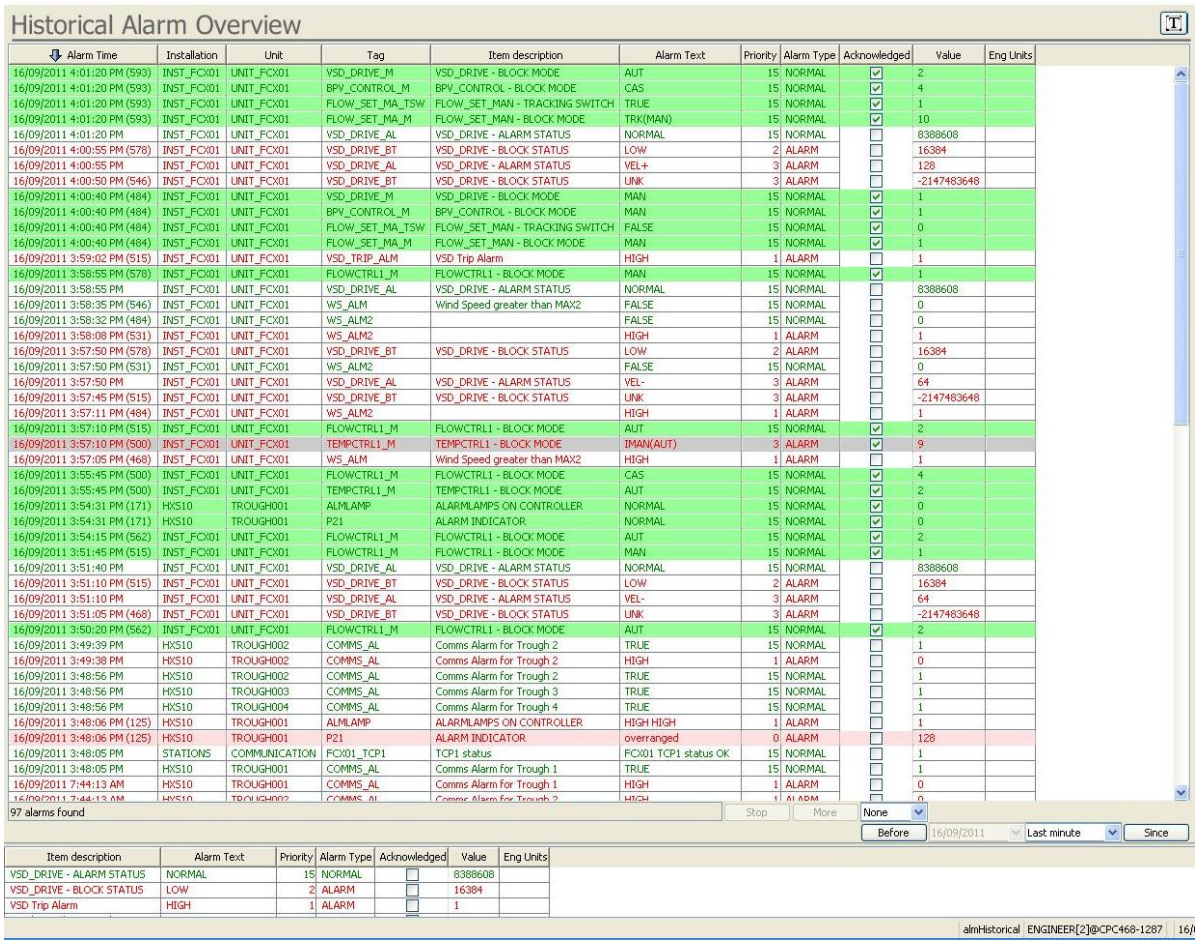
Goto Current Alarm List
Goto Historical Alarm List
Goto System Alarm List

5.4.2 Current Alarm Overview



Alarm Time	Installation	Unit	Tag	Item description	Alarm Text	Priority	Alarm Type	Acknowledged	Value	Eng Units
16/09/2011 4:01:20 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL	VSD_DRIVE - ALARM STATUS	NORMAL	15	NORMAL	☐	8388608	
16/09/2011 4:00:55 PM (578)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT	VSD_DRIVE - BLOCK STATUS	LOW	2	ALARM	☐	16384	
16/09/2011 3:59:02 PM (515)	INST_FCX01	UNIT_FCX01	VSD_TRIP_ALM	VSD Trip Alarm	HIGH	1	ALARM	☐	1	
16/09/2011 3:58:35 PM (546)	INST_FCX01	UNIT_FCX01	WS_ALM	Wind Speed greater than MAX2	FALSE	15	NORMAL	☐	0	
16/09/2011 3:58:32 PM (484)	INST_FCX01	UNIT_FCX01	WS_ALM2		FALSE	15	NORMAL	☐	0	
16/09/2011 3:57:10 PM (500)	INST_FCX01	UNIT_FCX01	TEMPCTRL1_M	TEMPCTRL1 - BLOCK MODE	IMAN(AUT)	3	ALARM	☑	9	
16/09/2011 3:49:39 PM	HXS10	TROUGH002	COMMS_AL	Comms Alarm for Trough 2	TRUE	15	NORMAL	☐	1	
16/09/2011 3:48:56 PM	HXS10	TROUGH003	COMMS_AL	Comms Alarm for Trough 3	TRUE	15	NORMAL	☐	1	
16/09/2011 3:48:56 PM	HXS10	TROUGH004	COMMS_AL	Comms Alarm for Trough 4	TRUE	15	NORMAL	☐	1	
16/09/2011 3:48:05 PM	STATIONS	COMMUNICATION	FCX01_TCP1	TCP1 status	FCX01 TCP1 status OK	15	NORMAL	☐	1	
16/09/2011 3:48:05 PM	HXS10	TROUGH001	COMMS_AL	Comms Alarm for Trough 1	TRUE	15	NORMAL	☐	1	
16/09/2011 7:25:46 AM (466)	INST_FCX01	UNIT_FCX01	LP_ALM	Low Pressure at Output	FALSE	15	NORMAL	☐	0	

5.4.3 Historical Alarm Overview

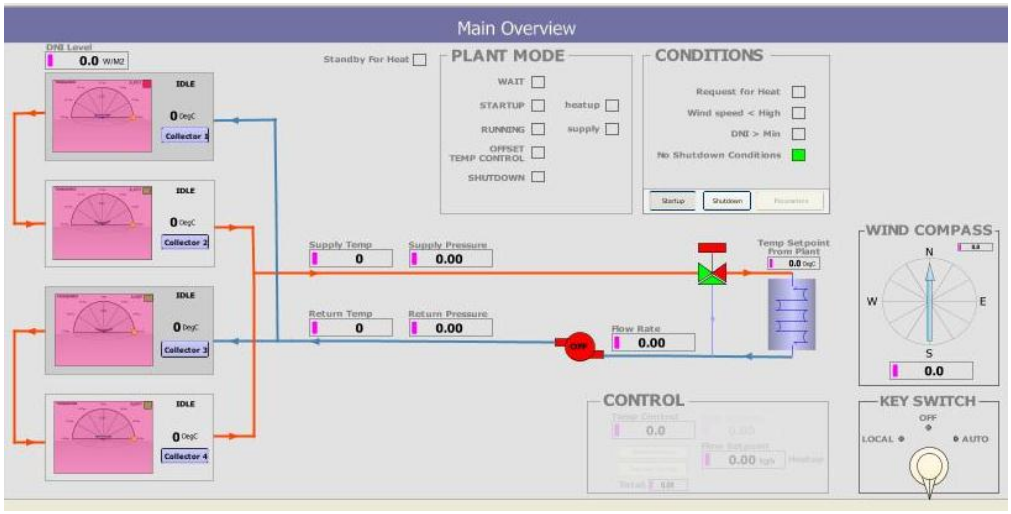


Alarm Time	Installation	Unit	Tag	Item description	Alarm Text	Priority	Alarm Type	Acknowledged	Value	Eng Units
16/09/2011 4:01:20 PM (593)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_M	VSD_DRIVE - BLOCK MODE	AUT	15	NORMAL	☑	2	
16/09/2011 4:01:20 PM (593)	INST_FCX01	UNIT_FCX01	BPV_CONTROL_M	BPV_CONTROL - BLOCK MODE	CAS	15	NORMAL	☑	4	
16/09/2011 4:01:20 PM (593)	INST_FCX01	UNIT_FCX01	FLOW_SET_MA_TSW	FLOW_SET_MAN - TRACKING SWITCH	TRUE	15	NORMAL	☑	1	
16/09/2011 4:01:20 PM (593)	INST_FCX01	UNIT_FCX01	FLOW_SET_MA_M	FLOW_SET_MAN - BLOCK MODE	TRK(MAN)	15	NORMAL	☑	10	
16/09/2011 4:01:20 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL	VSD_DRIVE - ALARM STATUS	NORMAL	15	NORMAL	☐	8388608	
16/09/2011 4:00:55 PM (578)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT	VSD_DRIVE - BLOCK STATUS	LOW	2	ALARM	☐	16384	
16/09/2011 4:00:55 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL	VSD_DRIVE - ALARM STATUS	VEL+	3	ALARM	☐	128	
16/09/2011 4:00:50 PM (546)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT	VSD_DRIVE - BLOCK STATUS	UNK	3	ALARM	☐	-2147483648	
16/09/2011 4:00:40 PM (484)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_M	VSD_DRIVE - BLOCK MODE	MAN	15	NORMAL	☑	1	
16/09/2011 4:00:40 PM (484)	INST_FCX01	UNIT_FCX01	BPV_CONTROL_M	BPV_CONTROL - BLOCK MODE	MAN	15	NORMAL	☑	1	
16/09/2011 4:00:40 PM (484)	INST_FCX01	UNIT_FCX01	FLOW_SET_MA_TSW	FLOW_SET_MAN - TRACKING SWITCH	FALSE	15	NORMAL	☑	0	
16/09/2011 4:00:40 PM (484)	INST_FCX01	UNIT_FCX01	FLOW_SET_MA_M	FLOW_SET_MAN - BLOCK MODE	MAN	15	NORMAL	☑	1	
16/09/2011 3:59:02 PM (515)	INST_FCX01	UNIT_FCX01	VSD_TRIP_ALM	VSD Trip Alarm	HIGH	1	ALARM	☐	1	
16/09/2011 3:58:55 PM (578)	INST_FCX01	UNIT_FCX01	FLOWCTRL1_M	FLOWCTRL1 - BLOCK MODE	MAN	15	NORMAL	☑	1	
16/09/2011 3:58:55 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL	VSD_DRIVE - ALARM STATUS	NORMAL	15	NORMAL	☐	8388608	
16/09/2011 3:58:35 PM (546)	INST_FCX01	UNIT_FCX01	WS_ALM	Wind Speed greater than MAX2	FALSE	15	NORMAL	☐	0	
16/09/2011 3:58:32 PM (484)	INST_FCX01	UNIT_FCX01	WS_ALM2		FALSE	15	NORMAL	☐	0	
16/09/2011 3:58:08 PM (531)	INST_FCX01	UNIT_FCX01	WS_ALM2		HIGH	1	ALARM	☐	1	
16/09/2011 3:57:50 PM (578)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT	VSD_DRIVE - BLOCK STATUS	LOW	2	ALARM	☐	16384	
16/09/2011 3:57:50 PM (531)	INST_FCX01	UNIT_FCX01	WS_ALM2		FALSE	15	NORMAL	☐	0	
16/09/2011 3:57:50 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL	VSD_DRIVE - ALARM STATUS	VEL-	3	ALARM	☐	64	
16/09/2011 3:57:45 PM (515)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT	VSD_DRIVE - BLOCK STATUS	UNK	3	ALARM	☐	-2147483648	
16/09/2011 3:57:11 PM (484)	INST_FCX01	UNIT_FCX01	WS_ALM2		HIGH	1	ALARM	☐	1	
16/09/2011 3:57:10 PM (515)	INST_FCX01	UNIT_FCX01	FLOWCTRL1_M	FLOWCTRL1 - BLOCK MODE	AUT	15	NORMAL	☑	2	
16/09/2011 3:57:10 PM (500)	INST_FCX01	UNIT_FCX01	TEMPCTRL1_M	TEMPCTRL1 - BLOCK MODE	IMAN(AUT)	3	ALARM	☑	9	
16/09/2011 3:57:05 PM (468)	INST_FCX01	UNIT_FCX01	WS_ALM	Wind Speed greater than MAX2	HIGH	1	ALARM	☐	1	
16/09/2011 3:55:45 PM (500)	INST_FCX01	UNIT_FCX01	FLOWCTRL1_M	FLOWCTRL1 - BLOCK MODE	CAS	15	NORMAL	☑	4	
16/09/2011 3:55:45 PM (500)	INST_FCX01	UNIT_FCX01	TEMPCTRL1_M	TEMPCTRL1 - BLOCK MODE	AUT	15	NORMAL	☑	2	
16/09/2011 3:54:31 PM (171)	HXS10	TROUGH001	ALMLAMP	ALARMLAMPS ON CONTROLLER	NORMAL	15	NORMAL	☑	0	
16/09/2011 3:54:31 PM (171)	HXS10	TROUGH001	P21	ALARM INDICATOR	NORMAL	15	NORMAL	☑	0	
16/09/2011 3:54:15 PM (562)	INST_FCX01	UNIT_FCX01	FLOWCTRL1_M	FLOWCTRL1 - BLOCK MODE	AUT	15	NORMAL	☑	2	
16/09/2011 3:51:45 PM (515)	INST_FCX01	UNIT_FCX01	FLOWCTRL1_M	FLOWCTRL1 - BLOCK MODE	MAN	15	NORMAL	☑	1	
16/09/2011 3:51:40 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL	VSD_DRIVE - ALARM STATUS	NORMAL	15	NORMAL	☐	8388608	
16/09/2011 3:51:10 PM (515)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT	VSD_DRIVE - BLOCK STATUS	LOW	2	ALARM	☐	16384	
16/09/2011 3:51:10 PM	INST_FCX01	UNIT_FCX01	VSD_DRIVE_AL	VSD_DRIVE - ALARM STATUS	VEL-	3	ALARM	☐	64	
16/09/2011 3:51:05 PM (468)	INST_FCX01	UNIT_FCX01	VSD_DRIVE_BT	VSD_DRIVE - BLOCK STATUS	UNK	3	ALARM	☐	-2147483648	
16/09/2011 3:50:20 PM (562)	INST_FCX01	UNIT_FCX01	FLOWCTRL1_M	FLOWCTRL1 - BLOCK MODE	AUT	15	NORMAL	☑	2	
16/09/2011 3:49:39 PM	HXS10	TROUGH002	COMMS_AL	Comms Alarm for Trough 2	TRUE	15	NORMAL	☐	1	
16/09/2011 3:49:38 PM	HXS10	TROUGH002	COMMS_AL	Comms Alarm for Trough 2	HIGH	1	ALARM	☐	0	
16/09/2011 3:48:56 PM	HXS10	TROUGH002	COMMS_AL	Comms Alarm for Trough 2	TRUE	15	NORMAL	☐	1	
16/09/2011 3:48:56 PM	HXS10	TROUGH003	COMMS_AL	Comms Alarm for Trough 3	TRUE	15	NORMAL	☐	1	
16/09/2011 3:48:56 PM	HXS10	TROUGH004	COMMS_AL	Comms Alarm for Trough 4	TRUE	15	NORMAL	☐	1	
16/09/2011 3:48:06 PM (125)	HXS10	TROUGH001	ALMLAMP	ALARMLAMPS ON CONTROLLER	HIGH HIGH	1	ALARM	☐	1	
16/09/2011 3:48:06 PM (125)	HXS10	TROUGH001	P21	ALARM INDICATOR	overranged	0	ALARM	☐	128	
16/09/2011 3:48:05 PM	STATIONS	COMMUNICATION	FCX01_TCP1	TCP1 status	FCX01 TCP1 status OK	15	NORMAL	☐	1	
16/09/2011 3:48:05 PM	HXS10	TROUGH001	COMMS_AL	Comms Alarm for Trough 1	TRUE	15	NORMAL	☐	1	
16/09/2011 7:44:13 AM	HXS10	TROUGH001	COMMS_AL	Comms Alarm for Trough 1	HIGH	1	ALARM	☐	0	

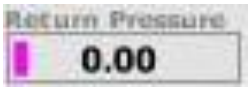
Item description	Alarm Text	Priority	Alarm Type	Acknowledged	Value	Eng Units
VSD_DRIVE - ALARM STATUS	NORMAL	15	NORMAL	☐	8388608	
VSD_DRIVE - BLOCK STATUS	LOW	2	ALARM	☐	16384	
VSD Trip Alarm	HIGH	1	ALARM	☐	1	

5.5 Loss of communications Display

Should communications be lost between the SCADA PC and the Solar Field and PLC then the SCADA screen will be displayed as follows:



Loss of communications to a Solar Element: A pink overview will be shown on each element for which communications is lost. The above screen shos shows a communications loss to all solar collectors.



If communications is lost to sensors then the particular element will display a pink status bar beside the parameter.

A faceplate pop-up would display a pink status icon and “OFFLINE” in the status bar.

If an offline solar element is selected, then the following display would be seen.

Once communications is re-established the normal display will be activated.

6 MAINTENANCE PROCEDURES

6.1 General

The Maintenance procedures below are provided to assist competent and authorised personnel to operate and maintain the Solar Thermal TriGen System installed in the building.

Any person operating or maintaining this installation must be authorised to do so and be properly trained and competent. This is to ensure proper operation of the System(s), and the health and safety of the building occupants, maintenance personnel, the general public and the environment.

Operation and maintenance of the installation is to be in accordance with the requirements of the Building Code of Australia., The Public Health Act, and the Occupational Health and Safety Act.

It is the responsibility of the Building Owner to ensure the operation and maintenance of the installation meets Code and Regulatory Authorities requirements. The building owner should request that any contractor employed for the operation and maintenance of the installation provide certification that the operation and maintenance is in accordance with Code and Regulatory Authority requirements, and that qualified licensed personnel have carried out the operation and maintenance.

6.2 Subcontractor Maintenance Contacts (During Defects Liability Period - DLP)

Description	Subcon/ Supplier	Address	Contact	Phone	Fax
Solar TriGen System	NEP Solar	20 / 14 Jubilee Avenue Warriewood NSW 2102	Johan Dreyer	+61 2 9998 4700 +61 417 894 672	

6.3 Solar Collectors

The solar collectors form part of the Nilsen Operation and Maintenance Manual, but included here for ease of reference:
Maintenance Manual
Concentrating Solar Thermal Collectors
UTS Broadway
NEP Solar

Maintenance Manual

Concentrating Solar Thermal Collectors

UTS Broadway

NEP Solar

6.4 Pink Chiller

Refer to section “Maintenance” on Page 26 of PinkChiller PC19 Operating Instructions in Section 9.1.

6.5 ORC

Refer to section “5 Maintenance” on Page 42 of ORC User Manual in Section 9.2.

6.6 Plate Heat Exchangers

Refer to section “Maintenance” on Page 11 of Alpha Laval Instruction Maual Plate Heat Exchangers in Section 9.3

6.7 Pumps

Refer to section “19. Maintenance and service” on Page 29 of Grundfos Installation and Operating Instructions in Section 9.5

6.8 Bypass Valves

The bypass valves and actuators are maintenance free. Refer to Samson Mounting and Operating Instructions in Section 9.6

6.9 Flow and Pressure Sensors

Refer section “10 Maintenance” of sensors Users’ Manuals in Section 9.7

7 MAINTENANCE SCHEDULES

Device / Maintenance Task	Procedure Reference	Frequency					
		Daily	Weekly	Mthly	3 Mth	6 Mth	Yearly
1 Water quality							✓
2 Leaks				✓			
3 DB and Switchboards							✓
4 Pumps	As per Section 6.7				✓		
5 ORC	As per Section 6.5					✓	
6 Chiller	As per Section 6.4			✓			
7 Solar Collector	As per Section 6.3			✓			

8 CLEANING & TROUBLE SHOOTING

8.1 General

This Section of the manual outlines some common problems and troubleshooting techniques. Most other problems will require trained service personnel to identify the problem and carry out the repair, please call for service.

8.2 Alarm Input

The Solar TriGen Control PC is set up with a SCADA system which monitors all the equipment in the system. When any fault occurs in the TriGen system an alarm is generated in the PLC and recorded on the SCADA. An alarm is sent to the BMS via digital output (low level).

Problem	Recommended Action
BMS Alarm notification	➢ Log onto the Solar TriGen Control PC ➢ Look at current alarms ➢ Refer to Section 5.4 ➢ Clear fault as appropriate ➢ Acknowledge Alarm in SCADA ➢ Call Service if necessary

8.3 Cleaning

Please refer to Maintenance Schedules Section 7 for the cleaning frequency of the solar collectors.
There are no specific cleaning methods for the equipment in the plant room.

Cleaning methods for the solar collector are outlined in the
Maintenance Manual
Concentrating Solar Thermal Collectors
UTS Broadway
NEP Solar as per Section 6.3

9 MANUFACTURERS DATA

9.1 Chiller

Refer to:
PinkChiller PC19
19 kWc absorption chiller
Ammonia/water based absorption chiller
Operating instructions / Installation manual
Version 1.1-E / June 2012

PinkChiller PC19
19 kW_c absorption chiller

Ammonia/water based absorption chiller

Operating instructions / Installation manual

Table of Contents

Specification

Product specifications			
Type classification		PinkChiller PC19	
Generation		5.4	
Technology		single-effect ammonia–water absorption chiller	
Sorbent / Refrigerant		Water / Ammonia	
Cooling capacity	kW	19,0	
Dimensions			
Width / Depth / Height	m	0,8 (1,05) / 0,6 / 1,95	
Total volume	m³	1,0	
Total weight (working solution incl.)	kg	ca. 440	
Operating weight (working solution incl.)	kg	ca. 490	
Filling quantities			
Sorbent (Water)	kg	15,0	
Refrigerant (Ammonia)	kg	19,0	
Cold water cycle		**Cooling ceiling**	**Fan-Coil**
Cooling capacity	kW	19,5	18,6
Temperature in	℃	18,0	12,0
Temperature out	℃	15,0	6,0
Mass flow rate	kg/h	5603	2672
Pressure drop	mbar / kPa	app. 450 / app. 45	app. 300 / app. 30
Max. allowable operating pressure PS	bar	4,0	
Allowable operating temperature	℃	-10 to +20	
Water capacity	Liter	20,0	
Hot water cycle		**Cooling ceiling**	**Fan-Coil**
Heating capacity	kW	27,0	30,0
Temperature in	℃	75,0	85,0
Temperature out	℃	68,0	78,0
Mass flow rate	kg/h	3325	3695
Pressure drop	mbar / kPa	app. 600 / app. 60	app. 600 / app. 60
Max. allowable operating pressure PS	bar	4,0	
Allowable operating temperature	℃	+65 to +110℃	
Water capacity	Liter	1,5	
Recooling cycle (wet cooling tower)		**Cooling ceiling**	**Fan-Coil**
Heating capacity	kW	49,0	
Temperature in	℃	24,0	
Temperature out	℃	30,0	
Mass flow rate	kg/h	7040	
Pressure drop	mbar / kPa	app. 850 / app. 85	
Max. allowable operating pressure PS	bar	4,0	
Allowable operating temperature	℃	+20 bis +35	
Water capacity	Liter	25,0	
Hydraulic connections			
Cold water cycle	"	1" internal thread	
Hot water cycle	"	1" internal thread	
Recooling cycle	"	6/4" internal thread	
Electrical Input			
Voltage	V	230V / ~1 Ph 50 Hz	
Power	W	app. 450	

Table 1: Specification

General Instructions

Foreword

With this manual we give you and your employees the information in hand, which makes the dealing with the newly purchased absorption chiller easier. Always keep in mind our safety- and hazard warnings and observe the operating and maintenance-instructions and all relevant safety regulations. This is essential for the function and the safety of our supplied products.

Operate and maintain your system according to this manual. This will give this attention with a trouble-free operation and high availability. For these operating instructions we take the protection visa to DIN 34 in that the disclosure of its contents to third parties is not permitted.

Wording in accordance with DIN 34:

Due to improvements and changes the illustrations in this manual can sometimes depart from the model used by you.

Caution:

This instruction manual and the safety- and hazard warnings should be read and understood before initial start up of the machine.

Warnings and Symbols

Danger:

This safety symbol indicates danger to life and limb. This arises mainly from disregarding references labelled with this symbol.
Therefore these references, the general safety- and hazard warnings and the relevant safety regulations must be strictly observed.
In this manual we have specially marked all the points that concern with your security. Pass all safety instructions to other users.

Caution:

This symbol indicates, that
- instructions
- regulations
- directions
- workflows

must be observed.

Disregarding them may result in
- damage
- destruction

of the machine.

Advice:

This symbol indicates user advice, which

- is useful for the further understanding of these operating instructions
- makes dealing with the product easier.

Safety and Hazards

General Instructions

This machine is a complex unit using state-of-the-art technology. Due to its complexity improper handling and use, particularly when

- being operated by inadequately trained personnel,
- employed in non intended or designed situations,
- not complying with these manual instructions,

danger to life and limb can arise for the operator or a third party or damage to the machinery and other material assets.
The machine is only to be used in the condition for which it was designed and in compliance with the safety- and hazard-instructions and the operating manual. Defects, which affect operation or safety of the machine, must be immediately remedied by an expert.

Intended use

Intended use in the meaning of the standard is that use, for which the technical product by the manufacturer - includes information for the purpose of advertising - is suited. In case of doubt it is such a usage that might arise from the design, implementation and operation of the technical product than usual.

To maintain the operation, the machine can only be used for the "Normal use" according to DIN 31000 / VDE 0100.

In the case of the PinkChiller PC19 its Normal Use is only for the production of chilled water for air-conditioning of buildings or cooling of processes.
The technical performance data in accordance with operation instructions must not be exceeded (see Table 1).

The use for other tasks is not intended. For all consequential damage due to other uses the company Pink GmbH cannot be held liable. Accordingly the operator assumes all risks for not intended or improper uses.

The intended use also includes:

- following the advice of the instruction manual
- using the operating and auxiliary materials under applicable safety regulations
- compliance with the operating- and maintenance-conditions (Inspections ans Servicing)
- the consideration of predictable misconduct.

Warranty and Liability

Warranty and liability claims for personal injury and property damage are particularly excluded, if they refer to one or more of the following causes:

- not intended or improper use of the machine
- improper assembling, commissioning, operation and maintenance of the machine
- operation with damaged safety equipment or not properly mounted or not operative safety and protection devices
- failure to comply with the advices in the operating instructions for assembling, commissioning, operation and maintenance of the machine

- structural changes in the machine
- repairs carried out improperly
- civil cases by foreign object damage and force majeure

Build modifications or other modifications to the machine are not permitted without the written authorisation of "Pink GmbH". Failure to comply with this requirement will result in the machine losing its EC-Declaration of Conformity.
Use only original spare parts which comply with the established technical requirements as defined by "Pink GmbH".

Basic safety and hazard warnings

Informal security measures

The construction and factory acceptance were made in accordance with the state-of-the-art for technology, ensuring safe operation at that point of time. The relevant provisions for periodic examination must be observed to ensure continued safe and hazard free operation.

The operating manual should be kept constantly at the place of the machine. All safety and hazard warnings on the machine must be kept in a readable condition.

While operating, servicing, maintaining and cleaning the machine all the relevant accident prevention regulations have to be observed.

Caution:

The safety and all the special hazard warnings for the machine must be read carefully prior to commissioning. Safety warnings and safety regulations must always be respected to avoid danger to life and limb, to health and to property.

Facilities for noise insulation

The facilities for noise insulation must be appropriated on the machine during operation.

Operating personnel / Operation manual

Everyone, who works at the machine, must have read the operation instructions and know and respect its contents.
The operating manager is obligated, to teach his staff based on the operating manual with the obligation, that all rules and instructions have to be observed.

Control system of the Machine

Only trained personnel are permitted to operate the control system of the machine.

Moisture, humidity and frost

The machine is designed for outdoor installation under an appropriate flying roof. All the electrical parts are protected adequately from moisture, humidity and dust by the construction. This requires the proper assembly and installation of the machines in multi-component delivery.
The liquids contained in the machine are frost-proofed. If there is a danger of frost, the parts of the machine connected to the hydraulic system (hot water, cold water, cooling water) must be completely emptied and blown out or filled with appropriate antifreeze admixture.

Danger:

Improper installation can cause failure of important functions, such as Safety systems. Consequently people and equipment parts can be damaged.

Ice in the hydraulic system (hot water, cold water, cooling water) can lead to the bursting or rupturing of pipes and especially of the plate heat exchangers, which can result in a leak of the working solution or the refrigerant from the machine or into the hydraulic system!

Technical Specifications

The technical performance data in accordance with operation instructions must not be exceeded (see Table 1).
Please consider, the machine cannot be used in any combination of hot- / cold- / cooling-water!

Maintenance and servicing

Required maintenance and inspection operating has to be done within the prescribed time limit. While all maintenance and inspection activities are beeing carried out the machine has to be switched OFF and the main switch has to be protected against unexpected switching ON.

The work is only permitted by qualified staff and in compliance with all the safety instructions.

To carry out maintenance and servicing activities proper workshop equipment is essential!

Packaging material

The packaging materials used for transport and protection of the machine mainly consists of the following substances, which have the potential for recycling:

- Corrugated paper / cardboard
- Polyethylene foil (transparent)
- Untreated wood

Do not place the packaging in general waste, but check with the waste disposal centre in your community or city administration, where this packaging can be recycled in an environmentally friendly manner.

Danger:

Keep packaging material out of reach of children!

Waste disposal of the machine

Machines, which have been out of operation for a long time or are decommissioned, still contain valuable materials. Do not dump the machine to waste, but check with the waste disposal centre in your community or city administration, where the machine parts can be delivered or if there are possibilities for recycling.

Danger:

Consider a proper disposal for the filled oil, working solution (water/ammonia) and the refrigerant ammonia.

Structural changes in the machine

Modifications or reconstruction to the machine are not permitted without the written authorisation of "Pink GmbH". Failure to comply with this requirement will result in the machine losing its EC-Declaration of Conformity. This also applies to the welding of supporting parts.

Use only original spare parts which comply with the established technical requirements as defined by "Pink GmbH".

Dangers posed by electrical energy

Danger:

Before opening the electric control box the main switch has to be switched OFF and has to be protected against unexpected switching on, or alternatively the power connector must be pulled out.

Electrical components and stationary electrical equipment have to be examined by an electrical professional at least every four years.

The switchbox and the electrical equipment are manufactured and tested according to VDE requirements.

Any subsequent work carried out on the switchbox and any electrical equipment or components have to be completed in accordance with the VDE requirements. Such work can only be completed by a qualified electrician.

The function of the safety equipment of the machine has to be examined regularly.

Use only fuses with a specification equivalent to the original.

Consider the accident prevention regulations of the Accident Prevention & Insurance Association.

Dangers by moving parts of the solution pump

Danger:

Before any work at the machine the main switch has to be switched OFF and has to be protected against unexpected switching on, or the power connector must be pulled off.
There is a risk of injury from the moving parts of the solution pump which can spontaneously start!

Dangers by the working solution ammonia / water

Danger:

The working solution of the machine is a 50% ammonia / water mixture.
- Toxic by inhalation
- Causes burns
- Very toxic to aquatic organisms

Please note the relevant safety data sheet.

The solution is in a closed circuit. Workings on the solution cycle can only be done by qualified employees with appropriate protective equipment.

General

Thermally driven cooling

Thermally driven chillers such as the absorption chiller "PinkChiller PC19" do have several positive properties:

- Use of renewable energy sources (biomass, Solar thermal,…) or waste heat (out of processes or CHP-units)
- Reduction of operating costs for the cold production due to low power consumption
- Reduction of electrical power input and the peak electricity demand
- Discharge of electricity networks
- Increased independence from energy suppliers
- Reduction of primary energy demand
- Reduction in CO_2 emissions
- Extending the running hours of CHP-units
- Reducing the use of harmful refrigerants

Description of the system

A complete thermally driven cooling system consists of three hydraulic cycles:

- Hot-water-cycle or driving-cycle (HT): feeding the absorption chiller with hot water (f.ex. biomass, solar thermal, waste heat,…)
- Cold-water-cycle (LT): cold-usage (extracting heat out of rooms or processes by using cold ceilings, fan-coils, heat-exchangers,…)
- Reecooling- or heat-rejection-cycle (MT): rejection of the heat on medium temperature level to the ambient or other heat sinks (recooler, swimming-pool,…)

Functional block diagram of a thermally driven cooling system:

Description of the Process

Absorption chillers use heat instead of mechanical energy to provide cooling. The mechanical vapour compressor is replaced by a continuously working thermal compressor, which consists of an absorber, a generator, a pump, and a throttling device. The basic operation of the thermal compressor of an ammonia-water chiller cycle is as follows: Heat from an adequate heat source (65 ... 100 ° C) is applied to the generator, which contains a solution of ammonia water, rich in ammonia. The heat causes high pressure ammonia vapour to desorb from the solution. The high pressure ammonia vapour flows to a condenser, typically cooled by a water cooling system (25 ... 30° C). The ammonia vapour condenses into a high pressure liquid, releasing heat into the recooling water cycle.

The high pressure ammonia liquid goes through a restriction to the low pressure side of the cycle. This liquid, at low pressures, boils or evaporates in the evaporator. This process provides the cooling or refrigeration product. The low pressure vapour flows to the absorber, which contains a water-rich solution obtained from the generator. This solution absorbs the ammonia while releasing the heat of absorption. This heat can be used as product heat or for internal heat recovery in other parts of the cycle, thus unloading the burner and increasing cycle efficiency. The solution in the absorber, now once again rich in ammonia, is pumped to the generator, where it is ready to repeat the cycle.
Due to the usage of the working-solution water/ammonia a wide range of cold-water-temperatures - even below zero - can be produced.

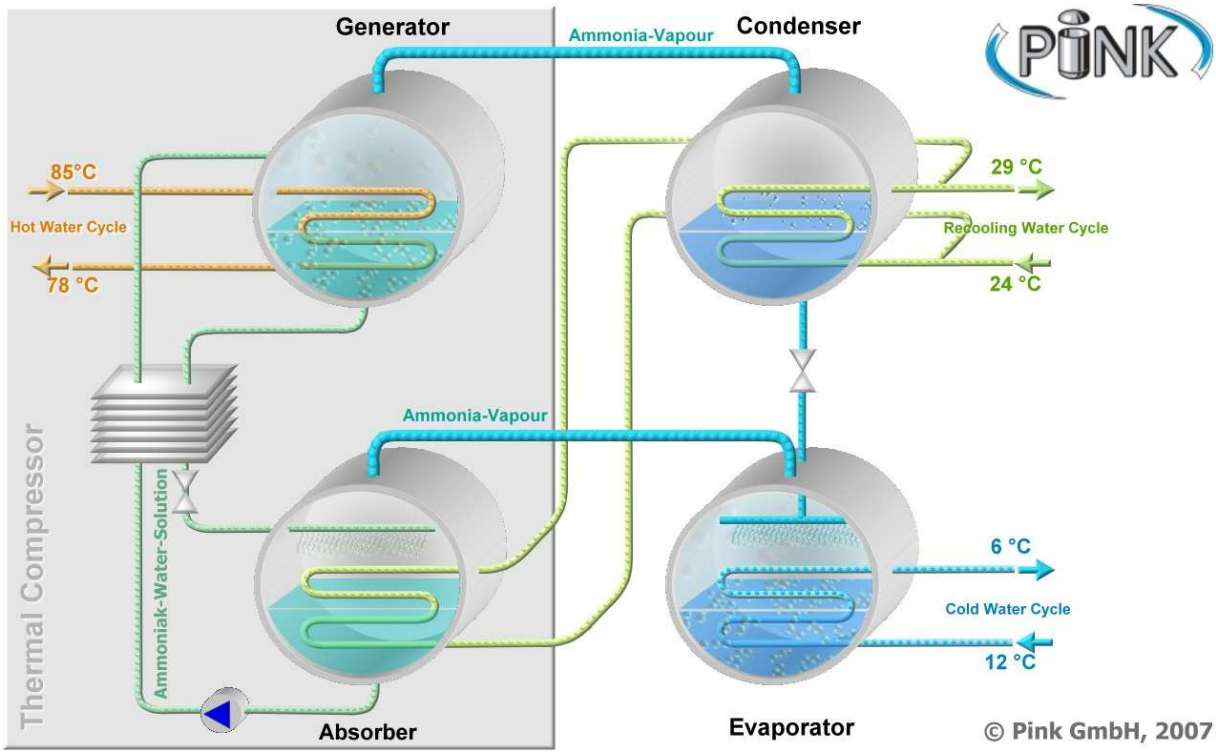


Figure 1: Basic principle of an absorption cooling machine

Performance

The Coefficient of Performance (COP) for a thermally driven ammonia/water chiller is defined as the refrigeration effect divided by the heat input.

$$\text{Coefficient of Performance (COP)} = \frac{\text{Refrigeration Effect}}{\text{Heat Input}}$$

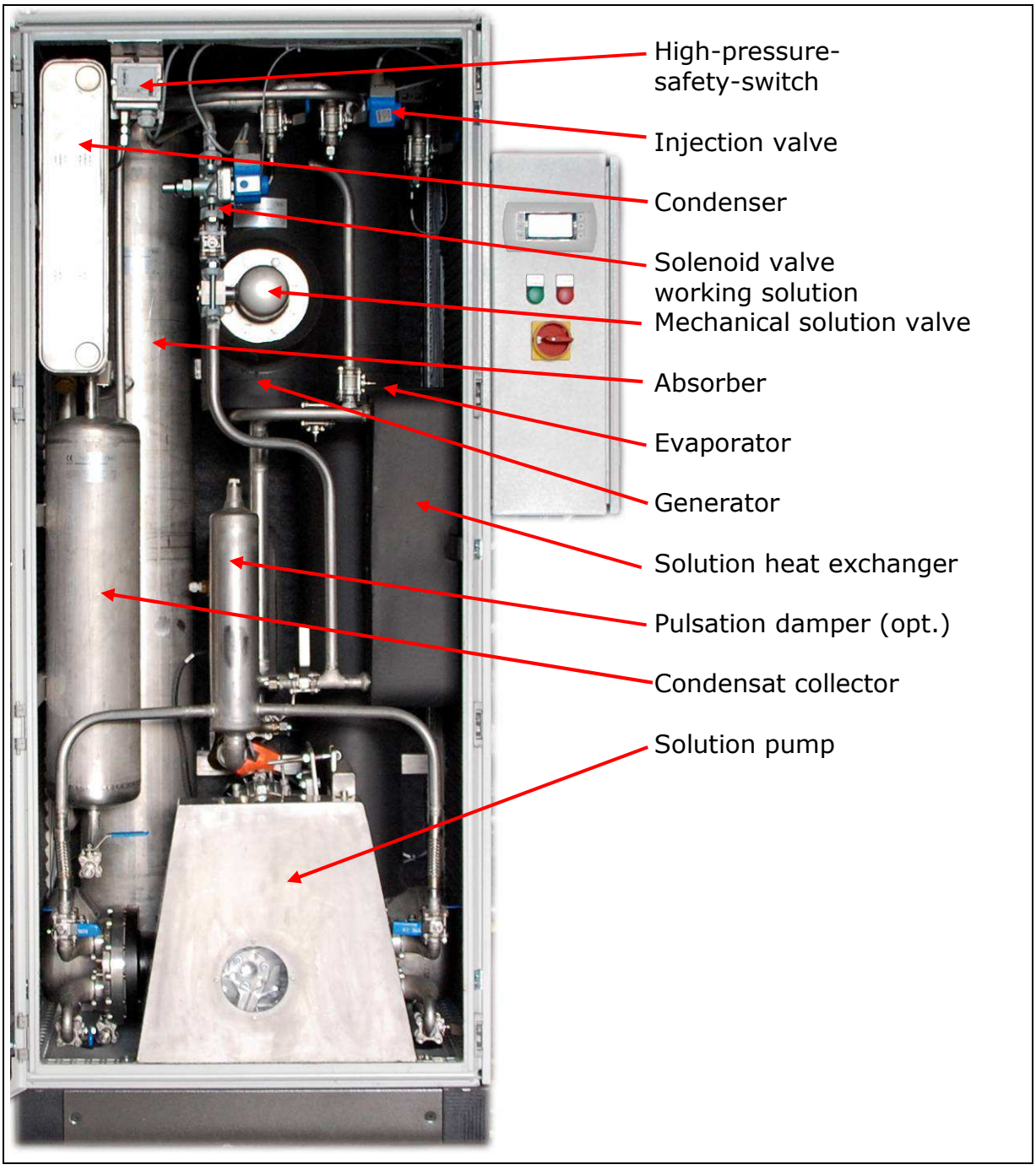
Primary depending on the temperature-levels in the three hydraulic cycles the COP of the PinkChiller PC19 is in the range of 0,5 and below (cold-water-production below 0°C), between 0,55 and 0,65 (cold-water-production 6°C) or between 0,65 and 0,75 (cold-water-production above 10°C).

Description of the machine-components

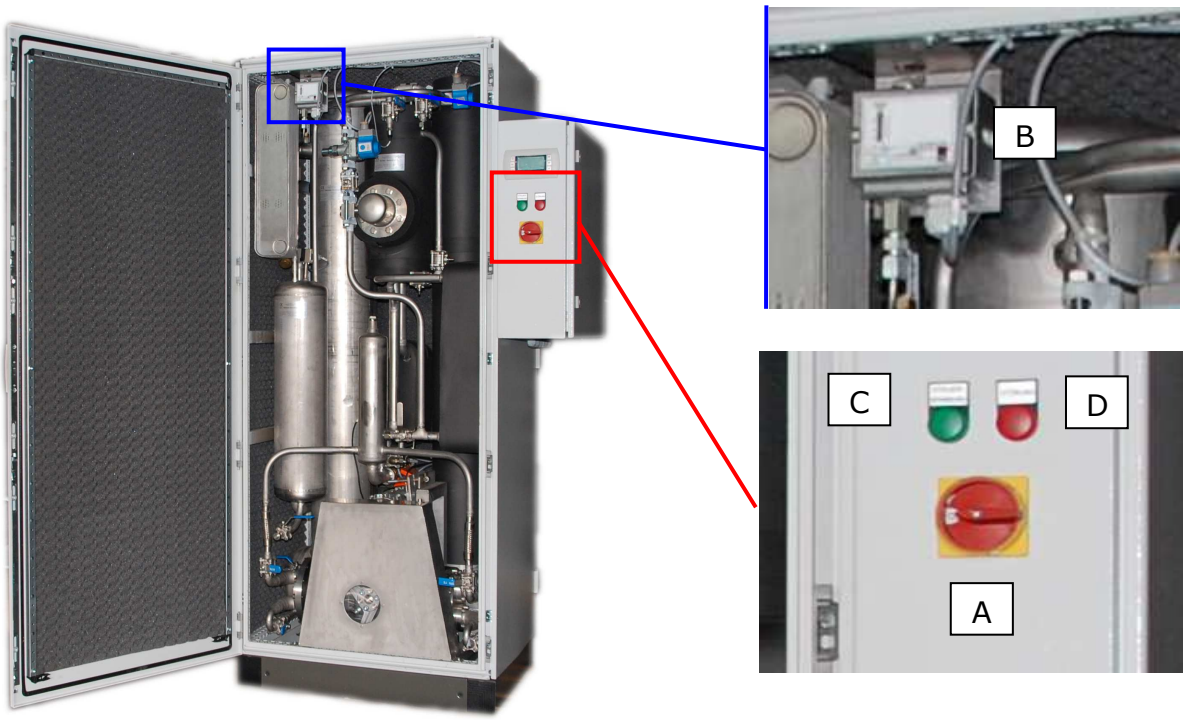
Front view from outside

Figure 2: Components of the absorption chiller PC19

Front view inside



Description of the operating- and display elements



[A] **Main switch**
Use the main switch for turning the machine ON and OFF. In ON-mode the machine is ready to be activated by the controller. The main switch is also the security cut-off-switch.

[B] **High-pressure-safety-switch**
This switch will turn off the machine by exceeding the maximum operating pressure of 20 bars. If this switch is released the red signal light [D] will be activated and the machine will stop immediately.

[C] **Stand-by**
The white signal light shows the stand-by-status of the machine, indicating voltage at the controller. It will be active after connecting the machine to the grid and after switching on the machine by the main switch [A].

[D] **Fault**
The red signal light indicates the release of the high-pressure-saftey-switch [B].

Preparations for the initial start up

Transport and packaging

After the machine's arrival at the customer all components need to be inspected for transport damage.

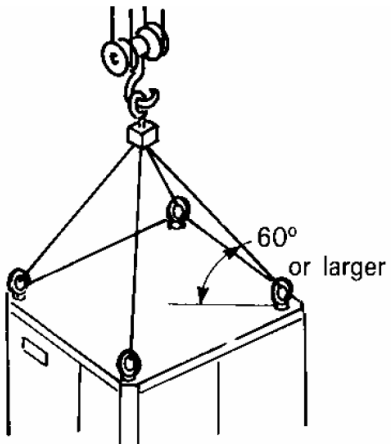
Any damages must be reported the relevant bodies immediately, for example:

For damage evident in the external packaging:
- Forwarding or Transport Company
- Railway Authority

For damage evident once packaging is removed
- Company "Pink GmbH"

The absorption chiller is delivered filled with working solution water/ammonia and in upright position.

To move the machine please use following possibilities:
- Lift the machine at the 4 ring-screws at the top



- Move the machine by a manual or motor driven fork lift

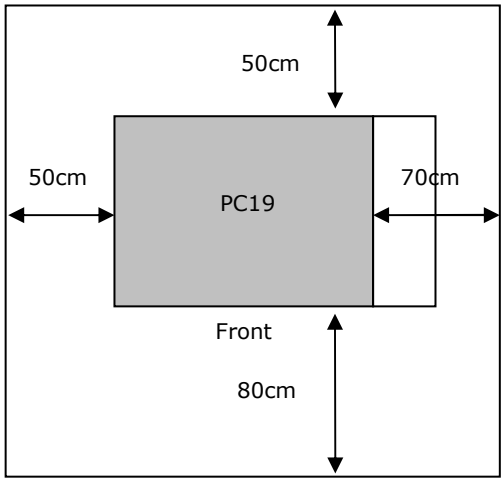
The machine must be placed on a horizontal, flat surface. The vertical position of the machine must be checked with a spirit level. The levelling can be done with the height adjustable feet on the lower frame of the machine. If necessary, the supported plastic plates can be snapped on to the ball joint of the variable feet.

Danger:

Consider national regulations regarding
- Suitable places of installation
- Regulations regarding mechanical ventilating equipment

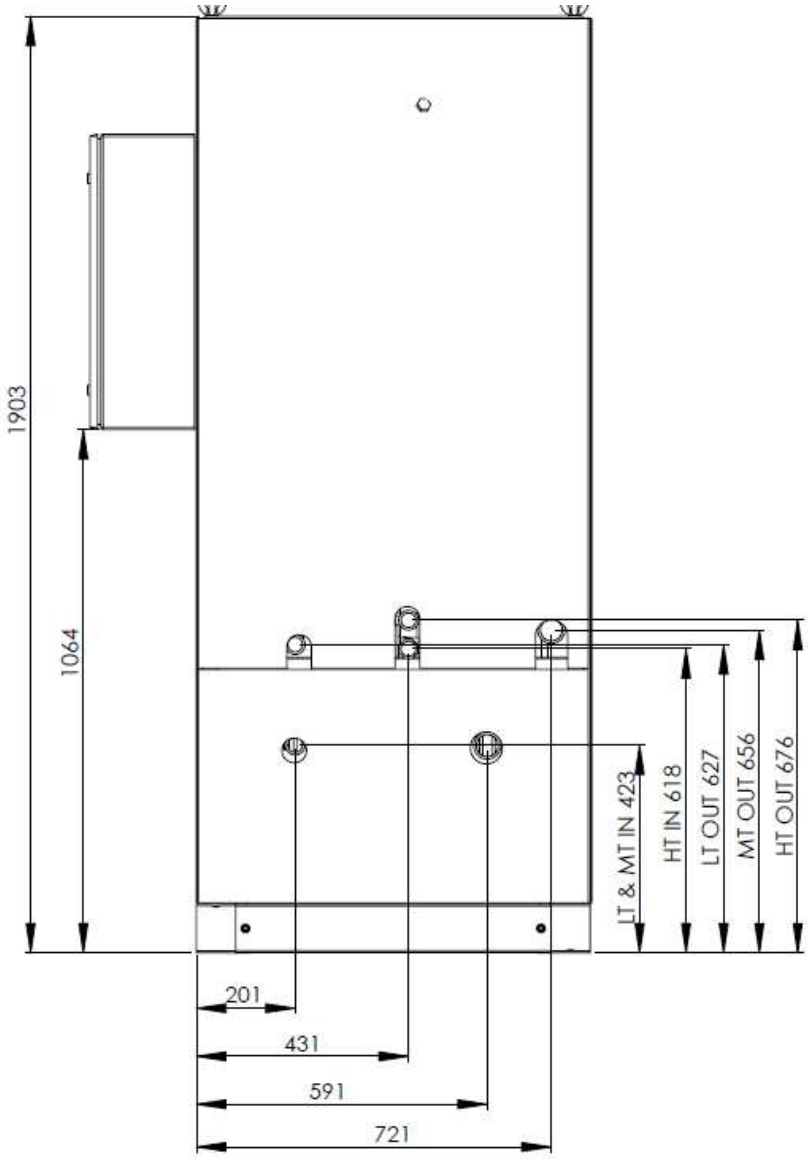
Caution:

Provide a minimum maintenance clearance like shown in the sketch below:



Hydraulic connections

The connectors for hot water are easily accessible on the rear of the machine.



All pumps within these circuits must be able to provide the required flow rates (see Table 1).

Pressure drops

The pressure drops of the three cycles are indicated in table 1 and in the pressure-drop-diagram.

Water quality - general

Water used in the chilled-hot water circuit and cooling water circuit may cause corrosion if not properly analyzed and treated to maintain a passive condition. The cooling water circuit is particularly vulnerable since in most cases, this is an open circuit thus lending itself to scaling from precipitation of dissolved solids, and to growth of algae and micro-organisms in the water. All have a detrimental effect on the function of rejecting heat. If left unchecked, moreover, performance of the chiller will be affected and a significant reduction in life expectancy could result. It is equally important to consider that extreme health hazards may attend badly maintained cooling towers.
Correct and continuous water treatment is thus essential to the correct operation of the chiller. Failure to provide and maintain in operation the necessary apparatus for water treatment will immediately void the warranty applying to the absorption machine.

Water Quality Limits

The following table describes the maximum limits of water contaminates within the circuits of the chiller-heater. Make-up water, exhibiting total dissolved solids no greater than 50ppm, with substantial "bleed-off", would be necessary to achieve this result in the cooling water circuit.

If such water quality in supply is not available under all circumstances, chemical treatment is required to combat scaling. Chemicals to combat algae and microorganisms are in any event necessary. It is highly recommended that water treatment specialists be retained prior to the initial commissioning of the plant and to provide an ongoing program of chemicals and periodic inspections to ensure that the cooling water circuit remains safe and compatible throughout.

Item			Cooling Water	Chilled-Hot Water
Standard Items	pH	At 25°C	6.5 ~ 8.2	6.8 ~ 8
	Conductivity	mS/m at 25°C	80 or less	40 or less
		µS/cm at 25°C	800 or less	400 or less
	Chloride ion	mg Cl^- / *l*	200 or less	50 or less
	Sulfate ion	mg SO_4^{2-} / *l*	200 or less	50 or less
	Acid consumption (pH4.8)	mg $CaCO_3$ / *l*	100 or less	50 or less
	Total hardness	mg $CaCO_3$ / *l*	200 or less	70 or less
	Calcium hardness	mg $CaCO_3$ / *l*	150 or less	50 or less
	Ionic silica	mg SiO_2 / *l*	50 or less	30 or less
Reference Items	Iron	mg Fe / *l*	1.0 or less	0.3 or less
	Copper	mg Cu / *l*	0.3 or less	0.1 or less
	Sulfide ion	mg S^{2-} / *l*	None detectable	None detectable
	Ammonium ion	mg NH_4^+ / *l*	1.0 or less	0.1 or less
	Residual chlorine	mg Cl / *l*	0.3 or less	0.3 or less
	Free carbon dioxide	mg CO_2 / *l*	4.0 or less	4.0 or less
	Ryzner stability index		6.0 ~ 7.0	-

Hydraulic scheme

The absorption chiller must be implemented in a hydraulic scheme approved by your distributor!

Caution:

Unsuitable hydraulic environments can cause damage to the machine!

Caution:

Be sure the threaded connections of the cooling water cycle inside the machine are securely tightened. Furthermore, check the plate heat exchangers are screwed to the piping correctly. Water leaking out of poor connections could damage parts of the machine!

Make sure the two inserted dirt traps in the hot-water and cooling-water-cycle are free of foreign objects to ensure full flow. Reduced flow due to clogged dirt traps will cause the machine function poorly.

Check all screwed connections of the solution cycle!

Electric connections

Please follow the separate wiring diagram!

Power supply

The power supply should be done by a cable with 230V, 50Hz, 1~.

Initial start up

Caution:

The initial start up must be done by a certified company!

Clear oil must be visible in the transparent filler of the working solution pump. If not, oil (type SAE 10W40) must be refilled until the level is visible at the bottom of the filler.

Check the tension of the V-belts. It should be possible, to twist the belt by 90 ° in the central area using thumb and index finger with reasonable strength. If necessary, the tension of the V-belts can be adjusted by altering the clamping device of the working solution pump.

Danger:

Before any work at the machine commences, the main switch has to be switched OFF and has to be protected against unexpected switch on, or alternatively the power connector must be pulled off.

There is a risk of injury from the moving parts of the solution pump that could spontaneously start!

Maintenance

The absorption chiller PinkChiller PC19 is characterized by its robust, low-maintenance design. To ensure a long, trouble free, operation the following inspections and maintenance activities have to be carried out:

Item	Activity	Interval	Person
Piping, Vessels, solution pump	Optical check regarding tightness	Every 200 working hours or monthly	Customer
Solution pump	Optical check regarding oil filling, oil colour, V-belt-tension	Every 600 working hours or every 3 months	Customer
Solution pump	Refill oil SAE10W40	When necessary – check reason of oil leakage and call distributor!	Installer
Solution pump	Change membrane	Every 2000 working hours or 3 years	Service team of your reseller
Screwed connections	Check tightness	Yearly	Installer
Dirt traps in hot water cycle, recooling-water cycle	Clean	Yearly	Installer
Pressure switches	Check function	Yearly	Installer

Caution:

Consider local regulations regarding periodic checks according to the Pressure Equipment Directive!

Danger:

Before any work at the machine commences the main switch has to be switched OFF and has to be protected against unexpected switching on, or alternatively the power connector must be pulled out.
There is a risk of injury from the moving parts of the solution pump which can spontaneously start!

Troubles and troubleshooting

General

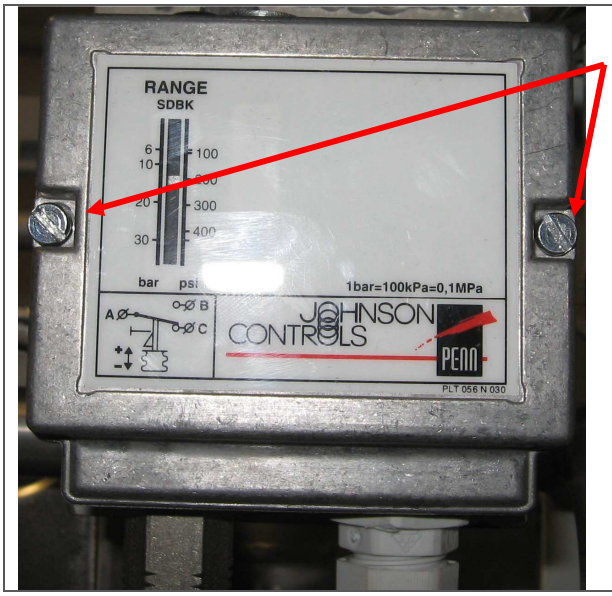
Trouble	Reason	Trouble shooting
Chiller does not start or stops	Plug not connected	Connect plug
	Main switch OFF	Switch main switch ON
	Low-pressure-switch activated	Check ambient conditions – switch will be deactivated at higher pressure due to higher ambient temperatures. If changing the setting of the low pressure switch be sure to fill with adequate brine (glycol filling)
	High–pressure-switch activated	Check recooling system (ventilator)
		Check recooling water pump
		Check and clean dirt trap
	Motor protection Working solution pump activated	Switch ON motor protection ,if it reoccurs again call distributor
Chiller stops, red light “Fault” is activated	High–pressure-safety-switch activated	Check recooling system (ventilator) and reset the safety switch
		Check recooling water pump and reset the safety switch
		Check and clean dirt trap and reset the safety switch
Deficient cooling power	Hot water temperature too low	Check heat source and hydraulic system
	Dirt trap in the hot water cycle clogged	Clean dirt trap
Ammonia smell	Leak	Deactivate machine, ensure good ventilation, avoid open fire and sparks, call distributor

Resetting the high-pressure-safety-switch

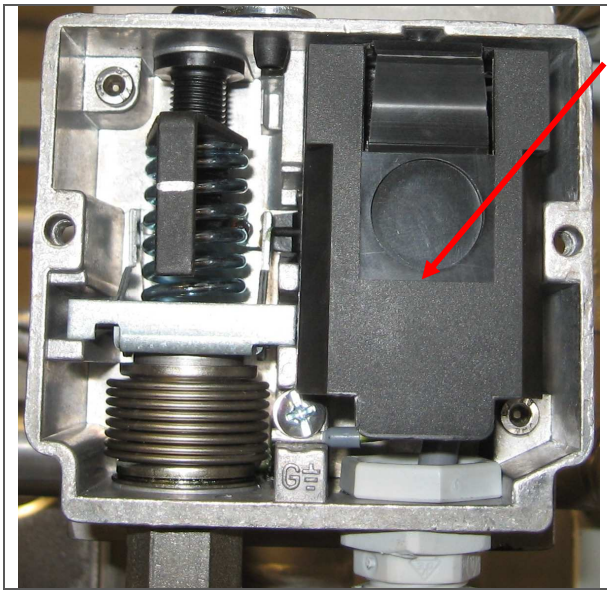
Danger:

If it's necessary to reset the high-pressure-safety-switch a fatal error must have previously occurred.

Be sure to remove the reason of the trouble first and allow the machine to cool down and decrease the pressure by at least 4 bar below release-pressure (20 bar) of the switch (20-4=16 bar).
To reset the high-pressure safety-switch it is necessary to open the case with a flat screwdriver.

	Open this two screws and remove the cover

After opening the cover press down the reset switch.

	Press down the black cover which operates the switch below.

Support

Manufacturer:

Pink GmbH

Bahnhofstrasse 22
A-8665 Langenwang

Tel.: +43 (3854) 3666
Fax: +43 (3854) 3666-40

e-mail: info@pink.co.at
Internet: www.pink.co.at

9.2 ORC

Refer to:

1- Installation Manual CLAZ-0002-Y v3.1
2- 2- User Manual_CLBZ-0003-Y v3.1
3- Enefcogen Green 10kW PA Control Panel

ENEFCO GEN GREEN

Combined production of heat and power

Installation manual

DUTY
Save this document for future consultation.

WARNING
Before working with the unit, users are advised to familiarise themselves with the technical documentation, and in particular to follow the safety regulations.

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Contents

I Identification data

I.1 Document

Type: CLAZ-0002-Y – Installation manual
Language: English

I.2 Unit

Name: ENEFCOGEN GREEN
Type: A unit for the combined production of heat and power

I.3 Revision control

Version	Date	Author	Note
1.0	02. 03. 2011	yco	First version
2.0	18. 07. 2011	yco	New version
3.0	22. 12. 2011	bsc	New version
3.1	03. 10. 2012	lpl	New version
3.2	09. 10. 2013	Lhe	New version

Table I-1

I.4 Rights for the publication of the document

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1 General introduction

1.1 General information

This document is prepared on the basis of information that was available at the time of its publication

The original version is in French.

The information contained in this document is the property of Eneftech Innovation SA. It was compiled for internal customer requirements while any other use is excluded. Assignment of this information to secondary parties as well as its publication is prohibited.
Eneftech Innovation SA has a continued interest in improving its products. Therefore, it reserves the right to change or improve the information contained in this document without prior notice.

Eneftech Innovation SA disclaims any responsibility in the case of any errors or omissions in this document.

1.2 Conformity with standards and directives

CE

The "CE" designation indicates that this product conforms to European requirements concerning safety, health, the environment and the user's safety.

1.3 Proper use

The data presented in this manual must be followed, especially the safety regulations.

1.4 The objectives of the documentation

The documentation provides information which is necessary for the proper installation of the system. It fully informs the installation technician so that he can carry out all the installation steps effectively.

For safety reasons and for reasons of protecting the environment, it is necessary to follow the regulations described in this document. We advise that you consult this documentation.

1.5 Technical assistance

For each technical requirement:

Procedure		
	Activity	**Note**
A	Collect information from the labels.	
B	Clearly identify the detected defect.	
C	Contact support at Eneftech Innovation SA.	

1.6 Contact

Eneftech Innovation SA
Route de Champ-Colin 2C
CH - 1260 Nyon
Switzerland

Telephone: +41 22 994 04 20
Fax: +41 22 566 27 43
E-mail: info@eneftech.com
Internet: www.eneftech.com

Technical support:
Telephone: +41 22 994 04 20
E-mail: support@eneftech.com

1.7 Terminology

User
The user is the owner of the unit who uses it alone as an owner or passes it to others for use.

Technical personnel
The term "technical personnel" refers to all persons who are authorized to operate the unit by virtue of their training or qualifications.

Personnel qualifications
Various types of the personnel's qualifications are required for various activities that must be carried out on the unit.

Unit
The term "unit" refers to the ENEFCOGEN^{GREEN} system.

INFORMATION!
The terminology for the individual components of the unit is defined in the general description in the user manual.

2 Safety regulations

INFORMATION
The Eneftech Innovation SA refuses any responsibility in the event of noncompliance with these regulations

DUTY
Personnel who have access to the place of installation must be authorized by Eneftech Innovation SA, trained in accordance with applicable laws and standards and be informed about the safety instructions concerning the unit.

2.1 General rules

DUTY
It is the user's obligation to read and understand each chapter before starting work with the unit.

DUTY
The place of installation must conform to applicable laws and standards for a system containing more than 50 kg of a safety group B1 refrigerant.

DUTY
The installation and the hydraulic and electrical circuit must conform to applicable laws and standards for circuits of supplied and produced heat.

DANGER
The pressures and temperatures of the hydraulic circuit must not be exceeded:
- Heat input:
- 40 bar;
- 160 °C;
- Cold input:
- 16 bar;
- When stopped: 60 °C,
- In operation: see the temperature limit in the table of technical characteristics on page 16.

DANGER
Failure to comply with these regulations can result in serious accidents!

INFORMATION
If you require to complete work with the unit which is not described in this document, then Eneftech Innovation SA offers solutions and service.

INFORMATION
The unit is designed to fully satisfy the requirements relating to safe work and operation. The machine conforms to applicable standards and European directives (CE).

WARNING
Eneftech Innovation SA isn't responsible for damage caused by inadequate handling or failure to comply with the information contained in this document.

FORBIDDEN !
The safety devices must never be decommissioned in conformity with the list on page 12.

2.1.1 The importance of the safety regulations

All the safety and protective regulations that are stated in this manual must be complied with in order to avoid bodily harm with temporary or permanent consequences, material damages or pollution to the environment.

Statutory regulations, preventative measures against accidents and the protection of the environment must be followed, as well as the recognized technical regulations that apply appropriate methods and non-hazardous work which are valid in the country or in the place of installation.

2.1.2 Ignoring the safety regulations

Ignoring safety and protective regulations as well as ignoring statutory and technical regulations can lead to bodily harm with temporary or permanent consequences, material damages or pollution of the environment.

2.2 Definitions of the pictograms

The warning pictograms and the pictograms about hazard that are used in this document provide information about the safety instructions, as well as information related to the safety of the unit.

2.2.1 General pictograms

FORBIDDEN
A sign that must be respected.

DANGER
It warns against the risk of bodily harm or death.

WARNING
It warns against the risk of injury and damage to one's health.

ATTENTION
It warns against the risk of minor injuries or major material damages to the unit or the environment.

CAUTION
It warns against mistakes during manipulation and negligence that can cause material damages to the unit.

DUTY
Directives and measures that should be applied.

INFORMATION
Informative comment.

The information has already been stated. It refers to a segment of the document.

2.2.2 Specific pictograms

DANGER
The risk of shock/death by an electric current.

DANGER
Risk of burns.

2.3 Rules for transportation and installation

DANGER
The risk of shock/death by an electric current.
All contact with a part of the device or the whole device which is under electrical stress poses a great danger. Only technical personnel who are expressly authorized can intervene with the device or its parts.

DANGER
Risk of burns. Make sure the temperature is sufficiently low on the performance elements.

2.3.1 Place of installation

The place of installing the unit and its hot-cold supply circuits must conform to the applicable laws and standards for a system containing a safety group refrigerant:
- For a system containing more than 50 kg of a refrigerant for 20 kW and 30 kW machines.
- For a system containing less than 50 kg of a refrigerant for 15 kW machines.

2.3.2 Installation of hydraulic circuits

The hydraulic circuits must conform to applicable laws and standards for circuits that supply and produce heat.

2.3.3 Safety of hydraulic circuits

The hydraulic pressure and temperature safety of the unit must be checked.

2.3.4 Installation of electrical circuits

The electrical circuits must conform to the applicable laws and standards.

2.3.5 Safety of electrical circuits

The electrical safety devices must be checked.

2.3.6 Other safety devices

All the other safety devices must be checked.

2.4 Safety devices

The following are the safety devices of the machine:
- Pressure gauge
- Thermostat
- Safety valve
- Casing
- The small door on the control box
- Thermal insulation

3 Installation

3.1 Recommendations

ATTENTION
Respect the signs shown on the cover.

DUTY
Only technical personnel are authorized to install the unit.

DUTY
Using protective footwear is mandatory.

DUTY
The commissioning of the unit must be done by qualified technical personnel who are authorized by Eneftech Innovation SA.

3.2 Inspection upon receipt

DUTY
All missing or defective material must be stated in the transport documentation. Inform the carrier, insurers and supplier without delay.

INFORMATION
It is possible to report some damage when the machine is being commissioned.

Check if all the delivered material corresponds to the shipping list and whether the delivered material is damaged.

3.3 Environmental conditions

Characteristics	Unit	Enefcogen 10kW	Enefcogen 15kW	Enefcogen 20kW	Enefcogen 30kW
Ambient humidity	%		0-65		
Ambient temperature	°C		5-50		
Ambient temperature during operation	°C		5-40		
Floor load	kg/m^2	600	600	750	750

DANGER
The machine must not be stored in temperatures below freezing point.

3.4 Technical characteristics ENEFCOGEN^{GREEN} 30, 20, 15 ET 10kW

ENEFCOGEN^{GREEN} 30kW 30GRE-01 (frame type: 1)				
Circuit - hot (W3A evaporation device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal input:	kW	330	180~360	
Mass flow rate:	kg/s	4.5		
Volumetric flow rate:	m3/h	20.5		
Inlet temperature:	°C	150	120~155	0.1 °C/s
Outlet temperature:	°C	119		
Maximum inlet operating temperature:	°C	160		
Operating pressure:	barg	1~3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure drop:	bar	<0.3		
Flanges:		PN40/DN50		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal outlet:	kW	290	160~320	
Mass flow rate:	kg/s	4.5		
Volumetric flow rate:	m3/h	16.3		
Inlet temperature:	°C	25	15~30	0.1 °C/s
Outlet temperature:	°C	40	30~50	
Maximum inlet operating temperature:	°C	30		
Operating pressure:	barg	3~5		
Maximum operating temperature:	barg	16		
Volume:	L	<25		
Pressure drop:	bar	<0.2		
Flanges:		PN16/DN50		
Electric power & efficiency				
Gross electric Power	kW	30.1	15~32	
Net electric Power	kW	25.4		
Electric Consumption	kW	4.7		
Efficiency	%	9.1		
Global efficiency	%	95.6		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1500		
Dimensions WxDxH	mm	1900x1040x2000		
Electrical network		400V / 50Hz, 3x100A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network:	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out on thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST" document of the machine) The final performance depends on the operating conditions at the place of installation.

ENEFCOGEN GREEN 20kW 20GRE-01 (frame type: 1)				
Circuit - hot (W3A evaporating device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal inlet:	kW	220	110-220	
Mass flow rate:	kg/s	3.2		
Volumetric flow rate:	m3/h	14.6		
Inlet temperature:	°C	150	120-155	0.1 °C/s
Outlet temperature:	°C	121		
Maximum inlet operating temperature:	°C	160		
Operating pressure:	barg	1-3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure drop:	bar	<0.3		
Flanges:		PN40/DN50		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal outlet:	kW	200	100-200	
Mass flow rate:	kg/s	3.6		
Volumetric flow rate:	m3/h	13.0		
Inlet temperature:	°C	30	20-35	0.1 °C/s
Outlet temperature:	°C	43	35-50	
Maximum inlet operating temperature:	°C	35		
Operating pressure:	barg	3-5		
Maximum operating pressure:	barg	16		
Volume:	L	<25		
Pressure loss:	bar	<0.2		
Flanges:		PN16/DN50		
Electric power & efficiency				
Gross electric Power	kW	20	10-20	
Net electric Power	kW	16.6		
Electric Consumption	kW	3.4		
Efficiency	%	9.1		
Global efficiency	%	98.5		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1500		
Dimensions WxDxH	mm	1900x1040x2000		
Electrical network		400V / 50Hz, 3x100A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network:	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out on thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST" document of the machine) The final performance depends on the operating conditions at the place of installation.

ENEFCOGEN GREEN 15kW 15GRE-01 (frame type: 1)				
Circuit - hot (W3A evaporating device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal outlet:	kW	175	100-175	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	9.9		
Inlet temperature:	°C	150	120-155	0.1 °C/s
Outlet temperature:	°C	115		
Maximum inlet operating temperature:	°C	160		
Operating pressure:	barg	1-3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure drop:	bar	<0.3		
Flanges:		PN40/DN40		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal outlet:	kW	150	90-150	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	7.8		
Inlet temperature:	°C	25	15~30	0.1 °C/s
Outlet temperature:	°C	40	30~50	
Maximum inlet operating temperature:	°C	30		
Operating pressure:	barg	3-5		
Maximum operating pressure:	barg	16		
Volume:	L	<25		
Pressure drop:	bar	<0.2		
Flanges:		PN16/DN40		
Electric power & efficiency				
Gross electric Power	kW	15	8.5-15	
Net electric Power	kW	13.5		
Electric Consumption	kW	1.5		
Efficiency	%	9.1		
Global efficiency	%	98.5		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1150		
Dimensions WxDxH	mm	1900x1040x2000		
Electrical network		400V / 50Hz, 3x63A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out on thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST" document of the machine) The final performance depends on the operating conditions at the place of installation.

ENEFCOGEN^{GREEN} 10kW 10GRE-01 (frame type: 2)				
Circuit - hot (W3A evaporating device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal inlet:	kW	**110**	80-120	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	9.9		
Inlet temperature:	°C	140	120-145	0.1 °C/s
Outlet temperature:	°C	107		
Maximum inlet operating temperature:	°C	145		
Operating pressure:	barg	1-3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure loss:	bar	<0.3		
Flanges:		PN40/DN40		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal outlet:	kW	100	60-120	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	7.8		
Inlet temperature:	°C	20	20-30	0.1 °C/s
Outlet temperature:	°C	30	30~50	
Maximum inlet operating temperature:	°C	30		
Operating pressure:	barg	3-5		
Maximum operating pressure:	barg	16		
Volume:	L	<25		
Pressure loss:	bar	<0.2		
Flanges:		PN16/DN40		
Electric power & efficiency				
Gross electric Power	kW	10	6.0-10.5	
Net electric Power	kW	9		
Electric Consumption	kW	1.0		
Efficiency	%	9.3		
Global efficiency	%	98.5		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1150		
Dimensions WxDxH	mm	1960x825x1805		
Electrical network		400V / 50Hz, 3x63A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out on thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST"document of the machine). The final performance depends on the operating

conditions at the place of installation.

Dimensional characteristics	Unit	EnefCogen 10kW	EnefCogen 15kW	EnefCogen 20kW	Enefcogen 30kW
Dimension					
Frame - type		2	1	1	1
Height (H)	mm	1960	1955	1955	1955
Width (W)	mm	1805	1 910	1 910	1910
Depth (D)	mm	825	1 025	1 025	1025
Dimensions of hydraulic connections					
h1	mm	252	272	272	272
p1	mm	70	175	175	175
p2	mm	290	395	395	395
p3	mm	510	615	615	615
p4	mm	730	835	835	835
Connection model for connecting the circuit of the thermal energy source		PN40 / DN40			PN40 / DN50
Connection model for connecting the circuit of the produced energy		PN16 / DN40			PN16 / DN50

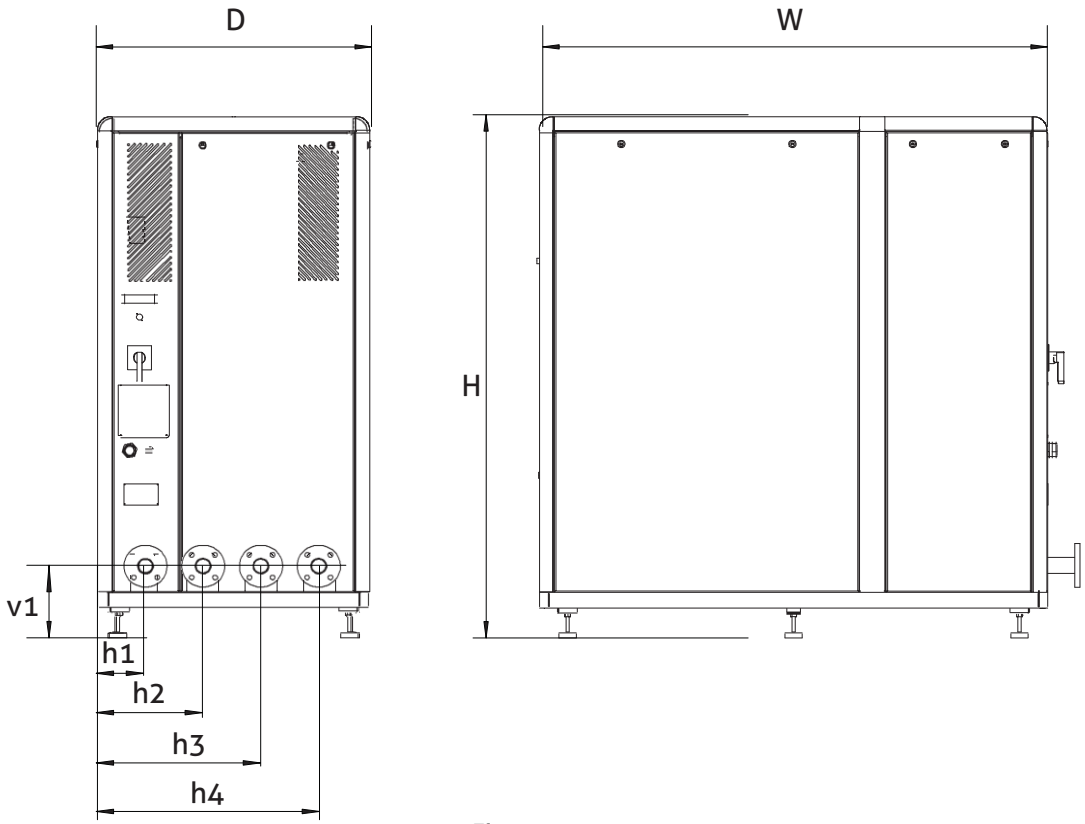

Figure 3-1

3.5 Transportation and unpacking

IMPORTANT: The manner of unpacking varies according to frame type 1 or 2: the frame type is stated in the technical characteristics (chapter 3.4).

Characteristics of transportation and unpacking	Unit	EnefCogen 15kW	EnefCogen 20kW	EnefCogen 30kW
Minimal mass (the device itself)	kg	1150	1500	1500
Mass with the carrying case	kg	1350	1700	1700
Dimensions of the carrying case	mm mm mm		W = 2100 D = 1190 H =2250	

3.5.1 Transportation of the packed equipment

ATTENTION
When moving it with a lifting system, take into account the centre of gravity of the packed unit.

DANGER
Prevent impact during manipulation.
Personnel must be out of reach of the activity during manipulation.

Procedure			
	Frame - type	Activity	Note
A	1 and 2	Moving the unit.	Using NZV or VZV

3.5.2 Unpacking

Procedure			
	Frame	Activity	Note
A	1 and 2	Removing parts of the cover	
B	1 and 2	Remove 4 side panels and open the control box.	Use the supplied wrenches: - side panels: square wrench - electrical box: round wrench
		**ATTENTION** **Don't damage the grounding cables.**	
C	Only type 1	Unscrew 8 red fixing screws from the pallets.	See Figure 3.2.
D	Only type 1	Raise the unit and loosen the pallets.	Using NZV.
E	1 and 2	Straighten the 6 legs and lay the unit on the ground.	

3.5.3 Transportation and placement

DUTY
Follow the installation plan for placing the unit.

DUTY
Only trained personnel may manipulate the unit for this purpose.

ATTENTION
Manipulation with the uncovered components of the unit, especially electrical equipment must be done with great caution.

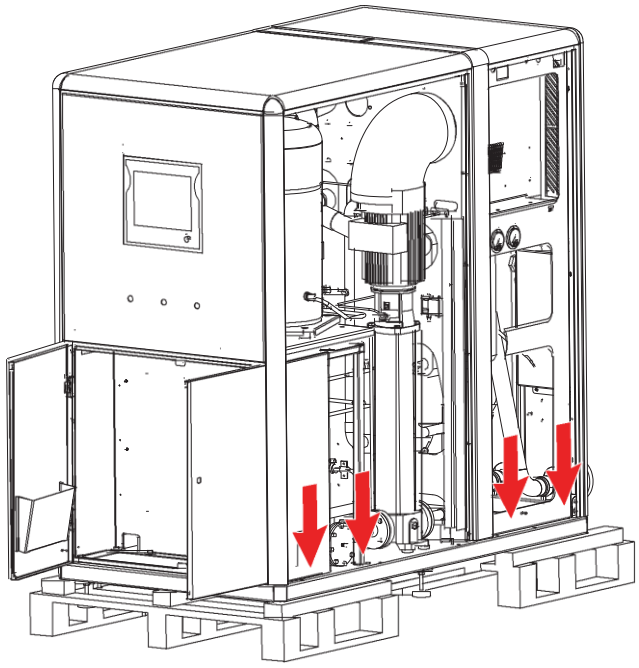

Figure 3-2

3.6 Hydraulic connections

INFORMATION
Follow the installation plan for the hydraulic connection of the system.

Procedure		
	Activity	**Note**
A	Connect the flexible connections **1** to the fixed connections **3** after the insertion of the gasket **2**.	
B	Fill the input and output circuits of the unit.	
C	Vent the circuit with the drain valves of the drain tap.	

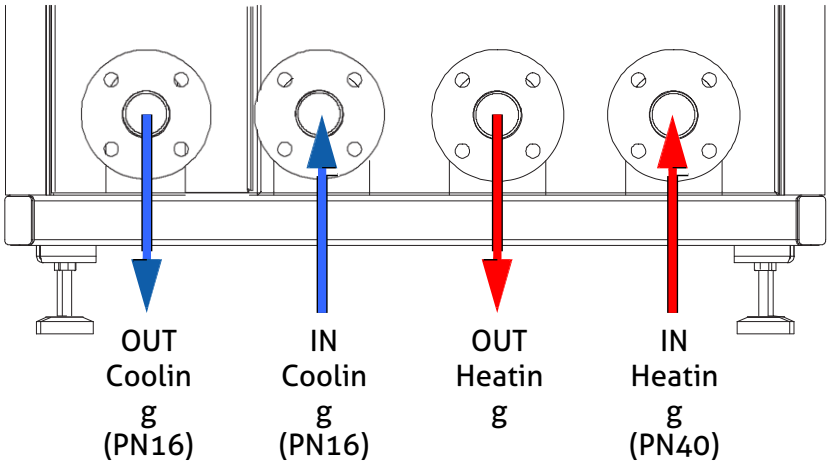

Figure 3-3

DANGER
The pressures and temperatures of the hydraulic circuit must not exceed:
- Heat input:
- 40 bar;
- 160 °C;
- Cold input:
- 16 bar;
- When stopped: 60 °C,
- During operation: see the temperature limit in the table of technical characteristics on page 16.

INFORMATION
The user is responsible for all damage to the unit caused by the drain tap. For example: corrosion, boiler scale, clogging, overpressure, frost, overheating, etc.

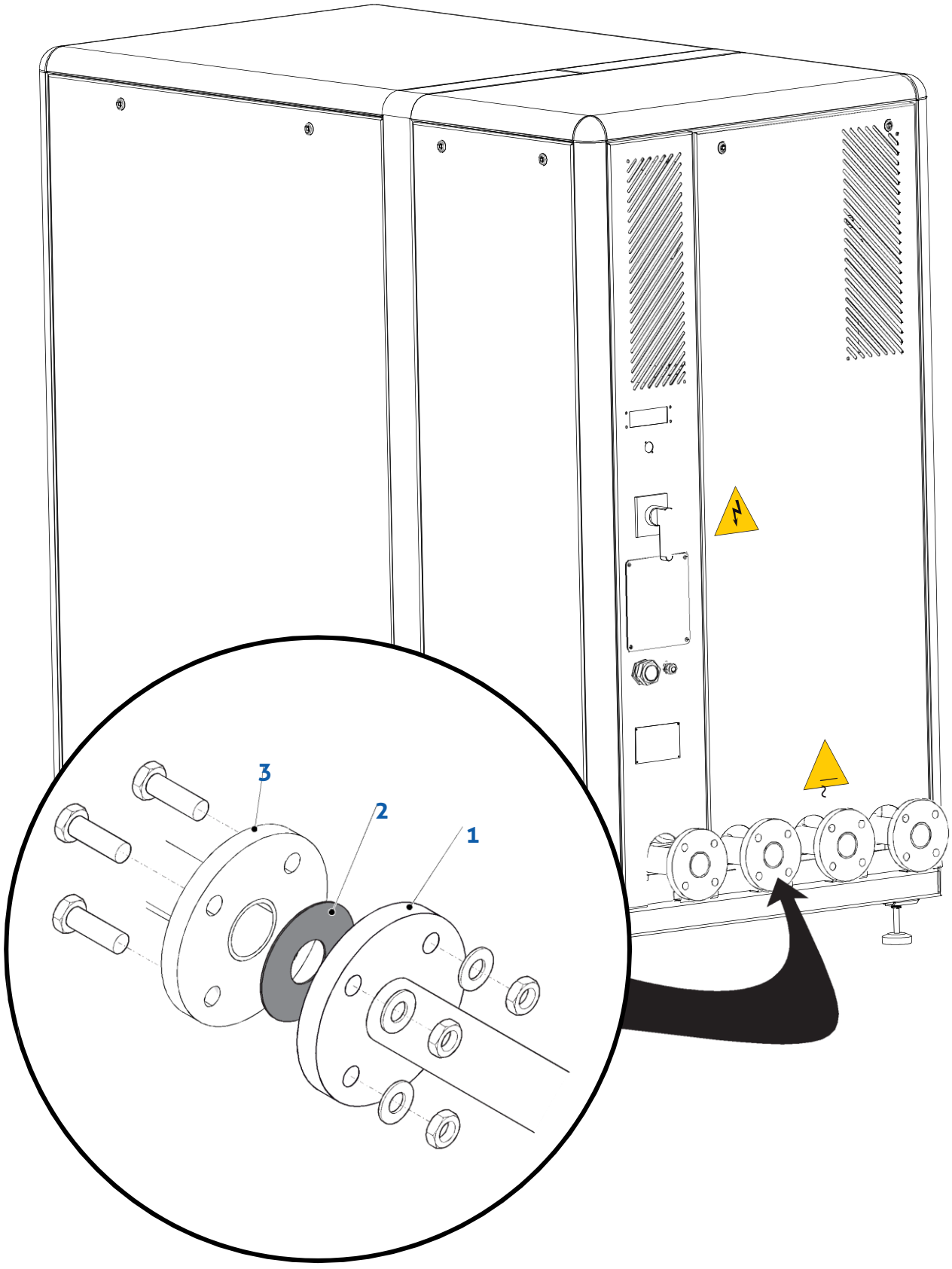

Figure 3-4

3.7 Electrical connections

DANGER
Only qualified technical personnel are authorized to work with the control box equipment.

ATTENTION
The main switch does not interrupt the secondary power supply connected to the unit. Therefore, it is necessary to turn off these secondary power supplies which are independant of the activation of the main switch during work with the unit.

DANGER
The capacitors of the unit can still discharge during the activation of the main switch and they can pose a potential danger for around 1 minute.

INFORMATION
For connection, follow the electrical wiring diagram.

WARNING
Prevent the ingress of water into the control box.

3.7.1 Supply voltage

Procedure		
	Activity	**Note**
A	Connect the power cables to the terminal by opening the lid 4 and pulling the cables through the cable gland 5.	Follow the electrical installation scheme for connection.

3.7.2 Signals

Procedure		
	Activity	**Note**
A	Remove the right rear cover of the unit.	Using the supplied square wrench.
B	Route the cables through the external system 2 through the cable gland placed above the network socket 3 and connect it directly to the terminals / pins of the machine's rack 1.	After connection follow the electrical installation scheme.
C	Place the right rear cover of the unit back.	Using the supplied square wrench.
D	Connect the networking cable 3.	

3.7.3 Standby / Emergency / Stop switch

DUTY
The remote emergency stop switch must be installed on the unit.
The "emergency state" signal is activated during the emergency stop.
- **Hot circuits must be turned off immediately.**
- **The cold circuits must be turned off within one minute.**

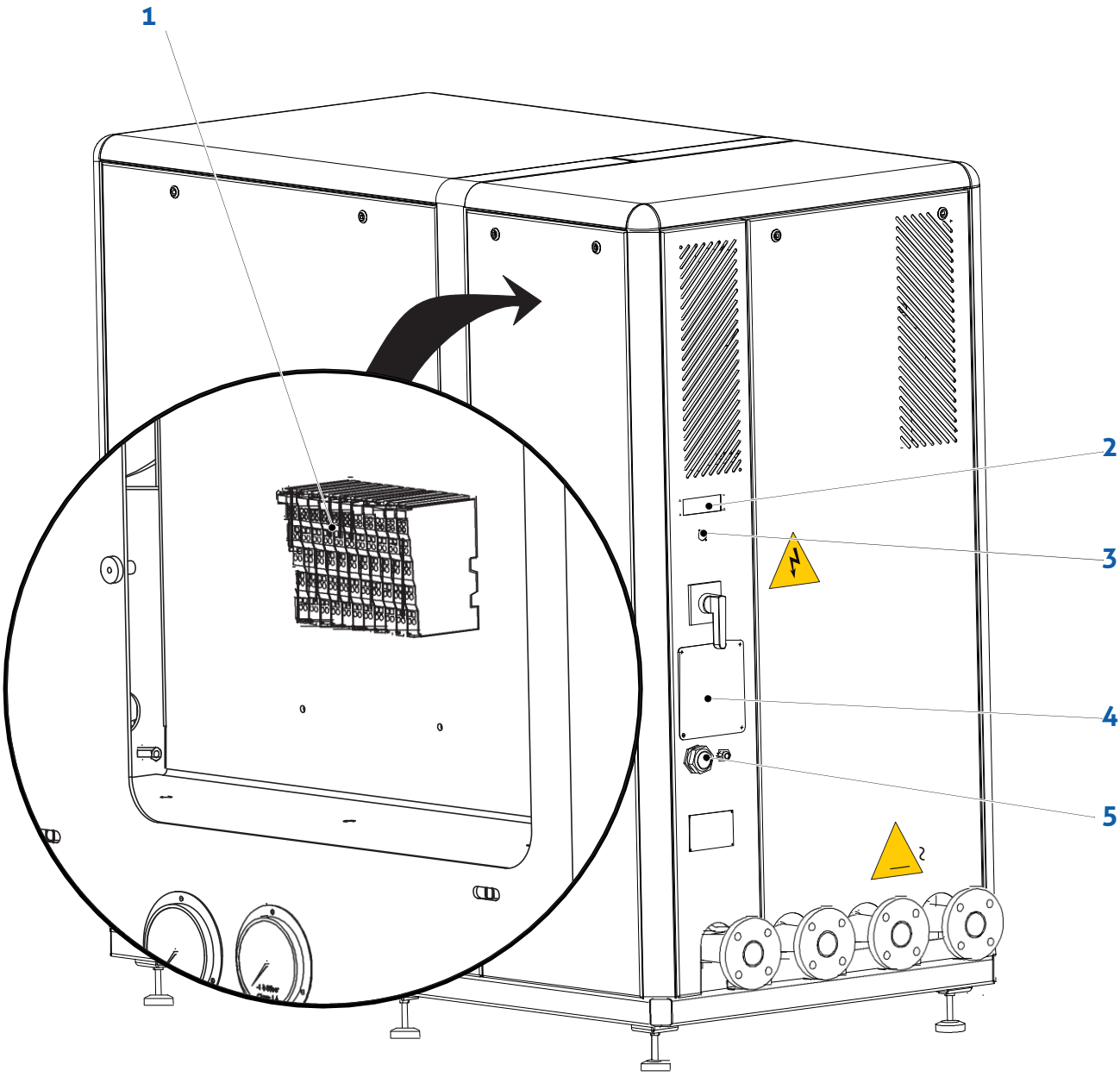

Figure 3-5 frame type 1

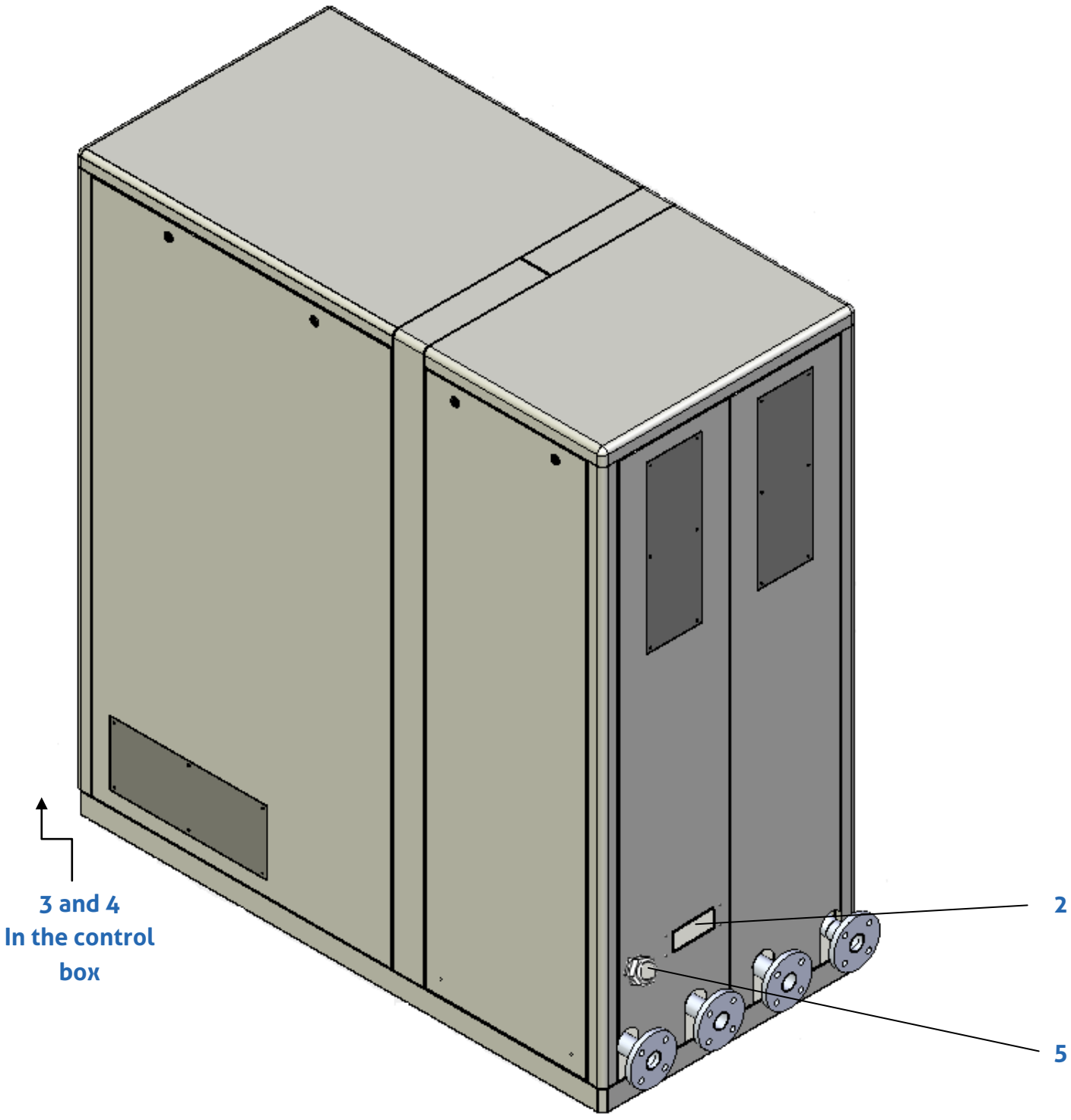

Figure 3-6 frame type 2

3.8 The components supplied with the unit

3.8.1 For the user

- User manual;
- The information card of the unit.

3.8.2 Components for technical personnel

- Installation manual contains:
  - A copy of the information card of the unit
  - A scheme of the cooling system
  - A diagram of the electrical circuit
- The register of the unit
- Wrenches for opening the cover and the control box

DUTY
Installation of the unit must be carried out by qualified technical personnel who are authorized and trained by Eneftech Innovation SA.

4 Commissioning

4.1 General information

DUTY
The commissioning of the ENEFCOGEN^{GREEN} system must be carried out by qualified personnel who are authorized and trained by Eneftech Innovation SA.

INFORMATION
Follow the documents about commisioning and the cable installation plan.

4.2 Updating registers

DUTY
The operators of a unit that contains 3 or more kilograms of fluorinated greenhouse gas, whether the system is hermetically sealed or not, must keep registers and make them available to competent national authorities or the European Commission at their request.

4.2.1 Contents of the equipment registers - categories A, B, C

The equipment registers must contain the following information:

- Name, postal address and the operators' phone number
- Relative information concerning the amount and type of installed fluorinated greenhouse gas (if it isn't stated in the technical documentation of the manufacturer, then it must be supplied by certified personnel)
- Added amounts of fluorinated greenhouse gas
- Amount of fluorinated greenhouse gas obtained during maintenance, maintenace and final elimination
- The given cause for the detected leakage
- Identification data of the company/personnel carrying out an adequate operation
- Data and results of the regular impermeability tests
- Data and results of the tests carried out on the leak detection systems (in case it's needed)
- All the other relative information.

Model example See Attachment.

INFORMATION
Source: ec.europa.eu : KH-80-08-354-FR-N.pdf.

eneftech

Generate your Heat & Power

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support@eneftech.com

www.eneftech.com

ENEFCO GEN GREEN

Combined production of heat and power

User Manual

DUTY
Save this document for future consultation.

WARNING
Before working with the unit, users are advised to familiarise themselves with the technical documentation, and in particular to follow the safety regulations.

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Contents

I Identification data

I.1 Document

Type: CLBZ-0003-Y – User manual
Language: English

I.2 Unit

Name: ENEFCOGEN GREEN Module
Type: A unit for the combined production of heat and power

I.3 Revision control

Version	Date	Author	Note
1.0	02. 03. 2011	yco	First version
2.0	18. 07. 2011	yco	New version
3.0	22. 12. 2011	bsc	New version
3.1	03. 10. 2012	lpl	New version
3.2	09. 10. 2013	Lhe	New version

Table I-1

I.4 Rights for the publication of the document

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1 General introduction

1.1 General information

This document is prepared on the basis of information that was available at the time of its publication

The original version is in French.

The information contained in this document is the property of Eneftech Innovation SA. It was compiled for internal customer requirements while any other use is excluded. Assignment of this information to secondary parties as well as its publication is prohibited.
Eneftech Innovation SA has a continued interest in improving its products. Therefore, it reserves the right to change or improve the information contained in this document without prior notice.
Eneftech Innovation SA disclaims any responsibility in the case of any errors or omissions in this document.

1.2 Conformity with standards and directives

CE

The "CE" designation indicates that this product conforms to European requirements concerning safety, health, the environment and the user's safety.

1.3 Proper use

The data presented in this manual must be followed, especially the safety regulations.

1.4 The objectives of the documentation

The documentation provides information which is necessary for the proper installation of the system. It fully informs the installation technician so that he can carry out all the installation steps effectively.

For safety reasons and for reasons of protecting the environment, it is necessary to follow the regulations described in this document. We advise that you consult this documentation.

1.5 Technical assistance

For each requirement of technical assistance:

Procedure		
	Activity	**Note**
A	Collect information from the labels.	
B	Clearly identify the detected defect.	
C	Contact support at Eneftech Innovation SA.	

1.6 Contact

Eneftech Innovation SA
Route de Champ-Colin 2C
CH - 1260 Nyon
Switzerland

Telephone: +41 22 994 04 20
Fax: +41 22 566 27 43
E-mail: info@eneftech.com
Internet: www.eneftech.com

Technical support:
Telephone: +41 22 994 04 20
E-mail: support@eneftech.com

1.7 Terminology

User
The user is the owner of the unit who uses it alone as an owner or passes it to others for use.

Technical personnel
The term "technical personnel" refers to all persons who are authorized to operate the unit by virtue of their training or qualifications.

Personnel qualifications
Various types of the personnel's qualifications are required for various activities that must be carried out on the unit.

Unit
The term "unit" refers to the ENEFCOGEN^{GREEN} system.

INFORMATION!
The terminology for the individual components of the unit is defined in the general description in the user manual.

2 Safety regulations

INFORMATION
Eneftech Innovation SA refuses any responsibility in the event of noncompliance with these regulations

DUTY
Personnel who have access to the place of installation must be authorized by Eneftech Innovation SA, trained in accordance with applicable laws and standards and be informed about the safety instructions concerning the unit.

2.1 General rules

DUTY
It is the user's obligation to read and understand each chapter before starting work with the unit.

DUTY
The place of installation must conform to applicable laws and standards for a system containing more than 50 kg of a safety group B1 refrigerant.

DUTY
The installation and the hydraulic and electrical circuit must conform to applicable laws and standards for circuits of supplied and produced heat.

DANGER
The pressures and temperatures of the hydraulic circuit must not be exceeded:
- Heat input:
- 40 bar;
- 160 °C;
- Cold input:
- 16 bar;
- When stopped: 60 °C,
- In operation: see the temperature limit in the table of technical characteristics on page 16.

DANGER
Failure to comply with these regulations can result in serious accidents!

INFORMATION
If you require to complete work with the unit which is not described in this document, then Eneftech Innovation SA offerssolutions and service.

INFORMATION
The unit is designed to fully satisfy the requirements relating to safe work and operation. The machine conforms to applicable standards and European directives (CE).

WARNING
Eneftech Innovation SA isn't responsible for damages caused by inadequate handling or failure to comply with the information contained in this document.

FORBIDDEN
The safety devices must never be decommissioned in conformity with the list on page 12.

2.1.1 The importance of the safety regulations

All the safety and protective regulations that are stated in this manual must be complied with in order to avoid bodily harm with temporary or permanent consequences, material damages or pollution to the environment.

Statutory regulations, preventative measures against accidents and the protection of the environment must be followed, as well as the recognized technical regulations that apply appropriate methods and non-hazardous work which are valid in the country or in the place of installation.

2.1.2 Ignoring the safety regulations

The warning pictograms and the pictograms about hazard that are used in this document provide information about the safety instructions, as well as information related to the safety of the unit.

2.2 Definitions of the pictograms

The warning pictograms and the pictograms about hazard that are used in this document provide information about the safety instructions, as well as, information related to the safety of the unit.

2.2.1 General pictograms

FORBIDDEN
A sign that must be respected.

DANGER
It warns against the risk of bodily harm or death.

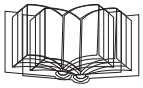
WARNING
It warns against the risk of injury and damage to one's health.

ATTENTION
It warns against the risk of minor injuries or major material damages to the unit or to the environment.

CAUTION
It warns against mistakes during manipulation and negligence that can cause material damages to the unit.

DUTY
Directives and measures that should be applied.

INFORMATION
Informative comment.



The information has already been stated. It refers to a segment of the document.

2.2.2 Specific pictograms

DANGER
The risk of shock/death by an electric current.

DANGER
Risk of burns.

2.3 Rules of use

FORBIDDEN
It is strictly prohibited to use the unit for purposes other then what it was designed for.

DUTY
No modifications, even minimal, can be made without a written consent of Eneftech Innovation SA.

DANGER
The risk of shock/death by an electric current. Every intervention with a part of the unit or the whole unit which is under electrical stress poses a great danger. Only technical personnel who are expressly authorized can intervene with the unit or its parts.

DUTY
Personnel who have access to the place where the unit is installed must be familiarized with the safety regulations concerning the unit.
Access codes to the control program of the unit must be respected and communicated to the personnel according to their competence.
The maintenance and repair personnel must be qualified (cooling technology specialist and/or electrician) and approved.

2.4 Safety devices

The following are the safety devices of the machine:

- Pressure gauge
- Thermostat
- Safety valve
- Casing
- The small door on the control box
- Thermal insulation

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3 Description

1.1 General information

The ENEFCOGEN*GREEN* product line is designed for the production of electricity and heat from an external heat source (boiler, district heating or solar panels).

The produced electricity can be used in an infrastructure or delivered to an electrical network.
The produced heat can be used for heating an infrastructure or water heating.

3.1.1 An example of an installation for a residential zone

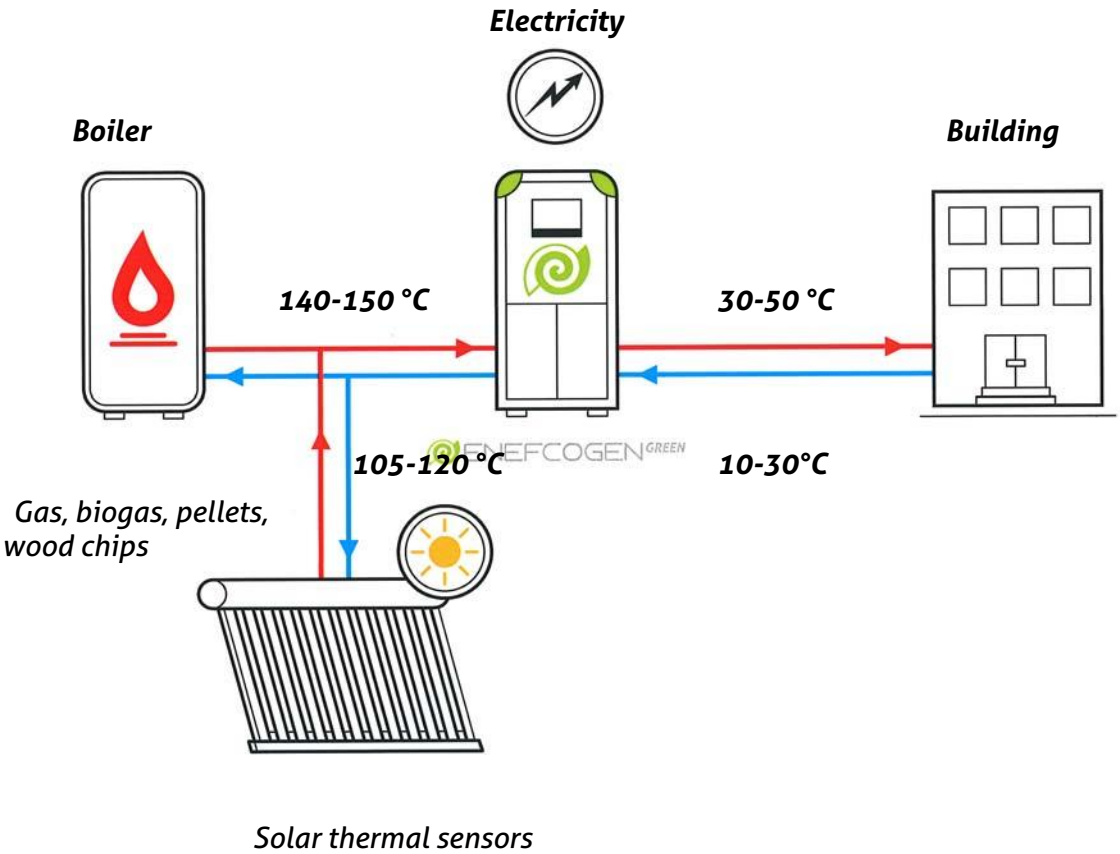

Figure 3-1

3.1.2 An example of an industrial installation

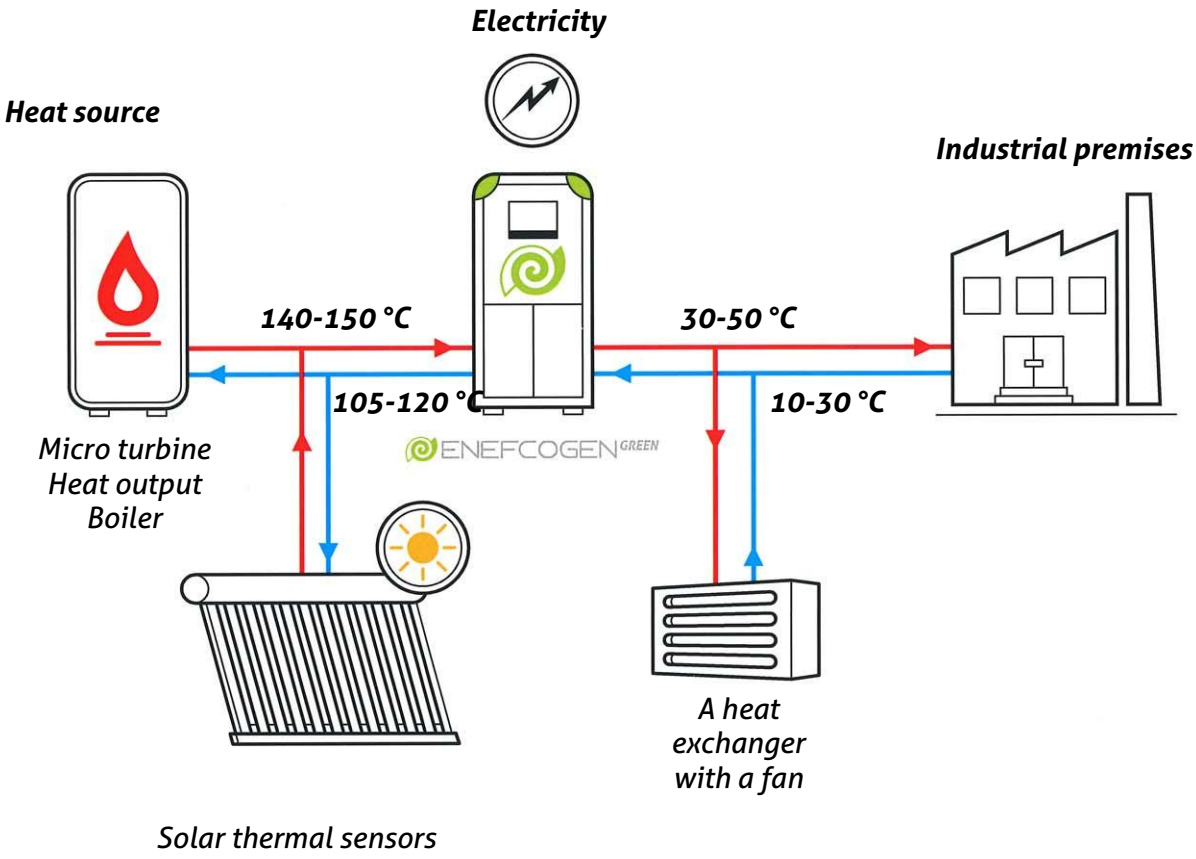

Figure 3-2

3.1.3 Principle of operation

The ENEFCOGEN$_{GREEN}$ unit is composed of an evaporator, turbines connected to the electric generator, a capacitor and a pump in the closed circuit.
The closed circuit contains a refrigerant with low evaporating temperatures.

The liquid refrigerant is sprayed into the evaporator through the pump.
By exchanging heat with the source it is transformed into steam which drives the turbines and generates electricity.
The steam is then condensed and it produces heat or hot water in the capacitor by thermal exchange.

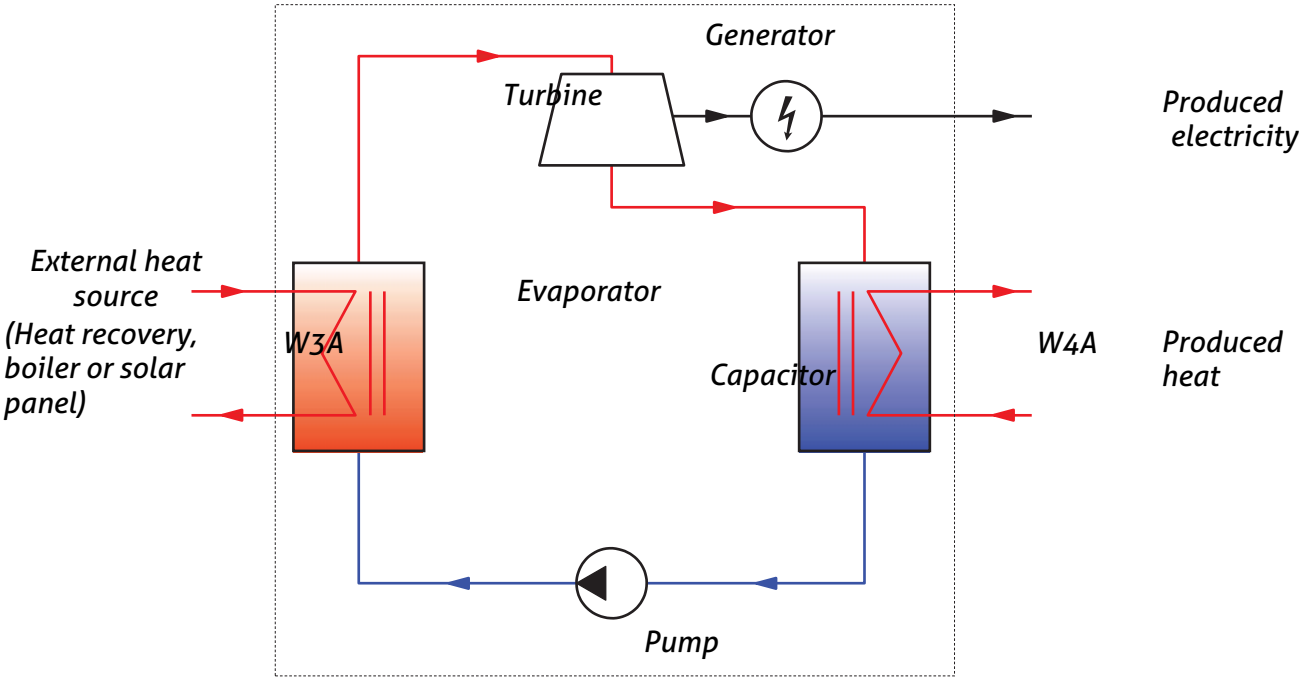

Figure 3-3

3.2 Technical characteristics ENEFCOGEN^{GREEN} 30, 20 a 15 kW

ENEFCOGEN^{GREEN} 30kW 30GRE-01 Circuit - hot (W3A evaporation device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal input:	kW	330	180~360	
Mass flow rate:	kg/s	4.5		
Volumetric flow rate:	m3/h	20.5		
Inlet temperature:	°C	150	120~155	0.1 °C/s
Outlet temperature:	°C	119		
Maximum inlet operating temperature:	°C	160		
Operating pressure:	barg	1~3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure drop:	bar	<0.3		
Flanges:		PN40/DN50		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal output	kW	290	160~320	
Mass flow rate:	kg/s	4.5		
Volumetric flow rate:	m3/h	16.3		
Inlet temperature:	°C	25	15~30	0.1 °C/s
Outlet temperature:	°C	40	30~50	
Maximum inlet operating temperature:	°C	30		
Operating pressure:	barg	3~5		
Maximum operating temperature:	barg	16		
Volume:	L	<25		
Pressure drop:	bar	<0.2		
Flanges:		PN16/DN50		
Electric power & efficiency				
Gross electric Power	kW	30.1	15~32	
Net electric Power	kW	25.4		
Electric Consumption	kW	4.7		
Efficiency	%	9.1		
Global efficiency	%	95.6		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1500		
Dimensions WxDxH	mm	1900x1040x2000		
Electrical network		400V / 50Hz, 3x100A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network:	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out with thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST" document of the machine) The final performance depends on the operating conditions at the place of installation.

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ENEFCOGEN GREEN 20kW 20GRE-01 Circuit - hot (W3A evaporating device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal inlet:	kW	220	110-220	
Mass flow rate:	kg/s	3.2		
Volumetric flow rate:	m3/h	14.6		
Inlet temperature:	°C	150	120-155	0.1 °C/s
Outlet temperature:	°C	121		
Maximum inlet operating temperature:	°C	160		
Operating pressure:	barg	1-3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure loss:	bar	<0.3		
Flanges:		PN40/DN50		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal outlet:	kW	200	100-200	
Mass flow rate:	kg/s	3.6		
Volumetric flow rate:	m3/h	13.0		
Inlet temperature:	°C	30	20-35	0.1 °C/s
Outlet temperature:	°C	43	35-50	
Maximum inlet operating temperature:	°C	35		
Operaating pressure:	barg	3-5		
Maximum operating pressure:	barg	16		
Volume:	L	<25		
Pressure loss:	bar	<0.2		
Flanges:		PN16/DN50		
Electric power & efficiency				
Gross electric Power	kW	20	10-20	
Net electric Power	kW	16.6		
Electric Consumption	kW	3.4		
Efficiency	%	9.1		
Global efficiency	%	98.5		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1500		
Dimensions WxDxH	mm	1900x1040x2000		
Electrical network		400V / 50Hz, 3x100A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network:	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out with thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST" document of the machine) The final performance depends on the operating conditions at the place of installation.

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ENEFCOGEN GREEN 15kW 15GRE-01 Circuit - hot (W3A evaporating device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal outlet:	kW	175	100-175	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	9.9		
Inlet temperature:	°C	150	120-155	0.1 °C/s
Outlet temperature:	°C	115		
Maximum inlet operating temperature:	°C	160		
Operating pressure:	barg	1-3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure loss:	bar	<0.3		
Flanges:		PN40/DN40		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal outlet:	kW	150	90-150	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	7.8		
Inlet temperature:	°C	25	15~30	0.1 °C/s
Outlet temperature:	°C	40	30~50	
Maximum inlet operating temperature:	°C	30		
Operating pressure:	barg	3-5		
Maximum operating pressure:	barg	16		
Volume:	L	<25		
Pressure loss:	bar	<0.2		
Flanges:		PN16/DN40		
Electric power & efficiency				
Gross electric Power	kW	15	8.5-15	
Net electric Power	kW	13.5		
Electric Consumption	kW	1.5		
Efficiency	%	9.1		
Global efficiency	%	98.5		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1150		
Dimensions WxDxH	mm	1900x1040x2000		
Electrical network		400V / 50Hz, 3x63A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out with thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST"document of the machine) The final performance depends on the operating conditions at the place of installation.

ENEFCOGEN GREEN 10kW 10GRE-01				
Circuit - hot (W3A evaporating device)	Unit	Nominal	Range	Tolerance
Liquid (Thermal oil/Shell Thermia B)				
Thermal inlet:	kW	**110**	80-120	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	9.9		
Inlet temperature:	°C	140	120-145	0.1 °C/s
Outlet temperature:	°C	107		
Maximum inlet operating temperature:	°C	145		
Operating pressure:	barg	1-3		
Maximum operating pressure:	barg	40		
Volume:	L	<25		
Pressure loss:	bar	<0.3		
Flanges:		PN40/DN40		
Circuit - cold (W4A capacitor)				
Liquid (coolant)				
Thermal outlet:	kW	100	60-120	
Mass flow rate:	kg/s	2.2		
Volumetric flow rate:	m3/h	7.8		
Inlet temperature:	°C	20	20-30	0.1 °C/s
Outlet temperature:	°C	30	30~50	
Maximum inlet operating temperature:	°C	30		
Operating pressure:	barg	3-5		
Maximum operating pressure:	barg	16		
Volume:	L	<25		
Pressure loss:	bar	<0.2		
Flanges:		PN16/DN40		
Electric power & efficiency				
Gross electric Power	kW	10	6.0-10.5	
Net electric Power	kW	9		
Electric Consumption	kW	1.0		
Efficiency	%	9.3		
Global efficiency	%	98.5		
Turndown ratio	%	50-100		
Sound level	dBA	60	at 10m	
	dBA	80	at 1m	
General data				
Mass	kg	1150		
Dimensions WxDxH	mm	1960x825x1805		
Electric network		400V / 50Hz, 3x63A		
Official approval		PED:	97/23 EC	
		Device:	2006/42 EC	
		Network	DIN VDE-0126-1-1	

These characteristics are based on laboratory tests carried out with thermal oil. (With reference to the „QUALITY_CONTROL_CHECKLIST“document of the machine) The final performance depends on the operating conditions at the place of installation.

General description

Element	Description
1	Covering the unit
2	LCD control touch screen with a program (optional)
3	Control buttons
4	Access door to the control box
5	Access trapdoor for connecting the signal to the external systems
6	RJ-45 Ethernet Socket
7	Main switch
8	The trapdoor of the electrical connection with two screw terminals for the electric wiring of the consumed and produced power. (See wiring diagram)
9	Cable gland for routing electrical cables
10	Label
11	Input connections of the source circuit of the supplied thermal energy
12	Output connections of the source circuit of the supplied thermal energy
13	Input connections of the circuit of produced heat during low a
14	Output connections of the circuit of produced heat during a low temperature

3.4 Control buttons and signals

3.4.1 Control buttons

Signal	Description
	Turning off the unit.
	Turning on the unit.
	Confirming the eventual alarms that may appear on the unit. Lighting on: the alarm is activated. Lighting off: alarm is turned off.
	Emergency shut-off of the unit requested by the user

3.4.2 Control signals

These signals are commands sent directly to the PLC controller of the unit through a surveillance system. It is only possible to use them when the start/stop commands which are divided into AUTO OR REMOTE (see page 32) are selected on the unit.

Signals	Description
Run	ORC Start/stop
Enable	Unit approved
State running	ORC device in operation
State no alarm	ORC without an alarm
Thermal power request	Thermal power request

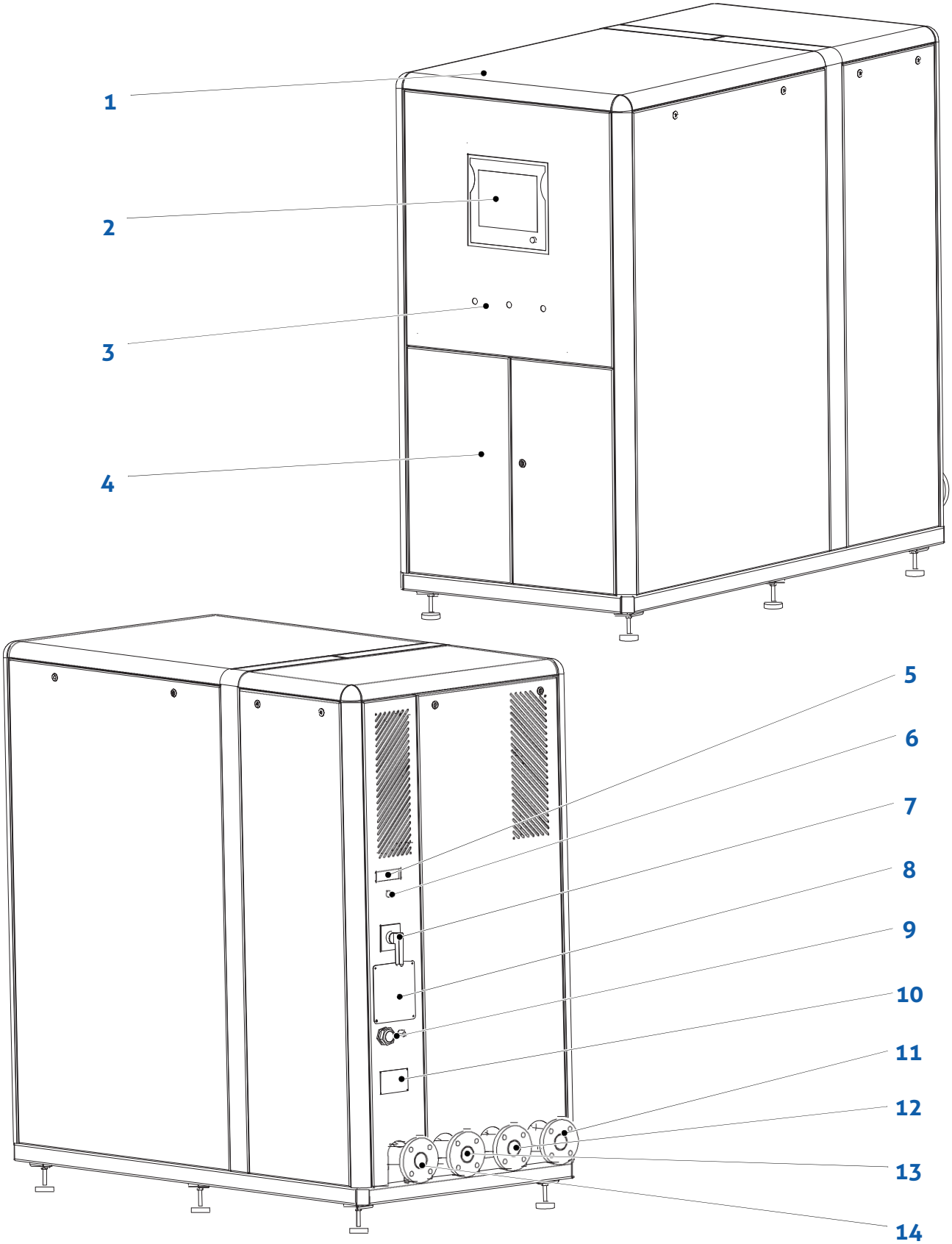

Figure 3-4

3.5 Human-machine interface (HMI)

3.5.1 User levels

INFORMATION
Three user levels exist which limit access.

DUTY
The access codes for the control program must be respected and communicated to personnel according to their competence.

3.5.1.1 Use without codes

Possible activities		
	Activity	**Note**
A	Display homescreen.	Click on the picture of the unit.
B	Access to information about the unit.	The unit's display. Without possible modifications.
C	Visualize alarms.	Without a possible confirmation.

3.5.1.2 Use with the operator's code.

INFORMATION
Manufacturer's settings: 1111.

Possible activities		
	Activity	**Note**
A	Choose language.	Homescreen
B	Confirm alarm.	
C	Start-up the unit.	Buttons on the display.
D	Reset the counter of produced electricity for the previous time.	
E	Change the load value.	
F	Change the temperature value.	With the **„Cogeneration"** configuration

3.5.1.3 Use with the customer's code

Possible activities		
	Activity	**Note**
A	Access to the same functions that the operator has.	
B	Change the operator's access code.	See the homescreen of the display on page 27

INFORMATION
The access code is supplied during the commissioning of the unit or you can request it at the following e-mail address: support@eneftech.com.

3.5.2 With an optional display

3.5.2.1 Main display

INFORMATION
The displayed information depends on the level of the access code.

Homescreen		
	Activity	**Note**
A	Select a language **4**.	
B	Enter the access code into the field **2**.	Then press the "Enter" button
C	Click on the "change" button.	If you wish to change the **„Operator"** access code
D	Click on the picture of the unit **1**.	For access to the **„unit"** page

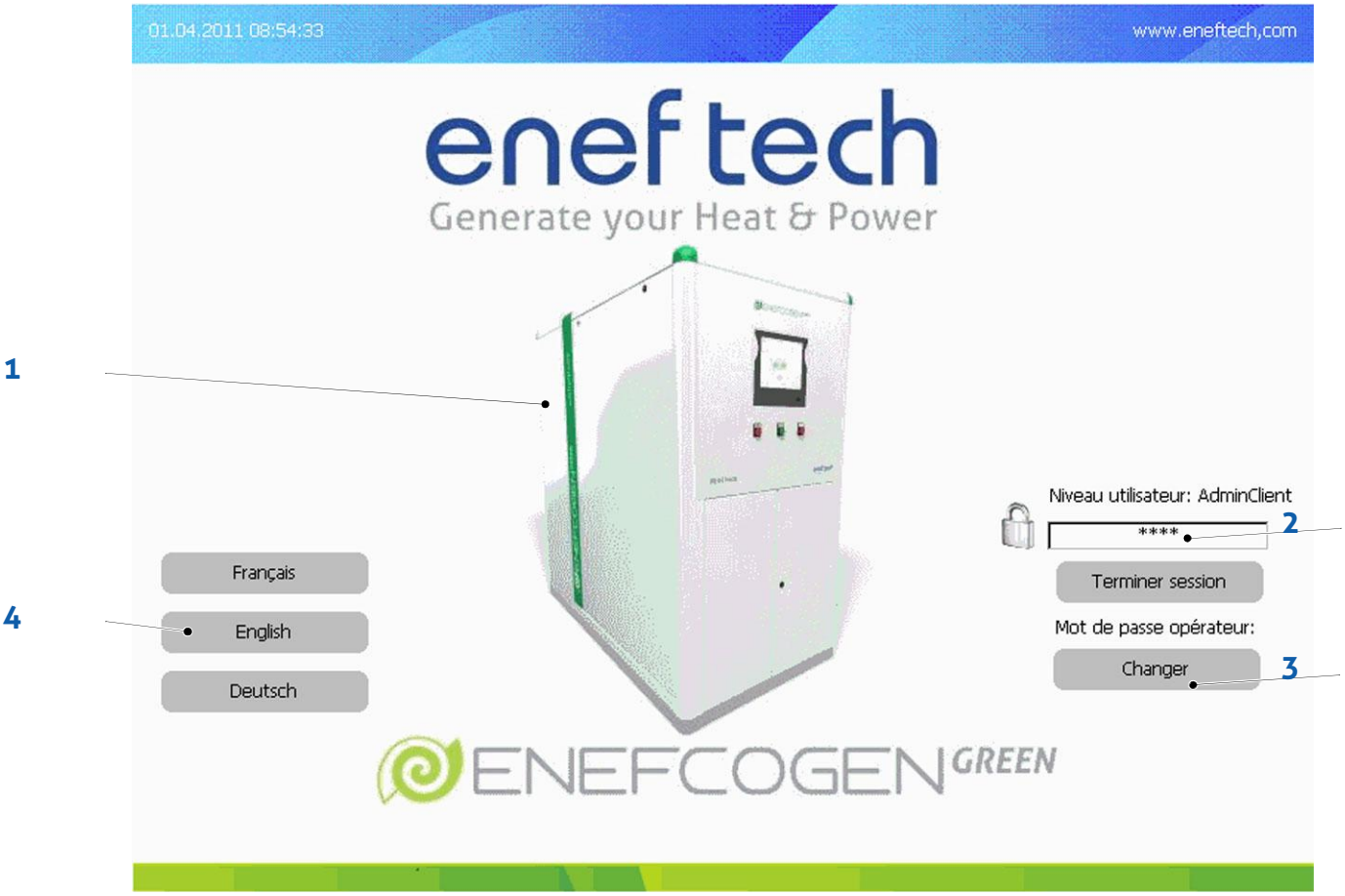

Figure 3-5: Preface display

Note: -

Niveau utilisateur: - -
User access level

AdminClient –customer

- Terminer la session –- End Session- Finish

- Mot de passe opérateur: -Operator's password

- Changer -Change Page machine – display unit

3.5.2.2 Displaying the unit

The page that displays the unit		
Point	**Description**	**Note**
1	User configuration	"Cogeneration" or "Recuperation" (defined during commissioning)
2	El. Energy produced	Produced electrical energy (total or from a recent time)
3	Required load value	It defines the required thermal performance (only during "Recuperation")
4	Required temperature value	It defines the required outlet temperature (only during "Cogeneration")
5	Cooling circuit	Data about the cooling circuit (temperature, performance, valve opening or pump percentage)
6	Confirmation of alarm button	
7	Access button for the alarm list	The page with the alarms displays the list in reverse chronological order: - Date and time; - Alarm number; - Alarm type; - Commentary. (See the alarm list on page 42.)
8	State of the unit	It is only displayed if the start/stop command is "**Manual**", (see page 32)
9	Start and stop buttons	Otherwise the start/stop command is selected in this place
10	Return to the homescreen	
11	Heating circuit	Data about the heating circuit (temperature, performance, valve opening or pump percentage)
12	The production load	The current production relative to the nominal production

13	Information about the unit	**User level** (without a code, operator or a customer's code) **El. energy produced:** Electric power produced by the turbines

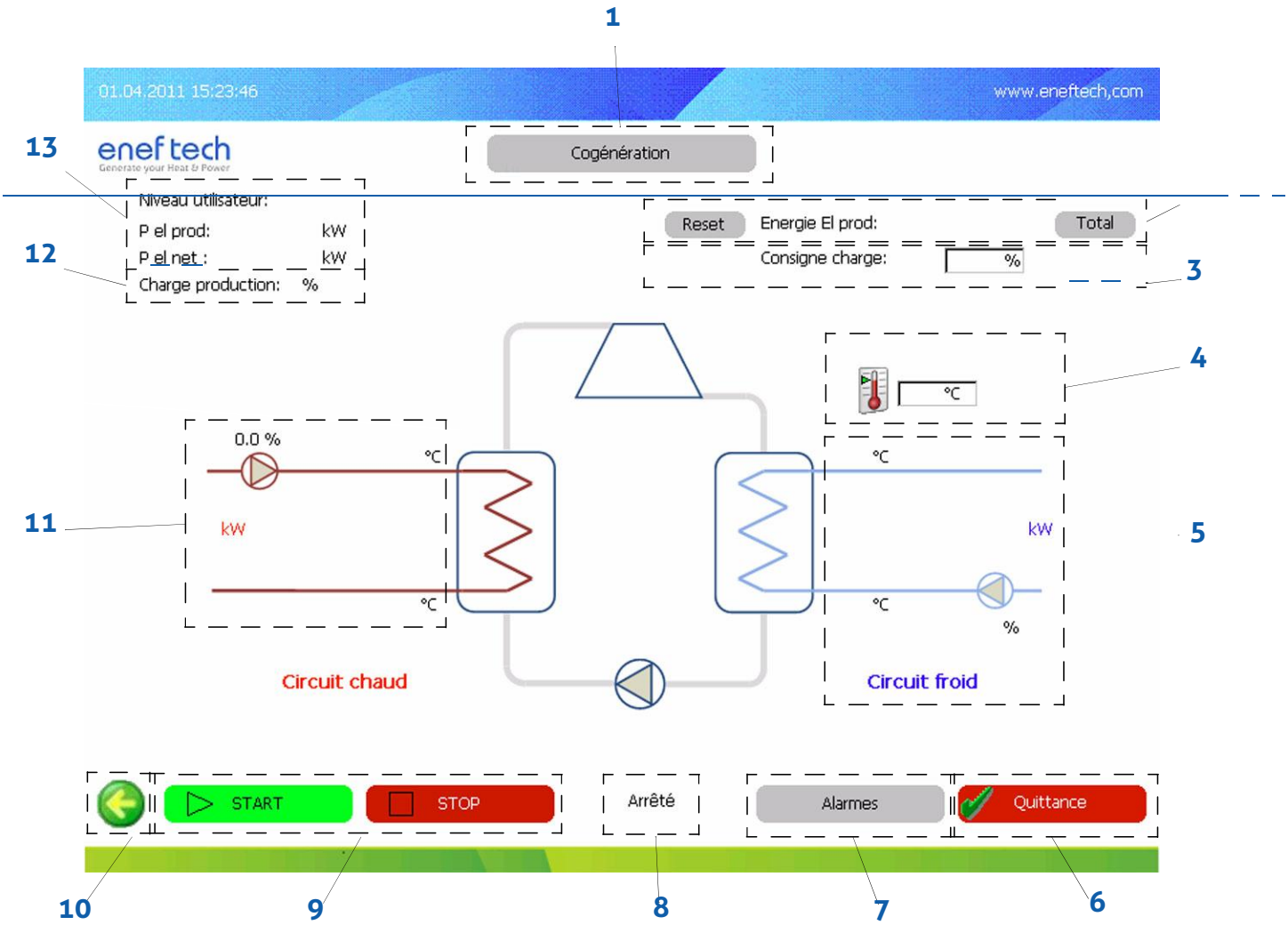

Figure 3-6: Displaying the unit

Note: - arreté - STATE
- alarmes – ALARMS
- quittance - CONFIRM
- circuit chaud -heating circuit
- circuit froid - cooling circuit
- energie El prod.- El. Energy produced

3.5.3 Visualization on a computer

INFORMATION
It is displayed identically on a computer as it is on the display.

3.5.4 Without the display

The error codes are expressed by a sequence of flashes on the confirmation button.

Sequence	Description
1	ON (2 seconds)
2	Countdown in tens
3	OFF (2 seconds)
4	Countdown in units

INFORMATION
In the countdown sequence in tens, the confirmation button:
- lights on for 0.4 of a second;
- lights off for 0.2 of a second.
In the countdown in units, the confirmation button:
- lights on for 0.2 of a second;
- lights off for 0.3 of a second.

Example: code 23

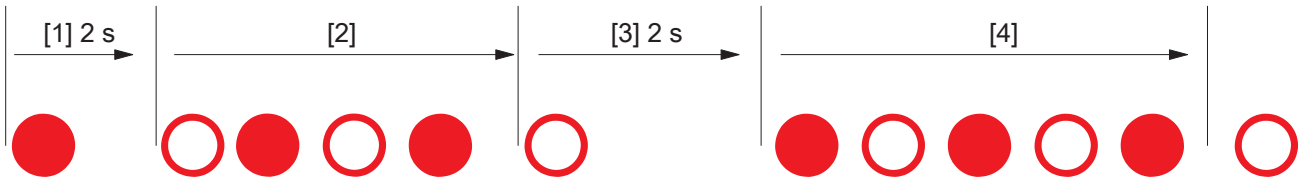

Figure 3-7

See the alarm list on page 42

3.6 Access zone around the unit

DUTY
The minimum distance allowing access around the unit is 60 cm.

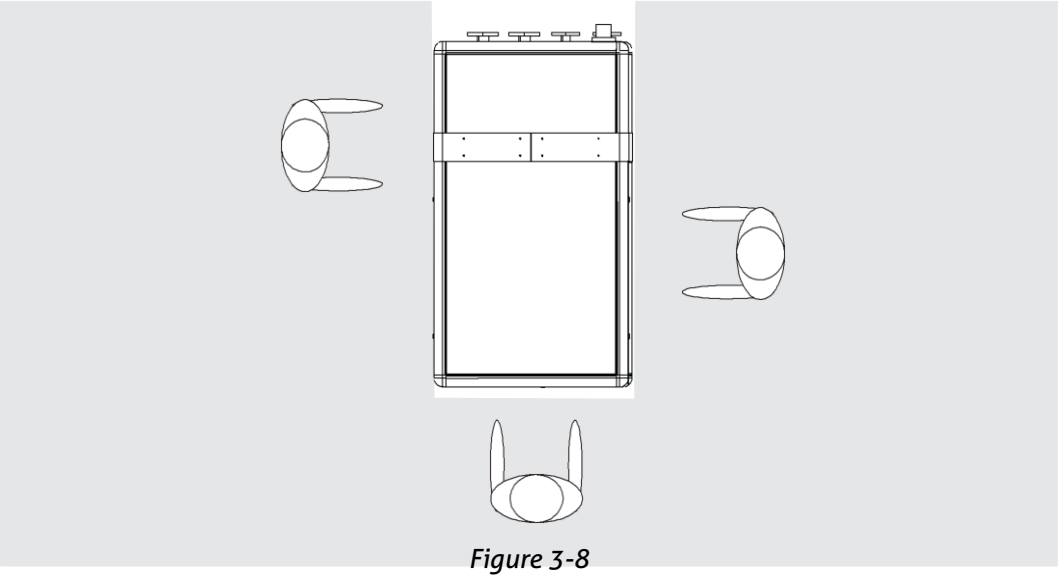

Figure 3-8

3.7 Noise pollution

The level of sound intensity generated by the unit is lower than **85 dB,** and it is in accordance with the applicable directives and standards.

INFORMATION
The value of the sound intensity level is measured according to the EN 3746 standard.

Characteristic	Unit	Value
The level of sound intensity LWA	dB	75 ± 3

Table 3-1

Note: LWA - physical unit of sound power

3.8 Label

INFORMATION
The label is placed on the back of the unit (see the following page).

3.9 Environmental conditions

Characteristics	Unit	Enefcogen 10kW	Enefcogen 15kW	Enefcogen 20kW	Enefcogen 30kW
Ambient humidity	%			0-65	
Ambient temperature	°C			5-50	
Ambient temperature during operation	°C			5-40	
Floor load	kg/m²	600	Floor load	kg/m²	600

DANGER
The machine must not be stored in temperatures below freezing point.

3.10 Labelling

The figure below shows the placement of the safety labels on the unit.

DUTY
Make sure the safety labels on the unit are readable and clean.
If necessary, you should replace the labels with new ones and put them in their original place.

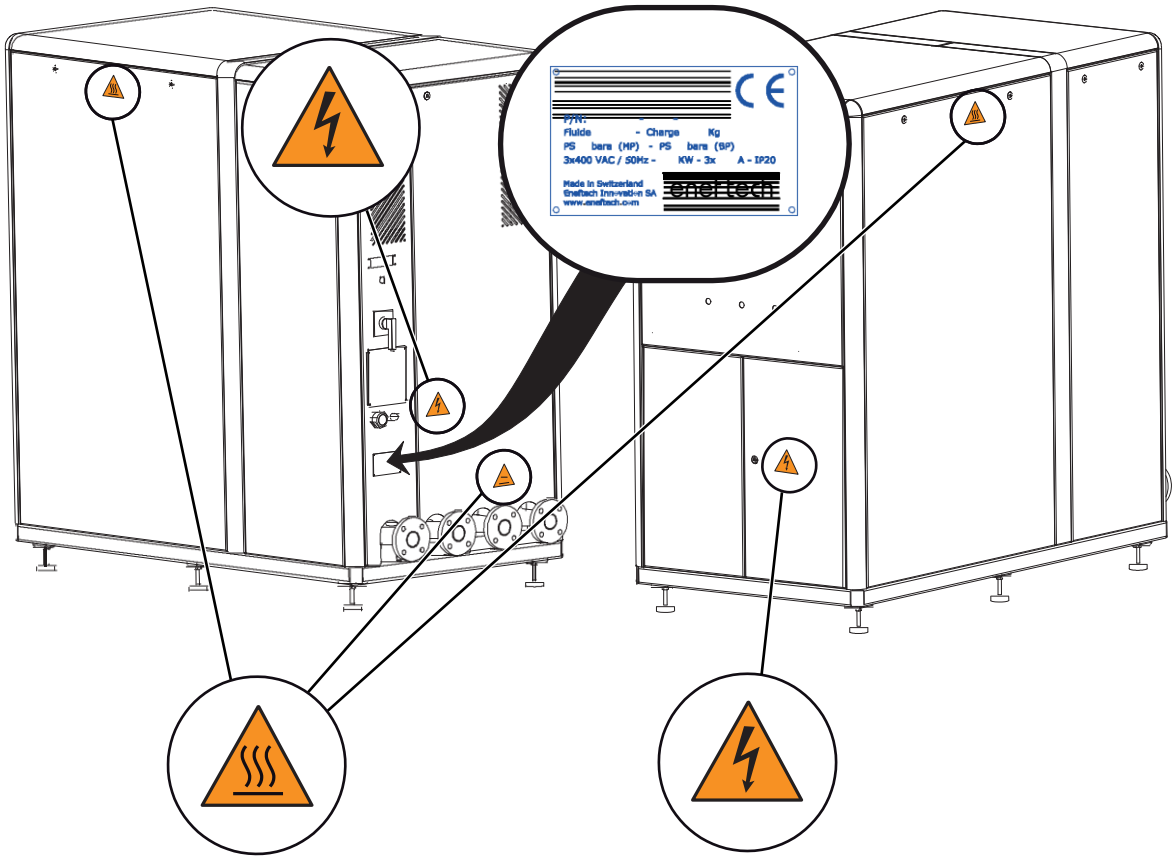

Figure 3-9

DANGER
The covers and control boxes must not be opened.

DANGER
Touching the hoses on the heat input is prohibited.

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4 Use

The unit is set up during commissioning so that it's possible for the operator to start it up (manually) or with an external signal.

FORBIDDEN !
Never turn off the safety equipment in accordance with the list on page 12.

DUTY
The ENEFCOGEN GREEN system may only be used by qualified personnel.

CAUTION
Do not turn off the main switch or disconnect the unit.

For prolonged stopping of the unit see chapter Maintenance on page 38.

INFORMATION
When the unit is stopped, automatic and periodic 3 second turbine starts in order to ensure the operational state. These start ups do not require opening the heating circuit and no production of electrical energy or heat occurs during these start ups.

4.1 Selecting a start/stop type and setting up the device

Three unit settings exist which are defined during commissioning:

- **MANUAL** allows the operator to take manual control of the unit through the start/stop commands.
- **REMOTE** allows you to control the start, settings and performance of the unit with an external signal.
- A**UTO** allows the unit itself to control the start, stop and set up the performance according to the cooling source (it is available as an optional function).

DUTY
Changing the settings must be done by qualified technical personnel who are trained and authorized by Eneftech Innovation SA.

4.2 User configuration

Two user operation types are possible.

4.2.1 Operation with cogeneration

The cooling source is used for heating. In this configuration, it is possible to change the supplied thermal power.

4.2.2 Operation without cogeneration (only the production of electricity)

The unit is set up to gain maximum thermal power and to supply the most possible electric power.

4.3 Manual operation (MANUAL)

CAUTION
Check if the cooling and heating circuits are functioning.

FORBIDDEN!
Never turn off the safety devices in accordance with the list on page 12.

4.3.1 Turning it on manually

Procedure

	Element	Activity	Note
A		Press the "START" button	
		**INFORMATION** **The production of electrical energy begins after 1 to 10 minutes, which can be monitored directly on the display of the unit or on a remote display.**	

4.3.2 Turning it off manually

Procedure			
	Element	Activity	Note
A		Press the "STOP" button	
		**INFORMATION** **In the event that stopping the unit is required, the production of electrical energy will stop after 0.1 to 5 minutes, and a complete stopping of the device is finished after 5 to 10 minutes. The stopping of production can be monitored on the unit's display or on a remote**	

4.3.3 Setting up the performance manually

During manually controlled operation, the required value (setpoint) of the thermal/electrical power of the unit is 100 % invariant. Adjustment isn't possible.

4.4 Use with an external signal (REMOTE)

The unit is controlled by an external signal. Manual interventions aren't required.

FORBIDDEN!
Never turn off the safety devices in accordance with the list on page 12.

DANGER
Only trained and authorized technical personnel can work with the cable lines or the unit's control box.

4.4.1 Setting up the performance of the unit with an external signal

If it's operated with cogeneration, the supplied thermal power can be changed by adjusting the unit's performance (40 to 100 %).
Adjusting the unit's performance is done with a 4-20 mA input signal delivered by the user (other signal types can be used if it is specified with the order). Regarding the scale, the ratio between the signal and the requirement is as follows:

- 0 % corresponds to 4 mA;
- 100 % corresponds to 20 mA.

INFORMATION
This setting is only taken into account in the event that the unit is commissioned with an external power requirement.

4.4.2 Commissioning with an external signal, operation with cogeneration

Procedure			
	Element	**Activity**	**Note**
A	ENABLE	Turn on the relay of the **ENABLE** signal.	Permission to start up the unit
B	Thermal power request	Request it through a unit performance signal, a performance greater or equal to the minimum performance (>= 50%).	

4.4.3 Commissioning with an external signal, operation without cogeneration

Procedure			
	Element	**Activity**	**Note**
A	ENABLE	Turn on the relay of the **ENABLE** signal.	Permission to start up the unit
B	RUN	Turn on the **RUN** signal.	
		INFORMATION **If it is started up with the RUN signal, then the unit works on nominal power and the performance settings aren't taken into account.**	

4.4.4 Stopping it with an external signal, operation with cogeneration

Procedure			
	Element	**Activity**	**Note**
A	Thermal power request	Request it through a unit performance signal with a performance less than or equal to	With the **ENABLE** signal still on (permission to start up the unit)
		INFORMATION **Turning off the ENABLE signal (permission to start up the device) when the unit is running causes it to stop.**	

4.4.5 Stopping it with an external signal, operation without cogeneration

Procedure			
	Element	**Activity**	**Note**
A	RUN	Turn off the RUN signal.	With the **ENABLE** signal still on (permission to start up the device)
		**INFORMATION** **Turning off the ENABLE signal (permission to start up the device) when the unit is running causes it to stop.**	

4.4.6 Returning the state of the unit to external operation

The OK STATE signal is deactivated if the unit stopped as a result of the operating alarm or if the unit isn't under electrical stress.
The NO STATE signal is deactivated when the unit is stopped.

4.4.7 Confirming alarms during external operation

Confirming alarms during external operation can be done in several ways:

- By clicking on the  symbol on the display screen. This requires a user access code which is at least at the operator's level.
- Pressing the confirmation button on the unit.

4.5 Automatic operation (AUTO)

INFORMATION
This function is available as optional.

FORBIDDEN!
Never turn off the safety devices in accordance with the list on page 12.

The unit manages the start, stop and performance settings by itself in order to maintain the temperature at the cooling source.

4.6 Emergency stop

The emergency stop of the unit can be requested by the user through a remote emergency switch.

4.7 Confirming alarms

If an alarm appears on the unit, the "Confirm" control button flashes.

INFORMATION
The operator can confirm the alarm according to the alarm type.

INFORMATION
If the unit is equipped with a control display, then the IHM/HMI program will display the alarm type.
Otherwise proceed according to the flashing signal of the error code.

See human-machine interface (HMI) on page 22.
See alarm list on page...

Procedure

	Element	Activity	Note
A		Confirm alarm.	The light turns off.
B		Press the button.	During manual operation, when the unit is stopped and when a start up is required.
		INFORMATION **If the alarm persists, wait for 2 hours and repeat the procedure.** **If the problem persists even after 2 hours of waiting, write down the error code and contact your technical assistance representative.**	

See chapter Contact on page 8.

4.8 Parameter visualization (version with a control screen or a remote display)

The state of the unit is shown on the bottom left corner of the main display panel.

The individual states are as follows:

Stopping: When the start signal isn't activated and the unit is stopped.

Stand-by: When the unit is stopped, and the "permission to start" signal is activated. The unit is waiting for a PTh4 power value, which is sufficient for starting up the unit (the operation is controlled by the start up management through an external signal: Remote option).

Start: The unit is started up.

Unit running: The turbines are turned on and they produce. The unit is stabilized. The PTh4 external power value is taken into account again.

Stopping takes place: The unit stops at the stop command.

Safety stopping: The unit is stopped resulting from the safety stop (software). The alarm is triggered and it requires confirmation so the unit can be put into operation again.

Emergency stop: The unit is stopped resulting from an emergency stop (hardware). The alarm is triggered and it requires confirmation so the unit can be put into operation again.

4.9 Levels for using visualization

The operator's access level is possible with a password. This password is available from Eneftech Innovation SA. It allows you to confirm the alarms. All the changes or activities carried out by a user with higher user level must be carried out by qualified personnel who are authorized to do so.

5 Maintenance

The user must ensure the cleanness of the unit's ventilation grills. He must check if there are any signs of oil, water or refrigerant leakage on the unit. He must inspect whether the unit is emitting any unusual sounds and whether its performance remains in a normal state without change.

If you find any problems concerning these inspections, contact Eneftech Innovation SA.

DUTY
In order to ensure optimal operation of the installation, it is recommended to perform regular maintenance.
Proceed according to the maintenance contract which includes the maintenance activities.

INFORMATION
The user is responsible for any damage to the unit caused by the drain circuits. For example: Corrosion, boiler scale, clogging, overpressure, frost, overheating, etc.

DUTY
The maintenance of the unit must only be carried out by qualified and trained personnel who are authorized by Eneftech Innovation SA.
Proceed according to the documents about maintenance and according to the local jurisdiction concerning all service work with the device.

INFORMATION
Eneftech Innovation SA recommends an annual inspection of the safety and adjustment devices of the hydraulic circuit of produced and supplied heat. (or according to the applicable laws and standards in the country of installation).

Frequency	Operation
	DUTY **Keep service records about maintenance.**
Annually (or according to the applicable laws and standards)	Total maintenance of the unit.

DANGER
Important: In order to avoid possible danger during maintenance work, when the unit's covers are taken off and when the control box is opened, it is necessary to proceed according to the instructions of trained personnel who are qualified to intervene with unit.

5.1 Record documentation

5.1.1 The unit's card

DUTY
The unit's information card must be placed in an accessible place by the installed system and adequately protected.

INFORMATION
A copy of the unit's card is available in the attachment.

5.1.2 Register update – maintenance record, maintenance service book

INFORMATION
The operator of a unit that contains 3 or more kilograms of fluorinated greenhouse gas, whether the system is hermetically sealed or not, must keep registers and make them available to competent national authorities or the European Commission at their request.

5.2 Prolonged operation shutdown

During an extended stop it is possible, but not recommended, to turn off the main switch located inside of the cabinet.

CAUTION

The main switch does not interrupt the secondary power supply connected to the unit. Therefore, it is necessary to turn off these secondary power supplies which are independent of the activation of the main switch during intervention with the unit.

DANGER

The capacitors of the unit can still discharge during the activation of the main switch and they can pose a potential danger for around 1 minute.

DUTY

Only qualified and authorized technical personnel may work with the unit.

INFORMATION

During the start up it is necessary to preheat the system, so it is appropriate to turn on the main switch at least 3 hours before launching operation.

5.3 Removing a defect

If there is a defect, proceed according to the contract about maintenance for Eneftech Innovation SA contact info.

DUTY

Only qualified technical personnel are authorized to work with the unit.

5.4 Decommissioning/disposal

DUTY
Only technical personnel are authorized to dismantle the unit for the purpose of decommissioning/disposal.

The disposal of the unit must be carried out according to the EU 2002/96/EC directive or according to the environmental standards applicable in the country where the unit is installed.

The materials from which the unit is manufactured will be sorted and then recycled in waste collection and recycling centres and in accordance with the applicable laws of the country where the unit is installed in order to decrease the impact on the environment and human health and to promote the recycling of materials.

For more information contact your local recycling centre.

Exceptional attention must be paid to the following materials:

Material	Required activity
Refrigerant	Sorting and recycling according to the standards.
Grease and oil	Sorting by the viscosity grades with the operator of the waste-specific collection point.
Metals	Sorted by type with the operator of a metal collection point or at a scrap yard.
Batteries	With an officially recognized operator of a waste-specific collection point or at a scrap yard.
Electr. cables	Sorted by the types (of metals) with an officially recognized operator of a waste-specific collection point.
Integr. circuits	With the least possible disturbances, sorted with an officially recognized operator of a waste-specific collection point.
Rubber	Sorted by the types with an officially recognized operator of a waste-specific collection point.
Hard plastics	Sorted by the types with an officially recognized operator of a waste-specific collection point.
Wood/ agglomerated woo d	Sorted with an officially recognized operator of a waste-specific collection point.

6 Attachments

6.1 Alarm types

Four types of alarms exist:

- "**Emergency**": it generates an emergency stop resulting from a safety element turning off, for example, the pressure gauge;
- "**Safety**":it generates a fast emergency stop resulting from the program finding that the limit has been exceeded, for example, the measured pressure is too high.
- "**Stop**": it generates a normal stop, for example, if the starting period is exceeded.
- "**Error/Alarm**": it informs about an error but it doesn't stop the unit, for example, an error in reading the information from the sensor.

6.2 A list of alarms

INFORMATION
If the problem persists after waiting for 2 hours, write down the error code and contact Eneftech Innovation SA technical assistance.

See chapter Contact on page 8.

No.	Alarms	Notification	Type	Remedy
1	Emergency	Emergency stop	Emergency	Confirm. If the alarm persists, contact Eneftech Innovation SA
2	Readin	Reading error	Error	Check if the SD card and the USB flash drive are connected.
3	g	Reading error	Error	
4	Readin	Reading error	Error	
5	g	Reading error	Error	
6	Readin	Reading error	Error	
7	g Readin	400V network error	Emergency	Check the 400V network
8	g Readin g	Preset error (2 active inputs)	Error	Confirm. If the alarm persists, change the preset button

No.	Alarms	Notification	Type	Remedy
9	The pressure gauge or thermostat	Pz/Tz :the pressure gauge or thermometer is running	Emergency	
12	Pressure	P1A: the outlet pressure of the evaporator is too high	Safety	
13	Temperature	T1A: the outlet temperature is too high	Safety	
14	Electrical	Turbine 1 failure	Safety	
15	Electrical	Turbine 2 failure	Safety	
16	Electrical	Turbine circuit breaker failure	Emergency	Confirm. If the problem persists, check the circuit breakers.
17	Pressure	P1A: the evaporator's outlet pressure is too low	Safety	
18	Temperature	Tsc1: the overheating is too low	Safety	
22	Pressure	P2A: the outlet pressure of the capacitor is too high	Safety	
23	Temperature	T2A: the outlet temperature of the capacitor is too high	Safety	
24	Refrigerant	PM2: pump error	Safety	
25	Refrigerant	PM2: the danger of pump cavitation	Alarm	Let the unit cool down and ventilate the room.
26	Temperature	T7A: the temperature of the pump motor PM2 is too high	Error	
27	Electrical	Network frequency error	Safety	Check the inlet temperature of the heating oil.
30	Temperature	T3A: the temperature of the heating oil is too high	Error	Confirm. If the alarm persists, restart the unit by turning the unit's main switch.
35	Electrical	PID: Program error	Stop	
50	Temperature	Aborting start up due to a temperature error	Stop	
51	Pressure	Aborting start up due		

No.	Alarms	Notification	Type	Remedy
52	Pressure	The differential pressure is too low	Safety	
53	Pressure	The turbine's pressure ratio is too low	Safety	
54	Pressure	The turbine's pressure ratio is too high	Safety	
55	Electrical	Start up error (period exceeded)	Stop	
56	Electrical	Normal stop error (period exceeded)	Safety	
57	Coolant	Cooling error (period exceeded)	Safety	Check the coolant flow.
63	Lubrication circuit	T6A: the temperature of the turbine casing is too high	Safety	
64	Lubrication circuit	The differential temperature of the casing is too high	Error	
65	Lubrication circuit	The pressure of the oil reservoir is either too high or too low	Safety	
66	Lubrication circuit	The pressure of the oil reservoir is either too high or too low	Safety	
70	Lubrication circuit	E1: el. measurement of the steam turbine error turbine error	Error	
71	Electric	E1: el. measurement of steam turbine 1 error	Error	
72	Electric	E1 : el. measurement of steam turbine 2 error	Error	
73	Electric	EPM2 :	Error	
74	Electric	P6A: measuring error	Error	
75	Electric	P1A: measuring error	Safety	
76	Electric	P1B: measuring error	Error	
77	Pressure	P2A: measuring error	Safety	
83	Pressure Pressure Pressure Temperature		Safety	Check the inlet temperature of the heating oil.

No.	Alarms	Notification	Type	Remedy
86	Temperature	Temperature measuring error	Error	
87				
88				
89				
90				
91				
92				
93				
94				
95				
96				

6.3 Safety concerning refrigerants

6.3.1 Defining danger in the event of a refrigerant leakage

6.3.1.1 Information about risks for people and the environment

INFORMATION
This substance isn't dangerous within the meaning of Directive 67/548/CEE.

6.3.1.2 Additional advice

WARNING
High concentrations of steam can cause headaches, vertigo, drowsiness, nausea and can cause loss of consciousness.

DANGER
It can cause cardiac dysrhythmia.

DANGER
It causes damage to the following organs: the cardio-vascular system and the upper airways.

6.3.2 First aid

6.3.2.1 Inhalation

Procedure		
	Activity	**Note**
A	Move the person somewhere with fresh air.	Artificial respiration and/or oxygen will be necessary.
B	Call a doctor immediately.	

6.3.2.2 Contact with skin

Procedure		
	Activity	Note
A	After exposure to skin, wash immediately with a good amount of water.	
B	Call a doctor if the skin irritation persists.	

6.3.2.3 Eye exposure

Procedure		
	Activity	Note
A	Remove contact lenses.	
B	Immediately rinse your eyes with a good amount of water, for at least 15 minutes. Also rise under the eyelids.	
C	Consult a medical expert if the eye irritation persists.	

6.3.2.4 Ingestion

Procedure		
	Activity	Note
A	Treat in the same way as inhalation.	Gaseous substances.
B	Call a doctor immediately.	

FORBIDDEN!
Do not induce vomiting without consulting a doctor.

FORBIDDEN
Never administer anything by mouth to an unconscious person.

6.3.2.5 For doctors

FORBIDDEN
Treatment: do not administer adrenaline or similar medicines.

6.3.3 Fire-fighting measures

6.3.3.1 An appropriate method of extinguishing a fire

INFORMATION
This product isn't flammable: ASHRAE 34
Use fire extinguishing powder or CO2.

6.3.3.2 Specific dangers during a fire

DANGER
There's a possibility of hazardous chemical reactions during a fire caused by the presence of F and CI.

WARNING
Heating causes an increase in pressure and the risk of an explosion.

DUTY
Cool the closed containers which are located close to the fire by spraying water.

WARNING
A non-flammable object with a temperature and atmospheric pressure of the environment can still ignite if it's mixed with air under pressure and if it's exposed to energy ignition sources.

6.3.3.3 Special protective equipment (for the personnel responsible for fire-fighting)

DUTY
Wear an autonomous respiratory protective device and protective clothing.

6.3.4 Safety measures in the event of an accidental leak

6.3.4.1 Individual safety measures

Procedure		
	Activity	**Note**
A	Contact medical personnel immediately.	
B	Wear personal protective equipment. Persons without protective equipment must be out of reach of unit installation.	
C	Ensure sufficient ventilation	In the case of insufficient ventilation, it is necessary to wear a respiratory protective device.

6.3.4.2 Measures for the protection of the environment

Procedure		
	Activity	**Note**
A	Prevent further leakage or spillage quickly. if it's possible without exposing yourself to danger.	The substance evaporates

6.3.5 Exposure control

INFORMATION
Components with occupational exposure limit values.
It doesn't contain substances with exposure limit values in the workplace.

6.3.5.1 Personal protective equipment

In the event of exposure to a refrigerant:

DUTY
Respiratory protective equipment: in the event of insufficient ventilation it is necessary to wear suitable respiratory protection.

DUTY
Hand protection: glove material: butyl rubber.

DUTY
Eye protection: protective glasses with side shields in accordance with EN166.

DUTY
Protective face shield.

DUTY
Skin and body protection.

DUTY
Protective footwear.

DUTY
Protective measures: the personal protective equipment must conform to applicable standards.

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PHONE. 03852/4665

CUSTOMER SYSTEM: UNIVERSITÄT SYDNEY
PINKCHILLER PC19

COMMISSION. NR. 2143

DRAWING NO. 149Q2013

ENCLOSURE

PRE-FUSE MAX. (BY THE COSTUMER)	16A
FULL LOAD CURRENT	4A
RATED VOLTAGE	3 X 230/400V
TYPE OF CURRENT / FREQUENCY	3~ N PE 50HZ
CONNECTED LOAD	2,5KW
CONTROL VOLTAGE	24VDC
STANDARD	BENEATH LOGICAL USE FOLLOWING ENGENEER STANDARDS: EN 61439-1 UND EN 60204-1
SHORT CIRCUIT CURRENT TIME	10KA / 0,5S
IP-PROTECTION CATEGORY	
CABLE ENRTY POINT	CABLE CONNECTION
DOOR STOP	RIGHT
COLOR	RAL 7035
AMBIENT TEMPERATURE	MAX. 40°C

CABLE COLOUR:

PRIMARY CIRCUIT:	
PHASE:	BLACK
NEUTRAL CONDUCTOR:	LIGHT BLUE
PROTECTIVE CONDUCTOR:	GREEN/YELLOW
CONTROL VOLTAGE 230VAC:	
PHASE:	RED
CONTROLCERO. (GROUNDED)	PINK
CONTROL VOLTAGE 24 VDC:	
PLUS	D-BLUE
MINUS (GROUNDED)	D-BLUE/WHITE
INTERNAL EXTRA-LOW VOLTAGE. FROM TU	WHITE
EXTERNAL VOLTAGE	ORANGE

+E1
-X1 = 230/400VAC
-X2 = 24VDC
-X3 = 230/400VAC EXTERNAL
-X4 = 24VDC EXTERNAL

CONDUCTOR LABELLING IN SS: NO

LABELLING PROCESSOR

+ALLG	GENERAL	+KAB	CABLE DIAGRAM
+E1	ENCLOSURE	+STK	BILL OF MATERIALS
+IN	INSTALATION	+BES	ORDER LIST
+AUF	CONSTRUCTION PLAN		
+KLE	TERMINAL DIAGRAM		

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	COVER SHEET	drawing nr: 149Q2013 F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	= + ALLG
			Ausdr.	27.05.2013	processor PINKCHILLER PC19					
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				drawing nr: 09149	Blatt 1
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch				von 3

Bismarck-Höhe 4
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Mobil: +43 664 4328037
martin@pretterhofer.co.at

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PRE5.SKJ

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		INHALTSVERZEICHNIS	drawing nr: 149Q2013 F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	= + ALLG
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			drawing nr: 09149	Blatt 2 / von 3
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch		DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP	

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0	1	2	3	4	5	6	7	8	9

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PRE5.SKJ

2

+E1/1

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Pretterhofer Elektrotechnik	INHALTSVERZEICHNIS	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19			F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ ALLG
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			drawing nr: 09149	Blatt 3
Änderung	Datum	Name	Gepr		Ersatz von / Ersetzt durch				von 3

Bismarck-Höhe 4
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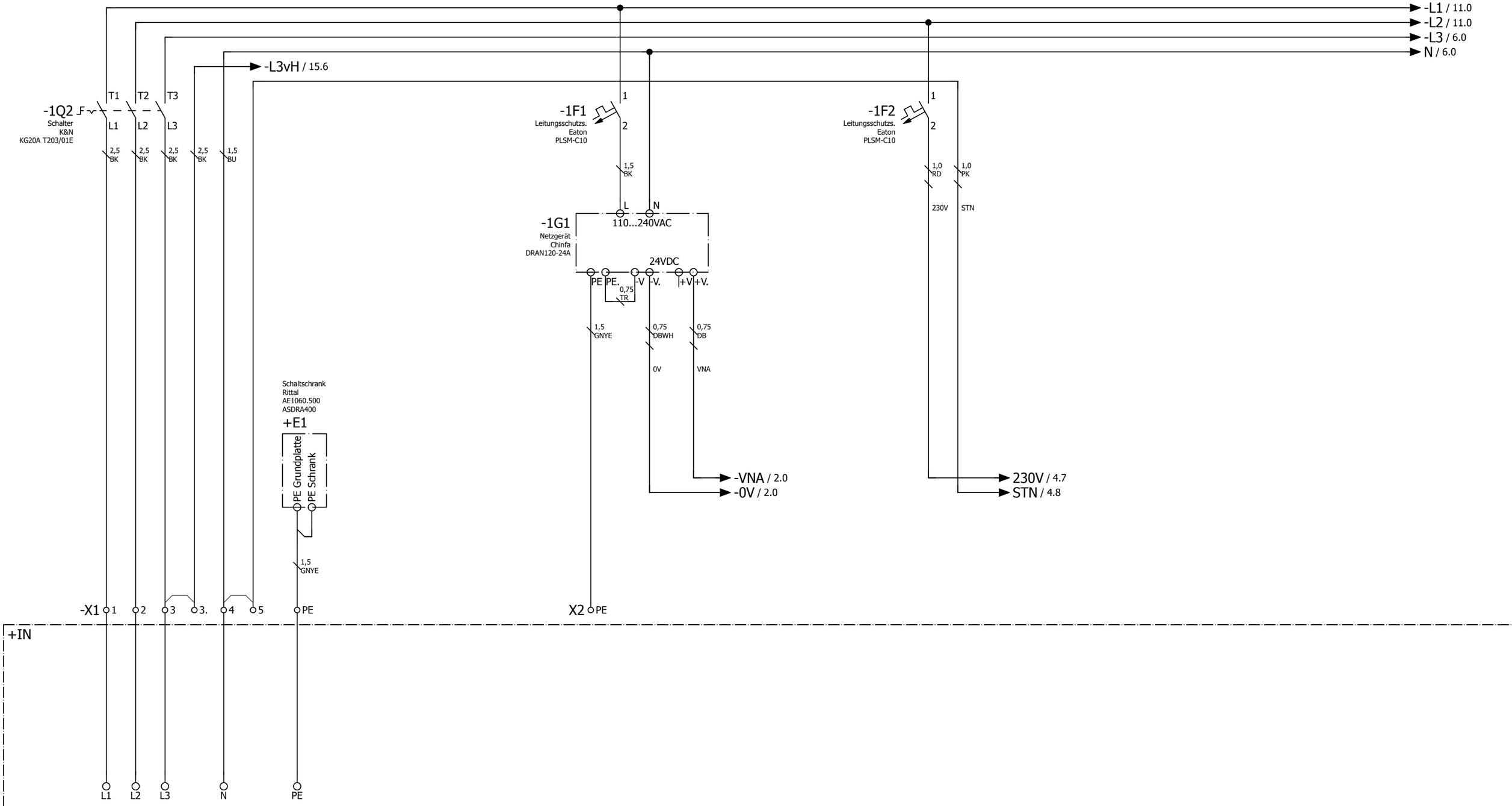

FEEDING
EXTERNAL

CONTROL
VOLTAGE 24VDC

CONTROL
VOLTAGE 230VAC

+ALLG/3

2

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	
			Ausdr.	27.05.2013	processor PINKCHILLER PC19	
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY	
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch

Pretterhofer Elektrotechnik
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martin@pretterhofer.co.at

FEED CONTROL
VOLTAGE

drawing nr: 149Q2013
F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk

=
+ E1

drawing nr: 09149

Blatt 1
von 92

Manuel
Carel
PGD1000F00

2A1

OPERATION MODULE

ETHERNET J10

Mikroprozessorsteuerung
Carel
PCO3000AL0

/91.1
91A1

PCO3

J1 G | J1 G0 | J4 VG | J4 VG0 | J5 IDC1 | J7 IDC9 | J20 IDC17 | J12 C1 | J13 C4 | J14 C7 | J15 C8 | J16 C9 | J23 E- | J23 E+ | J23 GND.

-2W1
LiYCY
3x0,5²
WH | BN | GN

E- / 3.0
E+ / 3.0
GND / 3.0
EXT / 15.0
NNA230V / 4.7
-VNA / 3.0
-0V / 3.0

1.4 / VNA
1.4 / 0V

1

3

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	SPS SUPPLY-UNIT	drawing nr: 149Q2013 =
			Ausdr.	27.05.2013	processor PINKCHILLER PC19		F:\Elektric P8 Projekte\2009\09149_Q Pink BAbsorp.elk + E1
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		drawing nr: 09149
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch	

Pretterhofer Elektrotechnik
Bismarck-Höhe 4
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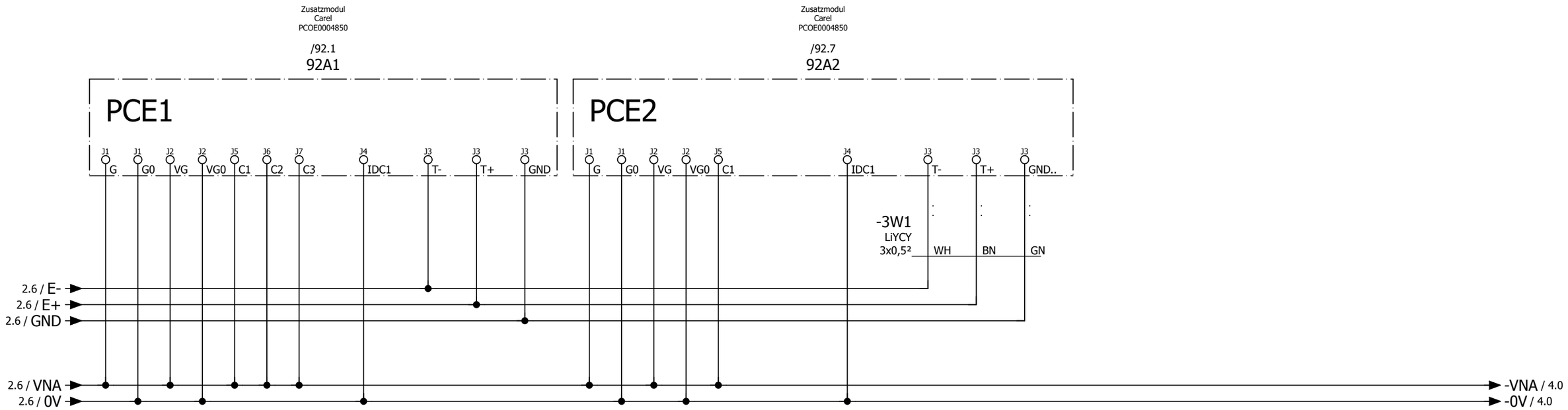

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		SPS SUPPLY-UNIT	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19			F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			= + E1
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch		drawing nr: 09149

Pretterhofer Elektrotechnik
Bismarck-Höhe 4
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3.9 / VNA

VNA / 5.0

2.6 / NNA230V

1.6 / 230V

NNA230V

MALFUNCTION
DOOR OPEN
91A1
J7 ID10

MALFUNCTION
HIGH PRESSURE
91A1
J5 ID1

-4K1
/4.8
21
22

x1
-4V1
Diodenklemme
Weidm.
ZDU 2,5/2x2AN/D
x2

-4H1
WEISS
Schildträger
Siemens
3SB3925-0AV
X1
X2

-4H2
ROT
Schildträger
Siemens
3SB3925-0AV
3SB1904-2XZ
X1
X2

-4K1
A1
A2

3.9 / 0V

0V / 6.0

1.6 / STN

STN / 7.0

-X2 1 2

X1 6 7 PE

+IN

-4W1
YSLY-OZ
2x1²
1 2

-4W2
YSLY-JZ
3x1²
1 2 PE

3RH1122-2AP00
3RT1916-1BD00
13 14
/4.3 21 22
31 32
43 44

21
-4S1
Türpositionsschalter
Rittal
SZ4127.010
22

A
-4S2
Hochdruckschalter
Johnson Controls
P77-BES-9750
B C
P

PE

CONTROL VOLTAGE
24VDC OK

MALFUNCTION
DOOR OPEN

MALFUNCTION
HIGH PRESSURE SWITCH

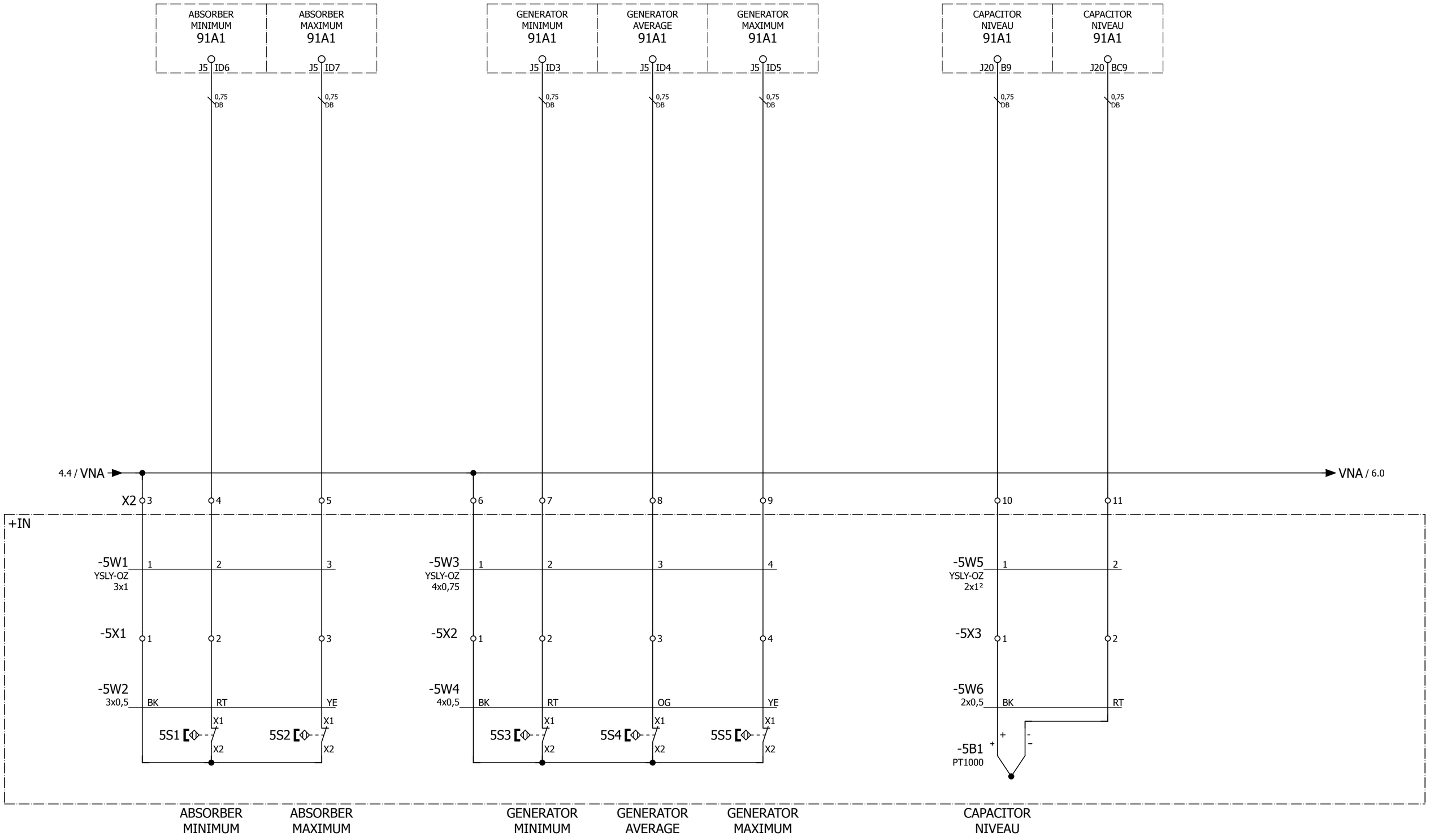
MALFUNCTION
HIGH PRESSURE

HIGH PRESSURE
SWITCH

HIGH PRESSURE
SWITCH OK

3 5

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Pretterhofer Elektrotechnik	PRESSURE SWITCH	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19	Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b		F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY	Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at		= + E1
Änderung	Datum	Name	Gepr		Ersatz von / Ersetzt durch		drawing nr: 09149	Blatt 4 von 92



4 6

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		REED SWITCH NIVEAU	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19			F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ E1
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			drawing nr: 09149	Blatt 5
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			von 92

Pretterhofer Elektrotechnik
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1.9 / L3
1.9 / -N
-L3 / 11.0
N / 11.0

-6F1
Leitungsschutzs.
Eaton
PLSM-C10

START
MT-EIN
91A1

SETPOINT
MT-EIN
91A1

FU OK
MT-EIN
92A1

THERMAL CONTACT
MT-EIN
92A1

J14 NO7
J4 Y1
J4 ID1
J4 ID2

1,5 BK
0,75 DB
0,75 DB
0,75 DB

R/L1 S/L2
LI1
A/1
R1A

-6U1
Frequenzumr.
Schneider
ATV-12H055M2

PE
U/T1
V/T2
W/T3
PE
SCHIRM
COM
R1C

1,5 GNYE

PARAMETER LIST

START TIME	ACC	0,2 SEC.
STOP TIME	DEC	0,2 SEC.
LOW FREQUENZ	LSP	0 HZ
HIGH FREQUENZ	HSP	60 HZ
MOTOR UPM	NSP	700 U/MIN
MOTOR FREQUENZ	BFR	50 HZ
HOW BFR	FRS	50 HZ
MOTOR CURRENT	ITH	3,3 A
HOE ITH	NCR	3,3 A
MOTOR MEASURING	TUN	YES 2SEC.
PRE-SELECT FREQUENZ	SP2	XXX
PRE-SELECT FREQUENZ	SP4	XXX

5.9 / VNA
4.4 / -0V
VNA / 8.0
-0V / 8.0

X1 PE
X2 12 13

+IN

-6W1
YSLCY-JZ
4x1
1 2 3 PE

-6W2
YSLY-OZ
2x1²
1 2

SH

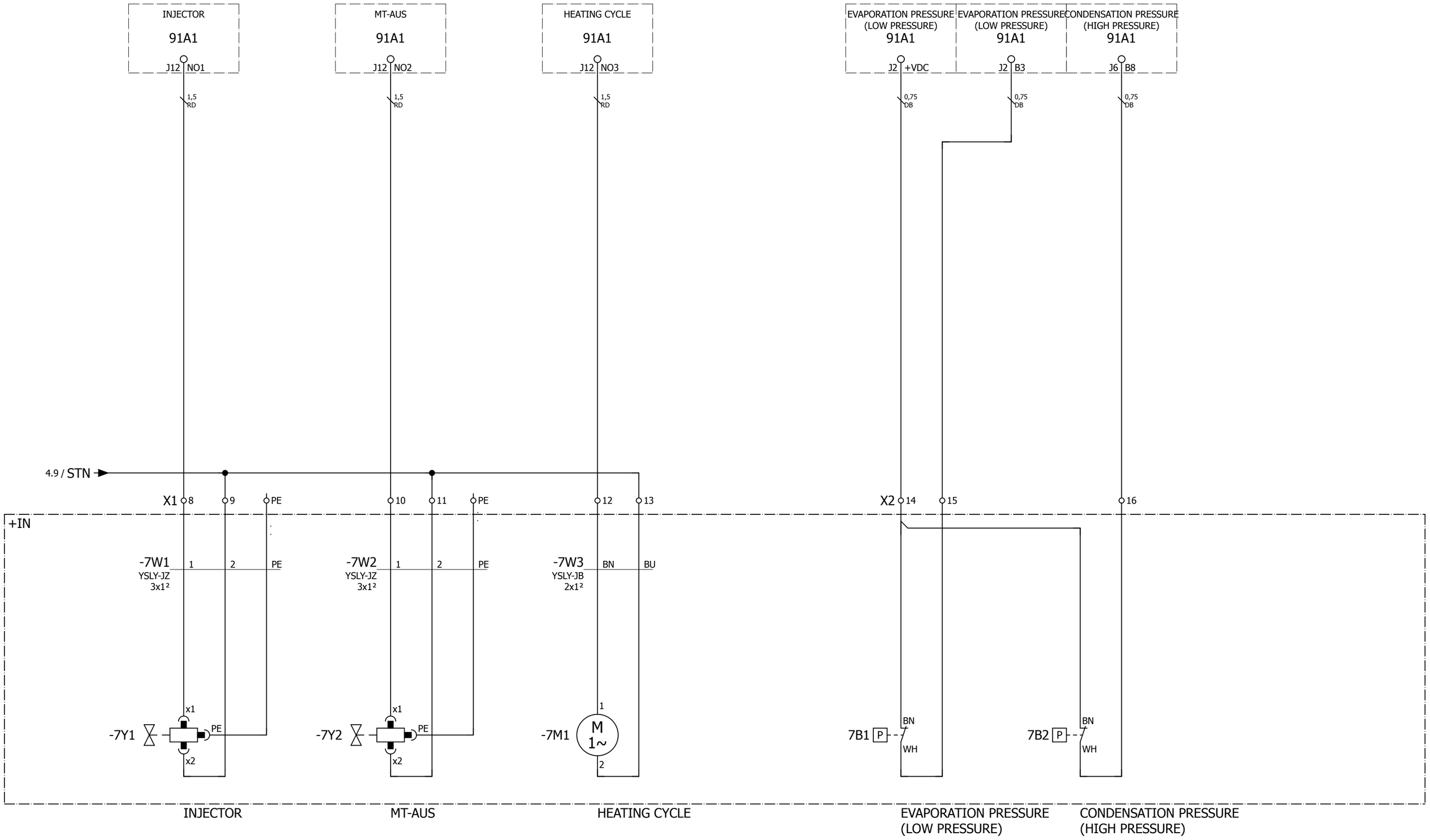
-6M1
0,55kW
TRIANGLE
U1 V1 W1 PE
M
3~

T1
Θ
T2

MT-EIN
TH OPTION

5 7

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	MT-EIN	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				= / + E1
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch	Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b	Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at	drawing nr: 09149



6 8

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	MT-KREIS	drawing nr: 149Q2013 F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	= + E1	
			Ausdr.	27.05.2013	processor PINKCHILLER PC19						
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				drawing nr: 09149	DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP	Blatt 7
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch					von 92

Bismarck-Höhe 4
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TEMPERATURE LT-ON 91A1 J24 GND

TEMPERATURE LT-ON 92A1 J10 B3

FLOW LT-OFF 91A1 J6 B6

TEMP. LT-OFF 91A1 J3 B4

TEMP. LT-OFF 91A1 J3 BC4

0,75 DBWH

0,75 DB

0,75 DB

0,75 DB

0,75 DB

6.9 / VNA

6.9 / -0V

VNA / 9.0

-0V / 9.0

X2 17 18 19 20 21 22 23

+IN

-8W1
/9.1
/10.1
YSLY-JZ
7x1²
1 2

-8E1
/9.1
/10.1
Gehäuse Alu
Weidm.
-X 1 2

-8W2
2X0,25 RD WH
- V1

-8B1
SENSOR 1

-8W3
5X0,25 BN BU BK WH GY

-8B2
SENSOR 2
1 3 4 2 5
+ -
4.....20MA
PT1000

TEMPERATURE LT-ON

FLOW LT-OFF

TEMP. LT-OFF

7

9

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	SENSORS COLD WATER	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ E1
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				drawing nr: 09149	Blatt 8
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch				von 92

Bismarck-Höhe 4
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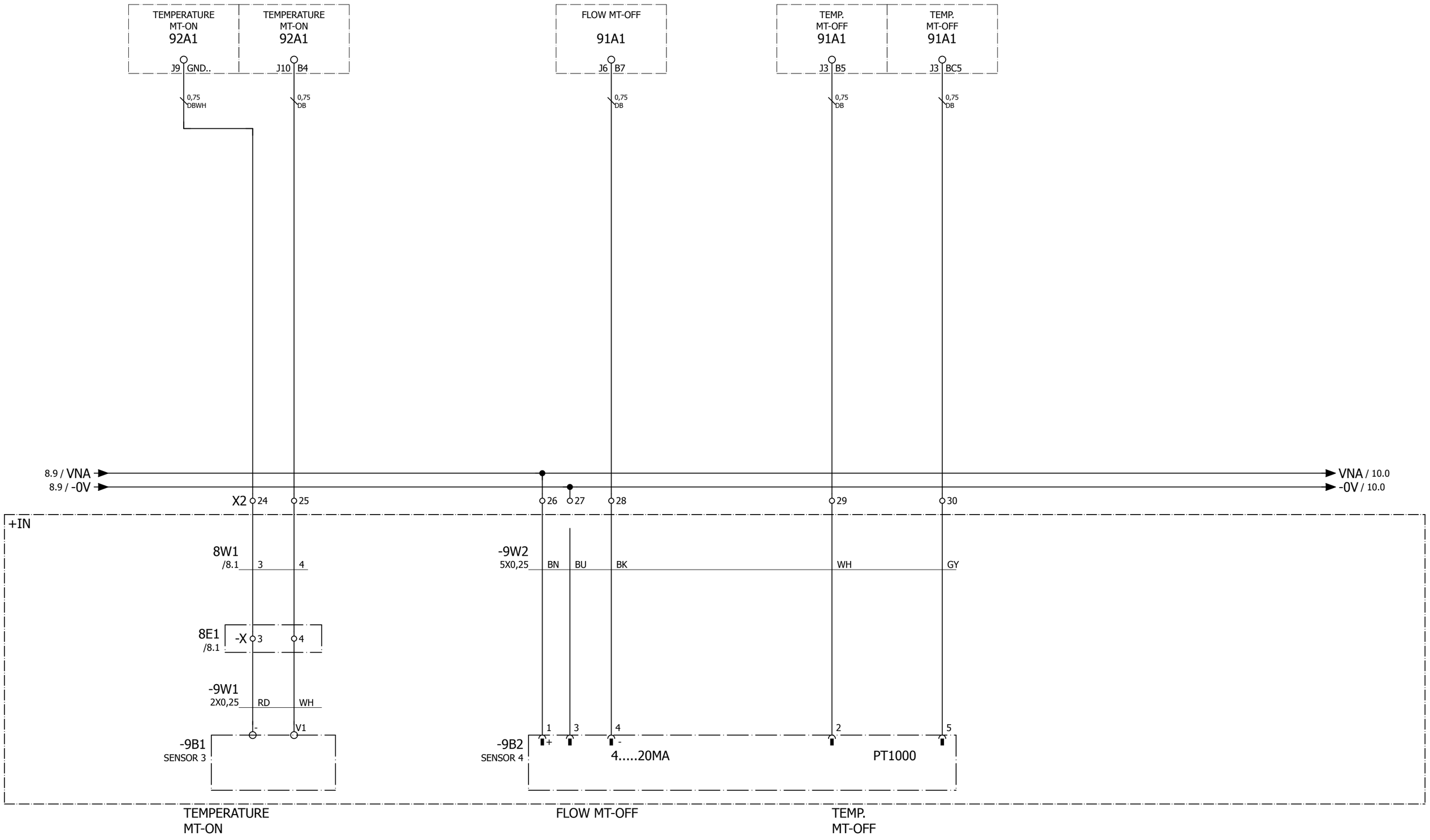
Betriebsstätte: Ganztal 1b
Tel. +43 3852 4665
Mobil: +43 664 4328037
martin@pretterhofer.co.at



8 10

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	SENSORS COOLING WATER	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				= + E1
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			drawing nr: 09149

Bismarck-Höhe 4
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Mobil: +43 664 4328037
martin@pretterhofer.co.at

TEMPERATURE
HT-OFF
92A2
J9 B1

FLOW HT-ON
91A1
J2 B2

TEMP.
HT-OFF
91A1
J20 B10

TEMP.
HT-OFF
91A1
J20 BC10

0,75
DB

13.4 / GND
9.9 / VNA
9.9 / -0V

VNA / 12.0
-0V / 11.0

X2 31 32 PE 33 34 35 36 37

+IN

8W1
/8.1 5 6 PE

-10W2
5X0,25 BN BU BK WH GY

8E1
/8.1 -X 5 6 PE

-10W1
2X0,25 RD WH
- V1

-10B1
SENSOR 5

1 3 4 2 5
+ -
4.....20MA PT1000

-10B2
SENSOR 6

TEMPERATURE
HT-OFF

FLOW HT-ON

TEMP.
HT-OFF

9 11

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	SENSORS HOT WATER	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				= + E1
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			drawing nr: 09149

Bismarck-Höhe 4
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Betriebsstätte: Ganztal 1b
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Mobil: +43 664 4328037
martin@pretterhofer.co.at

1.9 / L1
1.9 / L2
6.9 / L3
6.9 / -N

-L1 / 12.0
-L2 / 12.0
-L3 / 12.0
N / 12.0

START LT-PUMP 91A1
J15 NO8

-11F1
Leitungsschutzs.
Eaton
PLSM-C 6

SETPOINT LT-PUMP 91A1
J4 Y2

START MT-PUMP 91A1
J16 NO9

-11F2
Leitungsschutzs.
Eaton
PLSM-C 6

SETPOINT MT-PUMP 91A1
J4 Y3

0,75 DB
1,5 BK

-11K1 /11.1
-11K2 /11.5

-11K1
Relais
Finder
55.34.9.024.0040
94.84.2

-11K2
Relais
Finder
55.34.9.024.0040
94.84.2

10.9 / 0V
0V / 12.0

X3 X4 -X3 -X4

+EXT

-11W1 YSLY-JZ 3x1²
-11W2 LiYCY 2x0,5²
-11W3 YSLY-JZ 3x1²
-11W4 LiYCY 2x0,5²

55.34.9.024.0040
94.84.2

-11M1 150W
-11M2 700W

0-10V

START LT-PUMP
SETPOINT LT-PUMP
START MT-PUMP
SETPOINT MT-PUMP

10 12

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Pretterhofer Elektrotechnik	EXTERN PUMP	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19	Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b		F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ E1
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY	Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at		drawing nr: 09149	Blatt 11
Änderung	Datum	Name	Gepr		Ersatz von / Ersetzt durch			DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP	von 92

11.9 / L1
11.9 / L2
11.9 / L3
11.9 / -N

N / 15.6

START HT-PUMP 91A1 J16 NO10

-12F1 Leitungsschutz. Eaton PLSM-C 6

SETPOINT HT-PUMP 91A1 J4 Y4

START MT-FAN 91A1 J16 NO11

SETPOINT MT-FAN 91A1 J20 Y5

MALFUNCTION MT-FAN 91A1 J7 ID9

0,75 DB
1,5 BK

-12K1 /12.1
21 31 22 24 32 34

-12K1 Relais Finder 55.34.9.024.0040 94.84.2
A1 A2

-12K2 /12.6
22 24 21
1,0 OG

-12K2 Relais Finder 55.34.9.024.0040 94.84.2
A1 A2

10.9 / VNA
11.9 / 0V

VNA / 14.0
0V / 14.0

+EXT

55.34.9.024.0040 94.84.2
14 12 11 24 /12.2 22 21 34 /12.2 32 31 44 42 41

-12W1 YSLY-JZ 3x1²
1 2 PE

-12W2 LiYCY 2x0,5²
WH BN

-X3 5 6 PE
-X4 5 6 SH

-12M1 250W
L N M 1~ PE

0-10V

X3 7 8 9 10 PE
X4 7 8 9 10 11 12 SH

-12W3 YSLY-JZ 5x1²
1 2 3 4 PE

-12W4 LiYCY 8x0,75²
WH BN GN YE GY PK

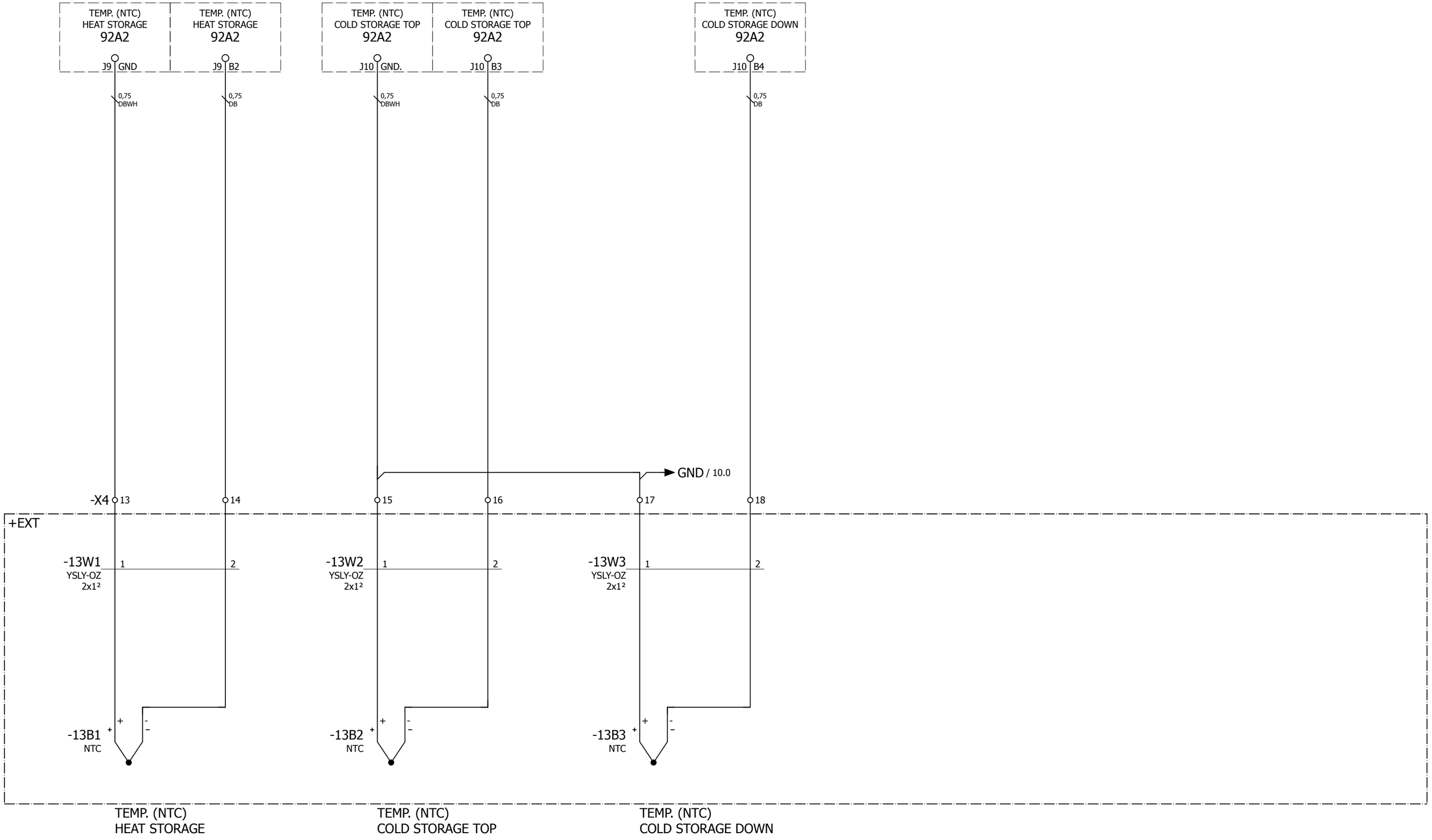
-12M2 700W
L1 L2 L3 N PE

0-10V

START HT-PUMP
SETPOINT HT-PUMP
FEEDING MT-FAN
START MT-FAN
SETPOINT MT-FAN
MALFUNCTION MT-FAN

11 13

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	EXTERN PUMP	drawing nr: 149Q2013 F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	= + E1
			Ausdr.	27.05.2013	processor PINKCHILLER PC19		Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b			
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at		drawing nr: 09149	Blatt 12
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP	von 92



12 14

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	EXTERN SENSORS COLD STORAGE HEAT STORAGE	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ E1
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b; Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at		drawing nr: 09149	Blatt 13
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP	von 92

SPARE
92A1
J6 NO2

SPARE
92A1
J7 NO3

SPARE
91A1
J24 +5VREF

SPARE
91A1
J2 B1

0,75 DB

-14K1
Relais Finder
55.34.9.024.0040
94.84.2
A1
A2

-14K2
Relais Finder
55.34.9.024.0040
94.84.2
A1
A2

-14K1 /14.1
22
24
21
1,0 OG

-14K2 /14.4
22
24
21
1,0 OG

12.9 / VNA
12.9 / -0V

X4 19 20 PE

21 22 PE

23 24

VNA / 15.4

+EXT

55.34.9.024.0040
94.84.2
14
12 11
24
/14.2 22 21
34
32 31
44
42 41

55.34.9.024.0040
94.84.2
14
12 11
24
/14.4 22 21
34
32 31
44
42 41

SPARE

SPARE

SPARE

13

15

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	EXTERN START SIGNAL SPARE	drawing nr: 149Q2013 F:\Elektric P8 Projekte\2009\09149_Q Pink BAbsorp.elk	= + E1
			Ausdr.	27.05.2013	processor PINKCHILLER PC19					
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b Tel. +43 3852 4665 Mobil: +43 664 4328037 martin@pretterhofer.co.at		drawing nr: 09149	DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch				Blatt 14 von 92

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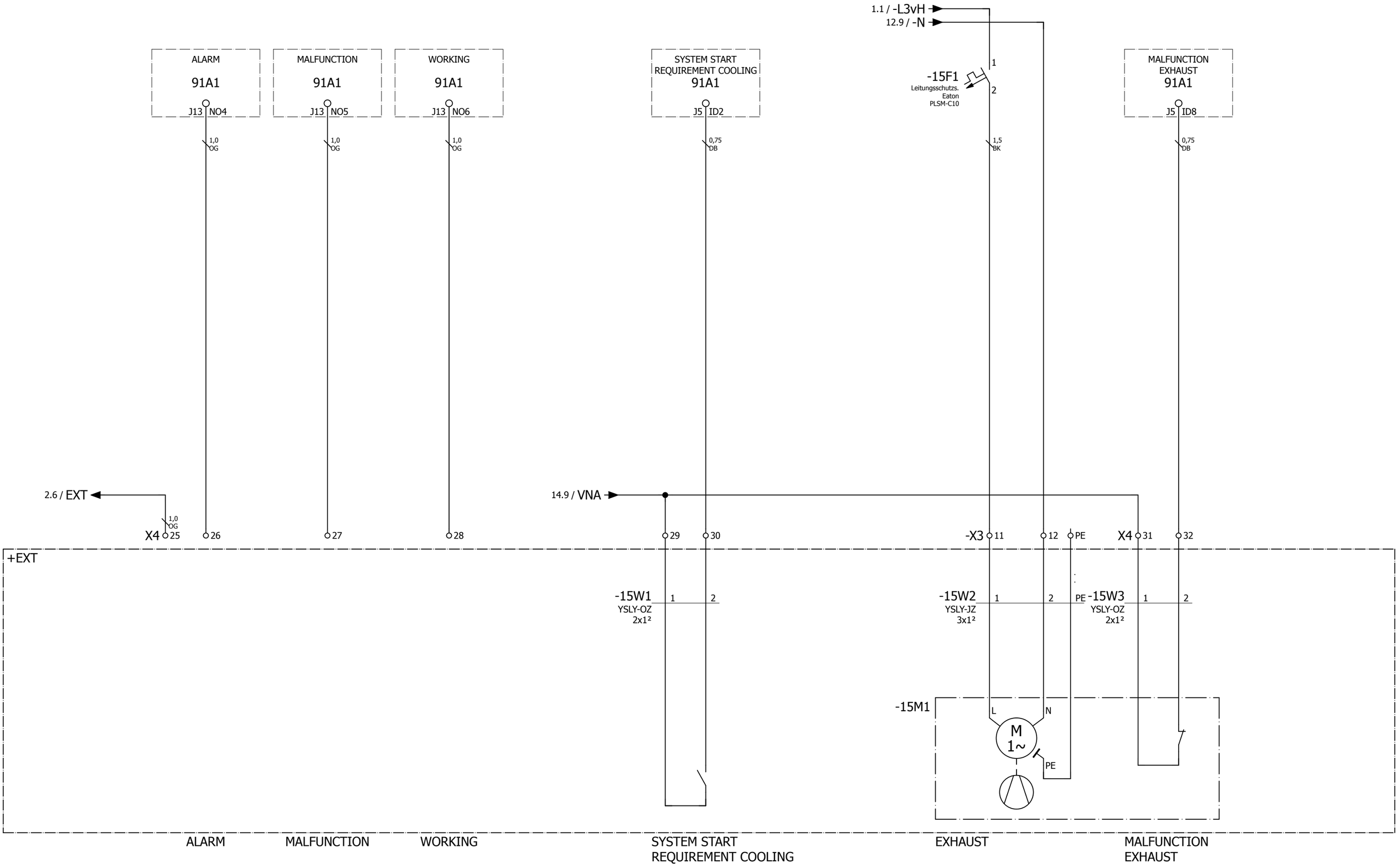

14 16

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	ALARM SIGNAL SYSTEM START	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				drawing nr: 09149
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			

Bismarck-Höhe 4
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Betriebsstätte: Ganztal 1b
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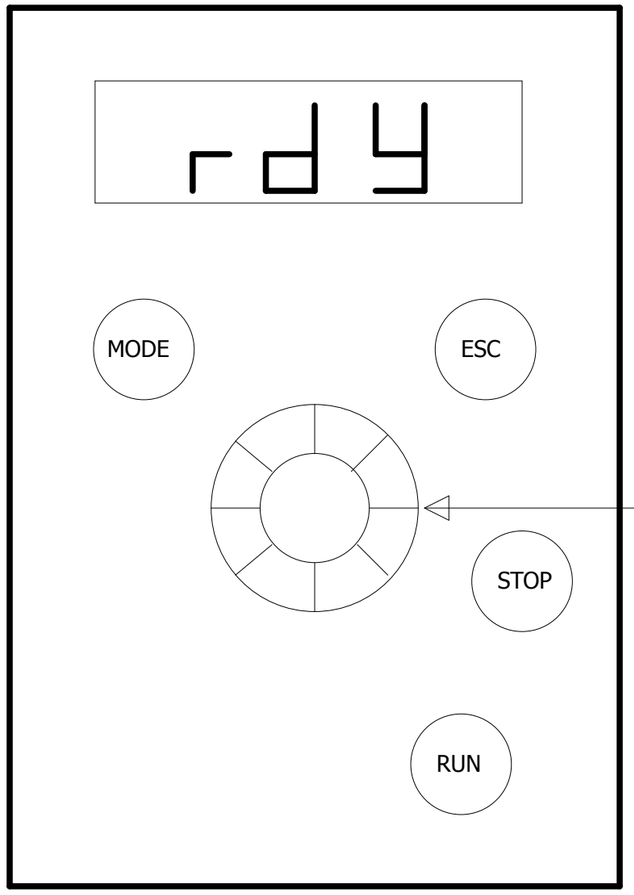
martin@pretterhofer.co.at

= + E1



PARAMETER ADJUST ATV 12 1 IN

THE MIDLE OF THE WEEL PRESS 2 WITH THE
WEEL (CONF) TAKE AND ENTER 3 PARAMETER TAKE AND ENTER 4 WITH THE
WEEL VALUE CHANGE AND ENTER 5 FOR
GO BACK (ESC) TILL (RDY)

WEEL FOR PARAMETER

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Pretterhofer Elektrotechnik	PARAMETER ADJUST ATV 12	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19			F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ E1
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			drawing nr: 09149	Blatt 16
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			von 92

Bismarck-Höhe 4
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0	1	2	3	4	5	6	7	8	9

91A1

Mikroprozessorsteuerung
Carel
PCO3000AL0

SPS VERSORGUNG	/2.1	G J1	J12 C1	/2.3	SPS VERSORGUNG				
SPS VERSORGUNG	/2.1	G0 J1	J12 NO1	/7.1	MAGNETSPULEN INJECTOR				
		+Vterm J24	J12 NO2	/7.2	MAGNETSPULEN MT-AUS				
SENSOREN KALTWASSER TEMPERATURE LT-ON	/8.1	GND J24	J12 NO3	/7.4	MAGNETSPULEN HEATING CYCLE				
EXTERNE STARTSIGNALE RESERVE SPARE	/14.7	+5VREF J24	J13 C4	/2.3	SPS VERSORGUNG				
		Rx-/Tx- J11	J13 NO4	/15.1	STÖRMELDUNGEN ANLAGENSTART ALARM				
		Rx+/Tx+ J11	J13 NO5	/15.2	STÖRMELDUNGEN ANLAGENSTART MALFUNCTION				
			J13 NO6	/15.3	STÖRMELDUNGEN ANLAGENSTART WORKING				
EXTERNE STARTSIGNALE RESERVE SPARE	/14.8	B1 J2	J14 C7	/2.3	SPS VERSORGUNG				
SENSOREN HEIßWASSER FLOW HT-ON	/10.4	B2 J2	J14 NO7	/6.2	LÖSUNGSPUMPE START MT-EIN				
MAGNETSPULEN EVAPORATION PRESSURE (LOW PRESSURE)	/7.7	B3 J2							
MAGNETSPULEN EVAPORATION PRESSURE (LOW PRESSURE)	/7.6	+VDC J2	J15 C8	/2.3	SPS VERSORGUNG				
SENSOREN KALTWASSER TEMP. LT-OFF	/8.5	B4 J3	J15 NO8	/11.1	EXTERNE PUMPEN START LT-PUMP				
SENSOREN KALTWASSER TEMP. LT-OFF	/8.6	BC4 J3	J15 NC8						
SENSOREN KÜHLWASSER TEMP. MT-OFF	/9.5	B5 J3	J16 C9	/2.4	SPS VERSORGUNG				
SENSOREN KÜHLWASSER TEMP. MT-OFF	/9.6	BC5 J3	J16 NO9	/11.5	EXTERNE PUMPEN START MT-PUMP				
SPS VERSORGUNG	/2.1	VG J4	J16 NO10	/12.1	EXTERNE PUMPEN START HT-PUMP				
SPS VERSORGUNG	/2.2	VG0 J4	J16 NO11	/12.6	EXTERNE PUMPEN START MT-FAN				
LÖSUNGSPUMPE SETPOINT MT-EIN	/6.3	Y1 J4							
EXTERNE PUMPEN SETPOINT LT-PUMP	/11.3	Y2 J4	J17 C12						
EXTERNE PUMPEN SETPOINT MT-PUMP	/11.7	Y3 J4	J17 NO12						
EXTERNE PUMPEN SETPOINT HT-PUMP	/12.3	Y4 J4	J17 NC12						
DRUCKSCHALTER MALFUNCTION HIGH PRESSURE	/4.4	ID1 J5	J18 C13						
STÖRMELDUNGEN ANLAGENSTART SYSTEM START REQUIREMENT COOLING	/15.5	ID2 J5	J18 NO13						
REED SCHALTER NIVEAU GENERATOR MINIMUM	/5.3	ID3 J5	J18 NC13						
REED SCHALTER NIVEAU GENERATOR AVERAGE	/5.4	ID4 J5							
REED SCHALTER NIVEAU GENERATOR MAXIMUM	/5.5	ID5 J5							
REED SCHALTER NIVEAU ABSORBER MINIMUM	/5.1	ID6 J5							
REED SCHALTER NIVEAU ABSORBER MAXIMUM	/5.2	ID7 J5							
STÖRMELDUNGEN ANLAGENSTART MALFUNCTION EXHAUST	/15.8	ID8 J5							
SPS VERSORGUNG	/2.2	IDC1 J5							

91A1

SENSOREN KALTWASSER FLOW LT-OFF	/8.4	B6 J6	J21 C14						
SENSOREN KÜHLWASSER FLOW MT-OFF	/9.4	B7 J6	J21 NO14						
MAGNETSPULEN CONDENSATION PRESSURE (HIGH PRESSURE)	/7.7	B8 J6	J21 NC14						
		GND J6	J21 C15						
			J21 NO15						
EXTERNE PUMPEN MALFUNCTION MT-FAN	/12.8	ID9 J7	J21 NC15						
DRUCKSCHALTER MALFUNCTION DOOR OPEN	/4.3	ID10 J7							
		ID12 J7	J22 C16						
SPS VERSORGUNG	/2.2	IDC9 J7	J22 NO16						
			J22 NO17						
		ID13H J8	J22 NO18						
		ID13 J8							
		IDC13 J8	J23 E-	/2.5	SPS VERSORGUNG				
		ID14 J8	J23 E+	/2.6	SPS VERSORGUNG				
		ID14H J8	J23 GND.	/2.6	SPS VERSORGUNG				
		ID15H J19							
		ID15 J19							
		IDC15 J19							
		ID16 J19							
		ID16H J19							
EXTERNE PUMPEN SETPOINT MT-FAN	/12.7	Y5 J20							
		Y6 J20							
REED SCHALTER NIVEAU CAPACITOR NIVEAU	/5.6	B9 J20							
REED SCHALTER NIVEAU CAPACITOR NIVEAU	/5.7	BC9 J20							
SENSOREN HEIßWASSER TEMP. HT-OFF	/10.5	B10 J20							
SENSOREN HEIßWASSER TEMP. HT-OFF	/10.6	BC10 J20							
		ID17 J20							
		ID18 J20							
SPS VERSORGUNG	/2.2	IDC17 J20							

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Pretterhofer Elektrotechnik	PLC OVERVIEW	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19	Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b		F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY	Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at		= / + E1
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch	drawing nr: 09149	DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP

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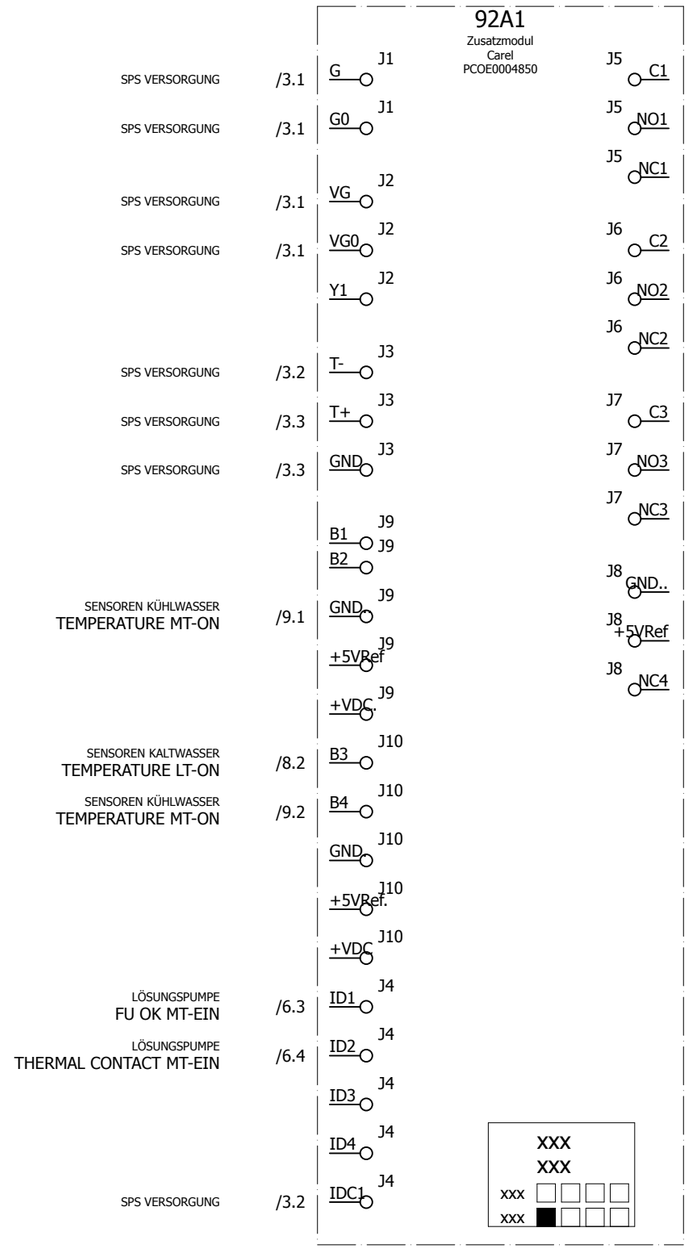

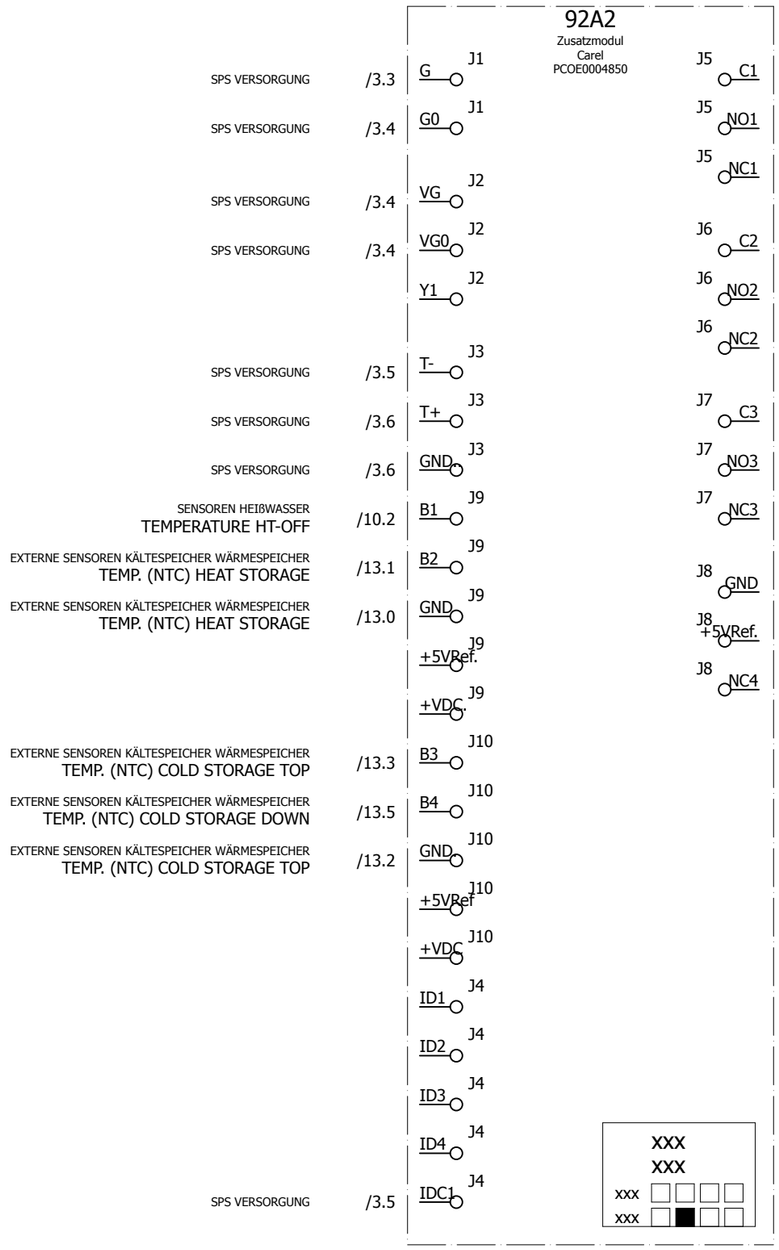

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		PLC OVERVIEW	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19			F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ E1
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			drawing nr: 09149	Blatt 92
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			von 92

Pretterhofer Elektrotechnik
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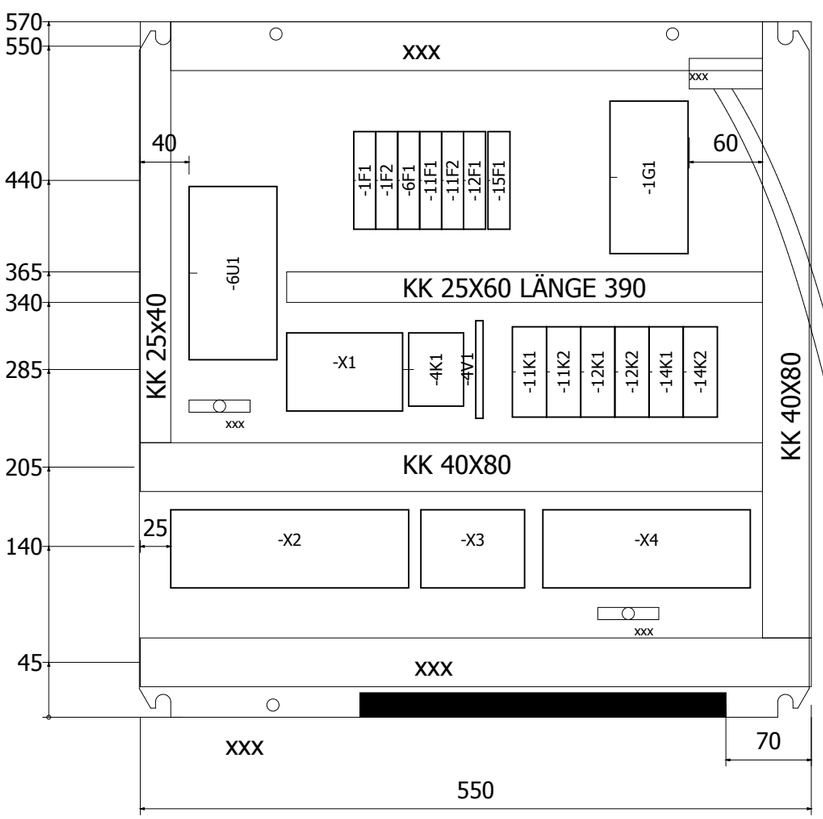
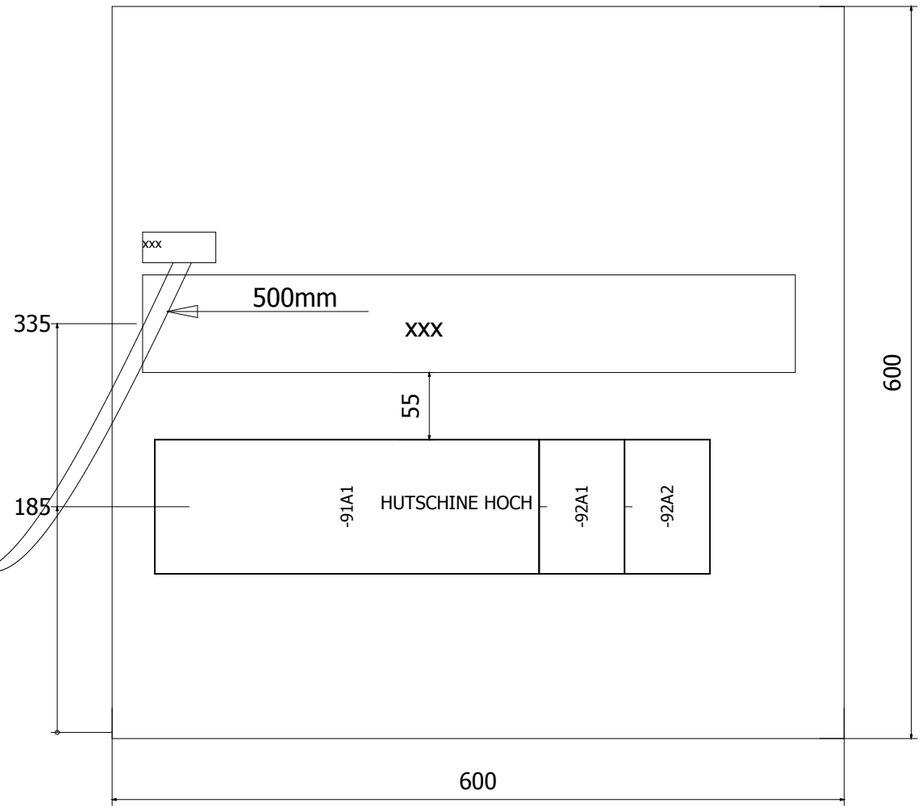
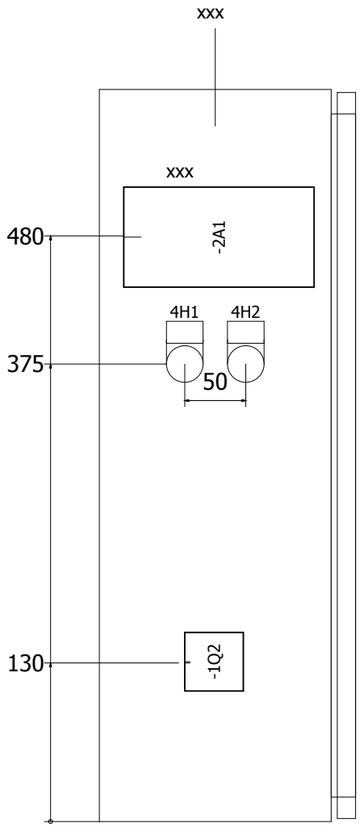
martin@pretterhofer.co.at

0	1	2	3	4	5	6	7	8	9

+E1



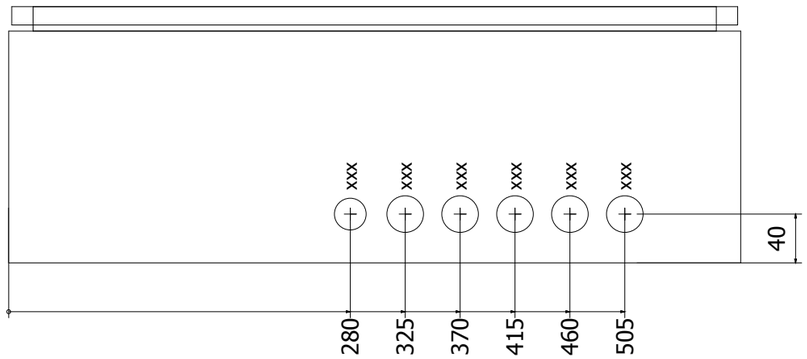


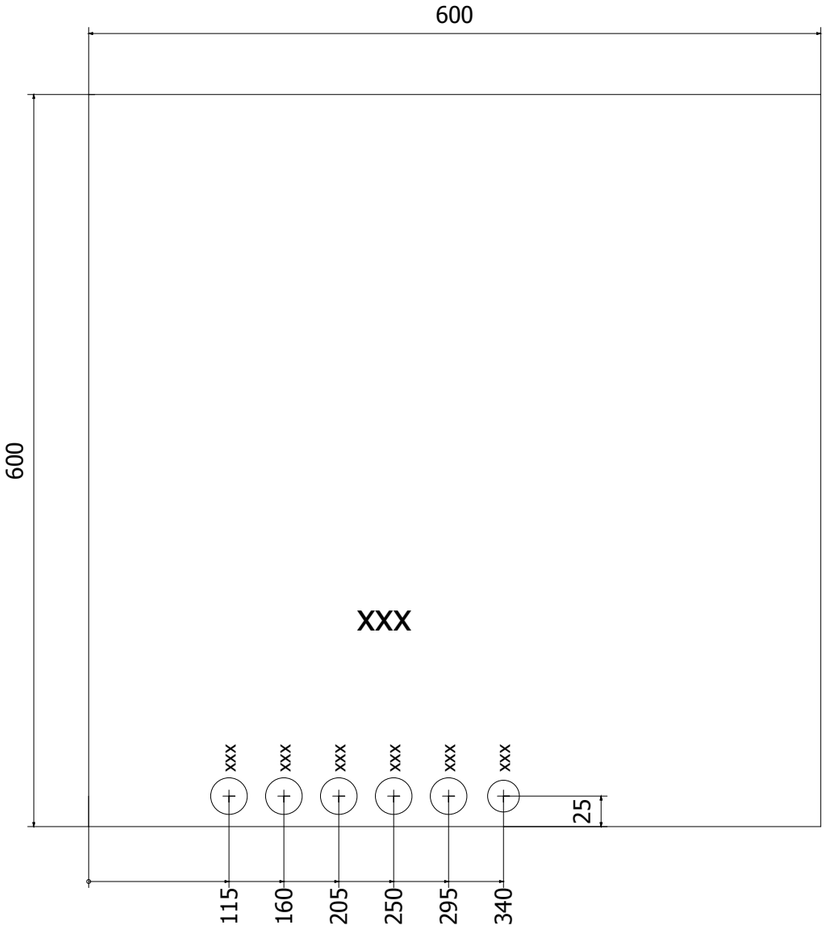


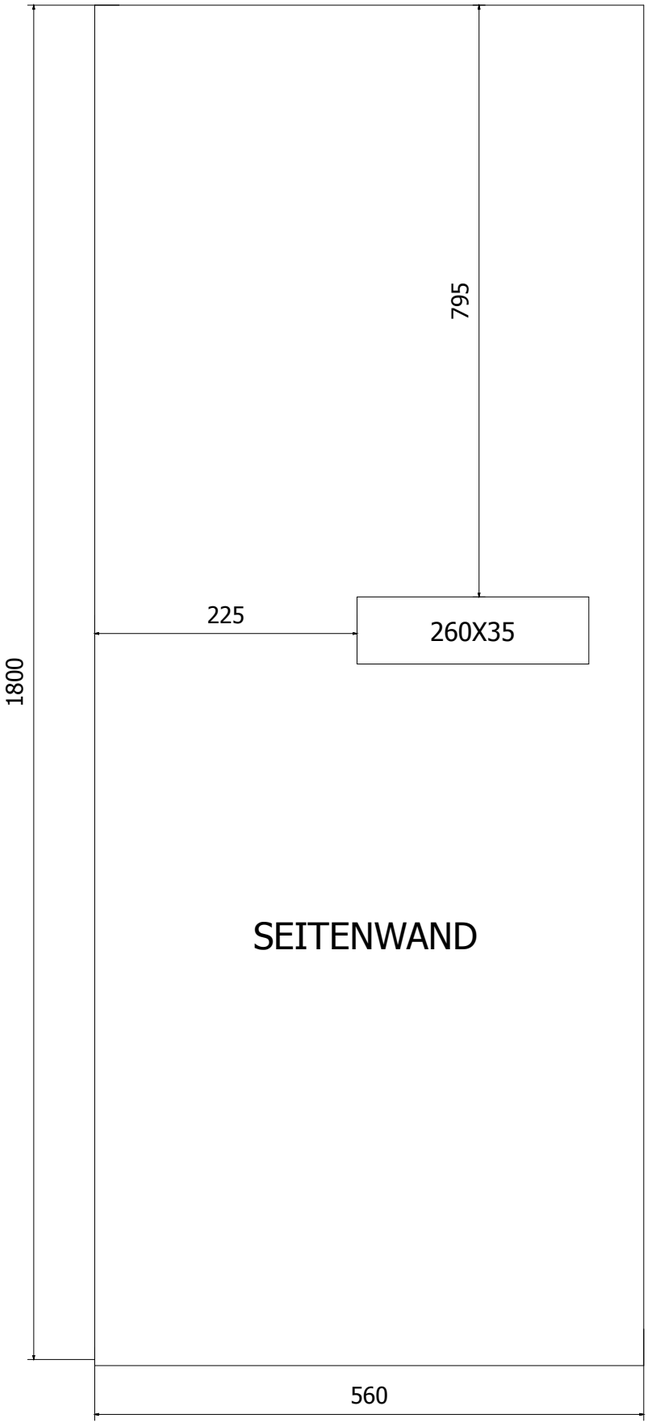
+E1/92

2

		13.03.2013	Datum	13.03.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	CONSTRUCTION SUBPLATE	drawing nr: 149Q2013 F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	= + AUF
			Ausdr.	27.05.2013	processor PINKCHILLER PC19					
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at		drawing nr: 09149	DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch				Blatt 1 von 2







1

+KLE/1

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Pretterhofer Elektrotechnik	CONSTRUCTION ENCLOSURE	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19				F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ AUF
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY				drawing nr: 09149	Blatt 2
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP	von 2

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+AUF/2

TERMINAL DIAGRAM

STRIP DESIGNATION

=+E1-X1

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ZDU 2,5/3AN/BL	5	P005365	/1.1
ZPE 2,5/3AN	PE	K804710	/1.2
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ZDU 2,5/3AN	7	K804006	/4.7
ZPE 2,5/3AN	PE	K804710	/4.7
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ZPE 2,5/3AN	PE	K804710	/7.3
ZDU 2,5/3AN	12	K804006	/7.4
ZDU 2,5/3AN	13	K804006	/7.4

Änderung	Datum	Name		
		27.05.2013	Datum	
			Ausdr.	
			Bearb	Martin
			Gepr	

Komm.Nr.: 2143
processor PINKCHILLER PC19
Customer UNIVERSITÄT SYDNEY

Ersatz von

Ersetzt durch

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Terminal diagram
=+E1-X1

drawing nr: 149Q2013
F:\Elektric PB Projekte\2009\09149 Q.Prok BA\sonp.elk

drawing nr: 09149

=
+ KLE

Blatt 1
von 5

2

TERMINAL DIAGRAM

STRIP DESIGNATION

=+E1-X2

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ZPE 2,5/3AN	PE	K804710	/1.3

Änderung | Datum | Name | Gepr
27.05.2013 | Datum | 27.05.2013
Ausdr. | 27.05.2013
Bearb | Martin

Komm.Nr.: 2143
processor PINKCHILLER PC19
Customer UNIVERSITÄT SYDNEY

Ersatz von | Ersetzt durch

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Terminal diagram
=+E1-X2

drawing nr: 149Q2013
F:\Elektric PB Projekte\2009\09149 Q.Prok BA\comp.elk
drawing nr: 09149

= + KLE

Blatt 2 von 5

TERMINAL DIAGRAM

STRIP DESIGNATION

=+E1-X3

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4	P005365	/11.7	ZDU 2,5/3AN/BL
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6	P005365	/12.2	ZDU 2,5/3AN/BL
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		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Terminal diagram =+E1-X3	drawing nr: 149Q2013
			Ausdr.	27.05.2013	processor PINKCHILLER PC19		F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		= / + KLE
Änderung	Datum	Name	Gepr		Ersatz von / Ersetzt durch		drawing nr: 09149

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TERMINAL DIAGRAM

STRIP DESIGNATION

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ZDU 2,5/3AN	13	K804006	/13.0
ZDU 2,5/3AN	14	K804006	/13.1
ZDU 2,5/3AN	15	K804006	/13.2
ZDU 2,5/3AN	16	K804006	/13.3
ZDU 2,5/3AN	17	K804006	/13.4
ZDU 2,5/3AN	18	K804006	/13.5
ZDU 2,5/3AN	19	K804006	/14.2
ZDU 2,5/3AN	20	K804006	/14.2
ZPE 2,5/3AN	PE	K804710	/14.2
ZDU 2,5/3AN	21	K804006	/14.4
ZDU 2,5/3AN	22	K804006	/14.5
ZPE 2,5/3AN	PE	K804710	/14.5
ZDU 2,5/3AN	23	K804006	/14.7
ZDU 2,5/3AN	24	K804006	/14.8
ZDU 2,5/3AN	25	K804006	/15.1
ZDU 2,5/3AN	26	K804006	/15.1
ZDU 2,5/3AN	27	K804006	/15.2
ZDU 2,5/3AN	28	K804006	/15.3
ZDU 2,5/3AN	29	K804006	/15.4
ZDU 2,5/3AN	30	K804006	/15.5
ZDU 2,5/3AN	31	K804006	/15.8
ZDU 2,5/3AN	32	K804006	/15.8

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Terminal diagram
=+E1-X4

Komm.Nr.: 2143
processor PINKCHILLER PC19
Customer UNIVERSITÄT SYDNEY

Änderung	Datum	Name		
		27.05.2013	Datum	27.05.2013
			Ausdr.	27.05.2013
			Bearb	Martin
			Gepr	

Ersatz von

Ersetzt durch

drawing nr: 149Q2013
F:\Elektric PB Projekte\2009\09149 Q.Prok BA\sonp.elk

drawing nr: 09149

=
+ KLE

Blatt 4
von 5

TERMINAL DIAGRAM

STRIP DESIGNATION

=+IN-8E1-X

TERMINAL-NUMBER	PART NUMBER	PAGE/PATH
1		+E1/8.1
2		+E1/8.2
3		+E1/9.1
4		+E1/9.2
5		+E1/10.1
6		+E1/10.2
PE		+E1/10.2

TYPE-DESIGNATION

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		
			Ausdr.	27.05.2013	processor PINKCHILLER PC19		
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch	

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Terminal diagram
=+IN-8E1-X

drawing nr: 149Q2013
F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk

=
+ KLE

drawing nr: 09149

CABLE DIAGRAM

PRE4

CABLE NAME =+EXT-11W1			CABLE TYPE YSLY-JZ 3x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/11.3	+E1-X3	PE	PE	-11M1	PE	+E1/11.2	
	+E1/11.2	+E1-X3	1	1	-11M1	L	+E1/11.2	
	+E1/11.2	+E1-X3	2	2	-11M1	N	+E1/11.2	

CABLE NAME =+EXT-11W2			CABLE TYPE LiYCY 2x0,5²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/11.3	+E1-X4	1	WH	-11M1		+E1/11.3	SETPOINT LT-PUMP
	+E1/11.4	+E1-X4	2	BN	-11M1		+E1/11.4	=
				SH				

CABLE NAME =+EXT-11W3			CABLE TYPE YSLY-JZ 3x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/11.7	+E1-X3	PE	PE	-11M2	PE	+E1/11.6	
	+E1/11.6	+E1-X3	3	1	-11M2	L	+E1/11.6	
	+E1/11.7	+E1-X3	4	2	-11M2	N	+E1/11.6	

CABLE NAME =+EXT-11W4			CABLE TYPE LiYCY 2x0,5²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/11.7	+E1-X4	3	WH	-11M2		+E1/11.7	SETPOINT MT-PUMP
	+E1/11.8	+E1-X4	4	BN	-11M2		+E1/11.8	=
				SH				

CABLE NAME =+EXT-12W1			CABLE TYPE YSLY-JZ 3x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/12.3	+E1-X3	PE	PE	-12M1	PE	+E1/12.2	
	+E1/12.2	+E1-X3	5	1	-12M1	L	+E1/12.2	
	+E1/12.2	+E1-X3	6	2	-12M1	N	+E1/12.2	

CABLE NAME =+EXT-12W2			CABLE TYPE LiYCY 2x0,5²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/12.3	+E1-X4	5	WH	-12M1		+E1/12.3	SETPOINT HT-PUMP
	+E1/12.4	+E1-X4	6	BN	-12M1		+E1/12.4	=
				SH				

CABLE NAME =+EXT-12W3			CABLE TYPE YSLY-JZ 5x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/12.5	+E1-X3	PE	PE	-12M2	PE	+E1/12.5	FEEDING MT-FAN
	+E1/12.5	+E1-X3	7	1	-12M2	L1	+E1/12.5	=
	+E1/12.5	+E1-X3	8	2	-12M2	L2	+E1/12.5	=
	+E1/12.5	+E1-X3	9	3	-12M2	L3	+E1/12.5	=
	+E1/12.5	+E1-X3	10	4	-12M2	N	+E1/12.5	=

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		
			Ausdr.	27.05.2013	processor PINKCHILLER PC19		
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch	

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CABLE DIAGRAM =+EXT-11W1
=+EXT-11W2 =+EXT-11W3
=+EXT-11W4 =+EXT-12W1
=+EXT-12W2 =+EXT-12W3

drawing nr: 149Q2013
F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk

=
+ KAB

drawing nr: 09149

Blatt 1
von 2

CABLE DIAGRAM

PRE4

CABLE NAME =+EXT-12W4			CABLE TYPE LiYCY 8x0,75²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/12.7	+E1-X4	7	WH	-12M2		+E1/12.7	START MT-FAN
	+E1/12.7	+E1-X4	8	BN	-12M2		+E1/12.7	SETPOINT MT-FAN
	+E1/12.7	+E1-X4	9	GN	-12M2		+E1/12.7	=
	+E1/12.8	+E1-X4	10	YE	-12M2		+E1/12.8	=
	+E1/12.8	+E1-X4	11	GY	-12M2		+E1/12.8	MALFUNCTION MT-FAN
	+E1/12.8	+E1-X4	12	PK	-12M2		+E1/12.8	=
				BU				
				RD				
				SH				

CABLE NAME =+EXT-13W1			CABLE TYPE YSLY-OZ 2x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/13.0	+E1-X4	13	1	-13B1	+	+E1/13.0	TEMP. (NTC) HEAT STORAGE
	+E1/13.1	+E1-X4	14	2	-13B1	-	+E1/13.0	=

CABLE NAME =+EXT-13W2			CABLE TYPE YSLY-OZ 2x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/13.2	+E1-X4	15	1	-13B2	+	+E1/13.2	TEMP. (NTC) COLD STORAGE TOP
	+E1/13.3	+E1-X4	16	2	-13B2	-	+E1/13.2	=

CABLE NAME =+EXT-13W3			CABLE TYPE YSLY-OZ 2x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/13.4	+E1-X4	17	1	-13B3	+	+E1/13.4	TEMP. (NTC) COLD STORAGE DOWN
	+E1/13.5	+E1-X4	18	2	-13B3	-	+E1/13.4	=

CABLE NAME =+EXT-15W1			CABLE TYPE YSLY-OZ 2x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/15.4	+E1-X4	29	1	-S3	2	+E1/15.5	
	+E1/15.5	+E1-X4	30	2	-S3	1	+E1/15.5	

CABLE NAME =+EXT-15W2			CABLE TYPE YSLY-JZ 3x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/15.7	+E1-X3	PE	PE	-15M1	PE	+E1/15.7	
	+E1/15.7	+E1-X3	11	1	-15M1	L	+E1/15.7	
	+E1/15.7	+E1-X3	12	2	-15M1	N	+E1/15.7	

CABLE NAME =+EXT-15W3			CABLE TYPE YSLY-OZ 2x1²					Cable length
	Seite / Spalte	Zielbezeichnung von	Anschluss	Ader	Zielbezeichnung nach	Anschluss	Seite / Spalte	
	+E1/15.8	+E1-X4	31	1	-15M1		+E1/15.8	
	+E1/15.8	+E1-X4	32	2	-15M1		+E1/15.8	

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19		F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ KAB
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY		drawing nr: 09149	Blatt 2
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch	DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP	von 2

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CABLE DIAGRAM =+EXT-12W4
=+EXT-13W1 =+EXT-13W2
=+EXT-13W3 =+EXT-15W1
=+EXT-15W2 =+EXT-15W3

0	1	2	3	4	5	6	7	8	9

Lfd. Nr.	xxx	BMK	Menge		Benennung/Hersteller/Typenbez./Bemerkung	Artikelnummer Auftraggeber	Artikel-nummer	Ident.number
1	+E1/1.1	=+E1	1	STK	CUBICLE RITTAL AE1060.500 600X600X210MM (BXHXT) RAL7035			P006674
2	+E1/1.1	=+E1	1	STK	DIAGRAM BAG SCHRACK ASDRA400 KUNSTSTOFF A4 HOCH SELBSTKL.			P003961
3	+E1/2.1	=+E1-2A1	1	STK	MT-PUMPE CAREL PGD1000F00			P009911
4	+E1/91.1	=+E1-91A1	1	STK	MIKROPROZESSORSTEUERUNG CAREL PCO3000AL0 LARGE			P009909
5	+E1/92.1	=+E1-92A1	1	STK	ADD-ON CAREL PCOE0004850			P009910
6	+E1/92.7	=+E1-92A2	1	STK	ADD-ON CAREL PCOE0004850			P009910
7	+E1/1.4	=+E1-1F1	1	STK	CIRCUIT BREAKE. EATON PLSM-C10 1POLIG		242202	P008638
8	+E1/1.6	=+E1-1F2	1	STK	CIRCUIT BREAKE. EATON PLSM-C10 1POLIG		242202	P008638
9	+E1/6.1	=+E1-6F1	1	STK	CIRCUIT BREAKE. EATON PLSM-C10 1POLIG		242202	P008638
10	+E1/11.2	=+E1-11F1	1	STK	CIRCUIT BREAKE. EATON PLSM-C 6 1POLIG		242200	P002976
11	+E1/11.6	=+E1-11F2	1	STK	CIRCUIT BREAKE. EATON PLSM-C 6 1POLIG		242200	P002976
12	+E1/12.2	=+E1-12F1	1	STK	CIRCUIT BREAKE. EATON PLSM-C 6 1POLIG		242200	P002976
13	+E1/15.7	=+E1-15F1	1	STK	CIRCUIT BREAKE. EATON PLSM-C10 1POLIG		242202	P008638
14	+E1/1.3	=+E1-1G1	1	STK	POWER SUPPLY UNIT CHINFA DRAN120-24A 230VAC/24VDC 5A			P009039
15	+E1/4.1	=+E1-4H1	1	STK	TAG HOLDER SIEMENS 3SB3925-0AV SCHWARZ H=51MM			K804720
16	+E1/4.1	=+E1-4H1	1	STK	SIGNBOARD SIEMENS 3SB1904-2XZ K1Y STEUER-	1		P004098
17	+E1/4.1	=+E1-4H1	1	STK	LIGHT SIGNAL INTENT EATON M22-L-W WHITE		216771	K804844
18	+E1/4.1	=+E1-4H1	1	STK	FIXED ADAPTER EATON M22-A FRONT FIXING.	E60405230	216374	K804851
19	+E1/4.1	=+E1-4H1	1	STK	LED-ELEMENT EATON M22-CLED-W FRONT FIXING. WHITE 24VAC/DC		216569	K804852
20	+E1/4.3	=+E1-4H2	1	STK	TAG HOLDER SIEMENS 3SB3925-0AV SCHWARZ H=51MM			K804720
21	+E1/4.3	=+E1-4H2	1	STK	SIGNBOARD SIEMENS 3SB1904-2XZ K1Y STÖRUNG			P004083
22	+E1/4.3	=+E1-4H2	1	STK	LIGHT SIGNAL INTENT EATON M22-L-R RED		216772	K804845
23	+E1/4.3	=+E1-4H2	1	STK	FIXED ADAPTER EATON M22-A FRONT FIXING.	E60405230	216374	K804851
24	+E1/4.3	=+E1-4H2	1	STK	LED-ELEMENT EATON M22-CLED-R FRONT FIXING. RED 24VAC/DC		216570	K804853
25	+E1/4.8	=+E1-4K1	1	STK	CONTACTOR SIEMENS 3RH1122-2AP00 2S+2Ö 230V 50HZ			P006809
26	+E1/4.8	=+E1-4K1	1	STK	VARISTOR SIEMENS 3RT1916-1BD00 127...240VAC; 150...250VDC			K804161
27	+E1/11.1	=+E1-11K1	1	STK	RELAY FINDER 55.34.9.024.0040 4W 24VDC			K804634
28	+E1/11.1	=+E1-11K1	1	STK	SOCKET FINDER 94.84.2 14POLIG			P008937
29	+E1/11.1	=+E1-11K1	1	STK	VARISTOR WITH LED FINDER 99.80.0.024.98 6...24 VAC/DC			K804843
30	+E1/11.5	=+E1-11K2	1	STK	RELAY FINDER 55.34.9.024.0040 4W 24VDC			K804634
31	+E1/11.5	=+E1-11K2	1	STK	SOCKET FINDER 94.84.2 14POLIG			P008937
32	+E1/11.5	=+E1-11K2	1	STK	VARISTOR WITH LED FINDER 99.80.0.024.98 6...24 VAC/DC			K804843
33	+E1/12.1	=+E1-12K1	1	STK	RELAY FINDER 55.34.9.024.0040 4W 24VDC			K804634
34	+E1/12.1	=+E1-12K1	1	STK	SOCKET FINDER 94.84.2 14POLIG			P008937
35	+E1/12.1	=+E1-12K1	1	STK	VARISTOR WITH LED FINDER 99.80.0.024.98 6...24 VAC/DC			K804843
36	+E1/12.6	=+E1-12K2	1	STK	RELAY FINDER 55.34.9.024.0040 4W 24VDC			K804634
37	+E1/12.6	=+E1-12K2	1	STK	SOCKET FINDER 94.84.2 14POLIG			P008937

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Pretterhofer Elektrotechnik	DEVICE LIST	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19			F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ STK
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			drawing nr: 09149	Blatt 1
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			von 2

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0	1	2	3	4	5	6	7	8	9

Lfd. Nr.	xxx	BMK	Menge		Benennung/Hersteller/Typenbez./Bemerkung	Artikelnummer Auftraggeber	Artikel-nummer	Ident.number
38	+E1/12.6	=+E1-12K2	1	STK	VARISTOR WITH LED FINDER 99.80.0.024.98 6...24 VAC/DC			K804843
39	+E1/14.1	=+E1-14K1	1	STK	RELAY FINDER 55.34.9.024.0040 4W 24VDC			K804634
40	+E1/14.1	=+E1-14K1	1	STK	SOCKET FINDER 94.84.2 14POLIG			P008937
41	+E1/14.1	=+E1-14K1	1	STK	VARISTOR WITH LED FINDER 99.80.0.024.98 6...24 VAC/DC			K804843
42	+E1/14.4	=+E1-14K2	1	STK	RELAY FINDER 55.34.9.024.0040 4W 24VDC			K804634
43	+E1/14.4	=+E1-14K2	1	STK	SOCKET FINDER 94.84.2 14POLIG			P008937
44	+E1/14.4	=+E1-14K2	1	STK	VARISTOR WITH LED FINDER 99.80.0.024.98 6...24 VAC/DC			K804843
45	+E1/1.0	=+E1-1Q2	1	STK	SWITCH K&N KG20A T203/01E (NOT-AUS AUSF.)	K804893		K804819
46	+E1/6.0	=+E1-6U1	1	STK	CONVERTER. SCHNEIDER ATV-12H055M2 1X230VAC 0,55KW			P009816
47	+E1/4.3	=+E1-4V1	1	STK	DIODE TERMINAL WEIDM. ZDU 2,5/2X2AN/D WITH 1N4007		165035	P005258
48	+E1/1.0;+E1/1.1;+E	=+E1-X1	12	STK	TERMINAL WEIDM. ZDU 2,5/3AN		160854	K804006
49	+E1/1.1	=+E1-X1	2	STK	TERMINAL WEIDM. ZDU 2,5/3AN/BL		160855	P005365
50	+E1/1.2;+E1/4.7;+E	=+E1-X1	5	STK	EARTHED CONDUCTOR CLAMP WEIDM. ZPE 2,5/3AN		160865	K804710
51	+E1/4.2;+E1/5.1...+	=+E1-X2	37	STK	TERMINAL WEIDM. ZDU 2,5/3AN		160854	K804006
52	+E1/1.3;+E1/10.2	=+E1-X2	2	STK	EARTHED CONDUCTOR CLAMP WEIDM. ZPE 2,5/3AN		160865	K804710
53	+E1/11.2;+E1/11.6;	=+E1-X3	7	STK	TERMINAL WEIDM. ZDU 2,5/3AN		160854	K804006
54	+E1/11.2;+E1/11.7;	=+E1-X3	5	STK	TERMINAL WEIDM. ZDU 2,5/3AN/BL		160855	P005365
55	+E1/11.3;+E1/11.7;	=+E1-X3	5	STK	EARTHED CONDUCTOR CLAMP WEIDM. ZPE 2,5/3AN		160865	K804710
56	+E1/11.3;+E1/11.4;	=+E1-X4	32	STK	TERMINAL WEIDM. ZDU 2,5/3AN		160854	K804006
57	+E1/14.2;+E1/14.5	=+E1-X4	2	STK	EARTHED CONDUCTOR CLAMP WEIDM. ZPE 2,5/3AN		160865	K804710
58	+E1/8.1	=+IN-8E1	1	STK	HOUSING ALU WEIDM. K1 70X70X40MM (BXHXT)		034200	P007179
59	+E1/4.2	=+IN-4S1	1	STK	DOOR POS SWITCH RITTAL SZ4127.010	E64775152		K801284
60	+E1/4.7	=+IN-4S2	1	STK	HIGH PRESSURE SWITCH JOHNSON CONTROLS P77-BES-9750			P008556
61	+E1/5.0	=+IN-5X1	1	STK	HOUSING ALU WEIDM. K1 70X70X40MM (BXHXT)		034200	P007179
62	+E1/5.3	=+IN-5X2	1	STK	HOUSING ALU WEIDM. K1 70X70X40MM (BXHXT)		034200	P007179
63	+E1/5.6	=+IN-5X3	1	STK	HOUSING ALU WEIDM. K1 70X70X40MM (BXHXT)		034200	P007179

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143		Device list	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19			F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ STK
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY			drawing nr: 09149	Blatt 2
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			von 2

Pretterhofer Elektrotechnik
Bismarck-Höhe 4
8680 Mürzzuschlag
Betriebsstätte: Ganztal 1b
Tel. +43 3852 4665
Mobil: +43 664 4328037
martin@pretterhofer.co.at

0	1	2	3	4	5	6	7	8	9

ser. Nr.	tot. Quantity		Designation (Remark)	xxx	City	DT	Article Number	xxx
1	1	STK	CUBICLE RITTAL AE1060.500 600X600X210MM (BXHXT) RAL7035		+E1			P006674
2	1	STK	DIAGRAM BAG SCHRACK ASDRA400 KUNSTSTOFF A4 HOCH SELBSTKL.		+E1			P003961
3	1	STK	MT-PUMPE CAREL PGD1000F00		+E1	2A1		P009911
4	1	STK	MIKROPROZESSORSTEUERUNG CAREL PCO3000AL0 LARGE		+E1	91A1		P009909
5	2	STK	ADD-ON CAREL PCOE0004850		+E1	92A1;92A2		P009910
6	4	STK	CIRCUIT BREAKE. EATON PLSM-C10 1POLIG		+E1	1F1;1F2;6F1;15F1	242202	P008638
7	3	STK	CIRCUIT BREAKE. EATON PLSM-C 6 1POLIG		+E1	11F1;11F2;12F1	242200	P002976
8	1	STK	POWER SUPPLY UNIT CHINFA DRAN120-24A 230VAC/24VDC 5A		+E1	1G1		P009039
9	2	STK	TAG HOLDER SIEMENS 3SB3925-0AV SCHWARZ H=51MM		+E1	4H1;4H2		K804720
10	1	STK	SIGNBOARD SIEMENS 3SB1904-2XZ K1Y STEUER-		+E1	4H1		P004098
11	1	STK	LIGHT SIGNAL INTENT EATON M22-L-W WHITE		+E1	4H1	216771	K804844
12	2	STK	FIXED ADAPTER EATON M22-A FRONT FIXING.		+E1	4H1;4H2	216374	K804851
13	1	STK	LED-ELEMENT EATON M22-CLED-W FRONT FIXING. WHITE 24VAC/DC		+E1	4H1	216569	K804852
14	1	STK	SIGNBOARD SIEMENS 3SB1904-2XZ K1Y STÖRUNG		+E1	4H2		P004083
15	1	STK	LIGHT SIGNAL INTENT EATON M22-L-R RED		+E1	4H2	216772	K804845
16	1	STK	LED-ELEMENT EATON M22-CLED-R FRONT FIXING. RED 24VAC/DC		+E1	4H2	216570	K804853
17	1	STK	CONTACTOR SIEMENS 3RH1122-2AP00 2S+2Ö 230V 50HZ		+E1	4K1		P006809
18	1	STK	VARISTOR SIEMENS 3RT1916-1BD00 127...240VAC; 150...250VDC		+E1	4K1		K804161
19	6	STK	RELAY FINDER 55.34.9.024.0040 4W 24VDC		+E1	11K1;11K2;12K1;12K2;14K1;14K2		K804634
20	6	STK	SOCKET FINDER 94.84.2 14POLIG		+E1	11K1;11K2;12K1;12K2;14K1;14K2		P008937
21	6	STK	VARISTOR WITH LED FINDER 99.80.0.024.98 6...24 VAC/DC		+E1	11K1;11K2;12K1;12K2;14K1;14K2		K804843
22	1	STK	SWITCH K&N KG20A T203/01E (NOT-AUS AUSF.)		+E1	1Q2		K804819
23	1	STK	CONVERTER. SCHNEIDER ATV-12H055M2 1X230VAC 0,55KW		+E1	6U1		P009816
24	1	STK	DIODE TERMINAL WEIDM. ZDU 2,5/2X2AN/D WITH 1N4007		+E1	4V1	165035	P005258
25	88	STK	TERMINAL WEIDM. ZDU 2,5/3AN		+E1	X1...X4	160854	K804006
26	7	STK	TERMINAL WEIDM. ZDU 2,5/3AN/BL		+E1	X1;X3	160855	P005365
27	14	STK	EARTHED CONDUCTOR CLAMP WEIDM. ZPE 2,5/3AN		+E1	X1...X4	160865	K804710
28	4	STK	HOUSING ALU WEIDM. K1 70X70X40MM (BXHXT)		+IN	5X1...5X3;8E1	034200	P007179
29	1	STK	DOOR POS SWITCH RITTAL SZ4127.010		+IN	4S1		K801284
30	1	STK	HIGH PRESSURE SWITCH JOHNSON CONTROLS P77-BES-9750		+IN	4S2		P008556

+STK/2

		27.05.2013	Datum	27.05.2013	Komm.Nr.: 2143	Pretterhofer Elektrotechnik	Order list	drawing nr: 149Q2013	=
			Ausdr.	27.05.2013	processor PINKCHILLER PC19	Bismarck-Höhe 4, 8680 Mürzzuschlag, Betriebsstätte: Ganztal 1b		F:\Elektric P8 Projekte\2009\09149 Q Pink BAbsorp.elk	+ BES
			Bearb	Martin	Customer UNIVERSITÄT SYDNEY	Tel. +43 3852 4665, Mobil: +43 664 4328037, martin@pretterhofer.co.at		drawing nr: 09149	DIESE ZEICHNUNG IST UNSER GEISTIGES UND MATERIELLES EIGENTUM. SIE IST EIN BETRIEBSGEHEIMNIS UND DARF NUR IM RAHMEN UNSERER WEISUNGEN VERWENDET WERDEN. MP
Änderung	Datum	Name	Gepr		Ersatz von	Ersetzt durch			Blatt 1 / von 1

9.3 Plate Heat Exchangers

Refer to Alfa Laval Instruction Manual
Plate Heat Exchangers
Part number 1644725-01

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Instruction Manual
Plate Heat Exchangers

M3 M6 M10 TS6
T2 T5

Part number 1644725-01
0502

Table of contents

How to contact Alfa Laval:

Contact details for all countries are continually updated on our website.

Please visit **www.alfalaval.com** and contact your local Alfa Laval Representative.

Except for this Instruction Manual, the following documents are also included in this shipment:

– Plate Heat Exchanger (PHE) drawing

– Plate hanging list

– Parts list with exploded view drawing.

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Notes

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Description

Main components

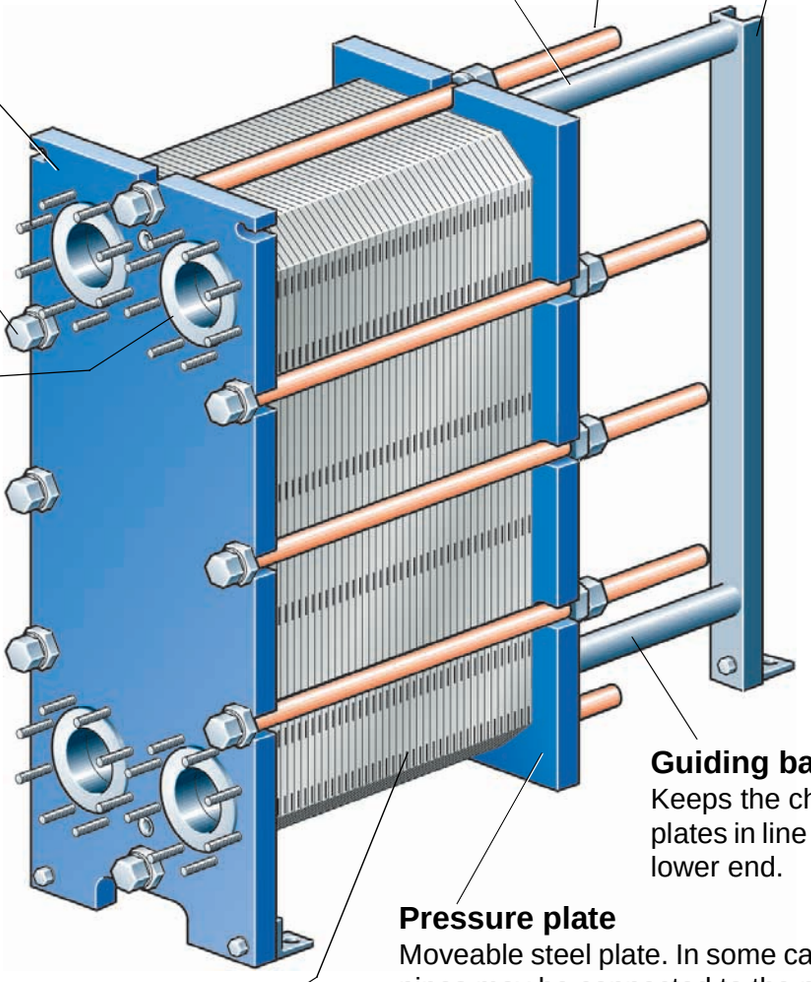
Frame plate

Carrying bar
Carries the channel plates and the pressure plate.

Bolt protection

Support column

Tightening bolts
Press the channel plates together.



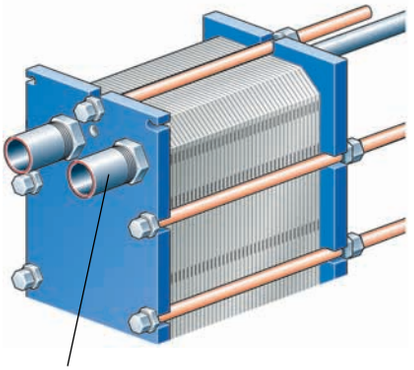
Connections
Holes through the frame plate, permitting the media to enter into the heat exchanger.

Threaded studs around the holes secure the pipes to the apparatus. Metallic or rubber-type linings may be used to protect the holes against corrosion.

Connections can also be pipes for welding or threaded.

Guiding bar
Keeps the channel plates in line at their lower end.

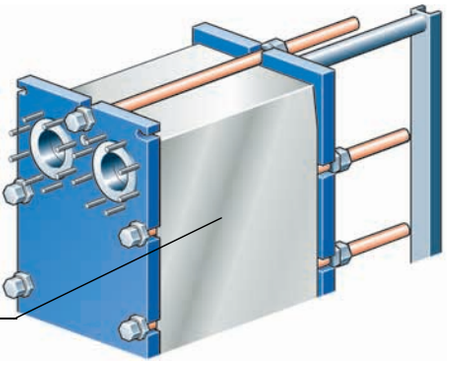
Pressure plate
Moveable steel plate. In some cases pipes may be connected to the pressure plate.



Pipe connections

Channel plates
Heat is transferred from one medium to the other through the thin channel plates.

The number of plates determines the total heat transfer surface.



Protective sheets
In the USA mandatory, in other countries optional.

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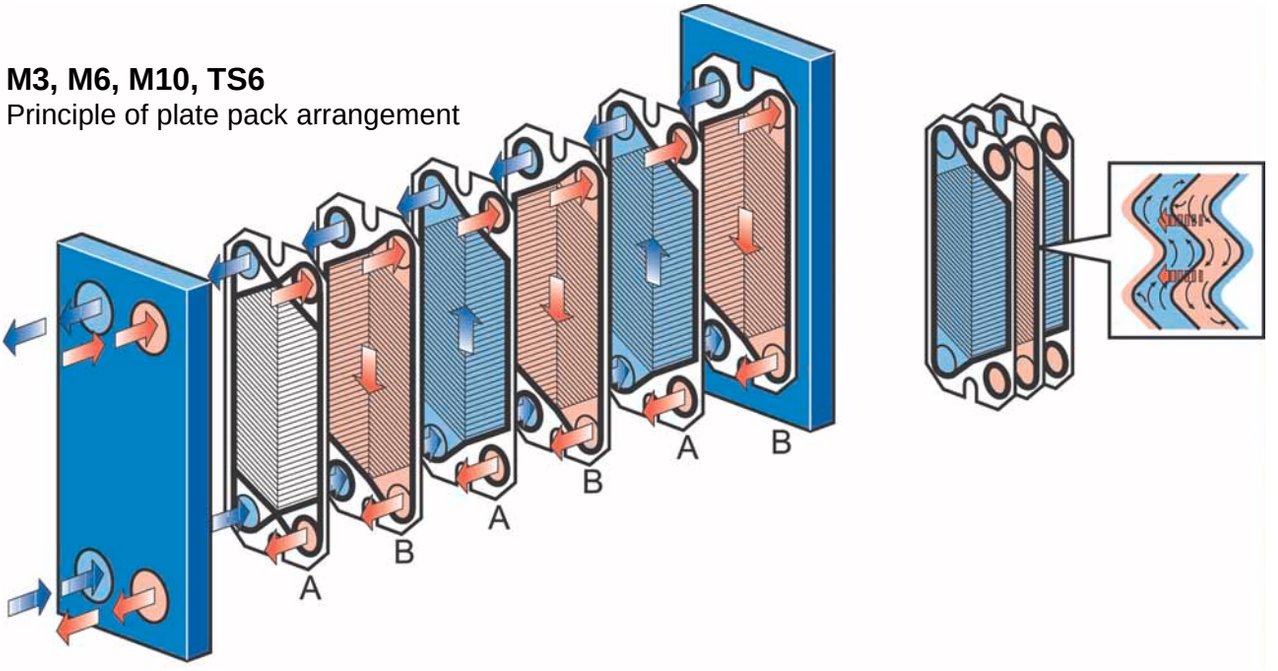
Function

The plate heat exchanger consists of a pack of corrugated metal plates with portholes for the passage of the two fluids between which heat transfer will take place.

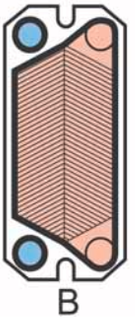
The plate pack is assembled between a frame plate and a pressure plate and compressed by tightening bolts. The plates are fitted with a gasket which seals the channel and directs the fluids into alternate channels. The plate corrugation promotes fluid turbulence and supports the plates against differential pressure.

M3, M6, M10, TS6
Principle of plate pack arrangement



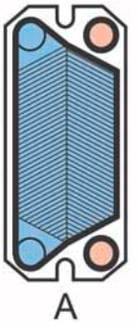
M3, M6, M10, TS6

The A-plate is a plate hanging with the chevron pointing downwards.

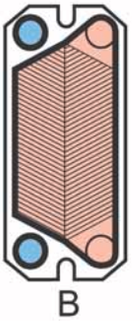


The B-plate is a plate hanging with the chevron pointing upwards.

T2, T5



The A-plate is a plate hanging with the chevron pointing upwards.



The B-plate is a plate hanging with the chevron pointing downwards.

Semi-welded PHE

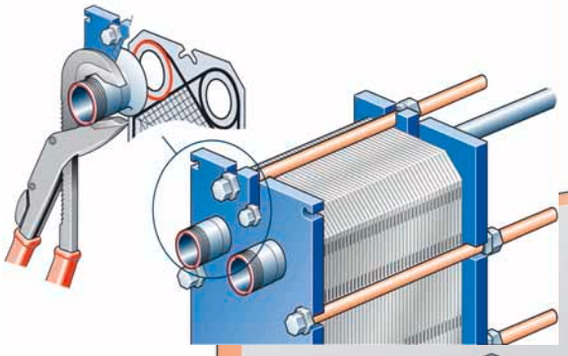
For certain plate sizes there are semi-welded plates (Cassettes) available. The function of the semi-welded PHE is the same as that of the conventional PHE. Chapters Installation and Operation of this manual are applicable to full extent. Chapter Maintenance is fully applicable when it comes to the parts Cleaning-in-Place and Pressure test after maintenance and partially applicable for the remaining part. To cover the specific requirements of the semi-welded PHE a separate additional manual has been made.

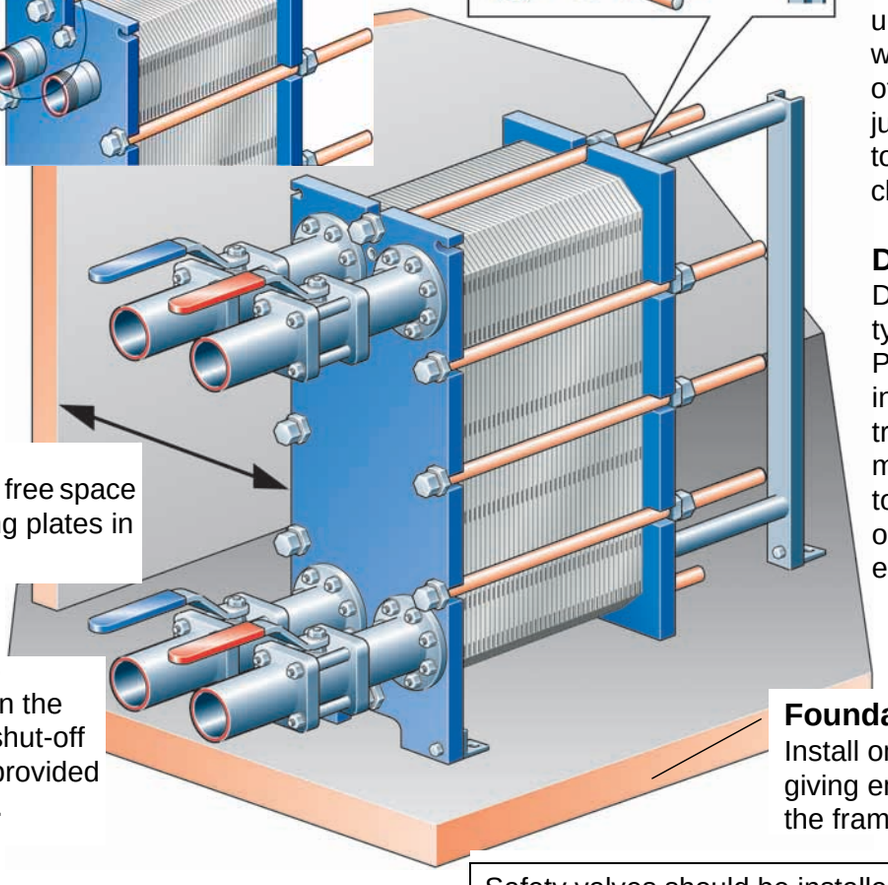
Installation

Requirements

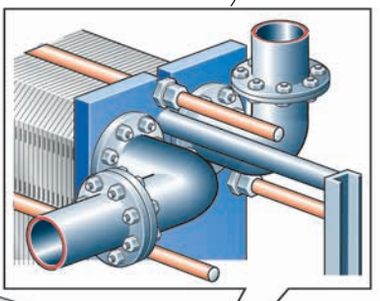
Pipes

Caution!
Make sure the pipe connections are locked when working on the piping. Turning of the connections will damage the gaskets on the end plate and cause leakage.





Multi-pass units: Connections on the pressure plate
It is important that the plate pack has been tightened to the correct measurement (check against drawing) before the pipe is connected.



Elbow
To make it easier to disconnect the plate heat exchanger, an elbow should be flanged to the connection in the pressure plate, directed upwards or sideways, and with another flange located just outside the contour of the heat exchanger.

Drip tray
Depending on the type of fluid in the PHE and the type of installation, a drip tray (drainage box) may be nesessary to avoid damages on personnel and equipment.

Space
600 mm minimum free space is needed for lifting plates in and out.

Shut-off valves
To be able to open the heat exchanger, shut-off valves should be provided in all connections.

Foundation
Install on a flat foundation giving enough support to the frame.

Note!

- Before connecting any piping, make sure all foreign objects have been flushed out of the system.
- When connecting the pipe system make sure the pipes do not subject the plate heat exchanger to stress or strain.
- To avoid water hammer, do not use fast-closing valves.

Safety valves should be installed according to current pressure vessel regulations.

If PHE surface temperature is expected to be hot or cold, the PHE should be isolated.

It is recommended that protective sheets are used to cover the PHE.

For each model, design pressures and temperatures are marked on the identification plate. These must not be exceeded.

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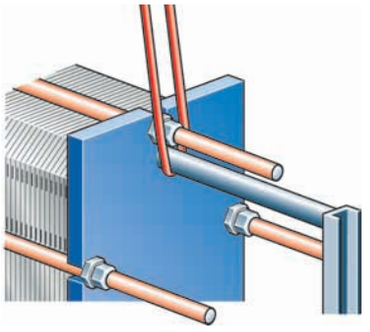
Lifting

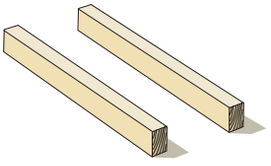
Warning!
Never lift by the connections or the studs around them.



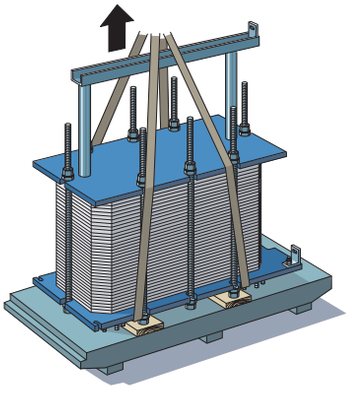
Straps should be used when lifting. Place straps according to picture.

Raising

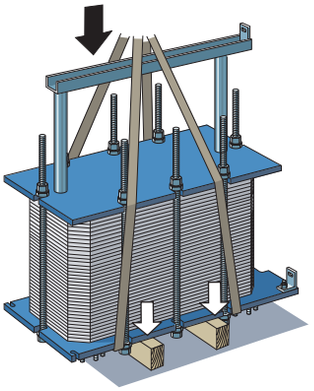
1. Place two timber beams on the floor.



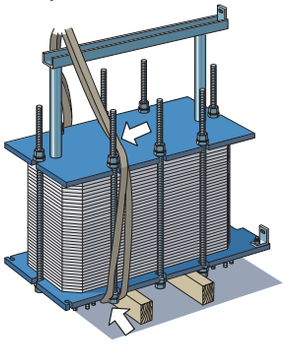
2. Lift the heat exchanger off pallet using e.g. straps.



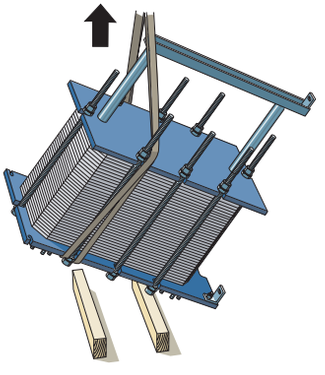
3. Place the heat exchanger on the timber beams.



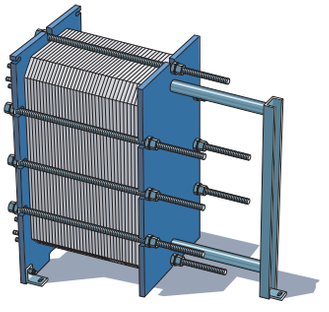
4. Place straps around one bolt on each side.



5. Lift the heat exchanger off the timber beams.



6. Lower the heat exchanger to horizontal position and place it on the floor.



Operation

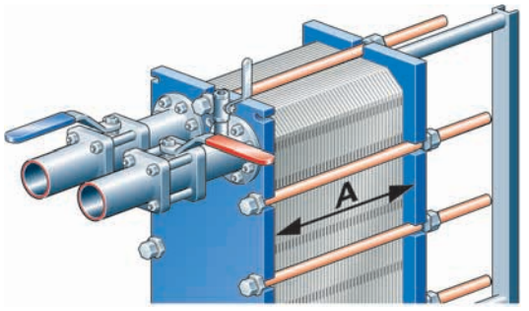
Start-up

Note!
If several pumps are included in the system, make sure you know which one should be activated first.

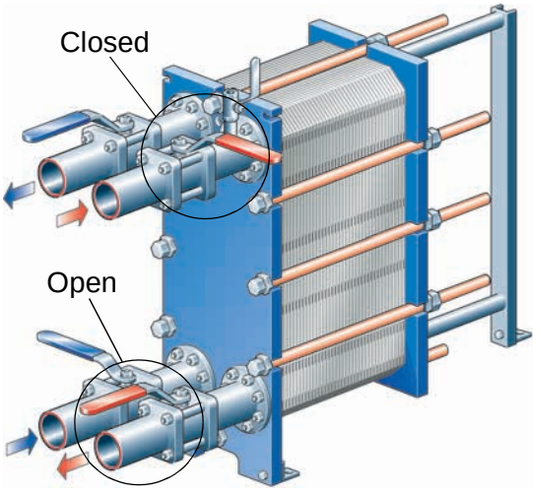
Note!
Adjustments of flowrates should be made slowly in order to avoid the risk of **water hammer**.

Water hammer is a shortlasting pressure peak that can appear during start-up or shut-down of a system, causing liquids to travel along a pipe as a wave at the speed of sound. This can cause considerable damage to the equipment.

1. Check that measurement A is correct. For A, see enclosed PHE-drawing.

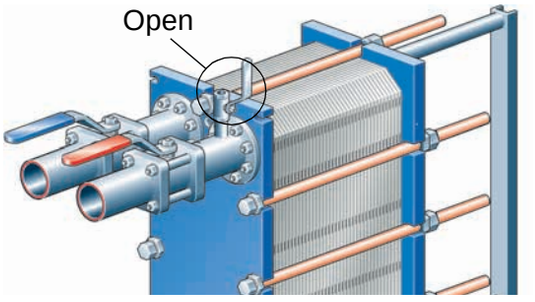


2. Check that the valve is closed between the pump and the unit controlling the system flowrate.

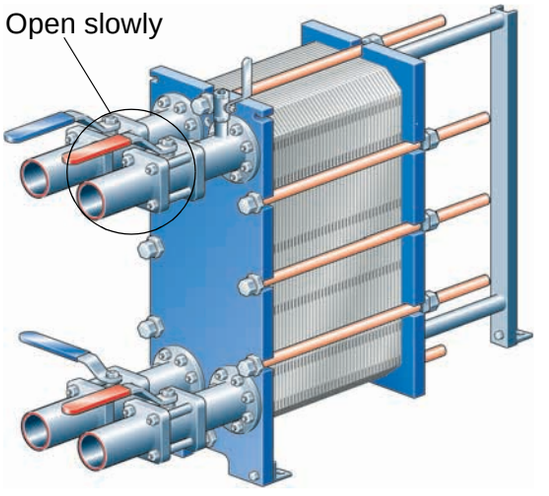


3. If there is a valve at the exit, make sure it is fully open.

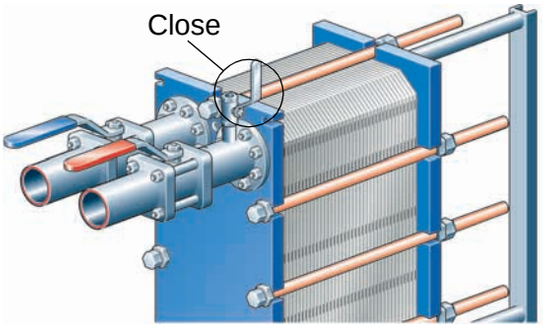
4. Open the vent and start the pump.



5. Open the valve slowly.



6. When all air is expelled, close the vent.



7. Repeat steps 1– 6 for the second media.

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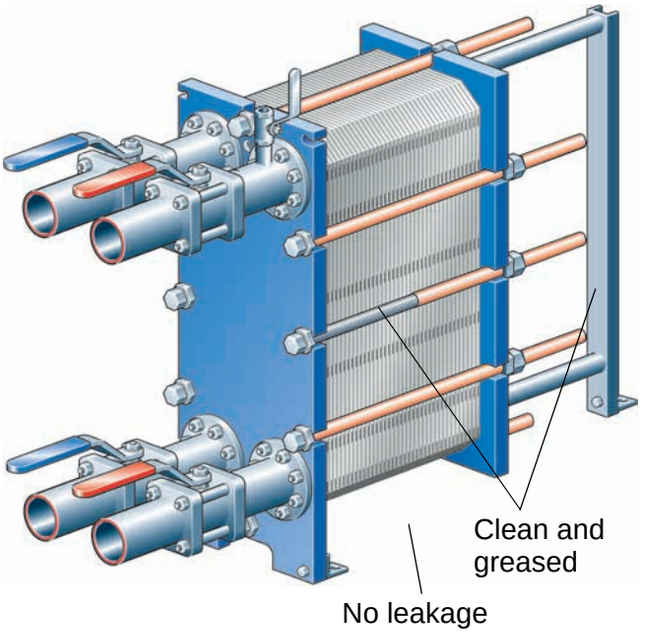
Unit in operation

Note!
Adjustments of flowrates should be made slowly in order to protect the system against sudden and extreme variations of temperature and pressure.

During operation, check that

- ☑ media temperatures and pressures are within the limits stated on the PHE-drawing
- ☑ no leakages appear due to faulty tightening of the plate pack or to defective or damaged gaskets
- ☑ support column, carrying bar and guiding bar are kept clean and greased
- ☑ the bolts are kept clean and greased.



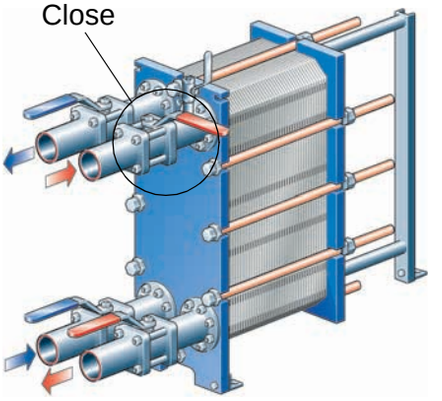
Always consult your local Alfa Laval Representative for advice on

- new plate pack dimensions if you intend to change number of plates
- selection of gasket material if operating temperatures and pressures are permanently changed, or if another medium is to be processed in the PHE.

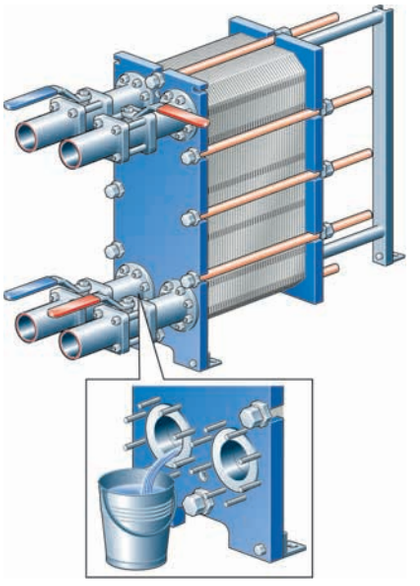
Shut-down

Note!
If several pumps are included in the system, make sure you know which one should be stopped first.

1. Slowly close the valve controlling the flowrate of the pump you are about to stop.



2. When the valve is closed, stop the pump.
3. Repeat steps 1–2 for the other side.
4. If the heat exchanger is shut down for several days or longer, it should be drained. Draining should also be done if the process is shut down and the ambient temperature is below freezing temperature of the media. Depending on the media processed, it is also recommended to rinse and dry the heat exchanger plates and connections.



Maintenance

Cleaning-In-Place (CIP)

The Cleaning-In-Place (CIP) equipment permits cleaning of the plate heat exchanger without opening it.

If CIP cannot be done, cleaning must be performed manually, see section “Manual cleaning”.

CIP performs

- cleaning of fouling and descaling of lime deposits
- passivation of cleaned surfaces to reduce susceptibility to corrosion
- neutralization of cleaning liquids before draining.

Follow the instructions of the CIP equipment.

CIP equipment

CIP model		Maximum number of plates					
		M3	M6	M6-M	M10-B	M10-M	TS6-M
	CIP 20	90	89	62	40	27	56
	CIP 40	–	178	124	81	53	110

Cleaning liquids

Cleaning liquid	Description
AlfaCaus	A strong alkaline liquid, for removing paint, fat, oil and biological deposits.
AlfaPhos	An acid cleaning liquid for removing metallic oxides, rust, lime and other inorganic scale.
AlfaPass	An alkaline liquid for passivation (inhibition of corrosion).
AlfaNeutra	A strong alkaline liquid for neutralization of AlfaCarbon or AlfaPhos before drainage.

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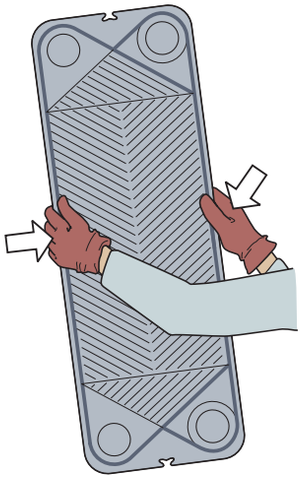
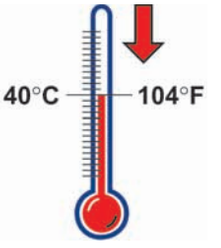
Manual cleaning

Warning!
To avoid hand injuries owing to sharp edges, protective gloves should always be worn when handling plates and protective sheets.

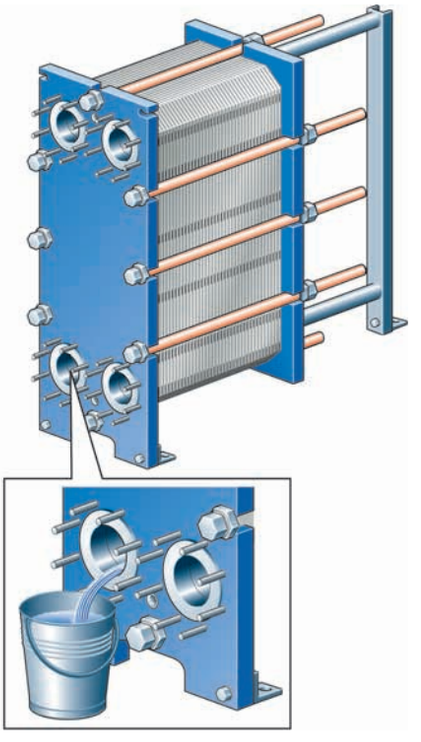


Opening

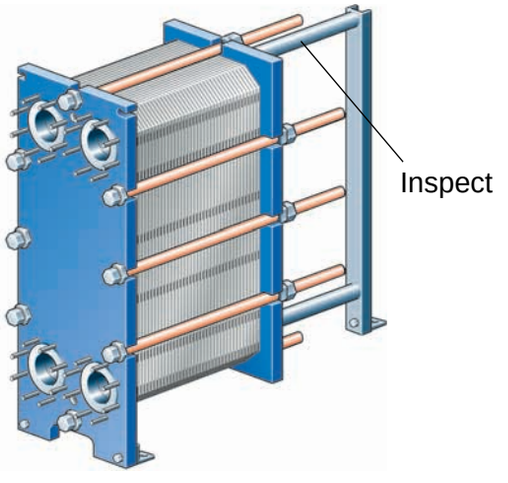
Warning!
If the heat exchanger is hot, wait until it has cooled down to about 40 °C (104 °F).



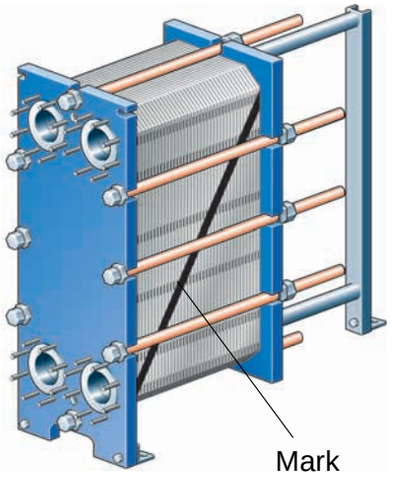
1 Drain the plate heat exchanger.



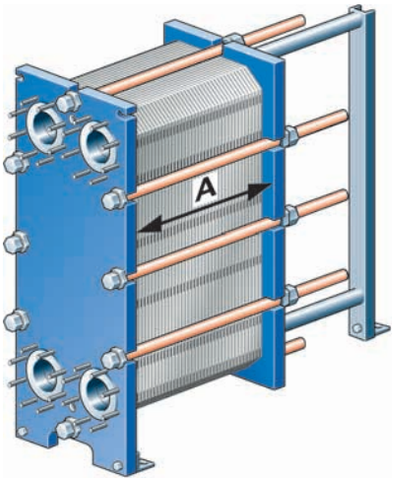
2 Inspect the sliding surfaces of the carrying bar and wipe clean.



3 Mark the plate assembly on the outside by a diagonal line.



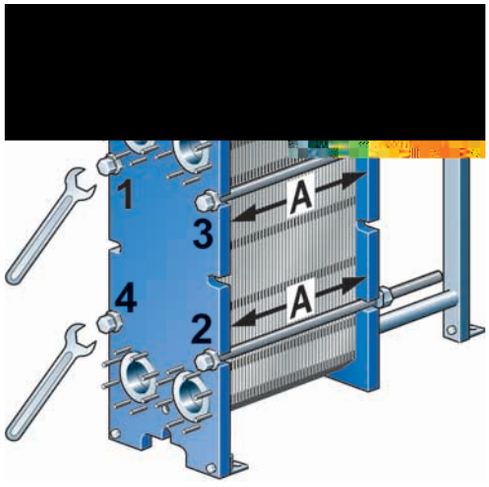
4 Measure and note down the dimension A.



5 Loosen and remove all bolts except the 4 at the positions indicated below. Use these remaining 4 bolts to open the plate pack according to the following scheme.

Step	Bolt No.	To dimension
1	1–2–3–4	1,05A
2	1–2 or 3–4	Opening

Be careful so that the plate and pressure plate are always in parallel. Skewing of the pressure plate during opening must not exceed 10 mm (2 turns per bolt) across the with and 25 mm (5 turns per bolt) vertically.



See also point 5 under part “Closing”.

6 Open the plate pack by letting the pressure plate glide on the carrying bar.

If plates are to be numbered, do this before removing the plates.

Plates need not to be removed if cleaning is done using only water, i.e. without cleaning agent.

Remove the plates

Warning!

The plate pack may still contain a small residual amount of liquid after draining. Depending on the type of product and type of installation special arrangments, e.g. drainage box, may be necessary to avoid damages on personnel and equipment.

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Manual cleaning of opened units

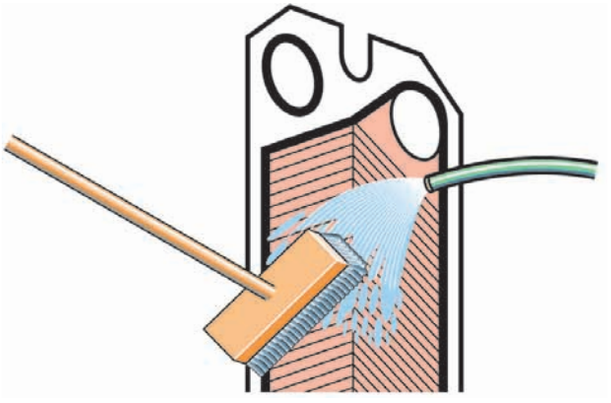
Caution!
Never use hydrochloric acid with stainless steel plates. Water of more than 330 ppm Cl may not be used for the preparation of cleaning solutions. It is very important that carrying bars and support columns in aluminium are protected against chemicals.

Note!
Be careful not to damage the gasket during manual cleaning.

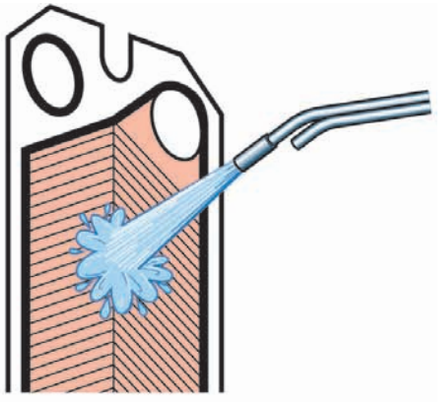
Deposits removable with water and brush

Plates need not to be removed from the plate heat exchanger during cleaning.

1. Remove deposits using a soft brush and running water.



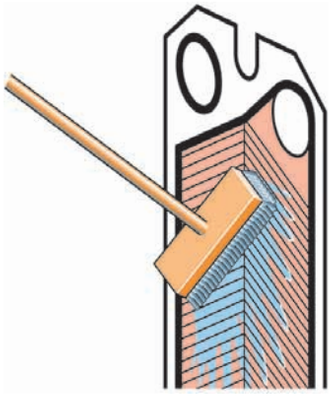
2. Rinse with water using a high pressure hose.



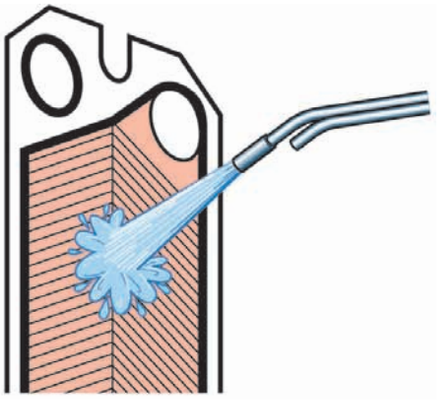
Deposits not removable with water and brush

Plates must be removed from the plate heat exchanger during cleaning.

1. Brush with cleaning agent.



2. Rinse with water.



Cleaning agents – Incrustation, scaling
Concentration max 4 %
Temperature max 60 °C (140 °F)

Incrustation – Scaling	Sediment	Cleaning agent
Calcium carbonate	Corrosion products	Nitric acid
Calcium sulphate	Metal oxides	Sulfamic acid
Silicates	Silt	Citric acid
	Alumina	Phosphoric acid
	Diatomic organisms and their excrement of various colours	Complexing agents (EDTA, NTA) Sodium polyphosphates

Cleaning agents – Biological growth, slime
Concentration max 4 %
Temperature max 80 °C (176 °F)

Biological growth – Slime	Cleaning agent
Bacteria	Sodium hydroxide
Nematodes	Sodium carbonate
Protozoa	Cleaning effect can be considerably increased by the addition of small quantities of hypochlorite or agents for the formation of complexes and surfactants.

Cleaning agents – Oil residues, asphalt, fats

Deposit	Cleaning agent
Oil residues Asphalt Fats	Paraffinic naphta-based solvent (e.g. kerosine). **Note**! Gaskets in EPDM rubber qualities swell in these media. Contact time should be limited to 30 minutes.

Caution!

The following solutions should not be used:

- Ketones (e.g. Acetone, Methyletylketone, Methylisobutylketone
- Esters (e.g. Ethylacetate, Butylacetate)
- Halogenated hydrocarbons (e.g. Chloro-thene, Carbon tetrachloride, Freons)
- Aromatics (e.g. Benzene, Toluene).

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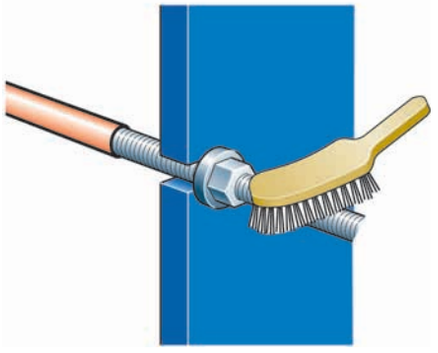
Closing

1 Check that all the sealing surfaces are clean.

2 Brush the threads of the bolts clean, using a steel wire brush. Lubricate the threads with a thin layer of grease, e.g. Gleitmo 800 or equivalent.

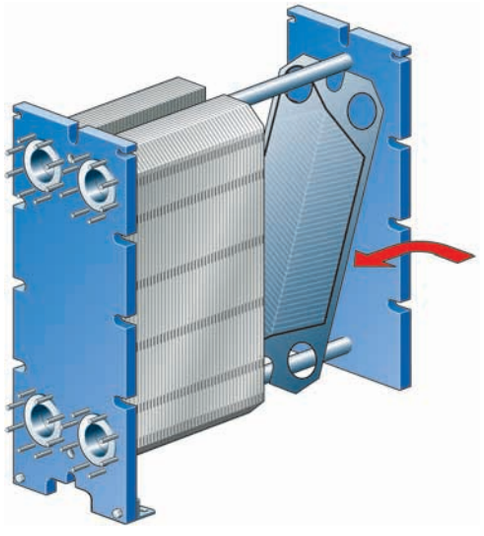


3 Attach gaskets to the plates or check that all the gaskets are properly attached.

Note!

If the gasket is wrongly positioned, it will show by the fact that it rises out of the gasket groove or that it is positioned outside the groove.

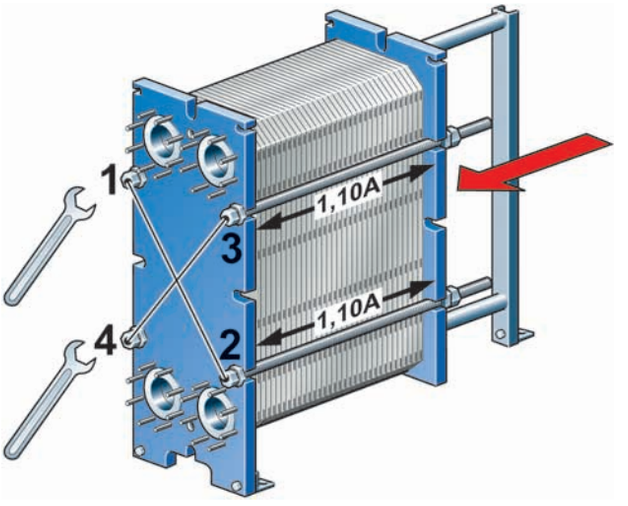
4 Insert the plates with the herring bone pattern positioned in alternate directions and with the gaskets turned towards the frame plate.



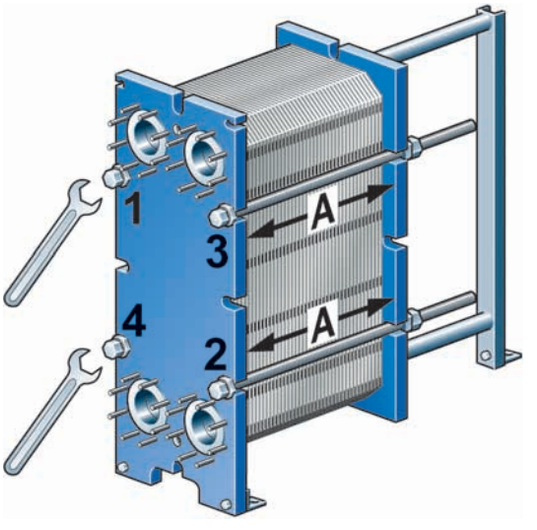
5 Press the plate assembly together. Tightening is done in two steps, see figures below. Be careful so that the frame plate and the pressure plate are always in parallel.

Step	Bolt No.	To dimension
1	1–2 or 3–4	1,10A
2	1–2–3–4	A

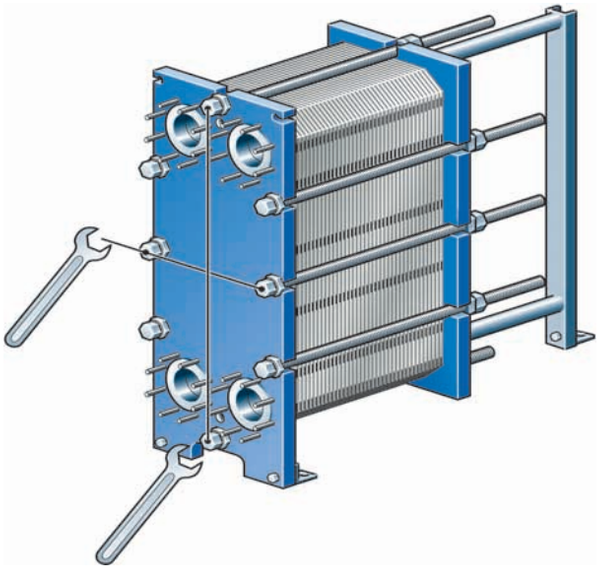
Tighten the two diagonal pair of bolts alternately until the plate package measures 1,10A.



After that bolts are tightened alternately and diagonally, as shown in the figure below.

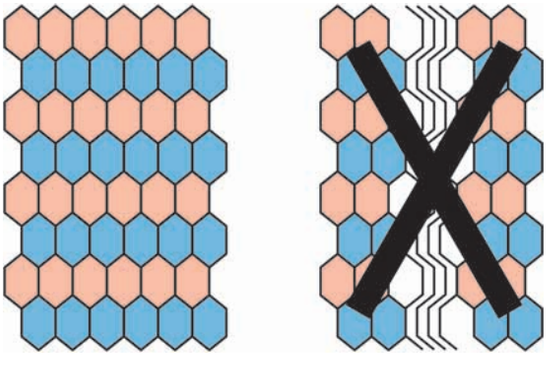


Finally the middle pair of bolts, and upper and lower bolts are tightened.



Note!
The actual measurement must never be less than the A-dimension.

6 If the plates are correctly assembled, the edges form a “honeycomb” pattern, see picture below.



Pressure test after maintenance

Before start-up of production, whenever plates or gaskets have been removed, inserted or exchanged, it is strongly recommended to perform a pressure test to confirm the internal and external sealing function of the PHE. At this test, one media side at the time must be tested with the other side open to the atmosphere.

The pressure testing shall be performed at a pressure equal to the operating pressure of the actual unit but never above the design pressure as stated on the nameplate.

The recommended test time is 10 minutes.

Please note that PHE units for refrigeration applications and units with media not mixable with water must be dried after hydrostatic pressure testing.

Please consult the local office/representative of the supplier for advice on the pressure testing procedure.

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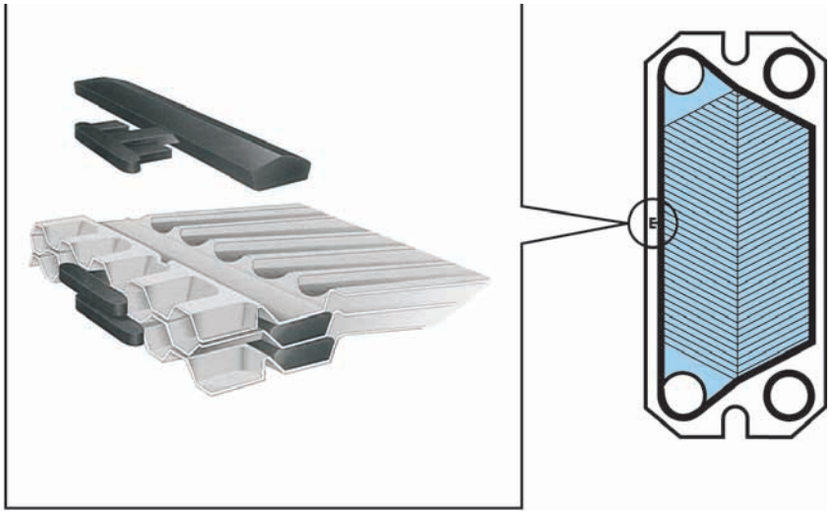
Regasketing

1. Open the plate heat exchanger according to page 8, and remove the plate that is to have a new gasket.

2. Remove the old gasket.

3. Assure that all sealing surfaces are dry, clean and free of foreign matter.

4. Attach the clip-on gasket to the plate. Slip the gasket prongs under the edge of the plate.



Note!
Make sure the two gasket prongs are in correct position.

5. Proceed with the next plate to be regasketed until all plates in need of regasketing are done with.

6. Close the plate heat exchanger according to page 12.

Glued gaskets
Separate gluing instructions will be delivered together with the glue.

9.4 Solar Collector

Refer to NEP Solar Manual included with Nilsen Manual and in Section 6.3

9.5 Pumps

Refer to GRUNDFOS INSTRUCTIONS
CRE, CRIE, CRNE,
SPKE, MTRE, CME
Installation and operating instructions

CRE, CRIE, CRNE, SPKE, MTRE, CME

Installation and operating instructions

Declaration of conformity

GB: EC declaration of conformity

We, Grundfos, declare under our sole responsibility that the products CRE, CRIE, CRNE, SPKE, MTRE and CME, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

— Machinery Directive (2006/42/EC).
Standard used: EN 809: 1998, A1:2009.

— EMC Directive (2004/108/EC).
Standard used: EN 61800-3:2004.

— Ecodesign Directive (2009/125/EC).
Water pumps:
Commission Regulation No 547/2012.
Applies only to water pumps marked with the minimum efficiency index MEI. See pump nameplate.

This EC declaration of conformity is only valid when published as part of the Grundfos installation and operating instructions (publication number 96780071 1112).

BG: ЕС декларация за съответствие

Ние, фирма Grundfos, заявяваме с пълна отговорност, че продуктите CRE, CRIE, CRNE, SPKE, MTRE и CME, за които се отнася настоящата декларация, отговарят на следните указания на Съвета за уеднаквяване на правните разпоредби на държавите членки на ЕС:

— Директива за машините (2006/42/EC).
Приложен стандарт: EN 809:1998, A1:2009.

— Директива за нисковолтови системи (2006/95/EC).
Приложен стандарт: EN 61800-5-1.

— Директива за електромагнитна съвместимост (2004/108/EC).
Приложен стандарт: EN 61800-3:2004.

— Директива за екодизайн (2009/125/EC).
Водни помпи:
Наредба No 547/2012 на Европейската комисия.
Отнася се само за водни помпи, маркирани с минималният индекс за ефективност MEI. Вижте табелата с данни на помпата.

Тази ЕС декларация за съответствие е валидна само когато е публикувана като част от инструкциите за монтаж и експлоатация на Grundfos (номер на публикацията 96780071 1112).

CZ: ES prohlášení o shodě

My firma Grundfos prohlašujeme na svou plnou odpovědnost, že výrobky CRE, CRIE, CRNE, SPKE, MTRE a CME, na něž se toto prohlášení vztahuje, jsou v souladu s ustanoveními směrnice Rady pro sblížení právních předpisů členských států Evropského společenství v oblastech:

— Směrnice pro strojní zařízení (2006/42/ES).
Použitá norma: EN 809:1998, A1:2009.

— Směrnice pro nízkonapěťové aplikace (2006/95/ES).
Použitá norma: EN 61800-5-1.

— Směrnice pro elektromagnetickou kompatibilitu (EMC) (2004/108/ES).
Použitá norma: EN 61800-3:2004.

— Směrnice o ekodesignu (2009/125/ES).
Vodní čerpadla:
Nařízení Komise č. 547/2012.
Vztahuje se pouze na vodní čerpadla označená minimální účinností index MEI. Viz typový štítek čerpadla.

Toto ES prohlášení o shodě je platné pouze tehdy, pokud je zveřejněno jako součást instalačních a provozních návodů Grundfos (publikace číslo 96780071 1112).

DK: EF-overensstemmelseserklæring

Vi, Grundfos, erklærer under ansvar at produkterne CRE, CRIE, CRNE, SPKE, MTRE og CME som denne erklæring omhandler, er i overensstemmelse med disse af Rådets direktiver om indbyrdes tilnærmelse til EF-medlemsstaternes lovgivning:

— Maskindirektivet (2006/42/EF).
Anvendt standard: EN 809:1998, A1:2009.

— Lavspændingsdirektivet (2006/95/EF).
Anvendt standard: EN 61800-5-1.

— EMC-direktivet (2004/108/EF).
Anvendt standard: EN 61800-3:2004.

— Ecodesigndirektivet (2009/125/EF).
Vandpumper:
Kommissionens forordning nr. 547/2012.
Gælder kun vandpumper der er mærket med mindsteeffektivitetsindekset MEI. Se pumpens typeskilt.

Denne EF-overensstemmelseserklæring er kun gyldig når den publiceres som en del af Grundfos-monterings- og driftsinstruktionen (publikationsnummer 96780071 1112).

DE: EG-Konformitätserklärung

Wir, Grundfos, erklären in alleiniger Verantwortung, dass die Produkte CRE, CRIE, CRNE, SPKE, MTRE und CME, auf die sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmen:

— Maschinenrichtlinie (2006/42/EG).
Norm, die verwendet wurde: EN 809:1998, A1:2009.

— Niederspannungsrichtlinie (2006/95/EG).
Norm, die verwendet wurde: EN 61800-5-1.

— EMV-Richtlinie (2004/108/EG).
Norm, die verwendet wurde: EN 61800-3:2004.

— ErP-Richtlinie (2009/125/EG).
Wasserpumpen:
Verordnung der Europäischen Kommission Nr. 547/2012.
Gilt nur für Pumpen, für die der Mindesteffizienzindex (MEI) anzugeben ist. Siehe Typenschild der Pumpe.

Diese EG-Konformitätserklärung gilt nur, wenn sie in Verbindung mit der Grundfos Montage- und Betriebsanleitung (Veröffentlichungsnummer 96780071 1112) veröffentlicht wird.

EE: EL vastavusdeklaratsioon

Meie, Grundfos, deklareerime enda ainuvastutusel, et tooted CRE, CRIE, CRNE, SPKE, MTRE ja CME, mille kohta käesolev juhend käib, on vastavuses EÜ Nõukogu direktiividega EMÜ liikmesriikide seaduste ühitamise kohta, mis käsitlevad:

— Masinate ohutus (2006/42/EC).
Kasutatud standard: EN 809:1998, A1:2009.

— Madalpinge direktiiv (2006/95/EC).
Kasutatud standard: EN 61800-5-1.

— Elektromagnetiline ühilduvus (EMC direktiiv) (2004/108/EC).
Kasutatud standard: EN 61800-3:2004.

— Ökodisaini direktiiv (2009/125/EC).
Veepumbad:
Komisjoni regulatsioon nr 547/2012.
Kehtiv ainult veepumpadele, mis on märgitud miinimum kasuteguri indeksiga MEI. Vaata pumba silti.

Käesolev EL-i vastavusdeklaratsioon kehtib ainult siis, kui see avaldatakse Grundfosi paigaldus- ja kasutusjuhendi (avaldamisnumber 96780071 1112) osana.

GR: Δήλωση συμμόρφωσης ΕC

Εμείς, η Grundfos, δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα CRE, CRIE, CRNE, SPKE, MTRE και CME στα οποία αναφέρεται η παρούσα δήλωση, συμμορφώνονται με τις εξής Οδηγίες του Συμβουλίου περί προσέγγισης των νομοθεσιών των κρατών μελών της ΕΕ:

— Οδηγία για μηχανήματα (2006/42/EC).
Πρότυπο που χρησιμοποιήθηκε: EN 809:1998, A1:2009.

— Οδηγία χαμηλής τάσης (2006/95/EC).
Πρότυπο που χρησιμοποιήθηκε: EN 61800-5-1.

— Οδηγία Ηλεκτρομαγνητικής Συμβατότητας (EMC) (2004/108/EC).
Πρότυπο που χρησιμοποιήθηκε: EN 61800-3:2004.

— Οδηγία Οικολογικού Σχεδιασμού (2009/125/EC).
Αντλίες νερού:
Ρύθμιση πρώτης εκκίνησης No 547/2012.
Ισχύει μόνο για αντλίες νερού που φέρουν τον ελάχιστο δείκτη απόδοσης MEI. Βλέπε πινακίδα αντλίας.

Αυτή η δήλωση συμμόρφωσης ΕC ισχύει μόνον όταν συνοδεύει τις οδηγίες εγκατάστασης και λειτουργίας της Grundfos (κωδικός εντύπου 96780071 1112).

ES: Declaración CE de conformidad

Nosotros, Grundfos, declaramos bajo nuestra entera responsabilidad que los productos CRE, CRIE, CRNE, SPKE, MTRE y CME, a los cuales se refiere esta declaración, están conformes con las Directivas del Consejo en la aproximación de las leyes de las Estados Miembros del EM:

— Directiva de Maquinaria (2006/42/CE).
Norma aplicada: EN 809:1998, A1:2009.

— Directiva de Baja Tensión (2006/95/CE).
Norma aplicada: EN 61800-5-1.

— Directiva EMC (2004/108/CE).
Norma aplicada: EN 61800-3:2004.

— Directiva sobre diseño ecológico (2009/125/CE).
Bombas de agua:
Reglamento de la Comisión Nº 547/2012.
Aplicable únicamente a las bombas de agua marcadas con el índice de eficiencia mínima (IEM). Véase la placa de características de la bomba.

Esta declaración CE de conformidad sólo es válida cuando se publique como parte de las instrucciones de instalación y funcionamiento de Grundfos (número de publicación 96780071 1112).

FR: Déclaration de conformité CE

Nous, Grundfos, déclarons sous notre seule responsabilité, que les produits CRE, CRIE, CRNE, SPKE, MTRE et CME, auxquels se réfère cette déclaration, sont conformes aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives aux normes énoncées ci-dessous:

— Directive Machines (2006/42/CE).
Norme utilisée : EN 809:1998, A1:2009.
— Directive Basse Tension (2006/95/CE).
Norme utilisée : EN 61800-5-1.
— Directive Compatibilité Electromagnétique CEM (2004/108/CE).
Norme utilisée: EN 61800-3:2004.
— Directive sur l'éco-conception (2009/125/CE).
Pompes à eau :
Règlement de la Commission Nº 547/2012.
S'applique uniquement aux pompes à eau marquées de l'indice de performance minimum IEM. Voir plaque signalétique de la pompe.

Cette déclaration de conformité CE est uniquement valide lors de sa publication dans la notice d'installation et de fonctionnement Grundfos (numéro de publication 96780071 1112).

HR: EZ izjava o usklađenosti

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod CRE, CRIE, CRNE, SPKE, MTRE i CME, na koji se ova izjava odnosi, u skladu s direktivama ovog Vijeća o usklađivanju zakona država članica EU:

— Direktiva za strojeve (2006/42/EZ).
Korištena norma: EN 809:1998, A1:2009.
— Direktiva za niski napon (2006/95/EZ).
Korištena norma: EN 61800-5-1.
— Direktiva za elektromagnetsku kompatibilnost (2004/108/EZ).
Korištena norma: EN 61800-3:2004.
— Direktiva o ekološkoj izvedbi (2009/125/EZ).
Crpke za vodu:
Uredba Komisije No 547/2012.
Odnosi se samo na crpke za vodu označene s indeksom minimalne učinkovitosti MEI. Pogledajte natpisnu pločicu crpke.

Ova EZ izjava o sukladnosti važeća je jedino kada je izdana kao dio Grundfos montažnih i pogonskih uputa (broj izdanja 96780071 1112).

IT: Dichiarazione di conformità CE

Grundfos dichiara sotto la sua esclusiva responsabilità che i prodotti CRE, CRIE, CRNE, SPKE, MTRE e CME, ai quali si riferisce questa dichiarazione, sono conformi alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE:

— Direttiva Macchine (2006/42/CE).
Norma applicata: EN 809:1998, A1:2009.
— Direttiva Bassa Tensione (2006/95/CE).
Norma applicata: EN 61800-5-1.
— Direttiva EMC (2004/108/CE).
Norma applicata: EN 61800-3:2004.
— Direttiva Ecodesign (2009/125/CE).
Pompe per acqua:
Regolamento CE n. 547/2012.
Applicabile solo a pompe per acqua con l'indice di efficienza minimo MEI. Vedere la targhetta di identificazione della pompa.

Questa dichiarazione di conformità CE è valida solo quando pubblicata come parte delle istruzioni di installazione e funzionamento Grundfos (pubblicazione numero 96780071 1112).

KZ: ЕО сәйкестік туралы мәлімдеме

Біз, Grundfos компаниясы, барлық жауапкершілікпен, осы мәлімдемеге қатысты болатын CRE, CRIE, CRNE, SPKE, MTRE және CME бұйымдары ЕО мүше елдерінің заң шығарушы жарлықтарын үндестіру туралы мына Еуроодақ Кеңесінің жарлықтарына сәйкес келетіндігін мәлімдейміз:

— Механикалық құрылғылар (2006/42/EC).
Қолданылған стандарттар: EN 809:1998, A1:2009.
— Төмен Кернеулі Жабдық (2006/95/EC).
Қолданылған стандарттар: EN 61800-5-1.
— Электр магнитті үйлесімділік (2004/108/EC).
Қолданылған стандарттар: EN 61800-3:2004.
— Қоршаған ортаны қорғауға арналған нұсқау (2009/125/EC).
Су сорғылар:
Еуропалық комиссия регламенті 547/2012.
Тек минималды тиімділік көрсіткішіпен МТК белгіленген су сорғыларына арналған. Сорғыдағы фирмалық тақтайшаны қараңыз.

Бұл ЕО сәйкестік туралы мәлімдеме тек ғана Грундфос компаниясының орнату және пайдалану нұсқасының бөлімі ретінде жарамды (баспаға шыққан нөмірі 96780071 1112).

LV: EK paziņojums par atbilstību prasībām

Sabiedrība GRUNDFOS ar pilnu atbildību dara zināmu, ka produkti CRE, CRIE, CRNE, SPKE, MTRE un CME, uz kuriem attiecas šis paziņojums, atbilst šādām Padomes direktīvām par tuvināšanos EK dalībvalstu likumdošanas normām:

— Mašīnbūves direktīva (2006/42/EK).
Piemērotais standarts: EN 809:1998, A1:2009.
— Zema sprieguma direktīva (2006/95/EK).
Piemērotais standarts: EN 61800-5-1.
— Elektromagnētiskās saderības direktīva (2004/108/EK).
Piemērotais standarts: EN 61800-3:2004.
— Ekodizaina direktīva (2009/125/EK).
Ūdens sūkņi:
Komisijas regula Nr. 547/2012.
Attiecas tikai uz ūdens sūkņiem, kuriem ir minimālais efektivitātes indekss MEI. Sk. sūkņa pases datu plāksnītē.

Šī EK atbilstības deklarācija ir derīga vienīgi tad, ja ir publicēta kā daļa no GRUNDFOS uzstādīšanas un ekspluatācijas instrukcijām (publikācijas numurs 96780071 1112).

LT: EB atitikties deklaracija

Mes, Grundfos, su visa atsakomybe pareiškiame, kad gaminiai CRE, CRIE, CRNE, SPKE, MTRE ir CME, kuriems skirta ši deklaracija, atitinka šias Tarybos Direktyvas dėl Europos Ekonominės Bendrijos šalių narių įstatymų suderinimo:

— Mašinų direktyva (2006/42/EB).
Taikomas standartas: EN 809:1998, A1:2009.
— Žemų įtampų direktyva (2006/95/EB).
Taikomas standartas: EN 61800-5-1.
— EMS direktyva (2004/108/EB).
Taikomas standartas: EN 61800-3:2004.
— Ekologinio projektavimo direktyva (2009/125/EB).
Vandens siurbliai:
Komisijos reglamentas Nr. 547/2012.
Galioja tik vandens siurbliams, ant kurių nurodytas minimalus efektyvumo koeficientas MEI. Žr. siurblio vardinę plokštelę.

Ši EB atitikties deklaracija galioja tik tuo atveju, kai yra pateikta kaip "Grundfos" įrengimo ir naudojimo instrukcijos (leidinio numeris 96780071 1112) dalis.

HU: EK megfelelőségi nyilatkozat

Mi, a Grundfos, egyedüli felelősséggel kijelentjük, hogy a CRE, CRIE, CRNE, SPKE, MTRE és CME termékek, amelyekre jelen nyilatkozik vonatkozik, megfelelnek az Európai Unió tagállamainak jogi irányelveit összehangoló tanács alábbi előírásainak:

— Gépek (2006/42/EK).
Alkalmazott szabvány: EN 809:1998, A1:2009.
— Kisfeszültségű Direktíva (2006/95/EK).
Alkalmazott szabvány: EN 61800-5-1.
— EMC Direktíva (2004/108/EK).
Alkalmazott szabvány: EN 61800-3:2004.
— Környezetbarát tervezésre vonatkozó irányelv (2009/125/EK).
Víz szivattyúk:
Az Európai Bizottság 547/2012. számú rendelete.
Csak a MEI minimum hatásfok index-el jelölt víz szivattyúkra vonatkozik. Lásd a szivattyú adattábláján.

Ez az EK megfelelőségi nyilatkozat kizárólag akkor érvényes, ha Grundfos telepítési és üzemeltetési utasítás (kiadvány szám 96780071 1112) részeként kerül kiadásra.

NL: EC overeenkomstigheidsverklaring

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat de producten CRE, CRIE, CRNE, SPKE, MTRE en CME waarop deze verklaring betrekking heeft, in overeenstemming zijn met de Richtlijnen van de Raad in zake de onderlinge aanpassing van de wetgeving van de EG Lidstaten betreffende:

— Machine Richtlijn (2006/42/EC).
Gebruikte norm: EN 809:1998, A1:2009.
— Laagspannings Richtlijn (2006/95/EC).
Gebruikte norm: EN 61800-5-1.
— EMC Richtlijn (2004/108/EC).
Gebruikte norm: EN 61800-3:2004.
— Ecodesign Richtlijn (2009/125/EC).
Waterpompen:
Verordening (EG) Nr. 547/2012 van de Commissie.
Is alleen van toepassing op waterpompen die gekenmerkt worden door de minimale efficiëntie index MEI. Zie het typeplaatje van de pomp.

Deze EC overeenkomstigheidsverklaring is alleen geldig wanneer deze gepubliceerd is als onderdeel van de Grundfos installatie- en bedieningsinstructies (publicatienummer 96780071 1112).

UA: Свідчення про відповідність вимогам ЄС

Компанія Grundfos заявляє про свою виключну відповідальність за те, що продукти CRE, CRIE, CRNE, SPKE, MTRE та CME, на які поширюється дана декларація, відповідають таким рекомендаціям Ради з уніфікації правових норм країн - членів ЄС):

— Механічні прилади (2006/42/ЄС).
Стандарти, що застосовувалися: EN 809:1998, A1:2009.
— Низька напруга (2006/95/ЄС).
Стандарти, що застосовувалися: EN 61800-5-1.
— Електромагнітна сумісність (2004/108/ЄС).
Стандарти, що застосовувалися: EN 61800-3:2004.
— Директива з екодизайну (2009/125/ЄС).
Насоси для води:
Регламент Комісії № 547/2012.
Стосується тільки насосів для води, що відзначені мінімальним показником ефективності MEI. Дивіться паспортну табличку на насоси.

Ця декларація відповідності ЄС дійсна тільки в тому випадку, якщо публікується як частина інструкцій Grundfos з монтажу та експлуатації (номер публікації 96780071 1112).

PL: Deklaracja zgodności WE

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze wyroby CRE, CRIE, CRNE, SPKE, MTRE oraz CME, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednolicenia przepisów prawnych krajów członkowskich WE:

— Dyrektywa Maszynowa (2006/42/WE).
Zastosowana norma: EN 809:1998, A1:2009.
— Dyrektywa Niskonapięciowa (LVD) (2006/95/WE).
Zastosowana norma: EN 61800-5-1.
— Dyrektywa EMC (2004/108/WE).
Zastosowana norma: EN 61800-3:2004.
— Dyrektywa Ekoprojektowa (2009/125/WE).
Pompy do wody:
Rozporządzenie komisji nr 547/2012.
Dotyczy tylko pomp do tłoczenia wody z minimalnym indeksem sprawności MEI. Patrz tabliczka znamionowa pompy.

Deklaracja zgodności WE jest ważna tylko i wyłącznie wtedy kiedy jest opublikowana przez firmę Grundfos i umieszczona w instrukcji montażu i eksploatacji (numer publikacji 96780071 1112).

PT: Declaração de conformidade CE

A Grundfos declara sob sua única responsabilidade que os produtos CRE, CRIE, CRNE, SPKE, MTRE e CME, aos quais diz respeito esta declaração, estão em conformidade com as seguintes Directivas do Conselho sobre a aproximação das legislações dos Estados Membros da CE:

— Directiva Máquinas (2006/42/CE).
Norma utilizada: EN 809:1998, A1:2009.
— Directiva Baixa Tensão (2006/95/CE).
Norma utilizada: EN 61800-5-1.
— Directiva EMC (compatibilidade electromagnética) (2004/108/CE).
Norma utilizada: EN 61800-3:2004.
— Directiva de Concepção Ecológica (2009/125/CE).
Bombas de água:
Regulamento da Comissão No 547/2012.
Aplica-se apenas a bombas de água registadas com o índice de eficiência mínimo MEI. Ver a chapa de características da bomba.

Esta declaração de conformidade CE é apenas válida quando publicada como parte das instruções de instalação e funcionamento Grundfos (número de publicação 96780071 1112).

RU: Декларация о соответствии ЕС

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия CRE, CRIE, CRNE, SPKE, MTRE и CME, к которым относится настоящая декларация, соответствуют следующим Директивам Совета Евросоюза об унификации законодательных предписаний стран-членов ЕС:

— Механические устройства (2006/42/EC).
Применявшийся стандарт: EN 809:1998, A1:2009.
— Низковольтное оборудование (2006/95/EC).
Применявшиеся стандарт: EN 61800-5-1.
— Электромагнитная совместимость (2004/108/EC).
Применявшиеся стандарт: EN 61800-3:2004.
— Директива по экологическому проектированию энергопотребляющей продукции (2009/125/EC).
Насосы для перекачивания воды:
Регламент Комиссии ЕС № 547/2012.
Применимо только к насосам для перекачивания воды, промаркированным показателем минимальной эффективности MEI. См. фирменную табличку насоса.

Данная декларация о соответствии ЕС имеет силу только в случае публикации в составе инструкции по монтажу и эксплуатации на продукцию производства компании Grundfos (номер публикации 96780071 1112).

RO: Declaraţie de conformitate CE

Noi, Grundfos, declarăm pe propria răspundere că produsele CRE, CRIE, CRNE, SPKE, MTRE şi CME, la care se referă această declaraţie, sunt în conformitate cu aceste Directive de Consiliu asupra armonizării legilor Statelor Membre CE:

— Directiva Utilaje (2006/42/CE).
Standard utilizat: EN 809:1998, A1:2009.
— Directiva Tensiune Joasă (2006/95/CE).
Standard utilizat: EN 61800-5-1.
— Directiva EMC (2004/108/CE).
Standard utilizat: EN 61800-3:2004.
— Directiva Ecodesign (2009/125/CE).
Pompe de apa:
Regulamentul Comisiei nr. 547/2012.
Se aplica numai pompelor de apa cu marca de eficienta minima index MEI. Vezi plăcuţa de identificare a pompei.

Această declaraţie de conformitate CE este valabilă numai când este publicată ca parte a instrucţiunilor Grundfos de instalare şi utilizare (număr publicaţie 96780071 1112).

SK: Prehlásenie o konformite ES

My firma Grundfos prehlasujeme na svoju plnú zodpovednosť, že výrobky CRE, CRIE, CRNE, SPKE, MTRE a CME, na ktoré sa toto prehlásenie vzťahuje, sú v súlade s ustanovením smernice Rady pre zblíženie právnych predpisov členských štátov Európskeho spoločenstva v oblastiach:

— Smernica pre strojové zariadenie (2006/42/ES).
Použitá norma: EN 809:1998, A1:2009.
— Smernica pre nízkonapäťové aplikácie (2006/95/ES).
Použitá norma: EN 61800-5-1.
— Smernica pre elektromagnetickú kompatibilitu (2004/108/ES).
Použitá norma: EN 61800-3:2004.
— Smernica o ekodizajne (2009/125/ES).
Čerpadlá na vodu:
Nariadenie Komisie č. 547/2012.
Vzťahuje sa iba na čerpadlá pre vodu označené minimálnym indexom energetickej účinnosti MEI. Viď typový štítok čerpadla.

Toto prehlásenie o konformite ES je platné iba vtedy, ak je zverejnené ako súčasť montážnych a prevádzkových pokynov Grundfos (publikácia číslo 96780071 1112).

SI: ES izjava o skladnosti

V Grundfosu s polno odgovornostjo izjavljamo, da so naši izdelki CRE, CRIE, CRNE, SPKE, MTRE in CME, na katere se ta izjava nanaša, v skladu z naslednjimi direktivami Sveta o približevanju zakonodaje za izenačevanje pravnih predpisov držav članic ES:

— Direktiva o strojih (2006/42/ES).
Uporabljena norma: EN 809:1998, A1:2009.
— Direktiva o nizki napetosti (2006/95/ES).
Uporabljena norma: EN 61800-5-1.
— Direktiva o elektromagnetni združljivosti (EMC) (2004/108/ES).
Uporabljena norma: EN 61800-3:2004.
— Eco-design direktiva (2009/125/ES).
Vodne črpalke:
Uredba Komisije št. 547/2012.
Velja le za vodne črpalke označene z indeksom minimalne učinkovitosti MEI. Glejte tipsko ploščico črpalke.

ES izjava o skladnosti velja samo kadar je izdana kot del Grundfos instalacije in navodil delovanja (publikacija številka 96780071 1112).

RS: EC deklaracija o konformitetu

Mi, Grundfos, izjavljujemo pod vlastitom odgovornošću da je proizvod CRE, CRIE, CRNE, SPKE, MTRE i CME, na koji se ova izjava odnosi, u skladu sa direktivama Saveta za usklađivanje zakona država članica EU:

— Direktiva za mašine (2006/42/EC).
Korišćen standard: EN 809:1998, A1:2009.
— Direktiva niskog napona (2006/95/EC).
Korišćen standard: EN 61800-5-1.
— EMC direktiva (2004/108/EC).
Korišćen standard: EN 61800-3:2004.
— Direktiva o ekološkom projektovanju (2009/125/EC).
Pumpe za vodu:
Uredba Komisije br. 547/2012.
Odnosi se samo na pumpe za vodu označene sa indeksom minimalne efikasnosti MEI. Pogledajte natpisnu pločicu pumpe.

Ova EC deklaracija o usaglašenosti važeća je jedino kada je izdata kao deo Grundfos uputstava za instalaciju i rad (broj izdanja 96780071 1112).

FI: EY-vaatimustenmukaisuusvakuutus

Me, Grundfos, vakuutamme omalla vastuullamme, että tuotteet CRE, CRIE, CRNE, SPKE, MTRE ja CME, joita tämä vakuutus koskee, ovat EY:n jäsenvaltioiden lainsäädännön yhdenmukaistamiseen tähtäävien Euroopan neuvoston direktiivien vaatimusten mukaisia seuraavasti:

— Konedirektiivi (2006/42/EY).
Sovellettu standardi: EN 809:1998, A1:2009.
— Pienjännitedirektiivi (2006/95/EY).
Sovellettu standardi: EN 61800-5-1.
— EMC-direktiivi (2004/108/EY).
Sovellettu standardi: EN 61800-3:2004.
— Ekologista suunnittelua koskeva direktiivi (2009/125/EY).
Vesipumput:
Komission asetus nro 547/2012.
Koskee vain vesipumppuja, jotka on merkitty minimihyötysuhdeindeksillä MEI. Katso pumpun tyyppikilvestä.

Tämä EY-vaatimustenmukaisuusvakuutus on voimassa vain, kun se julkaistaan osana Grundfosin asennus- ja käyttöohjeita (julkaisun numero 96780071 1112).

SE: EG-försäkran om överensstämmelse

Vi, Grundfos, försäkrar under ansvar att produkterna CRE, CRIE, CRNE, SPKE, MTRE och CME, som omfattas av denna försäkran, är i överensstämmelse med rådets direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende:

— Maskindirektivet (2006/42/EG).
Tillämpad standard: EN 809:1998, A1:2009.
— Lågspänningsdirektivet (2006/95/EG).
Tillämpad standard: EN 61800-5-1.
— EMC-direktivet (2004/108/EG).
Tillämpad standard: EN 61800-3:2004.
— Ekodesigndirektivet (2009/125/EG).
Vattenpumpar:
Kommissionens förordning nr. 547/2012.
Avser endast vattenpumpar markerade med min. effektivitetsindex (MEI). Se pumpens typskylt.

Denna EG-försäkran om överensstämmelse är endast giltig när den publiceras som en del av Grundfos monterings- och driftsinstruktion (publikation nummer 96780071 1112).

TR: EC uygunluk bildirgesi

Grundfos olarak bu beyannameye konu olan CRE, CRIE, CRNE, SPKE, MTRE ve CME ürünlerinin, AB Üyesi Ülkelerin kanunlarını birbirine yaklaştırma üzerine Konsey Direktifleriyle uyumlu olduğunun yalnızca bizim sorumluluğumuz altında olduğunu beyan ederiz:

— Makineler Yönetmeliği (2006/42/EC).
Kullanılan standart: EN 809:1998, A1:2009.
— Düşük Voltaj Yönetmeliği (2006/95/EC).
Kullanılan standart: EN 61800-5-1.
— EMC Diretifi (2004/108/EC).
Kullanılan standart: EN 61800-3:2004.
— Çevreye duyarlı tasarım (Ecodesign) Direktifi (2009/125/EC).
Devirdaim su pompaları:
547/2012 sayılı Komisyon Yönetmeliği.
Yalnızca Minimum Enerji Verimlilik Endeksine (MEI) dahil olan olan devirdaim su pompaları için geçerlidir. Pompanın bilgi etiketine bakın.

İşbu EC uygunluk bildirgesi, yalnızca Grundfos kurulum ve çalıştırma talimatlarının (basım numarası 96780071 1112) bir parçası olarak basıldığı takdirde geçerlilik kazanmaktadır.

JP: EC 適合宣言

Grundfos は、その責任の下に、CRE, CRIE, CRNE, SPKE, MTRE 製品および CME 製品が EC 加盟諸国の法規に関連する、以下の評議会指令に適合していることを宣言します：

– 機械指令（2006/42/EC）。
適用規格：EN 809:1998, A1:2009。
– 低電圧指令（2006/95/EC）。
適用規格：EN 61800-5-1。
– EMC 指令（2004/108/EC）。
適用規格：EN 61800-3:2004。
– エコデザイン指令（2009/125/EC）。
水用ポンプ：
委員会規定 No 547/2012。
最小効率指数 MEI を表示した水用ポンプのみに適用。ポンプ銘板を参照ください。

このEC適合宣言は、グルンドフォス取扱説明書（出版番号 96780071 1112）の一部に掲載される場合のみ有効です。

Bjerringbro, 15th November 2012

Svend Aage Kaae
Technical Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile technical file and empowered to sign the EC declaration of conformity.

Декларация о соответствии на территории РФ

Насосы центробежные вертикальные многоступенчатые CRE, CRIE, CRNE, SPKE, MTRE и CME сертифицированы на соответствие требованиям Технического регламента о безопасности машин и оборудования (Постановление правительства РФ от 15.09.2009 № 753).
Сертификат соответствия:
№ C-RU.АЯ56.В.04045, срок действия до 11.07.2017 г.
№ C-DK.АЯ56.В.03740, срок действия до 27.05.2017 г.
Изделия, произведенные в России, изготавливаются в соответствии с ТУ 3631-001-59379130-2005.

Истра, 15 ноября 2012 г.

Касаткина В. В.
Руководитель отдела качества,
экологии и охраны труда
ООО Грундфос Истра, Россия
143581, Московская область,
Истринский район,
дер. Лешково, д.188

Original installation and operating instructions.

CONTENTS

Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury!

Warning

The surface of the product may be so hot that it may cause burns or personal injury!

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment!***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. General information

These installation and operating instructions are a supplement to installation and operating instructions for the corresponding standard pumps CR, CRI, CRN, SPK, MTR and CM.
For instructions not mentioned specifically here, please see installation and operating instructions for the standard pump.

3. General description

Grundfos E-pumps have standard motors with integrated frequency converter. The pumps are for single-phase or three-phase mains connection.

3.1 Pumps without factory-fitted sensor

The pumps have a built-in PI controller and can be set up for an external sensor enabling control of the following parameters:

- pressure
- differential pressure
- temperature
- differential temperature
- flow rate.

From factory, the pumps have been set to control mode uncontrolled. The PI controller can be activated by means of R100.

3.2 Pumps with pressure sensor

The pumps have a built-in PI controller and are set up with a pressure sensor enabling control of the pump discharge pressure.

The pumps are set to control mode controlled. The pumps are typically used to hold a constant pressure in variable-demand systems.

3.3 Settings

The description of settings apply both to pumps without factory-fitted sensor and to pumps with a factory-fitted pressure sensor.

Setpoint

The desired setpoint can be set in three different ways:

- directly on the pump control panel
- via an input for external setpoint signal
- by means of the Grundfos wireless remote control R100.

Other settings

All other settings can only be made by means of the R100.

Important parameters such as actual value of control parameter, power consumption, etc. can be read via the R100.

If special or customized settings are required, use the Grundfos PC Tool E-products. Contact your local Grundfos company for more information.

4. Mechanical installation

The pump must be secured to a solid foundation by means of bolts through the holes in the flange or base plate.

Note ***In order to retain the UL/cUL approval, follow the additional installation procedures on page 791.***

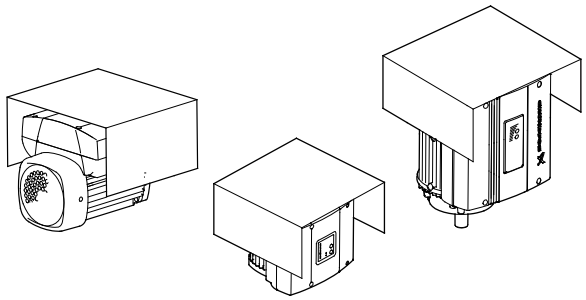
4.1 Motor cooling

To ensure sufficient cooling of motor and electronics, observe the following requirements:

- Make sure that sufficient cooling air is available.
- Keep the temperature of the cooling air below 40 °C.
- Keep cooling fins and fan blades clean.

4.2 Outdoor installation

When installed outdoors, the pump must be provided with a suitable cover to avoid condensation on the electronic components. See fig. 1.



TM00 8622 0101 / TM02 8514 0304

Fig. 1 Examples of covers

Remove the drain plug pointing downwards in order to avoid moisture and water build-up inside the motor.

Vertically mounted pumps are IP55 after removal of the drain plug. Horizontally mounted pumps change enclosure class to IP54.

5. Electrical connection

For description of how to connect E-pumps electrically, see the following pages:

5.1 Single-phase pumps, page 8

5.2 Three-phase pumps, 0.75 - 7.5 kW, page 9

5.3 Three-phase pumps, 11-22 kW, page 11.

5.1 Single-phase pumps

Warning

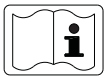
The user or the installer is responsible for the installation of correct earthing and protection according to current national and local standards. All operations must be carried out by qualified personnel.

Warning

Never make any connections in the pump terminal box unless all electric supply circuits have been switched off for at least 5 minutes.

Note for instance that the signal relay may be connected to an external supply which is still connected when the mains supply is disconnected.

The above warning is indicated on the motor terminal box by this yellow label:



Warning

The surface of the terminal box may be above 70 °C when the pump is operating.

5.1.1 Preparation

Before connecting the E-pump to the mains, take the issues illustrated in the figure below into consideration.

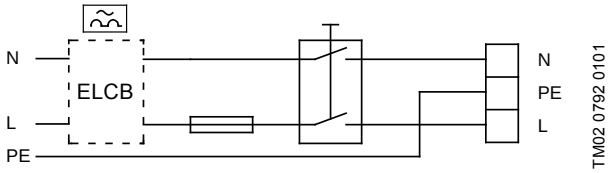


Fig. 2 Mains-connected pump with mains switch, backup fuse, additional protection and protective earthing

5.1.2 Protection against electric shock - indirect contact

Warning

The pump must be earthed and protected against indirect contact in accordance with national regulations.

Protective earth leads must always have a yellow/green (PE) or yellow/green/blue (PEN) colour marking.

5.1.3 Backup fuses

For recommended fuse sizes, see section *20.1 Supply voltage.*

5.1.4 Additional protection

If the pump is connected to an electric installation where an earth leakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbol:

The total leakage current of all the electrical equipment in the installation must be taken into account.

The leakage current of the motor in normal operation can be seen in section *20.3 Leakage current*.

During start and at asymmetrical supply systems, the leakage current can be higher than normal and may cause the ELCB to trip.

5.1.5 Motor protection

The pump requires no external motor protection. The motor incorporates thermal protection against slow overloading and blocking (IEC 34-11, TP 211).

5.1.6 Protection against mains voltage transients

The pump is protected against voltage transients by built-in varistors between phase-neutral and phase-earth.

5.1.7 Supply voltage and mains

1 x 200-240 V - 10 %/+ 10 %, 50/60 Hz, PE.

The supply voltage and frequency are marked on the pump nameplate. Make sure that the pump is suitable for the power supply of the installation site.

The wires in the terminal box must be as short as possible. Excepted from this is the protective earth lead which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

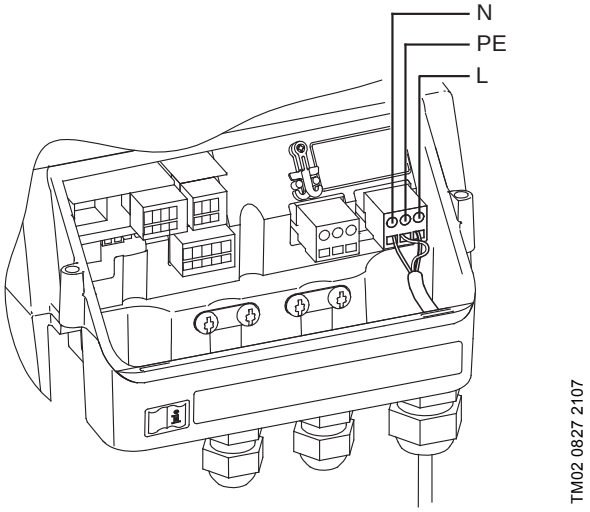


Fig. 3 Mains connection

Cable glands

Cable glands comply with EN 50626.

- 2 x M16 cable gland, cable diameter ∅4-∅10
- 1 x M20 cable gland, cable diameter ∅10-∅14
- 1 knock-out cable entry for M16 cable gland.

Warning

If the supply cable is damaged, it must be replaced by qualified personnel.

Grid types

Single-phase E-pumps can be connected to all grid types.

Warning

Do not connect single-phase E-pumps to a mains supply with a voltage between phase and earth of more than 250 V.

5.1.8 Start/stop of pump

Caution ***The number of starts and stops via the mains voltage must not exceed 4 times per hour.***

When the pump is switched on via the mains, it will start after approx. 5 seconds.

If a higher number of starts and stops is desired, use the input for external start/stop when starting/stopping the pump.

When the pump is switched on via an external on/off switch, it will start immediately.

5.1.9 Connections

Note ***If no external on/off switch is connected, connect terminals 2 and 3 using a short wire.***

As a precaution, the wires to be connected to the following connection groups must be separated from each other by reinforced insulation in their entire lengths:

Group 1: Inputs

- start/stop terminals 2 and 3
- digital input terminals 1 and 9
- setpoint input terminals 4, 5 and 6
- sensor input terminals 7 and 8
- GENIbus terminals B, Y and A

All inputs (group 1) are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits.
All control terminals are supplied with protective extra-low voltage (PELV), thus ensuring protection against electric shock.

Group 2: Output (relay signal, terminals NC, C, NO)

The output (group 2) is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.

Group 3: Mains supply (terminals N, PE, L)

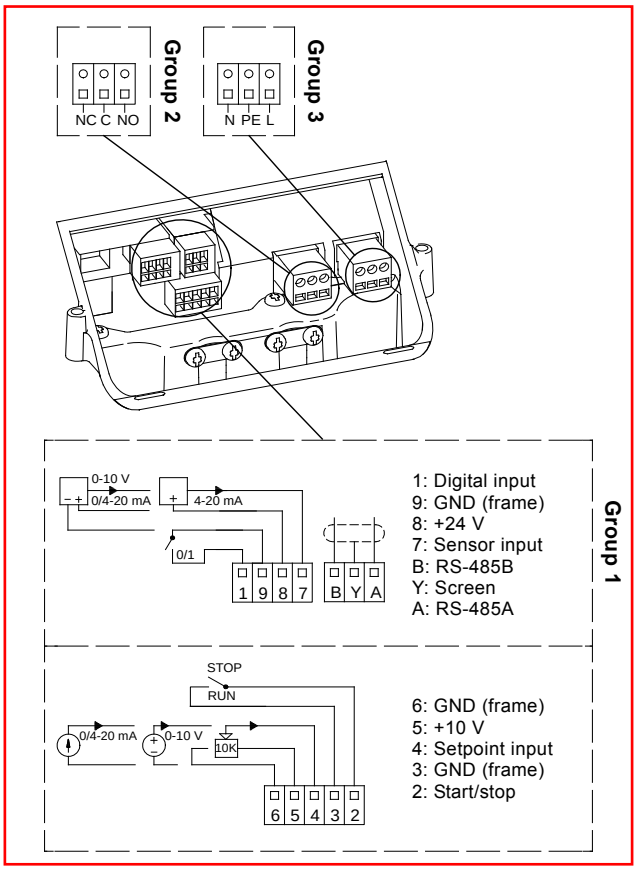


Fig. 4 Connection terminals

A galvanic separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 60335.

5.2 Three-phase pumps, 0.75 - 7.5 kW

Warning

The user or the installer is responsible for the installation of correct earthing and protection according to current national and local standards. All operations must be carried out by qualified personnel.

Warning

Never make any connections in the pump terminal box unless all electric supply circuits have been switched off for at least 5 minutes.

Note for instance that the signal relay may be connected to an external supply which is still connected when the mains supply is disconnected.

The above warning is indicated on the motor terminal box by this yellow label:

5.2.1 Preparation

Before connecting the E-pump to the mains, take the issues illustrated in the figure below into consideration.

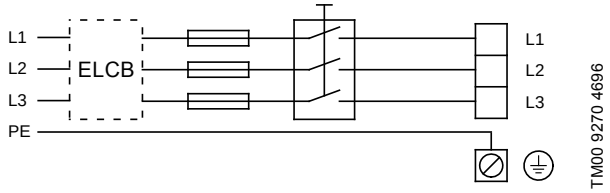


Fig. 5 Mains-connected pump with mains switch, backup fuses, additional protection and protective earthing

5.2.2 Protection against electric shock - indirect contact

Warning

The pump must be earthed in accordance with national regulations.

As the leakage current of 4 - 7.5 kW motors is > 3.5 mA, take extra precautions when earthing these motors.

EN 50178 and BS 7671 specify the following precautions when leakage current > 3.5 mA:

- The pump must be stationary and installed permanently.
- The pump must be permanently connected to the power supply.
- The earth connection must be carried out as duplicate leads.

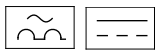
Protective earth leads must always have a yellow/green (PE) or yellow/green/blue (PEN) colour marking.

5.2.3 Backup fuses

For recommended fuse sizes, see section *21.1 Supply voltage*.

5.2.4 Additional protection

If the pump is connected to an electric installation where an earth leakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols:



This circuit breaker is **type B.**
The total leakage current of all the electrical equipment in the installation must be taken into account.

The leakage current of the motor in normal operation can be seen in section *21.3 Leakage current*.

During start and at asymmetrical supply systems, the leakage current can be higher than normal and may cause the ELCB to trip.

5.2.5 Motor protection

The pump requires no external motor protection. The motor incorporates thermal protection against slow overloading and blocking (IEC 34-11, TP 211).

5.2.6 Protection against mains voltage transients

The pump is protected against voltage transients by built-in varistors between the phases and between phases and earth.

5.2.7 Supply voltage and mains

3 x 380-480 V - 10 %/+ 10 %, 50/60 Hz, PE.

The supply voltage and frequency are marked on the pump nameplate. Make sure that the pump is suitable for the power supply of the installation site.

The wires in the terminal box must be as short as possible. Excepted from this is the protective earth lead which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

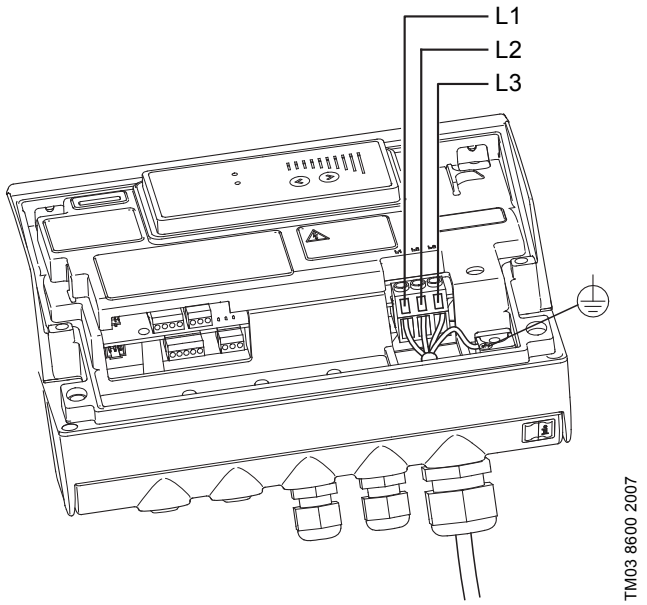


Fig. 6 Mains connection

Cable glands

Cable glands comply with EN 50626.

- 2 x M16 cable gland, cable diameter ∅4-∅10
- 1 x M20 cable gland, cable diameter ∅9-∅17
- 2 x M16 knock-out cable entries.

Warning

If the supply cable is damaged, it must be replaced by qualified personnel.

Grid types

Three-phase E-pumps can be connected to all grid types.

Warning

Do not connect three-phase E-pumps to a mains supply with a voltage between phase and earth of more than 440 V.

5.2.8 Start/stop of pump

Caution ***The number of starts and stops via the mains voltage must not exceed 4 times per hour.***

When the pump is switched on via the mains, it will start after approx. 5 seconds.

If a higher number of starts and stops is desired, use the input for external start/stop when starting/stopping the pump.

When the pump is switched on via an external on/off switch, it will start immediately.

Automatic restart

Note ***If a pump set up for automatic restart is stopped due to a fault, it will restart automatically when the fault has disappeared.***

However, automatic restart only applies to fault types set up to automatic restart. These faults could typically be one of these faults:

- temporary overload
- fault in the power supply.

5.2.9 Connections

Note ***If no external on/off switch is connected, connect terminals 2 and 3 using a short wire.***

As a precaution, the wires to be connected to the following connection groups must be separated from each other by reinforced insulation in their entire lengths:

Group 1: Inputs

- start/stop terminals 2 and 3
- digital input terminals 1 and 9
- setpoint input terminals 4, 5 and 6
- sensor input terminals 7 and 8
- GENIbus terminals B, Y and A

All inputs (group 1) are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits.
All control terminals are supplied with protective extra-low voltage (PELV), thus ensuring protection against electric shock.

Group 2: Output (relay signal, terminals NC, C, NO)

The output (group 2) is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.

Group 3: Mains supply (terminals L1, L2, L3)

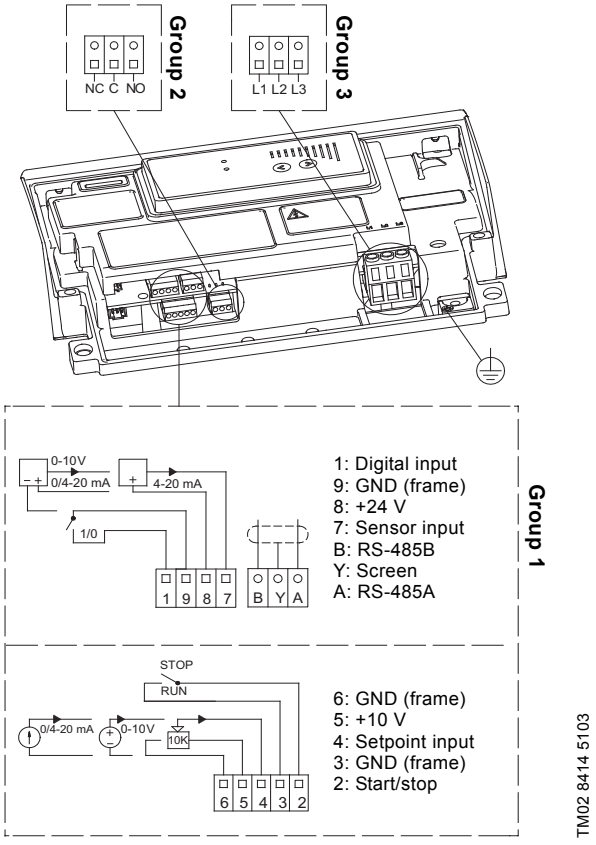


Fig. 7 Connection terminals

A galvanic separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 60335.

5.3 Three-phase pumps, 11-22 kW

Warning

The user or the installer is responsible for the installation of correct earthing and protection according to current national and local standards. All operations must be carried out by qualified personnel.

Warning

Never make any connections in the pump terminal box unless all electric supply circuits have been switched off for at least 5 minutes.

Note for instance that the signal relay may be connected to an external supply which is still connected when the mains supply is disconnected.

Warning

The surface of the terminal box may be above 70 °C when the pump is operating.

5.3.1 Preparation

Before connecting the E-pump to the mains, take the issues illustrated in the figure below into consideration.

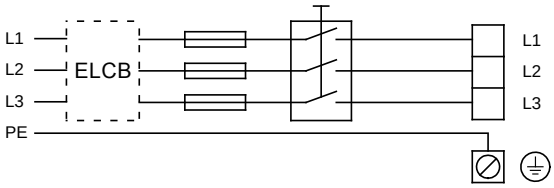


Fig. 8 Mains-connected pump with mains switch, backup fuses, additional protection and protective earthing

5.3.2 Protection against electric shock - indirect contact

Warning

The pump must be earthed in accordance with national regulations.

As the leakage current of 11-22 kW motors is > 10 mA, take extra precautions when earthing these motors.

EN 61800-5-1 specifies that the pump must be stationary and installed permanently when the leakage current is > 10 mA.

One of the following requirements must be fulfilled:

- A single protective earth lead having a cross-sectional area of min. 10 mm^2 copper.

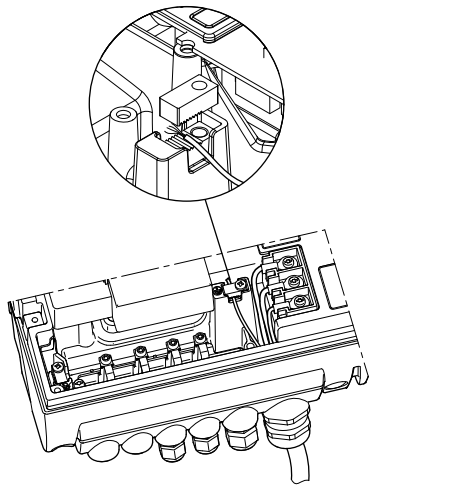


Fig. 9 Connection of a single protective earth lead using one of the leads of a 4-core mains cable (with cross-sectional area of min. 10 mm^2)

- Two protective earth leads of the same cross-sectional area as the mains leads, with one lead connected to an additional earth terminal in the terminal box.

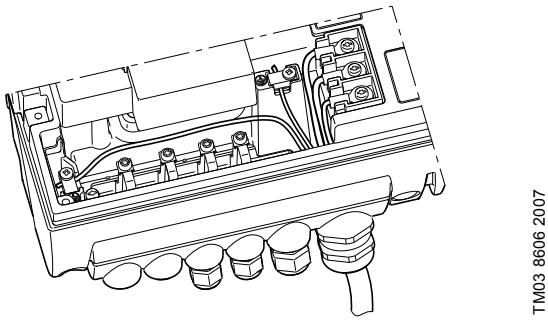


Fig. 10 Connection of two protective earth leads using two of the leads of a 5-core mains cable

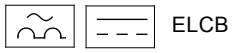
Protective earth leads must always have a yellow/green (PE) or yellow/green/blue (PEN) colour marking.

5.3.3 Backup fuses

For recommended fuse sizes, see section *22.1 Supply voltage*.

5.3.4 Additional protection

If the pump is connected to an electric installation where an earth leakage circuit breaker (ELCB) is used as additional protection, the circuit breaker must be of a type marked with the following symbols:



This circuit breaker is **type B.**
The total leakage current of all the electrical equipment in the installation must be taken into account.

The leakage current of the motor in normal operation can be seen in section *22.3 Leakage current*.

During start and at asymmetrical supply systems, the leakage current can be higher than normal and may cause the ELCB to trip.

5.3.5 Motor protection

The pump requires no external motor protection. The motor incorporates thermal protection against slow overloading and blocking (IEC 34-11, TP 211).

5.3.6 Protection against mains voltage transients

The pump is protected against mains voltage transients in accordance with EN 61800-3 and is capable of withstanding a VDE 0160 pulse.

The pump has a replaceable varistor which is part of the transient protection.

Over time this varistor will be worn and need to be replaced. When the time for replacement has come, R100 and PC Tool E-products will indicate this as a warning.
See section *19. Maintenance and service*.

5.3.7 Supply voltage and mains

3 x 380-480 V - 10 %/+ 10 %, 50/60 Hz, PE.

The supply voltage and frequency are marked on the pump nameplate. Make sure that the motor is suitable for the power supply of the installation site.

The wires in the terminal box must be as short as possible. Excepted from this is the protective earth lead which must be so long that it is the last one to be disconnected in case the cable is inadvertently pulled out of the cable entry.

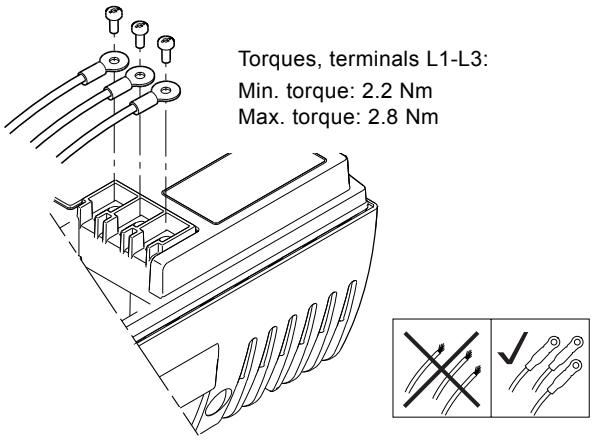


Fig. 11 Mains connection

Cable glands

Cable glands comply with EN 50626.

- 1 x M40 cable gland, cable diameter ∅16-∅28
- 1 x M20 cable gland, cable diameter ∅9-∅17
- 2 x M16 cable gland, cable diameter ∅4-∅10
- 2 x M16 knock-out cable entries.

Warning

If the supply cable is damaged, it must be replaced by qualified personnel.

Grid types

Three-phase E-pumps can be connected to all grid types.

Warning

Do not connect three-phase E-pumps to a mains supply with a voltage between phase and earth of more than 440 V.

5.3.8 Start/stop of pump

Caution ***The number of starts and stops via the mains voltage must not exceed 4 times per hour.***

When the pump is switched on via the mains, it will start after approx. 5 seconds.

If a higher number of starts and stops is desired, use the input for external start/stop when starting/stopping the pump.

When the pump is switched on via an external on/off switch, it will start immediately.

5.3.9 Connections

Note ***If no external on/off switch is connected, connect terminals 2 and 3 using a short wire.***

As a precaution, the wires to be connected to the following connection groups must be separated from each other by reinforced insulation in their entire lengths:

Group 1: Inputs

- start/stop terminals 2 and 3
- digital input terminals 1 and 9
- setpoint input terminals 4, 5 and 6
- sensor input terminals 7 and 8
- GENIbus terminals B, Y and A

All inputs (group 1) are internally separated from the mains-conducting parts by reinforced insulation and galvanically separated from other circuits.
All control terminals are supplied with protective extra-low voltage (PELV), thus ensuring protection against electric shock.

Group 2: Output (relay signal, terminals NC, C, NO)

The output (group 2) is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.

Group 3: Mains supply (terminals L1, L2, L3)

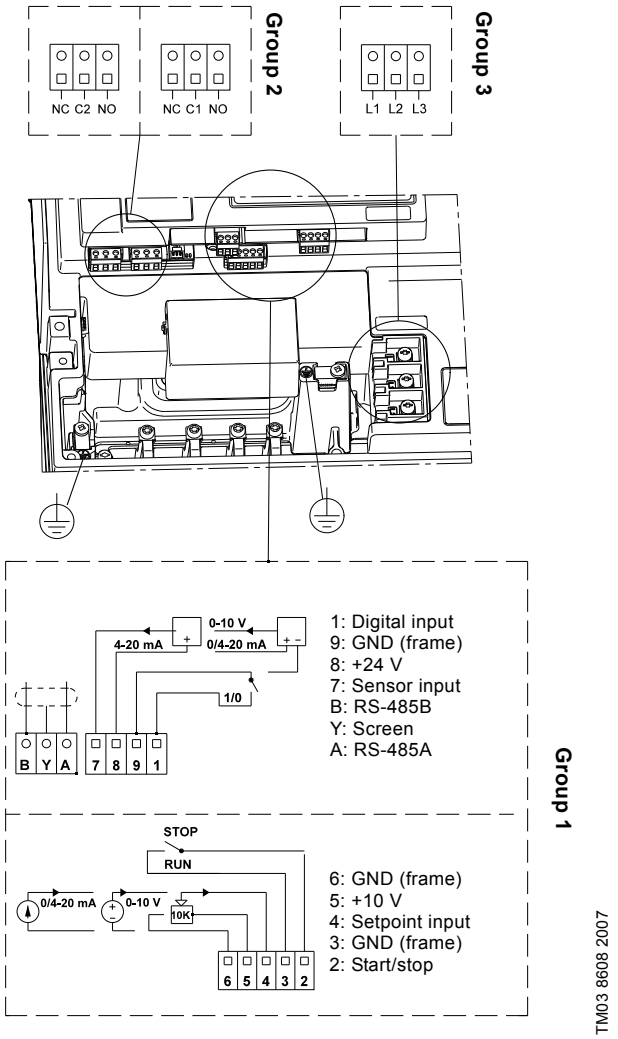
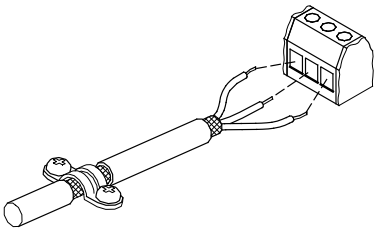


Fig. 12 Connection terminals

A galvanic separation must fulfil the requirements for reinforced insulation including creepage distances and clearances specified in EN 61800-5-1.

5.4 Signal cables

- Use screened cables with a conductor cross-section of min. 0.5 mm^2 and max. 1.5 mm^2 for external on/off switch, digital input, setpoint and sensor signals.
- Connect the screens of the cables to frame at both ends with good frame connection. The screens must be as close as possible to the terminals. See fig. 13.



TM02 1325 0901

Fig. 13 Stripped cable with screen and wire connection

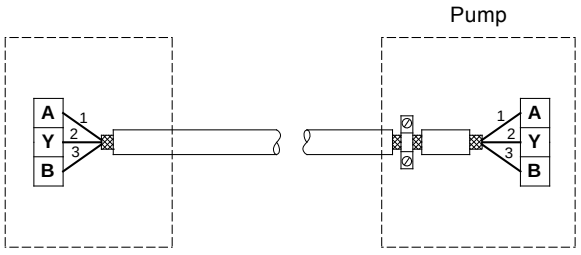
- Always tighten screws for frame connections whether a cable is fitted or not.
- Make the wires in the pump terminal box as short as possible.

5.5 Bus connection cable

5.5.1 New installations

For the bus connection, use a screened 3-core cable with a conductor cross-section of 0.2 mm^2 - 1.5 mm^2.

- If the pump is connected to a unit with a cable clamp which is identical to the one on the pump, connect the screen to this cable clamp.
- If the unit has no cable clamp as shown in fig. 14, leave the screen unconnected at this end.

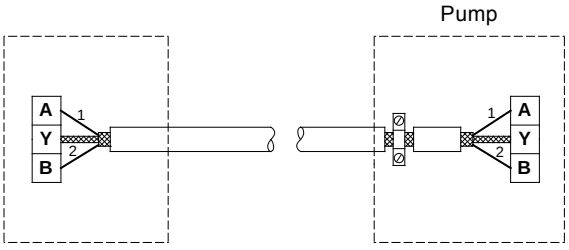


TM02 8841 0904

Fig. 14 Connection with screened 3-core cable

5.5.2 Replacing an existing pump

- If a screened 2-core cable is used in the existing installation, connect it as shown in fig. 15.



TM02 8842 0904

Fig. 15 Connection with screened 2-core cable

- If a screened 3-core cable is used in the existing installation, follow the instructions in section *5.5.1 New installations.*

6. Modes

Grundfos E-pumps are set and controlled according to operating and control modes.

6.1 Overview of modes

Operating modes	Normal	— Stop	— Min.	— Max.
Control modes	Uncontrolled	— Controlled		
	Constant curve	Constant pressure [1]		

1) For this control mode the pump is equipped with a pressure sensor. The pump may also be equipped with a temperature sensor in which case the description would be constant temperature in control mode controlled.

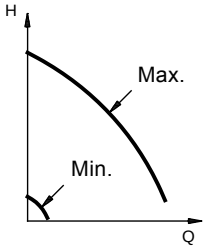
6.2 Operating mode

When the operating mode is set to *Normal,* the control mode can be set to controlled or uncontrolled. See section *6.3 Control mode*.

The other operating modes that can be selected are *Stop*, *Min.* or *Max.*

- *Stop*: the pump has been stopped
- *Min.*: the pump is operating at its minimum speed
- *Max.*: the pump is operating at its maximum speed.

Figure 16 is a schematic illustration of min. and max. curves.



TM00 5547 0995

Fig. 16 Min. and max. curves

The max. curve can for instance be used in connection with the venting procedure during installation.
The min. curve can be used in periods in which a minimum flow is required.

If the power supply to the pump is disconnected, the mode setting will be stored.

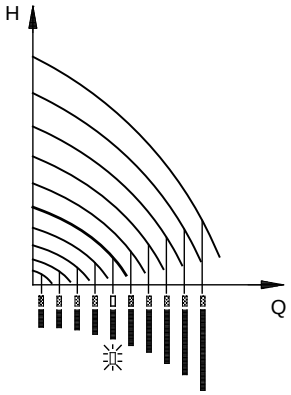
The remote control R100 offers additional possibilities of setting and status displays. See section *9. Setting by means of R100*.

6.3 Control mode

6.3.1 Pumps without factory-fitted sensor

The pumps are factory-set to control mode **uncontrolled**.

In control mode uncontrolled, the pump will operate according to the constant curve set, fig. 17.



TM00 7746 1304

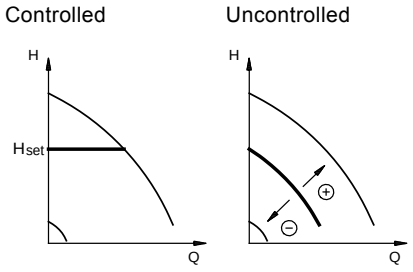
Fig. 17 Pump in control mode **uncontrolled** (constant curve)

6.3.2 Pumps with pressure sensor

The pump can be set to one of two control modes, i.e. controlled and uncontrolled, fig. 18.

In control mode **controlled**, the pump will adjust its performance, i.e. pump discharge pressure, to the desired setpoint for the control parameter.

In control mode **uncontrolled**, the pump will operate according to the constant curve set.



TM00 7668 0404

Fig. 18 Pump in control mode **controlled** (constant pressure) or **uncontrolled** (constant curve)

7. Setting up the pump

7.1 Factory setting

Pumps without factory-fitted sensor

The pumps have been factory-set to control mode **uncontrolled**. The setpoint value corresponds to 100 % of the maximum pump performance (see data sheet for the pump).

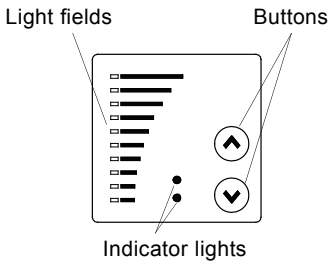
Pumps with pressure sensor

The pumps have been factory-set to control mode **controlled**. The setpoint value corresponds to 50 % of the sensor measuring range (see sensor nameplate).

8. Setting by means of control panel

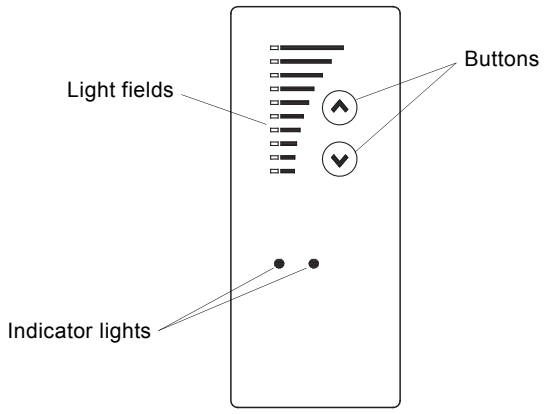
The pump control panel, see fig. 19 or 20, incorporates the following buttons and indicator lights:

- Buttons, ⊛ and ⊛, for setpoint setting.
- Light fields, yellow, for indication of setpoint.
- Indicator lights, green (operation) and red (fault).



TM00 7600 0304

Fig. 19 Control panel, single-phase pumps, 0.37 - 1.1 kW



TM02 8513 0304

Fig. 20 Control panel, three-phase pumps, 0.75 - 22 kW

8.1 Setting of operating mode

Settings available:

- *Normal*
- *Stop*
- *Min.*
- *Max.*

Start/stop of pump

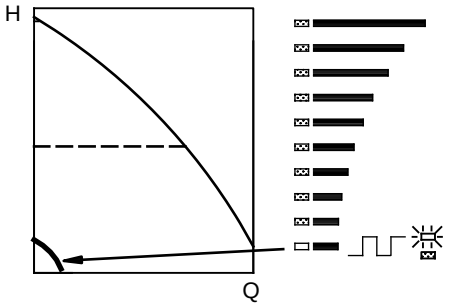
Start the pump by continuously pressing ⊛ until the desired setpoint is indicated. This is operating mode *Normal*.

Stop the pump by continuously pressing ⊛ until none of the light fields are activated and the green indicator light flashes.

Setting to Min.

Press ⊛ continuously to change to the min. curve of the pump (bottom light field flashes). When the bottom light field is on, press ⊛ for 3 seconds until the light field starts flashing.

To return to uncontrolled or controlled operation, press ⊛ continuously until the desired setpoint is indicated.



TM00 7346 1304

Fig. 21 Min. curve duty

Setting to Max.

Press ⊙ continuously to change to the max. curve of the pump (top light field flashes). When the top light field is on, press ⊙ for 3 seconds until the light field starts flashing.

To return to uncontrolled or controlled operation, press ⊙ continuously until the desired setpoint is indicated.

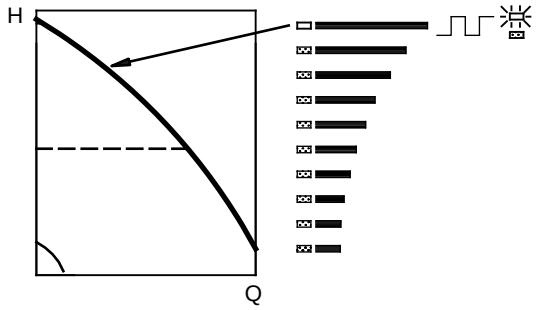


Fig. 22 Max. curve duty

8.2 Setpoint setting

Set the desired setpoint by pressing the button ⊙ or ⊙.

The light fields on the control panel will indicate the setpoint set. See examples in sections *8.2.1* and *8.2.2*.

8.2.1 Pump in control mode controlled (pressure control)

Example

Figure 23 shows that the light fields 5 and 6 are activated, indicating a desired setpoint of 3 bar. The setting range is equal to the sensor measuring range (see sensor nameplate).

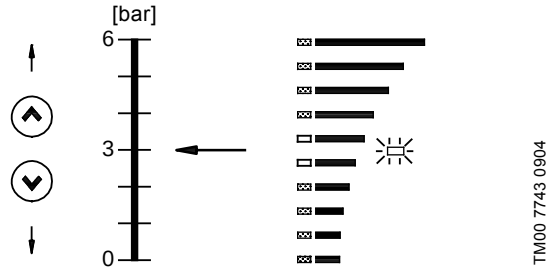


Fig. 23 Setpoint set to 3 bar, pressure control

8.2.2 Pump in control mode uncontrolled

Example

In control mode uncontrolled, the pump performance is set within the range from min. to max. curve. See fig. 24.

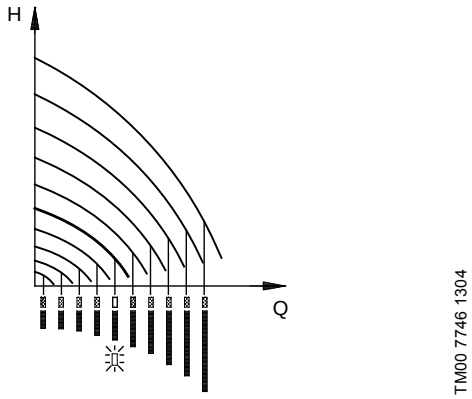


Fig. 24 Pump performance setting, control mode uncontrolled

9. Setting by means of R100

The pump is designed for wireless communication with the Grundfos remote control R100.

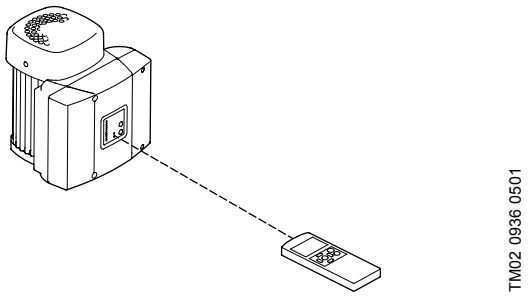


Fig. 25 R100 communicating with the pump via infra-red light

During communication, the R100 must be pointed at the control panel. When the R100 communicates with the pump, the red indicator light will flash rapidly. Keep pointing the R100 at the control panel until the red LED diode stops flashing.

The R100 offers setting and status displays for the pump.

The displays are divided into four parallel menus (see fig. 26):

0. GENERAL (see operating instructions for the R100)
1. OPERATION
2. STATUS
3. INSTALLATION

The figure above each individual display in fig. 26 refers to the section in which the display is described.

(1) This display only appears for three-phase pumps, 0.75 - 22 kW.

(2) This display only appears for three-phase pumps, 11-22 kW.

(3) This display only appears for single- and three-phase pumps, 0.37 - 7.5 kW.

(4) This display only appears if an advanced I/O module is installed.

Fig. 26 Menu overview

Displays in general

In the following explanation of the functions, one or two displays are shown.

One display

Pumps without or with factory-fitted sensor have the same function.

Two displays

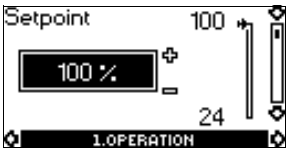
Pumps without or with factory-fitted pressure sensor have different functions and factory settings.

9.1 Menu OPERATION

The first display in this menu is this:

9.1.1 Setpoint

Without sensor (uncontrolled)



- Setpoint set
- Actual setpoint
- Actual value

Set the setpoint in %.

With pressure sensor (controlled)

- Setpoint set
- Actual setpoint
- Actual value

Set the desired pressure in bar.

In control mode **uncontrolled**, the setpoint is set in % of the maximum performance. The setting range will lie between the min. and max. curves.

In control mode **controlled**, the setting range is equal to the sensor measuring range.

If the pump is connected to an external setpoint signal, the value in this display will be the maximum value of the external setpoint signal. See section *13. External setpoint signal.*

Setpoint and external signal

The setpoint cannot be set if the pump is controlled via external signals (*Stop*, *Min. curve* or *Max. curve*). R100 will give this warning: *External control!*
Check if the pump is stopped via terminals 2-3 (open circuit) or set to min. or max. via terminals 1-3 (closed circuit).

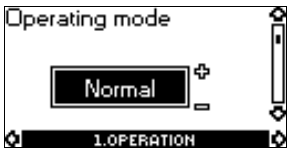
See section *11. Priority of settings*.

Setpoint and bus communication

The setpoint cannot be set either if the pump is controlled from an external control system via bus communication. R100 will give this warning: *Bus control!*
To override bus communication, disconnect the bus connection.

See section *11. Priority of settings*.

9.1.2 Operating mode



Set one of the following operating modes:

- ***Normal*** (duty)
- *Stop*
- *Min.*
- *Max.*

The operating modes can be set without changing the setpoint setting.

9.1.3 Fault indications

In E-pumps, faults may result in two types of indication: alarm or warning.

An "alarm" fault will activate an alarm indication in R100 and cause the pump to change operating mode, typically to stop. However, for some faults resulting in alarm, the pump is set to continue operating even if there is an alarm.

A "warning" fault will activate a warning indication in R100, but the pump will not change operating or control mode.

Note ***The indication, Warning, only applies to three-phase pumps.***

Alarm

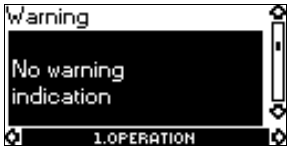
In case of alarm, the cause will appear in this display.

Possible causes:

- *No alarm indication*
- *Too high motor temperature*
- *Undervoltage*
- *Mains voltage asymmetry* (11-22 kW)
- *Overvoltage*
- *Too many restarts* (after faults)
- *Overload*
- *Underload* (only three-phase pumps)
- *Sensor signal outside signal range*
- *Setpoint signal outside signal range*
- *External fault*
- *Duty/standby, Communication fault*
- *Dry running* (only three-phase pumps)
- *Other fault.*

If the pump has been set up to manual restart, an alarm indication can be reset in this display if the cause of the fault has disappeared.

Warning (only three-phase pumps)



In case of warning, the cause will appear in this display.

Possible causes:

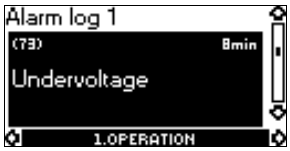
- *No warning indication*
- *Sensor signal outside signal range*
- *Relubricate motor bearings, see section 19.2*
- *Replace motor bearings, see section 19.3*
- *Replace varistor, see section 19.4.*

A warning indication will disappear automatically once the fault has been remedied.

9.1.4 Fault log

For both fault types, alarm and warning, the R100 has a log function.

Alarm log

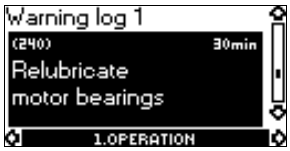


In case of "alarm" faults, the last five alarm indications will appear in the alarm log. "Alarm log 1" shows the latest fault, "Alarm log 2" shows the latest fault but one, etc.

The example above gives this information:

- the alarm indication *Undervoltage*
- the fault code *(73)*
- the number of minutes the pump has been connected to the power supply after the fault occurred, *8 min*.

Warning log (only three-phase pumps)



In case of "warning" faults, the last five warning indications will appear in the warning log. "Warning log 1" shows the latest fault, "Warning log 2" shows the latest fault but one, etc.

The example above gives this information:

- the warning indication *Relubricate motor bearings*
- the fault code *(240)*
- the number of minutes the pump has been connected to the power supply since the fault occurred, *30 min*.

9.2 Menu STATUS

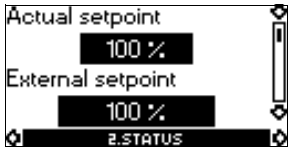
The displays appearing in this menu are status displays only. It is not possible to change or set values.

The displayed values are the values that applied when the last communication between the pump and the R100 took place.
If a status value is to be updated, point the R100 at the control panel and press "OK".
If a parameter, e.g. speed, should be called up continuously, press "OK" constantly during the period in which the parameter in question should be monitored.

The tolerance of the displayed value is stated under each display. The tolerances are stated as a guide in % of the maximum values of the parameters.

9.2.1 Actual setpoint

Without sensor (uncontrolled)



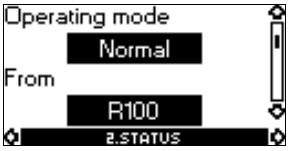
Tolerance: ± 2 %.

With pressure sensor (controlled)

Tolerance: ± 2 %.

This display shows the actual setpoint and the external setpoint in % of the range from minimum value to the setpoint set.
See section *13. External setpoint signal.*

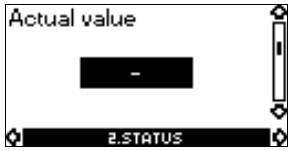
9.2.2 Operating mode



This display shows the actual operating mode (*Normal* (duty), *Stop*, *Min.*, or *Max.*). Furthermore, it shows where this operating mode was selected (*R100*, *Pump*, *Bus*, *External* or *Stop func.*).
For further details about the stop function (*Stop func.),*
see section 9.3.8 Stop function.

9.2.3 Actual value

Without sensor (uncontrolled)



With pressure sensor (controlled)

This display shows the value actually measured by a connected sensor.

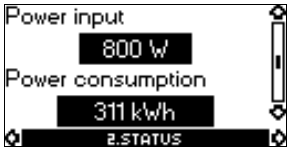
If no sensor is connected to the pump, "-" will appear in the display.

9.2.4 Speed

Tolerance: ± 5 %

The actual pump speed will appear in this display.

9.2.5 Power input and power consumption



Tolerance: ± 10 %

This display shows the actual pump input power from the mains supply. The power is displayed in W or kW.

The pump power consumption can also be read from this display. The value of power consumption is an accumulated value calculated from the pump's birth and it cannot be reset.

9.2.6 Operating hours

Tolerance: ± 2 %

The value of operating hours is an accumulated value and cannot be reset.

9.2.7 Lubrication status of motor bearings (only 11-22 kW)

This display shows how many times the motor bearings have been relubricated and when to replace the motor bearings.

When the motor bearings have been relubricated, confirm this action in the INSTALLATION menu.
See section *9.3.14 Confirming relubrication/replacement of motor bearings (only three-phase pumps)*. When relubrication is confirmed, the figure in the above display will be increased by one.

9.2.8 Time till relubrication of motor bearings (only 11-22 kW)

This display shows when to relubricate the motor bearings.
The controller monitors the operating pattern of the pump and calculates the period between bearing relubrications. If the operating pattern changes, the calculated time till relubrication may change as well.

The displayable values are these:

- *in 2 years*
- *in 1 year*
- *in 6 months*
- *in 3 months*
- *in 1 month*
- *in 1 week*
- *Now!*

9.2.9 Time till replacement of motor bearings (only three-phase pumps)

When the motor bearings have been relubricated a prescribed number of times stored in the controller, the display in section *9.2.8* will be replaced by the display below.

This display shows when to replace the motor bearings.
The controller monitors the operating pattern of the pump and calculates the period between bearing replacements.

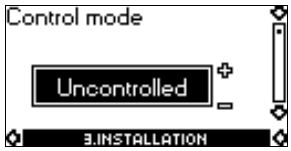
The displayable values are these:

- *in 2 years*
- *in 1 year*
- *in 6 months*
- *in 3 months*
- *in 1 month*
- *in 1 week*
- *Now!*

9.3 Menu INSTALLATION

9.3.1 Control mode

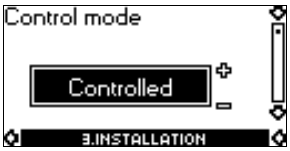
Without sensor (uncontrolled)



Select one of the following control modes (see fig. 18):

- *Controlled*
- ***Uncontrolled***.

With pressure sensor (controlled)



Select one of the following control modes (see fig. 18):

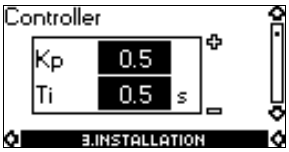
- ***Controlled***
- *Uncontrolled*.

Note

If the pump is connected to a bus, the control mode cannot be selected via the R100. See section 14. Bus signal.

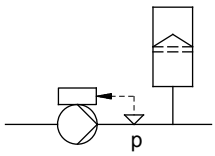
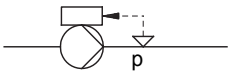
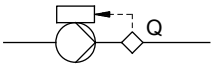
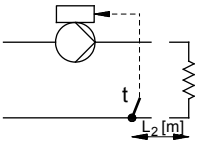
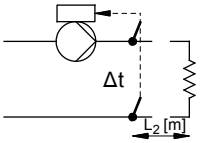
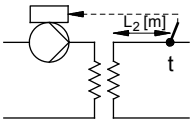
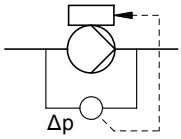
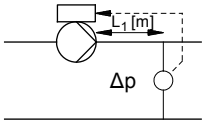
9.3.2 Controller

E-pumps have a factory default setting of gain (K_p) and integral time (T_i). However, if the factory setting is not the optimum setting, the gain and the integral time can be changed in the display below.



- The gain (K_p) can be set within the range from *0.1* to *20*.
- The integral time (T_i) can be set within the range from *0.1* to *3600 s*. If *3600 s* is selected, the controller will function as a P controller.
- Furthermore, it is possible to set the controller to inverse control, meaning that if the setpoint is increased, the speed will be reduced. In the case of inverse control, the gain (K_p) must be set within the range from *-0.1* to *-20*.

The table below shows the suggested controller settings:

System/application	K_p		T_i
	Heating system [1]	Cooling system [2]	
	**0.5**		**0.5**
	**0.1**		**0.5**
	**0.5**		**0.5**
	**0.5**	-0.5	$10 + 5L_2$
	**0.5**		$10 + 5L_2$
	**0.5**	-0.5	$30 + 5L_2$
	**0.5**		**0.5**
	**0.5**		$L_1 < 5$ m: **0.5** $L_1 > 5$ m: 3 $L_1 > 10$ m: 5

1. Heating systems are systems in which an increase in pump performance will result in a rise in temperature at the sensor.
2. Cooling systems are systems in which an increase in pump performance will result in a drop in temperature at the sensor.

L_1 = Distance in m between pump and sensor.

L_2 = Distance in m between heat exchanger and sensor.

How to set the PI controller

For most applications, the factory setting of the controller constants K_p and T_i will ensure optimum pump operation. However, in some applications an adjustment of the controller may be needed.

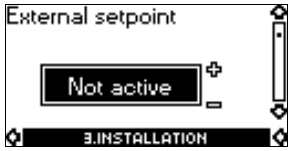
Proceed as follows:

1. Increase the gain (K_p) until the motor becomes unstable. Instability can be seen by observing if the measured value starts to fluctuate. Furthermore, instability is audible as the motor starts hunting up and down.
   Some systems, such as temperature controls, are slow-reacting, meaning that it may be several minutes before the motor becomes unstable.
2. Set the gain (K_p) to half of the value which made the motor unstable. This is the correct setting of the gain.
3. Reduce the integral time (T_i) until the motor becomes unstable.
4. Set the integral time (T_i) to twice the value which made the motor unstable. This is the correct setting of the integral time.

General rules of thumb:

- If the controller is too slow-reacting, increase K_p.
- If the controller is hunting or unstable, dampen the system by reducing K_p or increasing T_i.

9.3.3 External setpoint



The input for external setpoint signal can be set to different signal types.

Select one of the following types:

- *0-10 V*
- *0-20 mA*
- *4-20 mA*
- ***Not active***.

If *Not active* is selected, the setpoint set by means of the R100 or on the control panel will apply.

If one of the signal types is selected, the actual setpoint is influenced by the signal connected to the external setpoint input. See section *13. External setpoint signal*.

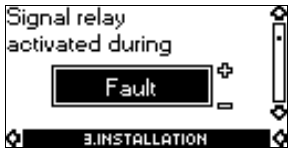
9.3.4 Signal relay

Pumps of 0.37 - 7.5 kW have one signal relay. The factory setting of the relay will be *Fault*.

Pumps of 11-22 kW have two signal relays. Signal relay 1 is factory set to *Alarm* and signal relay 2 to *Warning*.

In one of the displays below, select in which one of three or six operating situations the signal relay should be activated.

0.37 - 7.5 kW



- *Ready*
- ***Fault***
- *Operation*
- *Pump running* (only three-phase pumps, 0.55 - 7.5 kW)
- *Warning* (only three-phase pumps, 0.55 - 7.5 kW).

11-22 kW

- *Ready*
- ***Alarm***
- *Operation*
- *Pump running*
- *Warning*
- *Relubricate.*

11-22 kW

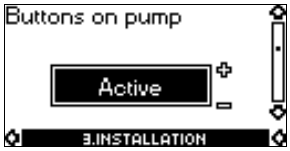
- *Ready*
- *Alarm*
- *Operation*
- *Pump running*
- ***Warning***
- *Relubricate.*

Note

Fault and Alarm cover faults resulting in Alarm. Warning covers faults resulting in Warning. Relubricate covers only that one individual event. For distinction between alarm and warning, see section 9.1.3 Fault indications.

For further information, see section *16. Indicator lights and signal relay.*

9.3.5 Buttons on pump

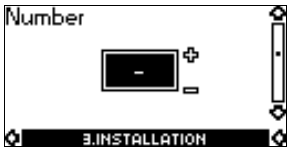


The operating buttons ⊙ and ⊙ on the control panel can be set to these values:

- ***Active***
- *Not active.*

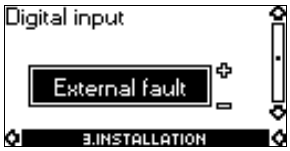
When set to *Not active* (locked), the buttons do not function.
Set the buttons to *Not active* if the pump should be controlled via an external control system.

9.3.6 Pump number



A number between 1 and 64 can be allocated to the pump. In the case of bus communication, a number must be allocated to each pump.

9.3.7 Digital inputs



The digital inputs of the pump (terminal 1, fig. 4, 7 or 12) can be set to different functions.

Select one of the following functions:

- *Min. (min. curve)*
- *Max. (max. curve)*
- ***External fault***
- *Flow switch*
- *Dry running* (from external sensor) (only three-phase pumps).

The selected function is activated by closing the contact between terminals 1 and 9, 1 and 10 or 1 and 11. See figs 4, 7 and 12.

See also section *12.2 Digital input*.

***Min.*:**
When the input is activated, the pump will operate according to the min. curve.

***Max.*:**
When the input is activated, the pump will operate according to the max. curve.

***External fault*:**
When the input is activated, a timer will be started. If the input is activated for more than 5 seconds, the pump will be stopped and a fault will be indicated. If the input is deactivated for more than 5 seconds, the fault condition will cease and the pump can only be restarted manually by resetting the fault indication.

***Flow switch*:**
When this function is selected, the pump will be stopped when a connected flow switch detects low flow.
It is only possible to use this function if the pump is connected to a pressure sensor.

If the input is activated for more than 5 seconds, the stop function incorporated in the pump will take over. See section *9.3.8 Stop function*.

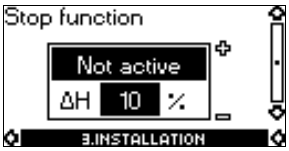
Dry running (only three-phase pumps):

When this function is selected, lack of inlet pressure or water shortage can be detected. This requires the use of an accessory, such as these:

- a Grundfos Liqtec® dry-running sensor
- a pressure switch installed on the suction side of a pump
- a float switch installed on the suction side of a pump.

When lack of inlet pressure or water shortage (*Dry running)* is detected, the pump will be stopped. The pump cannot restart as long as the input is activated.

9.3.8 Stop function



The stop function can be set to these values:

- *Active*
- ***Not active***.

When the stop function is active, the pump will be stopped at very low flows. The causes are the following:

- avoid unnecessary heating of the pumped liquid
- reduce wear of the shaft seals
- reduce noise from operation.

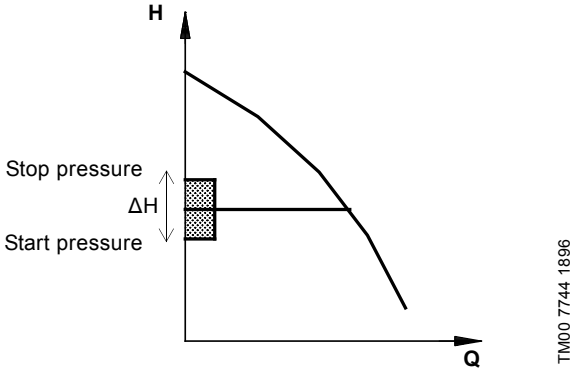


Fig. 27 Difference between start and stop pressures (ΔH)

ΔH is factory-set to **10 % of actual setpoint**.
ΔH can be set within the range from 5 % to 30 % of actual setpoint.

Low flow can be detected in two different ways:

1. A built-in "low-flow detection function" which functions if the digital input is not set up for flow switch.
2. A flow switch connected to the digital input.

1. Low-flow detection function

The pump will check the flow regularly by reducing the speed for a short time. If there is no or only a small change in pressure, this means that there is low flow. The speed will be increased until the stop pressure (actual setpoint + 0.5 x ΔH) is reached and the pump will stop. When the pressure has fallen to the start pressure (actual setpoint - 0.5 x ΔH), the pump will restart.

When restarting, the pumps will react differently according to pump type:

Single-phase pumps

The pump will return to continuous operation at constant pressure and the pump will continue checking the flow regularly by reducing the speed for a short time.

Three-phase pumps

1. If the flow is higher than the low-flow limit, the pump will return to continuous operation at constant pressure.
2. If the flow is still lower than the low-flow limit, the pump will continue in start/stop operation. It will continue in start/stop operation until the flow is higher than the low-flow limit; when the flow is higher than the low-flow limit, the pump will return to continuous operation.

2. Flow switch

When the digital input is activated for more than 5 seconds because there is low flow, the speed will be increased until the stop pressure (actual setpoint + 0.5 x ΔH) is reached, and the pump will stop. When the pressure has fallen to start pressure, the pump will start again. If there is still no flow, the pump will quickly reach stop pressure and stop. If there is flow, the pump will continue operating according to the setpoint.

Operating conditions for the stop function

It is only possible to use the stop function if the system incorporates a pressure sensor, a non-return valve and a diaphragm tank.

Caution ***The non-return valve must always be installed before the pressure sensor. See figs 28 and 29.***

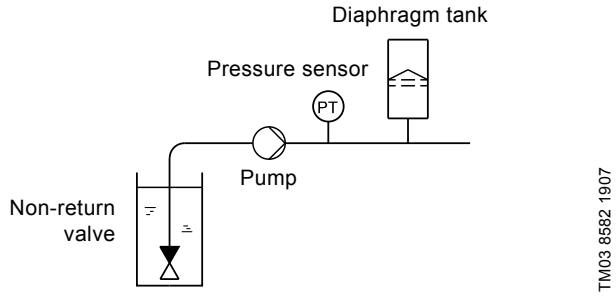


Fig. 28 Position of the non-return valve and pressure sensor in system with suction lift operation

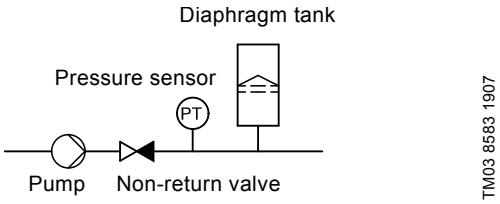


Fig. 29 Position of the non-return valve and pressure sensor in system with positive inlet pressure

Diaphragm tank

The stop function requires a diaphragm tank of a certain minimum size. The tank must be installed immediately after the pump and the precharge pressure must be 0.7 x actual setpoint.

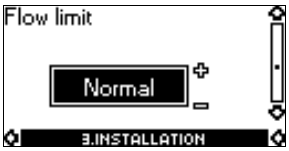
Recommended diaphragm tank size:

Rated flow rate of pump [m³/h]	CRE pump	Typical diaphragm tank size [litres]
0-6	1s, 1, 3, 5	8
7-24	10, 15, 20	18
25-40	32	50
41-70	45, 64	120
71-100	90	180

If a diaphragm tank of the above size is installed in the system, the factory setting of ΔH is the correct setting.
If the tank installed is too small, the pump will start and stop too often. This can be remedied by increasing ΔH.

9.3.9 Flow limit for the stop function (only three-phase pumps)

Note ***Flow limit for the stop function only works if the system is not set up for flow switch.***



In order to set at which flow rate the system is to go from continuous operation at constant pressure to start/stop operation, select among these four values of which three are preconfigured flow limits:

- *Low*
- ***Normal***
- *High*
- *Custom*.

The default setting of the pump is *Normal*, representing approx. 10 % of the rated flow rate of the pump.

If a lower flow limit than normal is desired or the tank size is smaller than recommended, select *Low*.

If a higher flow than normal is wanted or a large tank is used, set the limit to *High*.

The value *Custom* can be seen in R100 but it can only be set by means of the PC Tool E-products. *Custom* is for customised set-up and optimising to the process.

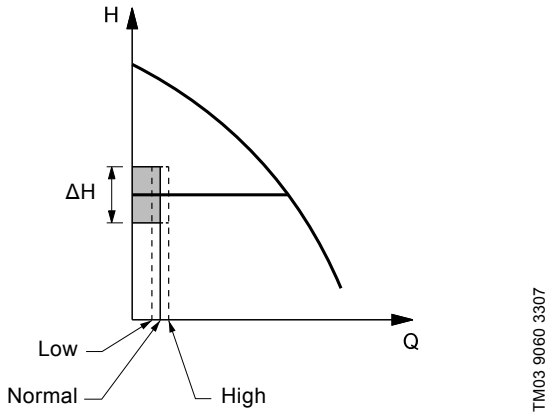
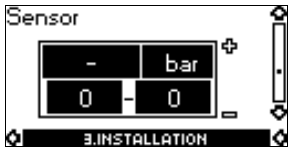


Fig. 30 Three preconfigured flow limits, *Low*, *Normal* and *High*

9.3.10 Sensor

Without sensor (uncontrolled)



With pressure sensor (controlled)

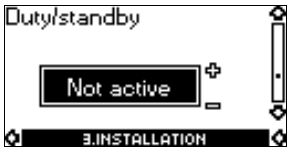
The setting of the sensor is only relevant in the case of controlled operation.

Select among the following values:

- Sensor output signal
  0-10 V
  0-20 mA
  4-20 mA,
- Unit of measurement of sensor:
  bar, mbar, m, kPa, psi, ft, m³/h, m³/s, l/s, gpm, °C, °F, %
- Sensor measuring range.

9.3.11 Duty/standby (only three-phase pumps)

The duty/standby function applies to two pumps connected in parallel and controlled via GENIbus.



The duty/standby function can be set to these values:

- *Active*
- ***Not active.***

When the function is set to *Active*, the following applies:

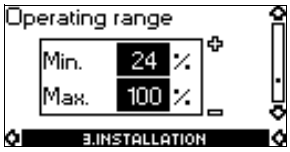
- Only one pump is running at a time.
- The stopped pump (standby) will automatically be cut in if the running pump (duty) has a fault. A fault will be indicated.
- Changeover between the duty pump and the standby pump will take place every 24 hours.

Activate the duty/standby function as follows:

1. Connect one of the pumps to the mains supply.
   Set the duty/standby function to *Not active*.
   Using the R100, make the necessary settings in menu OPERATION and INSTALLATION.
2. Set the operating mode to *Stop* in menu OPERATION.
3. Connect the other pump to the mains supply.
   Using the R100, make the necessary settings in menu OPERATION and INSTALLATION.
   Set the duty/standby function to *Active*.

The running pump will search for the other pump and automatically set the duty/standby function of this pump to *Active*. If it cannot find the other pump, a fault will be indicated.

9.3.12 Operating range



How to set the operating range:

- Set the min. curve within the range from max. curve to 12 % of maximum performance. The pump is factory-set to 24 % of maximum performance.
- Set the max. curve within the range from maximum performance (100 %) to min. curve.

The area between the min. and max. curves is the operating range.

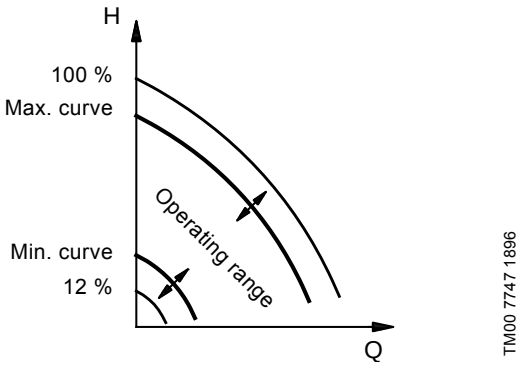


Fig. 31 Setting of the min. and max. curves in % of maximum performance

9.3.13 Motor bearing monitoring (only three-phase pumps)

The motor bearing monitoring function can be set to these values:

- ***Active***
- *Not active.*

When the function is set to *Active*, a counter in the controller will start counting the mileage of the bearings. See section *9.2.7 Lubrication status of motor bearings (only 11-22 kW)*.

Note

The counter will continue counting even if the function is switched to Not active, but a warning will not be given when it is time for relubrication.

When the function is switched to Active again, the accumulated mileage will again be used to calculate the relubrication time.

9.3.14 Confirming relubrication/replacement of motor bearings (only three-phase pumps)

This function can be set to these values:

- *Relubricated* (only 11-22 kW)
- *Replaced*
- ***Nothing done***.

When the bearing monitoring function is *Active,* the controller will give a warning indication when the motor bearings are due to be relubricated or replaced. See section *9.1.3 Fault indications*.

When the motor bearings have been relubricated or replaced, confirm this action in the above display by pressing "OK".

Note

Relubricated cannot be selected for a period of time after confirming relubrication.

9.3.15 Standstill heating (only three-phase pumps)

The standstill heating function can be set to these values:

- *Active*
- ***Not active.***

When the function is set to *Active*, an AC voltage will be applied to the motor windings. The applied voltage will ensure that sufficient heat is generated to avoid condensation in the motor.

10. Setting by means of PC Tool E-products

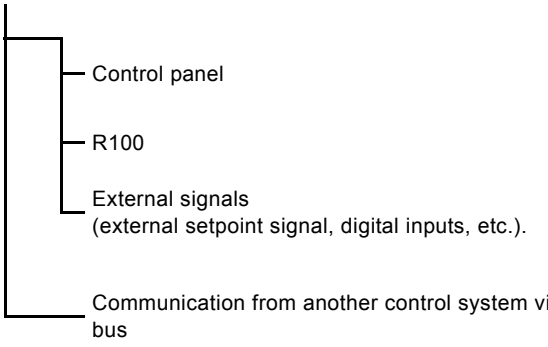
Special setup requirements differing from the settings available via the R100 require the use of Grundfos PC Tool E-products. This again requires the assistance of a Grundfos service technician or engineer. Contact your local Grundfos company for more information.

11. Priority of settings

The priority of settings depends on two factors:

1. control source
2. settings.

1. Control source



2. Settings

- Operating mode *Stop*
- Operating mode *Max.* (Max. curve)
- Operating mode *Min.* (Min. curve)
- Setpoint setting.

An E-pump can be controlled by different control sources at the same time, and each of these sources can be set differently. Consequently, it is necessary to set an order of priority of the control sources and the settings.

Note ***If two or more settings are activated at the same time, the pump will operate according to the function with the highest priority.***

Priority of settings without bus communication

Priority	Control panel or R100	External signals
1	Stop	
2	Max.	
3		Stop
4		Max.
5	Min.	Min.
6	Setpoint setting	Setpoint setting

Example: If the E-pump has been set to operating mode *Max.* (Max. frequency) via an external signal, such as digital input, the control panel or R100 can only set the E-pump to operating mode *Stop*.

Priority of settings with bus communication

Priority	Control panel or R100	External signals	Bus communication
1	Stop		
2	Max.		
3		Stop	Stop
4			Max.
5			Min.
6			Setpoint setting

Example: If the E-pump is operating according to a setpoint set via bus communication, the control panel or R100 can set the E-pump to operating mode *Stop* or *Max.*, and the external signal can only set the E-pump to operating mode *Stop*.

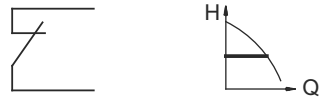
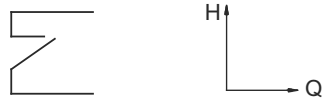
12. External forced-control signals

The pump has inputs for external signals for these forced-control functions:

- Start/stop of pump
- Digital function.

12.1 Start/stop input

Functional diagram: Start/stop input:

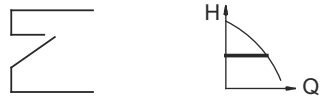
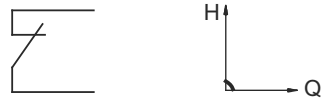
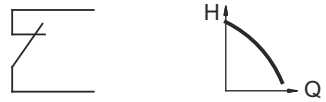
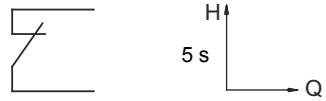
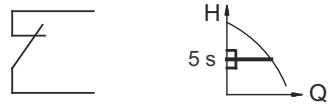
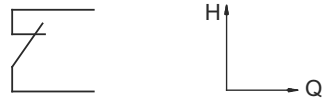
Start/stop (terminals 2 and 3)	
	**Normal duty**
	**Stop**

12.2 Digital input

By means of the R100, one of the following functions can be selected for the digital input:

- *Normal duty*
- *Min. curve*
- *Max. curve*
- *External fault*
- *Flow switch*
- *Dry running*.

Functional diagram: Input for digital function

Digital function (terminals 1 and 9)	
	**Normal duty**
	**Min. curve**
	**Max. curve**
	**External fault**
	**Flow switch**
	**Dry running**

13. External setpoint signal

The setpoint can be remote-set by connecting an analogue signal transmitter to the input for the setpoint signal (terminal 4).

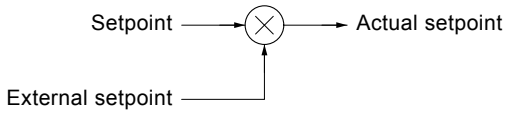


Fig. 32 Actual setpoint as a product (multiplied value) of setpoint and external setpoint

Select the actual external signal, *0-10 V*, *0-20 mA*, *4-20 mA,* via the R100. See section *9.3.3 External setpoint.*

If control mode **uncontrolled** is selected by means of the R100, the pump can be controlled by any controller.

In control mode **controlled**, the setpoint can be set externally within the range from the lower value of the sensor measuring range to the setpoint set on the pump or by means of the R100.

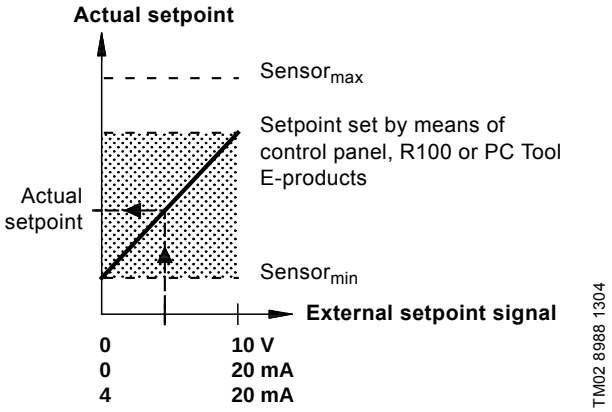


Fig. 33 Relation between the actual setpoint and the external setpoint signal in control mode controlled

Example: At a sensor$_{min}$ value of 0 bar, a setpoint set of 3 bar and an external setpoint of 80 %, the actual setpoint will be as follows:

Actual setpoint = (setpoint - sensor$_{min}$) x %$_{external\ setpoint}$ + sensor$_{min}$
= (3 - 0) x 80 % + 0
= 2.4 bar

In control mode **uncontrolled**, the setpoint can be set externally within the range from the min. curve to the setpoint set on the pump or by means of the R100.

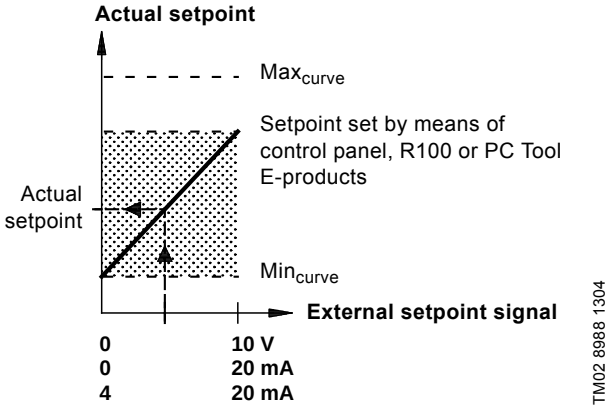


Fig. 34 Relation between the actual setpoint and the external setpoint signal in control mode uncontrolled

14. Bus signal

The pump supports serial communication via an RS-485 input. The communication is carried out according to the Grundfos bus protocol, GENIbus protocol, and enables connection to a building management system or another external control system.

Operating parameters, such as setpoint, operating mode, etc. can be remote-set via the bus signal. At the same time, the pump can provide status information about important parameters, such as actual value of control parameter, input power, fault indications, etc.

Contact Grundfos for further details.

Note ***If a bus signal is used, the number of settings available via the R100 will be reduced.***

15. Other bus standards

Grundfos offers various bus solutions with communication according to other standards.

Contact Grundfos for further details.

16. Indicator lights and signal relay

The operating condition of the pump is indicated by the green and red indicator lights fitted on the pump control panel and inside the terminal box. See figs 35 and 36.

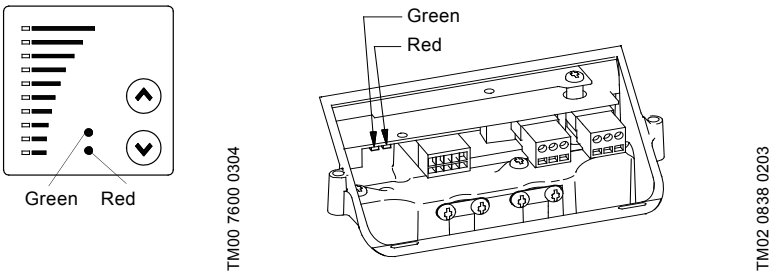


Fig. 35 Position of indicator lights on single-phase pumps

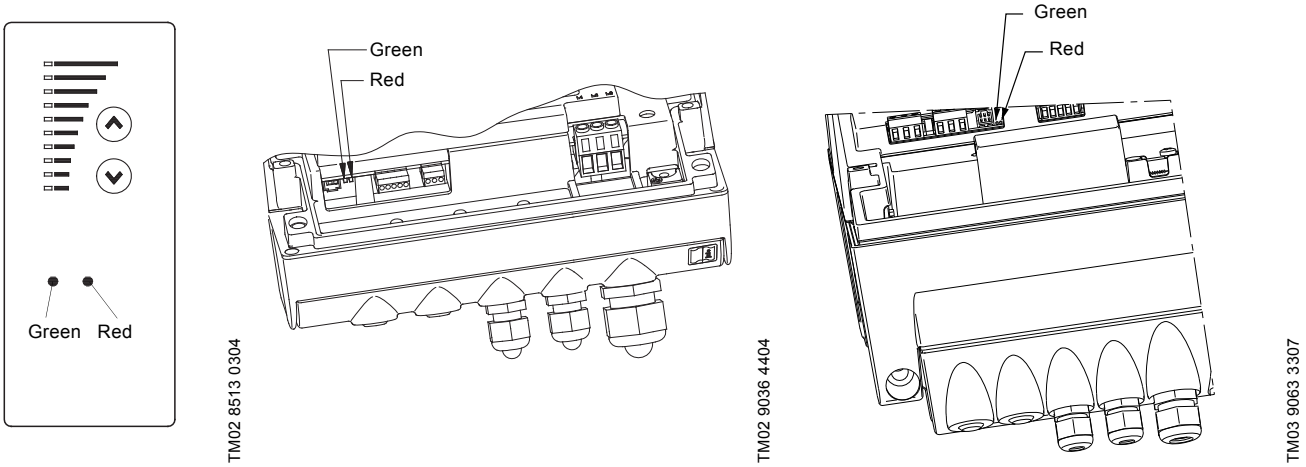
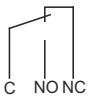


Fig. 36 Position of indicator lights on three-phase pumps

Besides, the pump incorporates an output for a potential-free signal via an internal relay.

For signal relay output values, see section *9.3.4 Signal relay.*

The functions of the two indicator lights and the signal relay are as shown in the following table:

Indicator lights		Signal relay activated during:				
Fault (red)	**Operation (green)**	**Fault/Alarm, Warning and Relubricate**	**Operating**	**Ready**	**Pump running**	**Description**
Off	Off					The power supply has been switched off.
Off	Permanently on					The pump is operating.
Off	Permanently on					The pump is stopped by the stop function.
Off	Flashing					The pump has been set to stop.
Permanently on	Off					The pump has stopped because of a *Fault/Alarm* or is running with a *Warning* or *Relubricate* indication. If the pump was stopped, restarting will be attempted (it may be necessary to restart the pump by resetting the *Fault* indication). If the cause is "external fault", the pump must be restarted manually by resetting the *Fault* indication.
Permanently on	Permanently on					The pump is operating, but it has or has had a *Fault/Alarm* allowing the pump to continue operation or it is operating with a *Warning* or *Relubricate* indication. If the cause is "sensor signal outside signal range", the pump will continue operating according to the max. curve and the fault indication cannot be reset until the signal is inside the signal range. If the cause is "setpoint signal outside signal range", the pump will continue operating according to the min. curve and the fault indication cannot be reset until the signal is inside the signal range.
Permanently on	Flashing					The pump has been set to stop, but it has been stopped because of a *Fault*.

Resetting of fault indication

A fault indication can be reset in one of the following ways:

- Briefly press the button ⊙ or ⊙ on the pump. This will not change the setting of the pump.
  A fault indication cannot be reset by means of ⊙ or ⊙ if the buttons have been locked.
- Switch off the power supply until the indicator lights are off.
- Switch the external start/stop input off and then on again.
- Use the R100. See section *9.1.3 Fault indications.*

When the R100 communicates with the pump, the red indicator light will flash rapidly.

17. Insulation resistance

0.37 - 7.5 kW

Caution

Do not measure the insulation resistance of motor windings or an installation incorporating E-pumps using high voltage megging equipment, as this may damage the built-in electronics.

11-22 kW

Caution

Do not measure the insulation resistance of an installation incorporating E-pumps using high voltage megging equipment, as this may damage the built-in electronics.

The motor leads can be disconnected separately and the insulation resistance of the motor windings can be tested.

18. Emergency operation (only 11-22 kW)

Warning

Never make any connections in the pump terminal box unless all electric supply circuits have been switched off for at least 5 minutes.

Note for instance that the signal relay may be connected to an external supply which is still connected when the mains supply is disconnected.

If the pump is stopped and you cannot start the pump immediately after normal remedies, the reason could be a faulty frequency converter. If this is the case it is possible to maintain emergency operation of the pump.

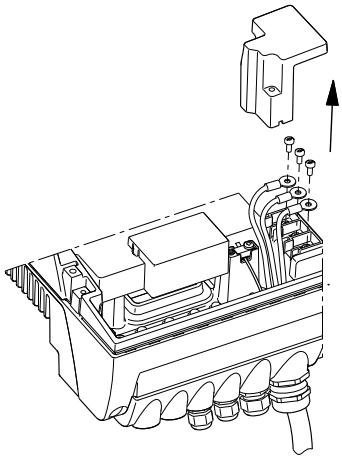
Before change over to emergency operation we recommend you to:

- check that the mains supply is OK
- check that control signals are working (start/stop signals)
- check that all alarms are reset
- make a resistance test on the motor windings (disconnect the motor leads from the terminal box)

If the pump remains stopped it is possible that the frequency converter is faulty.

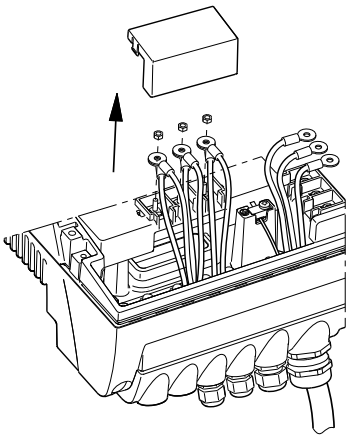
To establish emergency operation proceed as follows:

1. Disconnect the three mains leads, L1, L2, L3, from the terminal box, but leave the protective earth lead(s) in position on the PE terminal(s).



TM03 8607 2007

2. Disconnect the motor supply leads, U/W1, V/U1, W/V1, from the terminal box.



TM03 9120 3407

3. Connect the leads as shown in fig. 37.

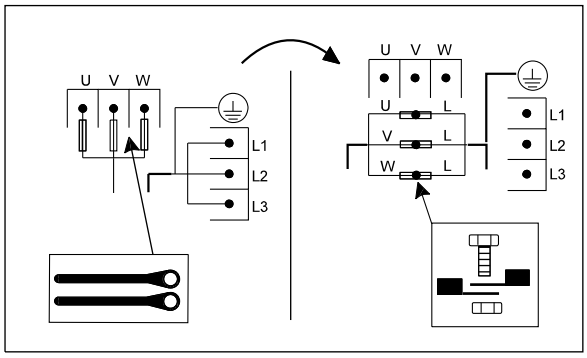


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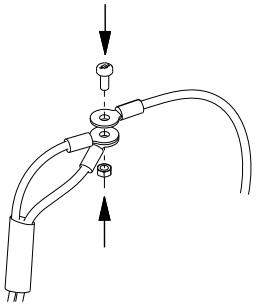
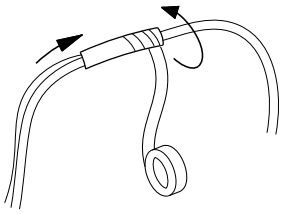
Fig. 37 How to switch an E-pump from normal operation to emergency operation

Use the screws from the mains terminals and the nuts from the motor terminals.

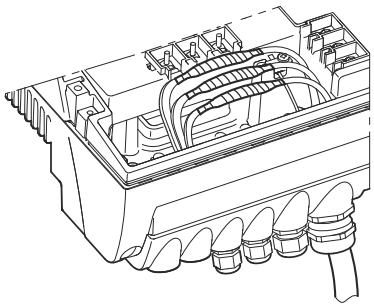


TM03 9121 3407

4. Insulate the three leads from each other by means of insulating tape or the like.



TM03 9122 3407



TM03 9123 3407

Warning

Do not bypass the frequency converter by connecting the mains leads to the U, V and W terminals.

This may cause hazardous situations for personnel as the high voltage potential of the mains may be transferred to touchable components in the terminal box.

Caution ***Check the direction of rotation when starting up after switching to emergency operation.***

19. Maintenance and service

19.1 Cleaning of the motor

Keep the motor cooling fins and fan blades clean to ensure sufficient cooling of the motor and electronics.

19.2 Relubrication of motor bearings

0.37 - 7.5 kW pumps

The motor bearings are of the closed type and greased for life. The bearings cannot be relubricated.

11-22 kW pumps

The motor bearings are of the open type and must be relubricated regularly.
The motor bearings are prelubricated on delivery. The built-in bearing monitoring function will give a warning indication on the R100 when the motor bearings are due to be relubricated.

Note

Before relubrication, remove the bottom plug in the motor flange and the plug in the bearing cover to ensure that old and excess grease can escape.

When relubricating the first time, use the double quantity of grease as the lubricating channel is still empty.

Frame size	Quantity of grease [ml]	
	Drive end (DE)	Non-drive end (NDE)
MGE 160	13	13
MGE 180	15	15

The recommended grease type is a polycarbamide-based lubricating grease.

19.3 Replacement of motor bearings

11-22 kW motors have built-in bearing monitoring function which will give a warning indication on the R100 when the motor bearings are due to be replaced.

19.4 Replacement of varistor (only 11-22 kW)

The varistor protects the pump against mains voltage transients. If voltage transients occur, the varistor will be worn over time and need to be replaced. The more transients, the more quickly the varistor will be worn. When it is time to replace the varistor, R100 and PC Tool E-products will indicate this as a warning.

A Grundfos technician is required for replacement of the varistor. Contact your local Grundfos company for assistance.

19.5 Service parts and service kits

For further information on service parts and service kits, visit www.Grundfos.com, select country, select WebCAPS.

20. Technical data - single-phase pumps

20.1 Supply voltage

1 x 200-240 V - 10 %/+ 10 %, 50/60 Hz - 2 %/+ 2 %, PE.

Cable: Max 1.5 mm^2 / 12 AWG.

Use min. 70 °C copper conductors only.

Recommended fuse size

Motor sizes from 0.37 to 1.1 kW: Max. 10 A.

Standard as well as quick-blow or slow-blow fuse may be used.

20.2 Overload protection

The overload protection of the E-motor has the same characteristic as an ordinary motor protector. As an example, the E-motor can stand an overload of 110 % of I_{nom} for 1 min.

20.3 Leakage current

Earth leakage current < 3.5 mA.

The leakage currents are measured in accordance with EN 61800-5-1.

20.4 Inputs/outputs

Start/stop

External potential-free contact.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.

Digital

External potential-free contact.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.

Setpoint signals

- Potentiometer
  0-10 VDC, 10 kΩ (via internal voltage supply).
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 100 m.
- Voltage signal
  0-10 VDC, R_i > 50 kΩ.
  Tolerance: + 0 %/- 3 % at maximum voltage signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 175 Ω.
  Tolerance: + 0 %/- 3 % at maximum current signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.

Sensor signals

- Voltage signal
  0-10 VDC, R_i > 50 kΩ (via internal voltage supply).
  Tolerance: + 0 %/- 3 % at maximum voltage signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 175 Ω.
  Tolerance: + 0 %/- 3 % at maximum current signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.

Internal power supplies

- 10 V power supply for external potentiometer:
  Max. load: 2.5 mA.
  Short-circuit protected.
- 24 V power supply for sensors:
  Max. load: 40 mA.
  Short-circuit protected.

Signal relay output

Potential-free changeover contact.
Maximum contact load: 250 VAC, 2 A, cos φ 0.3 - 1.
Minimum contact load: 5 VDC, 10 mA.
Screened cable: 0.5 - 2.5 mm^2 / 28-12 AWG.
Maximum cable length: 500 m.

Bus input

Grundfos bus protocol, GENIbus protocol, RS-485.
Screened 3-core cable: 0.2 - 1.5 mm^2 / 28-16 AWG.
Maximum cable length: 500 m.

21. Technical data - three-phase pumps, 0.75 - 7.5 kW

21.1 Supply voltage

3 x 380-480 V - 10 %/+ 10 %, 50/60 Hz - 2 %/+ 2 %, PE.

Cable: Max 10 mm^2 / 8 AWG.

Use min. 70 °C copper conductors only.

Recommended fuse sizes

Motor sizes from 0.75 to 5.5 kW: Max. 16 A.
Motor size 7.5 kW: Max. 32 A.

Standard as well as quick-blow or slow-blow fuses may be used.

21.2 Overload protection

The overload protection of the E-motor has the same characteristic as an ordinary motor protector. As an example, the E-motor can stand an overload of 110 % of I_{nom} for 1 min.

21.3 Leakage current

Motor size [kW]	Leakage current [mA]
0.75 to 3.0 (supply voltage < 460 V)	< 3.5
0.75 to 3.0 (supply voltage > 460 V)	< 5
4.0 to 5.5	< 5
7.5	< 10

The leakage currents are measured in accordance with EN 61800-5-1.

21.4 Inputs/output

Start/stop

External potential-free contact.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.

Digital

External potential-free contact.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.

Setpoint signals

- Potentiometer
  0-10 VDC, 10 kΩ (via internal voltage supply).
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 100 m.
- Voltage signal
  0-10 VDC, R_i > 50 kΩ.
  Tolerance: + 0 %/- 3 % at maximum voltage signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 175 Ω.
  Tolerance: + 0 %/- 3 % at maximum current signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.

Sensor signals

- Voltage signal
  0-10 VDC, R_i > 50 kΩ (via internal voltage supply).
  Tolerance: + 0 %/- 3 % at maximum voltage signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 175 Ω.
  Tolerance: + 0 %/- 3 % at maximum current signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.

Internal power supplies

- 10 V power supply for external potentiometer:
  Max. load: 2.5 mA.
  Short-circuit protected.
- 24 V power supply for sensors:
  Max. load: 40 mA.
  Short-circuit protected.

Signal relay output

Potential-free changeover contact.
Maximum contact load: 250 VAC, 2 A, cos φ 0.3 - 1.
Minimum contact load: 5 VDC, 10 mA.
Screened cable: 0.5 - 2.5 mm^2 / 28-12 AWG.
Maximum cable length: 500 m.

Bus input

Grundfos bus protocol, GENIbus protocol, RS-485.
Screened 3-core cable: 0.2 - 1.5 mm^2 / 28-16 AWG.
Maximum cable length: 500 m.

22. Technical data - three-phase pumps, 11-22 kW

22.1 Supply voltage

3 x 380-480 V - 10 %/+ 10 %, 50/60 Hz - 3 %/+ 3 %, PE.

Cable: Max. 10 mm^2 / 8 AWG.

Use min. 70 °C copper conductors only.

Recommended fuse sizes

Motor size [kW]	Max. [A]
11	32
15	36
18.5	43
22	51

Standard as well as quick-blow or slow-blow fuses may be used.

22.2 Overload protection

The overload protection of the E-motor has the same characteristic as an ordinary motor protector. As an example, the E-motor can stand an overload of 110 % of I_{nom} for 1 min.

22.3 Leakage current

Earth leakage current > 10 mA.

The leakage currents are measured in accordance with EN 61800-5-1.

22.4 Inputs/output

Start/stop

External potential-free contact.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.

Digital

External potential-free contact.
Voltage: 5 VDC.
Current: < 5 mA.
Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.

Setpoint signals

- Potentiometer
  0-10 VDC, 10 kΩ (via internal voltage supply).
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 100 m.
- Voltage signal
  0-10 VDC, R_i > 50 kΩ.
  Tolerance: + 0 %/- 3 % at maximum voltage signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 250 Ω.
  Tolerance: + 0 %/- 3 % at maximum current signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.

Sensor signals

- Voltage signal
  0-10 VDC, R_i > 50 kΩ (via internal voltage supply).
  Tolerance: + 0 %/- 3 % at maximum voltage signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.
- Current signal
  DC 0-20 mA/4-20 mA, R_i = 250 Ω.
  Tolerance: + 0 %/- 3 % at maximum current signal.
  Screened cable: 0.5 - 1.5 mm^2 / 28-16 AWG.
  Maximum cable length: 500 m.

Internal power supplies

- 10 V power supply for external potentiometer:
  Max. load: 2.5 mA.
  Short-circuit protected.
- 24 V power supply for sensors:
  Max. load: 40 mA.
  Short-circuit protected.

Signal relay output

Potential-free changeover contact.
Maximum contact load: 250 VAC, 2 A, cos φ 0.3 - 1.
Minimum contact load: 5 VDC, 10 mA.
Screened cable: 0.5 - 2.5 mm^2 / 28-12 AWG.
Maximum cable length: 500 m.

Bus input

Grundfos bus protocol, GENIbus protocol, RS-485.
Screened 3-core cable: 0.2 - 1.5 mm^2 / 28-16 AWG.
Maximum cable length: 500 m.

22.5 Other technical data

EMC (electromagnetic compatibility to EN 61800-3)

<table>
<tr><th>Motor [kW]</th><th>Emission/immunity</th></tr>
<tr><td>0.37
0.55
0.75
1.1
1.5
2.2
3.0
4.0
5.5
7.5</td><td>Emission:
The motors may be installed in residential areas (first environment), unrestricted distribution, corresponding to CISPR11, group 1, class B.

Immunity:
The motors fulfil the requirements for both the first and second environment.</td></tr>
<tr><td>11
15
18.5
22</td><td>Emission:
The motors are category C3, corresponding to CISPR11, group 2, class A, and may be installed in industrial areas (second environment).
If equipped with an external Grundfos EMC filter, the motors are category C2, corresponding to CISPR11, group 1, class A, and may be installed in residential areas (first environment).

 
Warning
When the motors are installed in residential areas, supplementary measures may be required as the motors may cause radio interference.

Motor sizes 11, 18.5 and 22 kW comply with EN 61000-3-12 provided that the short-circuit power at the interface point between the user's electrical installation and the public power supply network is greater than or equal to the values stated below. It is the responsibility of the installer or user to ensure, by consultation with the power supply network operator, if necessary, that the motor is connected to a power supply with a short-circuit power greater than or equal to these values:

<table>
<tr><th>Motor size [kW]</th><th>Short-circuit power [kVA]</th></tr>
<tr><td>11</td><td>1500</td></tr>
<tr><td>15</td><td>-</td></tr>
<tr><td>18.5</td><td>2700</td></tr>
<tr><td>22</td><td>3000</td></tr>
</table>
Note 15 kW motors do not comply with EN 61000-3-12.

By installing an appropriate harmonic filter between the motor and the power supply, the harmonic current content will be reduced. In this way, the 15 kW motor will comply with EN 61000-3-12.

Immunity:
The motors fulfil the requirements for both the first and second environment.</td></tr>
</table>

Contact Grundfos for further information.

Enclosure class

- Single-phase pumps: IP55 (IEC 34-5).
- Three-phase pumps, 0.75 - 7.5 kW: IP55 (IEC 34-5).
- Three-phase pumps, 11-22 kW: IP55 (IEC 34-5).

Insulation class

F (IEC 85).

Ambient temperature

During operation:

- Min -20 °C
- Max +40 °C without derating.

During storage/transport:

- -30 °C to +60 °C (0.37 - 7.5 kW)
- -25 °C to +70 °C (11-22 kW).

Relative air humidity

Maximum 95 %.

Sound pressure level

Single-phase pumps:

< 70 dB(A).

Three-phase pumps:

Motor [kW]	Speed stated on nameplate [min^{-1}]	Sound pressure level [dB(A)]
0.75	2800-3000	60
	3400-3600	65
1.1	2800-3000	60
	3400-3600	65
1.5	2800-3000	65
	3400-3600	70
2.2	2800-3000	65
	3400-3600	70
3.0	2800-3000	65
	3400-3600	70
4.0	2800-3000	70
	3400-3600	75
5.5	2800-3000	75
	3400-3600	80
7.5	2800-3000	67
	3400-3600	72
11	2800-3000	65
	3400-3600	70
15	2800-3000	65
	3400-3600	70
18.5	2800-3000	66
	3400-3600	71
22	2800-3000	75
	3400-3600	80

23. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

24. Installation in the USA and Canada

Note

In order to maintain the UL/cURus approval, follow these additional installation instructions. The UL approval is according to UL508C.

24.1 Electrical connection

24.1.1 Conductors

Use 140/167 °F (60/75 °C) copper conductors only.

24.1.2 Torques

Power terminals

Motor size [kW]	Thread size	Torque [Nm]
Up to 7.5 kW	M4	2.35
11-22 kW	M4	Min. 2.2 Max. 2.8

Relay, M2.5: 0.5 Nm.
Input control, M2: 0.2 Nm.

24.1.3 Line reactors

Max line reactor size must not exceed 2 mH.

24.1.4 Fuse size/circuit breaker

If a short circuit happens the pump can be used on a mains supply delivering not more than 5000 RMS symmetrical amperes, 600 V maximum.

Fuses

When the pump is protected by fuses they must be rated for 480 V. Maximum sizes are stated in table below.

Motors up to and including 7.5 kW require class K5 UL-listed fuses. Any UL-listed fuse can be used for motors from 11 to 22 kW.

Circuit breaker

When the pump is protected by a circuit breaker this must be rated for a maximum voltage of 480 V. The circuit breaker must be of the "Inverse time" type.
The interrupting rating (RMS symmetrical amperes) must not be less than the values stated in table below.

USA - hp

2-pole	4-pole	Fuse size	Circuit breaker type/model
1	1	25 A	25 A / Inverse time
1.5	1.5	25 A	25 A / Inverse time
2	2	25 A	25 A / Inverse time
3	3	25 A	25 A / Inverse time
5	5	40 A	40 A / Inverse time
7.5	-	40 A	40 A / Inverse time
10	7.5	50 A	50 A / Inverse time
15	15	80 A	80 A / Inverse time
20	20	110 A	110 A / Inverse time
25	25	125 A	125 A / Inverse time
30	-	150 A	150 A / Inverse time

Europe - kW

2-pole	4-pole	Fuse size	Circuit breaker type/model
-	0.55	25 A	25 A / Inverse time
0.75	0.75	25 A	25 A / Inverse time
1.1	1.1	25 A	25 A / Inverse time
1.5	1.5	25 A	25 A / Inverse time
2.2	2.2	25 A	25 A / Inverse time
3	3	25 A	25 A / Inverse time
4	4	40 A	40 A / Inverse time
5.5	-	40 A	40 A / Inverse time
7.5	5.5	50 A	50 A / Inverse time
11	11	80 A	80 A / Inverse time
15	15	110 A	110 A / Inverse time
18.5	18.5	125 A	125 A / Inverse time
22	-	150 A	150 A / Inverse time

24.1.5 Overload protection

Degree of overload protection provided internally by the drive, in percent of full-load current: 102 %.

24.2 General considerations

For installation in humid environment and fluctuating temperatures, it is recommended to keep the pump connected to the power supply continuously. This will prevent moisture and condensation build-up in the terminal box.

Start and stop must be done via the start/stop digital input (terminal 2-3).

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ECM: 1101149

9.6 Bypass Valves

Refer to SAMSON **Type 3374 Electric Actuator**
Mounting and
Operating Instructions
EB 8331-1 EN
Edition July 2012

Refer to SAMSON Electrohydraulic Actuators
Type 3274-11 to -23
Data Sheet T 8340 EN

Type 3374 Electric Actuator with digital positioner Setting using TROVIS-VIEW software

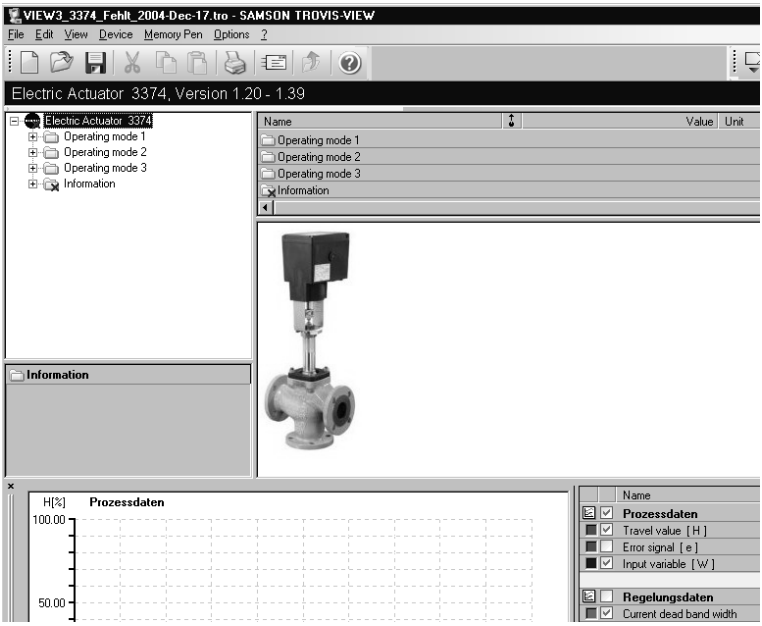


Fig. 1 · TROVIS-VIEW Operator Interface for Type 3374 Electric Actuator

Operating Instructions

EB 8331-2 EN

Firmware version 1.3x

Edition July 2012

TROVIS® Electronics from SAMSON

Contents Page

Modifications of positioner firmware compared to previous version	
Previous **1.1**	New **1.2**
	In operating modes 1 and 2, travel calibration is also possible when the valve is closed even for versions with retracting actuator stem.
1.2	**1.3x**
	On upgrading a positioner or replacing it, an actuator calibration needs to be performed. This is also possible without TROVIS-VIEW software.

1 General

The TROVIS-VIEW software allows various smart SAMSON devices to be configured over a common operator interface. It consists of the operator interface, communication server and the device-specific module. The software has a Windows Explorer® look and feel.

The entire configuration of the digital positioner can be performed over the TROVIS-VIEW Configuration and Operator Interface.

The TROVIS-VIEW software is available in Internet (http://www.samson.de) in Services > Software > TROVIS-VIEW. The software can also be supplied on a CD-ROM on request.

To enable communication with the PC, connect the serial interface to the serial interface (RJ-12 jack) at the actuator using a SAMSON connecting cable.

A hardware package including the connecting cable, memory pen, and modular adapter can be ordered (**order no. 1400-7704**). The memory pen is also available separately (order no. 1400-7697).

The positioner settings configured in TROVIS-VIEW can be directly transferred over the SAMSON connecting cable to the actuator on site. The transferred data are automatically checked to ensure that are complete and correct.
The travel calibration for the control valve is started by the operator interface. Positioner settings can also be uploaded and displayed in the operator interface.

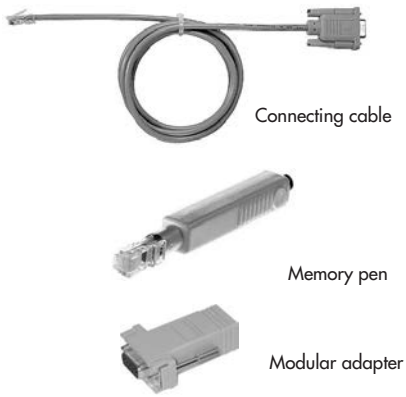


Fig. 2 · Hardware package

2 Settings in TROVIS-VIEW

2.1 Start-up

Note: *Before you set the positioner using the TROVIS-VIEW Operator Interface, you must first mount the actuator onto the valve as described in section 2.2 and establish the electrical connections as described in section 3 of the Mounting and Operating Instructions EB 8331-1 EN.*

Refer to the online help [?] for a detailed description of TROVIS-VIEW.

1. Turn the selector switch (2) to operating mode **0** =  (control switched off).
2. Check if the rated travel indicated on top of the potentiometer gear (12) corresponds with the rated travel of the control valve.

The inscription for the rated travel ("Nennhub") is 15 (for 6 to 20 mm travel) on one side or 30 (for 6 to 35 mm travel) on the other side of the potentiometer gear.

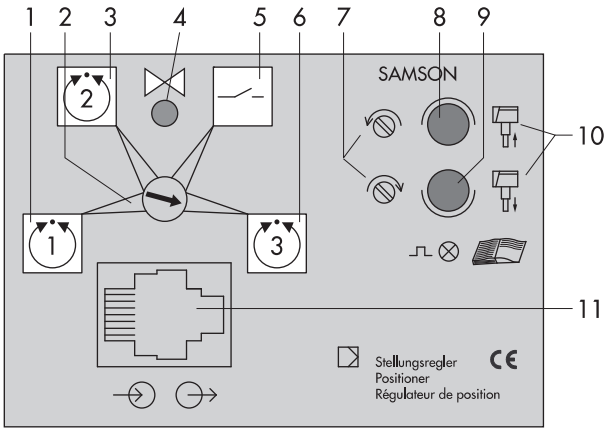
If the rated travel indicated on top of the potentiometer gear and hence the mounting position of the gear does not correspond with the rated travel of the control valve, pull the gear off the shaft and put it back on again with the other side facing upward allowing the mating gear to engage properly.

Make sure that the shaft of the potentiometer (12.1) is not adjusted.

Note!
Actuators with fail-safe action "actuator stem retracts or extends" are only designed for a rated travel of 15 mm. Do not rearrange the gear in this case.

3. Switch on the auxiliary power.
4. Turn the selector switch (2) to operating mode **3**.
5. Establish communication between the PC and actuator using the SAMSON connecting cable.

1 Operating mode 1
2 Selector switch
3 Operating mode 2
4 Travel calibration button
5 Operating mode 0
6 Operating mode 3
7 Potentiometer shaft (12.1) clockwise or counterclockwise
8 Signal lamp
9 Signal lamp
10 Actuator stem extends or retracts
11 Jack (serial interface)
12 Potentiometer gear
12.1 Potentiometer shaft



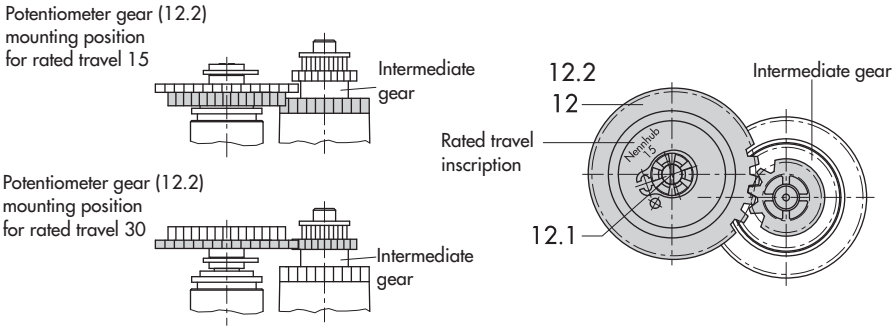


Fig. 3 · Selector switch and mounting position of the potentiometer gear

2.2 Starting TROVIS-VIEW and performing settings

Note!
You can perform the settings in TROVIS-VIEW without the actuator being directly connected, i.e. in offline mode and download the settings later onto the actuator.
When online mode is selected, the PC is connected over the software directly to the actuator.
Online and offline modes can be switched between in the Device *menu or by clicking the icon on the device toolbar.*

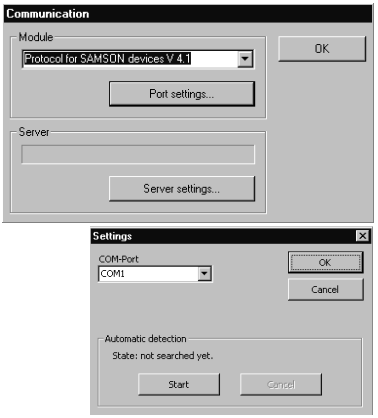
1. Start TROVIS-VIEW.

   To upload the setting data from the actuator onto the operator interface, select *Upload from Device* in *Device* menu or click icon on the device toolbar.

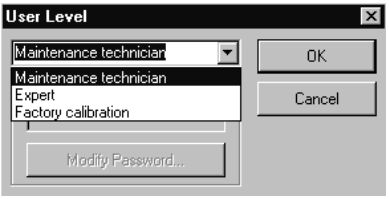
2. Click options in the *View* menu to select or deselect them. When the Trend Viewer is activated, all operating data are uploaded cyclically from the actuator in online mode and displayed in graphs. Right-click the graph to edit the graph or to save it in a file.

3. In *Options* menu, select *Languages* to change the interface language. You can switch the language of the interface at anytime while the software is running.

4. Select *Communications* in *Options* menu to open the communication window.
   Click on *Port settings* button to determine the port.
   You can select the COM port manually or start the automatic detection. This function searches through all COM ports (max. 256) of the computer for the device (Type 3374 Actuator) or for the memory pen with 3374 data.
   The search function is completed when the device or memory pen has been found.

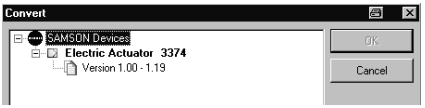


5. Select *User level* in *Device* menu in order to be able to enter or alter data.
   The default setting of *Maintenance technician* only allows you to read setting data. *Expert* and *Factory calibration* requires the user to enter a password (max. 8 characters) which can be altered.
   Default password: samson



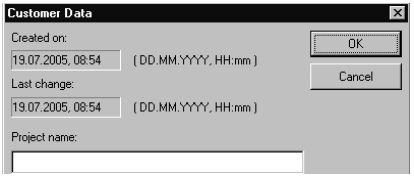
When necessary:

6. Select *Convert* in *File* menu to choose the actuator firmware version.
   It must match the version specified in the display bar.

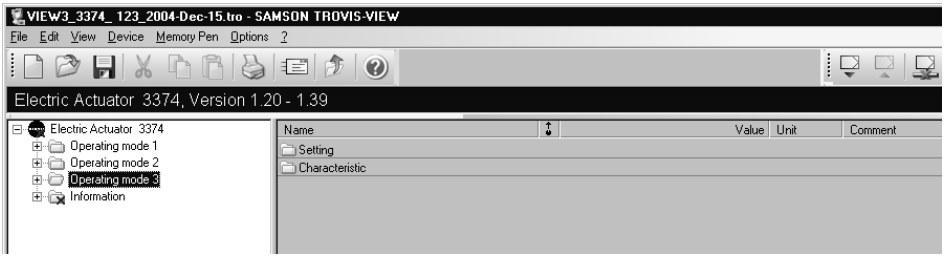


7. Select *Customer data* in *Edit* menu to enter details on the plant, if required.

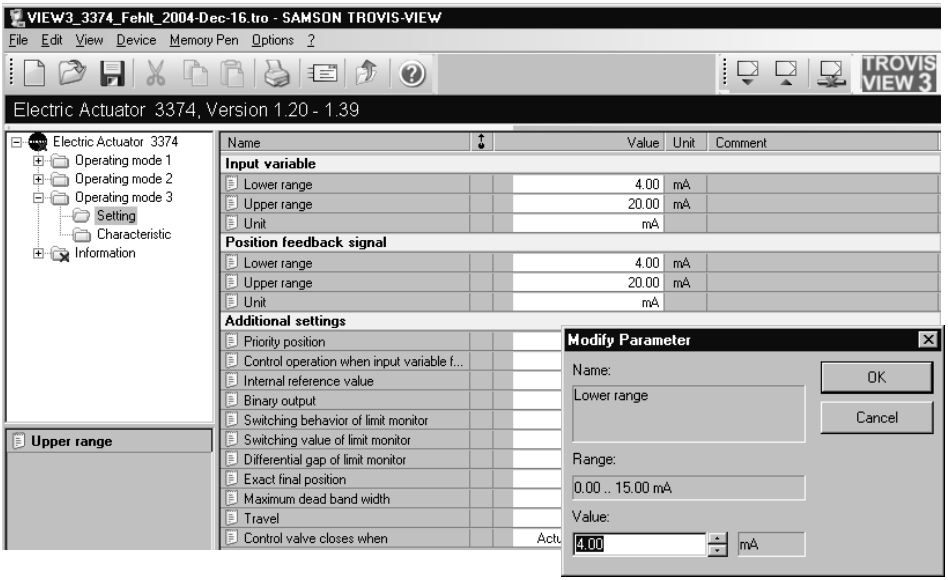
8. Select *Load Factory Defaults* in *Edit* menu to load default settings onto the operator interface. Any configured data will be overwritten by the default data.



9. Double-click the *Operating mode* 3 folder in the folder hierarchy.



10. Right-click the *Setting* subfolder or the *Setting* row.
    The current settings of the digital positioner are displayed.



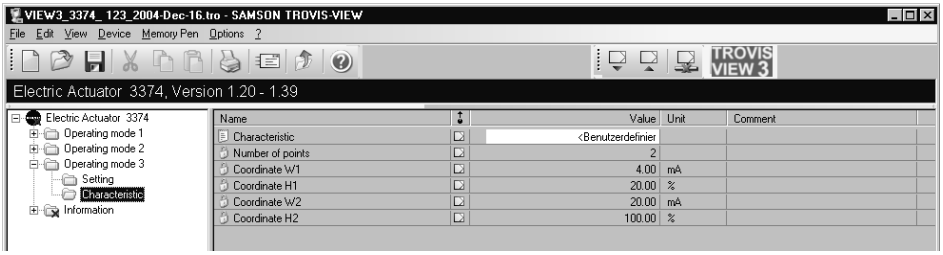
Left-click the corresponding row to select a parameter and double-click it to open the window to modify parameter settings.
Right-click the row to open the window to edit the parameter.

More details on the setting parameters are listed in the following table.

Parameter	Meaning
Input variable	
Lower range	The default values of the lower and upper ranges of the reference variable are 4 and 20 mA. If you, for example, want to connect two or more actuators in parallel to achieve split-range operation, set the lower range of the actuator between 0 and 75 % and the smallest span to 25 %.
Upper range	
Unit	
Position feedback signal	
Lower range	The position feedback signal is used for remote transmission of the current valve position and is usually the same as the input variable. The lower and upper ranges can be set between 0 and 20 mA or 0 to 10 V. The direction of action of the feedback signal can be reversed by setting lower range > upper range.
Upper range	
Unit	
Additional settings	
Priority position (binary input)	The priority position function is activated when the switching voltage exists at the terminals of the binary input. If the priority position function is triggered by an external signal at terminals 81 and 82 during the control operation, the actuator stem moves to the open position (actuator stem retracts) or to the closed position of the valve (actuator stem extends) according to the setting. For a mixing valve, the open and closed positions are reversed accordingly. If no signal exists at the terminals, the normal control operation following the input signal is active.
Control operation when input variable fails	This function allows you to determine whether the last travel value or the internal reference value (described below) is used for control operation when the input variable fails. This control operation is activated when the input variable falls below 0.5 V or 1 mA.
Internal reference value	Default setting 50 %, adjustable between 0 and 100 %.
Binary output	This function is used to determine whether the binary output signal serves as a status monitor, as a monitor for "control switched off" (Fig. 3: Selector switch 2 to Position 0 = ) or as a limit monitor.

Switching behavior of limit monitor	The binary output is activated when the value falls below the adjusted minimum limit or exceeds the maximum limit. The binary output is reset when the value exceeds the minimum limit or falls below the maximum limit plus the adjustable differential gap.
Switching value of limit monitor	Limit monitor function: Setting in % in relation to the travel position of the valve.
Exact final position	When this function is activated, the plug stem moves into its exact final position in the closing phase. As soon as the travel position is reached which is closer to the closing position than the current dead band width, the motor is controlled over a constant signal. The current dead band is continuously measured by the actuator and is always smaller than the maximum dead band width. The actuator in the closing position is switched off by the limit contacts.
Maximum dead band width	Adjustable between 1.1 and 5.0 %. A corresponding change in the input signal always leads to a travel movement.
Travel	(if SAMSON memory pen is used) In case the travel range of the control valve is transferred by the SAMSON memory pen, you can set the travel to any value between 6.0 and 35.0 mm.
Control valve closes when	(if SAMSON memory pen is used) This function is used to determine whether the control valve is to close when the actuator stem "extends" or "retracts".

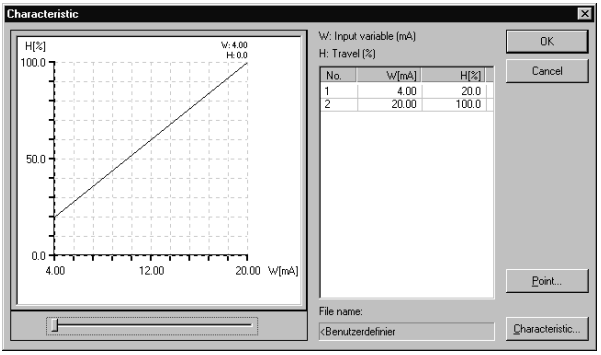
11. Double-click the *Characteristic* subfolder and then double-click the *Characteristic* row in the list to open the *Characteristic* dialog box.



This dialog box displays the set characteristic and its coordinates.

The default characteristic appears as User-defined and is a linear characteristic defined by two co-ordinates.

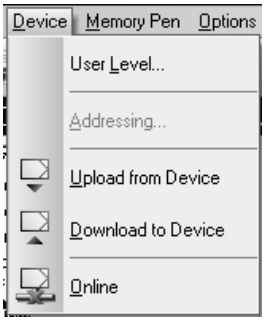
Click *Point* button and select *Add* to enter coordinates (maximum 11) for a freely configurable characteristic.



Click *Characteristic* button and select *Save* to save the new characteristic.

To open default and saved characteristics, select *File* and *Open* on clicking the *Characteristic* button. The files are stored in C:\programme\samson\view3/3374/deu/. The characteristics are saved on installing the TROVIS-VIEW software in the directory "view3...".

12. Select *Download to Device* in *Device* menu or click
    on the device toolbar to download data from the operator interface to the actuator.
    Click *OK* to confirm prompted message.



Note: *You can reset the data that you have modified to the default setting at any time. To reset the data, select* Load Factory Defaults *in the* Edit *menu.*

Select Upload from Device *in the* Device *menu or click* *on the device toolbar to transfer all setting data of the control valve to the operator interface where you can check and modify them, if necessary.*

Select Download to Device *in the* Device *menu or click* *on the device toolbar in order to transfer the modified setting data back to the actuator.*

Note that you can activate and deactivate the Additionally Read Factory Setting *function by clicking on the* Device *menu and selecting* Additionally Read Factory Setting.

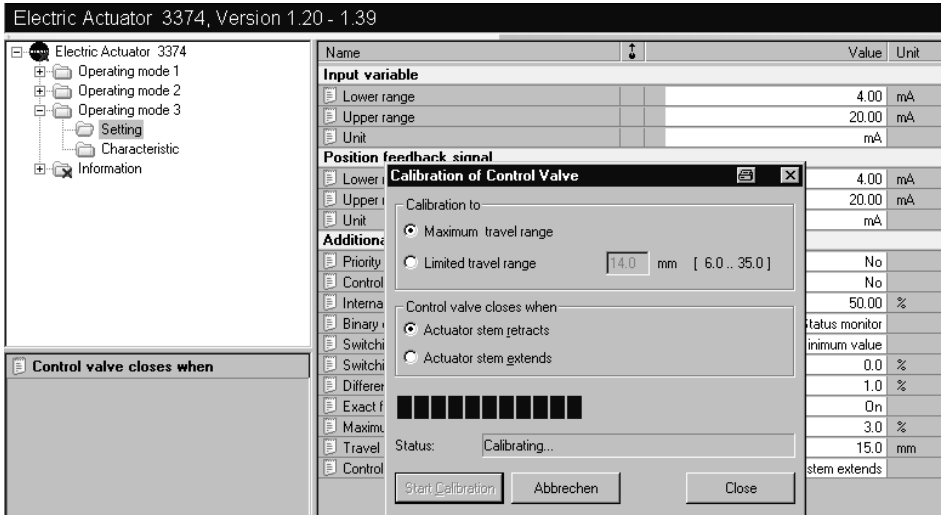
You can print the setting data by selecting Print *in the* File *menu.*

2.3 Travel calibration

After downloading all the setting data to the actuator, you can calibrate the travel.

CAUTION!
The automatic travel calibration lasts approximately twice as long as the actuator's transit time. During this, the valve moves out of its present position. Carry out the travel calibration on the test bench or when the shut-off valves in the plant are closed.

1. Select *Calibration of Control Valve* in *Device* menu to open the *Calibration of Control Valve* dialog box.



2. In this box, check either Calibration to *Maximum travel range* or to *Limited travel range* and determine whether the control valve closes when the actuator stem retracts or extends.
3. In order to initialize the travel calibration, click *Start Calibration* button. The progress bar indicates the calibration progress. Read the messages displayed in the status field!

Note: If the status field reads "Potentiometer setting is incorrect", the corresponding signal lamp of the positioner board starts to blink indicating that the potentiometer gear (12) has been wrongly positioned and must be readjusted manually (see Fig. 2).

However, do not alter the potentiometer gear until the closed position is actually reached. You can recognize when the closed position is reached by looking at the associated limit contact located on the board which is activated by the tag (refer to EB 8331-1 EN, Fig. 5). To proceed, use a screwdriver to gradually turn the potentiometer shaft (12.1) clockwise or counterclockwise in accordance with the symbols (7) until the signal lamp stops blinking and is lit constantly.
Turn the screwdriver counterclockwise if the upper signal lamp (8) blinks and turn it clockwise if the lower signal lamp (9) blinks. The travel calibration will not continue until both signal lamps are lit at the same time.

If the status field reads "Mounting position of potentiometer gear is incorrect" during the travel calibration, check if the correct side of the gear is facing upwards.

If there is no travel movement during the calibration (caused by a loose or missing potentiometer gear, for example), the two signal lamps blink alternately. Then, the travel calibration is canceled after a short period of time and the error message "Controlled variable does not change!" is displayed. Click OK, remedy the error and then restart the travel calibration.

If the status field reads "Calibration finished", the travel has been calibrated successfully. The actuator starts its control operation in response to its reference variable.

4. Close the *Calibration of Control Valve* dialog box and interrupt communication by disconnecting the SAMSON connecting cable.

3 Additional positioner functions

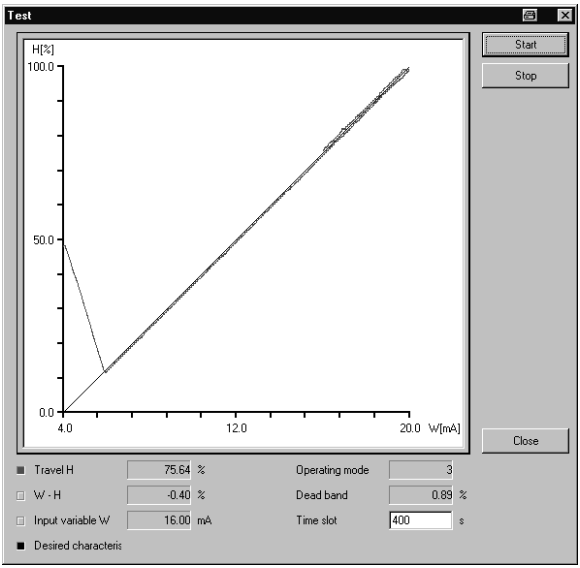
3.1 Testing

To start the test run, select *Test* in *Device* menu and then select *Start*. Note that you can only perform the test run in one of the operating modes **1**, **2** and **3**. In order to select one of the operating modes, turn the selector switch (2) of the positioner to the corresponding operating mode.

The test run starts to generate an input variable which increases from the determined lower range (if the input variable corresponds to the lower range value) to the determined upper range at a constant rate. When it reaches the upper range value, it automatically switches over and continuously decreases until it reaches the lower range again and stops the test run.

This continuously changing input signal is transferred from the operator interface to the positioner of the actuator during the test run and causes the control valve to open or close according to the increasing or decreasing signal. The resulting travel position of the control valve, the difference between the input variable and the travel position as well as the current dead band width are continuously transferred from the positioner to the operator interface during the test run and their continuously changing values can be monitored on the operator interface.

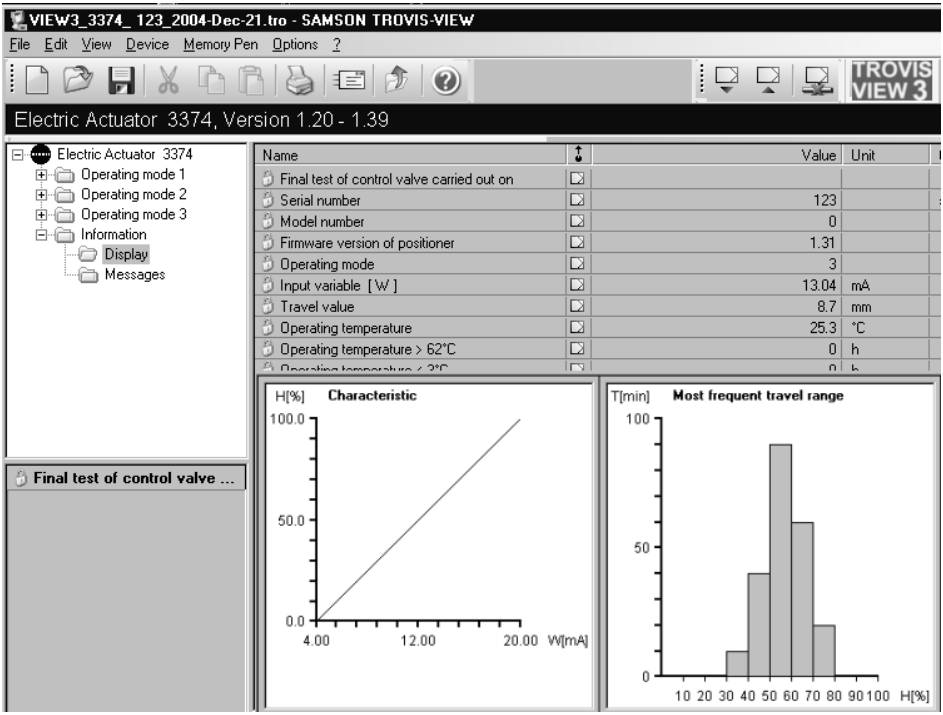
The changing values of the input variable (reference variable w) and travel position (controlled variable x) are displayed in a graph. The input variable and the travel position as well as their difference in percent, the current dead band width and the operating mode are displayed numerically. You can determine the rate of change of the input variable by entering a time parameter in the *Time slot* text box. The time parameter determines the transit time from the lower range to the upper range of the input variable. This parameter should exceed the transit time of the actuator.



3.2 Displaying setting data

In order to display the key setting data of the positioner, double-click the *Information* folder and then the *Display* subfolder in the folder hierarchy.

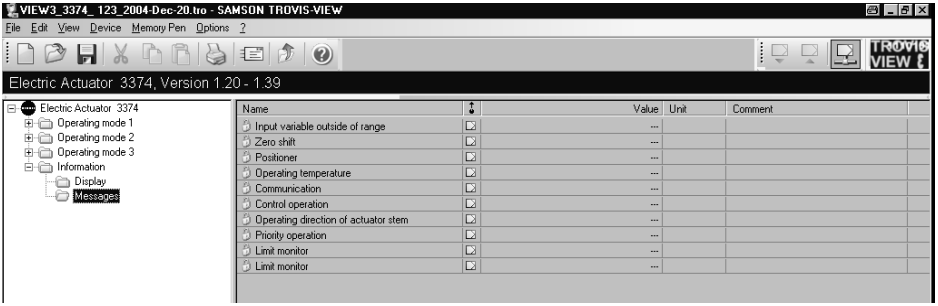
Select *Upload from Device* in *Device* menu or click on the device toolbar to upload the current setting data and other information from the positioner and to display them on screen. The displayed data may differ depending on the operating mode selected.
The relation between the input variable and the travel position and the characteristic are displayed in graphs.



3.3 Reporting defined events

In order to display the events which have occurred during the control operation of the positioner, double-click the *Information* folder and then the *Messages* subfolder in the folder hierarchy.

Select *Upload from Device* in *Device* menu or click on the device toolbar to upload the current setting data on the operator interface.



Possible defined events:

- Input variable outside of range [< 0 %; > 105 %]
- Zero shift [has occurred]
  Initialization if travel > 5 % and travel rate = 0 mm/s and input variable corresponds to the lower range of the reference variable
- Positioner [cannot calibrate]
  if error > 2 dead band widths and travel rate = 0 mm/s; time-delayed message
- Operating temperature [outside of operating range]
  if temperature < 1 °C or > 64 °C
- Communication [inactive]
  if time-monitored data traffic does not take place
- Control operation [with last travel value; with internal reference value]
  when input variable fails

- Operating direction of actuator stem [check]
  displayed when the closed position of the control valve does not match on switching the operating mode 3 to 1 or 2 or vice versa

- Priority operation [active]
  if binary input is active

- Limit monitor [active]
  if set limit value is not reached or is exceeded.

- Transmitter controlled variable

4 Factory calibration

The factory calibration comprises the basic setting of the positioner, the travel calibration of the actuator as well as the entering of the serial number and is carried out at the factory.

If necessary, for example, if you have replaced the electronic components, you can also carry out the factory calibration at the place of installation of the actuator. There are two different approaches to calibration:

- Best method to perform the calibration involves using a PC, the TROVIS-VIEW Operator Interface, a current or a voltage source, a sufficiently precise ammeter or voltmeter and a sufficiently precise, mechanical length measuring instrument. This method allows the operation of the actuator with the best precision.
- Simplest method to perform the calibration is possible on site without additional tools such as a PC installed with the TROVIS-VIEW software or the measuring instruments. This method may be used for actuator settings for HVAC applications.

Note: *The factory calibration requires that the actuator be isolated from the control valve. The rated travel of the actuator (see nameplate) must be the same as the inscription "Nennhub 15" or "Nennhub 30" printed on the gear that faces upwards. If this is not the case, rearrange the gear as described in section 2.1.*
After factory calibration is completed, you have to recalibrate the travel of the control valve!

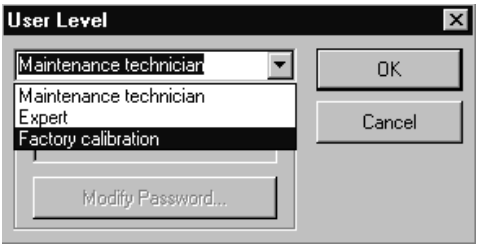
4.1 Calibration using TROVIS-VIEW software

1. Connect the PC to the interface of the positioner using the SAMSON connecting cable. Establish the electrical connection according to the wiring diagram. Switch on voltage supply.

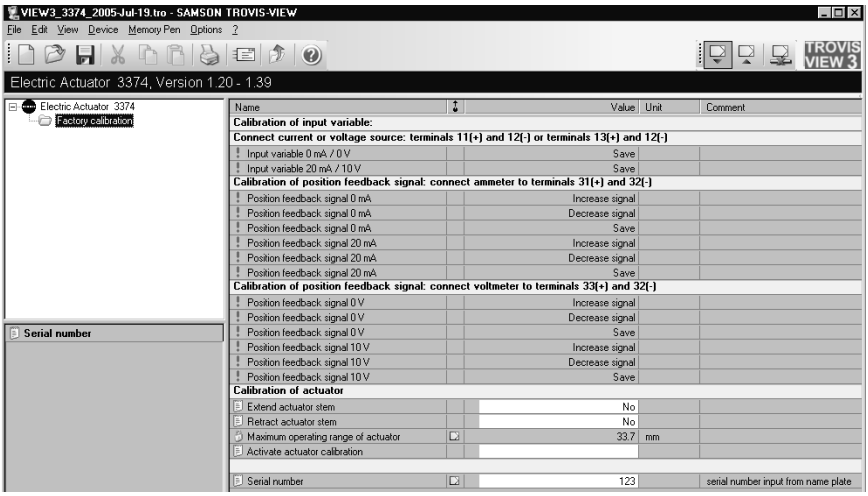
2. Turn the selector switch (2) to operating mode **0** =  .

3. Start TROVIS-VIEW.

4. Select *User level* in *Device* menu.
   Choose *Factory calibration* from the drop-down list.
   Enter the required password "samson" and click *OK*.



5. Select *Upload from Device* in *Device* menu or click  on the device toolbar to upload the current setting data onto the operator interface.



4.1.1 Calibrating the input variable

6. Connect an input signal of 0 V.
   Right-click the *Input variable* row and select Execute to start calibration. After the calibration is completed, the setting is saved and indicated by a controller symbol.
   Connect an input signal of 10 V.
   Right-click the *Input variable* row and select Execute to start calibration. After the calibration is completed, the setting is saved and indicated by a controller symbol.

7. An additional calibration of the mA input signal is not absolutely necessary. If this is not the case, proceed as described previously for the V input signal.

4.1.2 Calibrating the position feedback signal

8. Calibrate position feedback signal to 0 mA.
   Depending on the existing output signal, right-click the *Increase signal* or *Decrease signal* row and select Execute.
   As soon as the correct reading is displayed at the measuring device, click Save and select Execute.
   After the calibration is completed, the setting is saved and indicated by a controller symbol.

   Calibrate position feedback signal to 20 mA.
   Right-click the *Increase signal* row and select *Execute* until the reading at the measuring device is 20 mA.
   Click Save and select Execute. After the calibration is completed, the setting is saved and indicated by a controller symbol.

9. Calibrate the position feedback signal 0 and 10 V in the same way as for the mA signal.
   .

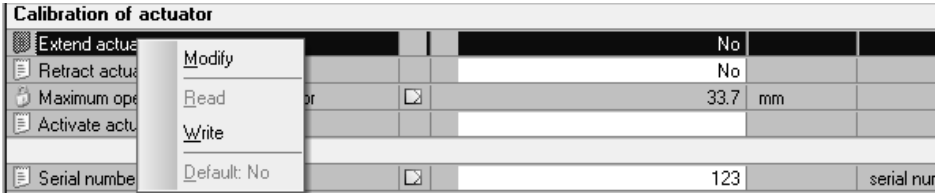
4.1.3 Calibrating the actuator

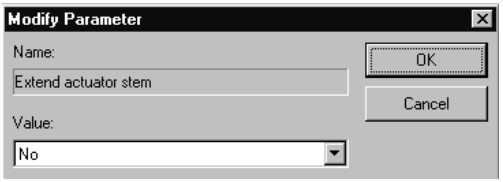
Actuator stem extends

10. Right-click *Extend actuator stem* row and select *Modify* in the pop-up menu.
    Right-click *Extend actuator stem* row again and select *Write* in the pop-up menu.
    The actuator stem extends until the limit contact switches off the actuator.

11. Measure the length of the actuator stem up to where the thread of the housing starts and write it down.

12. Right-click *Extend actuator stem* row and select *Modify* in the pop-up menu.
    Select *No* from the drop-down list for the value in the *Modify Parameter* dialog box and click OK button to confirm.





Actuator stem retracts

13. Right-click *Retract actuator stem* row and select *Modify* in the pop-up menu.
    Select *Yes* from the drop-down list for the value in the *Modify Parameter* dialog box and click OK button to confirm.
    Right-click *Retract actuator stem* row again and select *Write* in the pop-up menu.
    The actuator stem extends until the limit contact switches off the actuator.

14. Measure the length of the actuator stem up to where the thread of the housing starts and write it down. The difference between the final positions that you have measured is the maximum operating range of the actuator.

15. Right-click *Retract actuator stem* row and select *Modify* in the pop-up menu.
Reselect *No* from the drop-down list for the value in the *Modify Parameter* dialog box and click OK button to confirm.

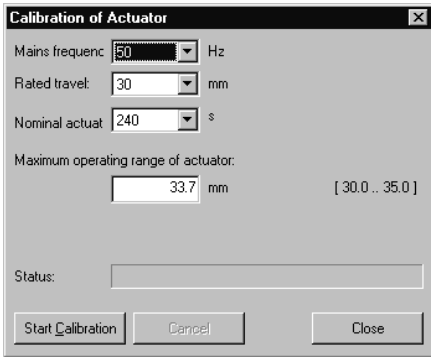
Serial number

16. Right-click *Serial number* row and select *Modify* in the pop-up menu.
Enter the serial number from the nameplate for the value in the *Modify Parameter* dialog box and click OK button to confirm.

Note: *The actuator cannot be calibrated before the serial number has been entered. If you do not have the serial number, enter a value greater than 0.*

Activate the calibration

17. Right-click *Activate actuator calibration* row and select *Modify* in the pop-up menu.
In the pop-up window, enter the values for mains frequency, rated travel and nominal actuating time as written on the nameplate. Enter the maximum operating range of the actuator in mm that you previously measured, however, the value may not be greater than 35 mm.



18. Click *Start Calibration* button to perform the calibration.

Note: If the factory calibration has not been carried out completely, the signal lamp (9) starts to blink. The message that the calibration or the serial number is missing is displayed in the "Calibration has not been carried out completely" section of the *Messages* subfolder in the *Information* folder.

19. To exit the calibration parameter, select *User Level* in *Device* menu and change the user level to *Maintenance technician* or *Expert*.
    Enter the required password (samson) again on selecting *Expert*.

4.2 Simplest calibration method at the press of a button

If tools such as the TROVIS-VIEW software, PC etc. are not available for calibration of the actuator and the actuator operation with maximum precision is not necessary, the simplest calibration method can be performed as follows:

1. Position the selector switch (2) to operating mode **0** =  .
2. Press down the travel calibration button (4) for at least 15 seconds until both signal lamps light up.
3. Release the button to start calibration.
   The actuator stem extends until the torque-dependent switches switch off the actuator.
   The position of the potentiometer is checked.

4. Re-adjust the potentiometer, if necessary, while observing the signal lamps. Refer to the description given on page 14.
   After adjusting the potentiometer, the calibration of the actuator is continued.
   On completion of the calibration, the maximum travel is set to 20 mm or 35 mm, depending on the position of the gear.
   The serial number is set to 999 999.

5. Mount the actuator on the valve.

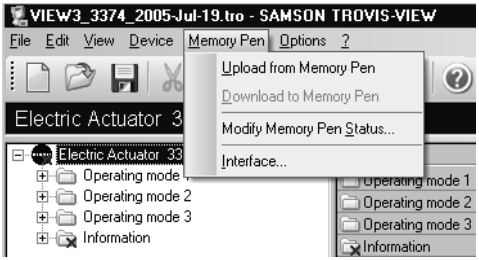
6. Perform the calibration of the control valve.

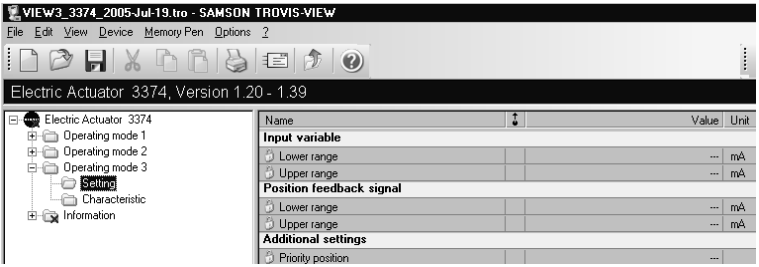
   You can perform this calibration in TROVIS-VIEW as described in section 2.3 on travel calibration.
   If you do not have this software, proceed as described in section 4.3 on Setting the digital positioner in the Mounting and Operating Instructions EB 8331-**1** EN.

5 SAMSON memory pen

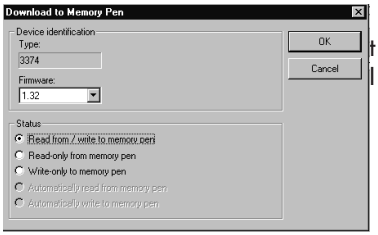
The SAMSON memory pen (1400-7697) is able to load and store data in its non- volatile memory and serves as a data carrier to transfer the setting data of the positioner from the TROVIS-VIEW Operator Interface to the actuator and vice versa.

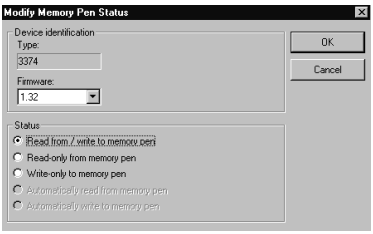
You can select the most relevant functions from the *Memory Pen* menu such as *Upload from Memory Pen*, *Download to Memory Pen*, *Modify Memory Pen Status* and *Interface*.





Note that you need a SAMSON modular adapter (1400-7698) to transfer the setting data from the PC o the memory pen and vice versa.
In order to transfer the setting data from the memory pen to the positioner and vice versa, you do not require any adapter because the connector of the memory pen fits the jack of the positioner board. The SAMSON memory pen makes it easy to exchange data with the positioner. The memory pen enables you, for example, to copy the setting data of one positioner to the positioner of another actuator of the same type. You can also download the setting data from a PC or notebook to the memory pen when you are, for example, in your office or at the place of installation of the control valve. Then, you can download this data to the positioner of the corresponding actuator on site. Furthermore, you can archive the setting





data of the positioner of your actuator in the memory pen. If you have to replace this actuator by a new one, you can download the archived setting data from the memory pen to the new actuator.

Note that the calibration data needed for setting the hardware components of the positioner can only be loaded and transferred using the operator interface and not by means of the SAMSON memory pen. The memory pen can only be used to load and transfer the setting data of the positioner.

If you want to use the memory pen to transfer the setting data to the positioner, for example, first set the selector switch (2, Fig. 2) on the actuator to operating mode **0** =  and then insert the memory pen into the jack of the actuator. The associated signal lamp (9) starts to blink for about 10 seconds to indicate that communication has been established successfully and that the setting data are being checked.

If the transferred data are considered to be incorrect, corrupt or incompatible, the data transfer is canceled and the signal lamp (9) is not lit continuously. In this case, connect the memory pen to the PC via the adapter, open the *Setting* folder of the corresponding Operating mode folder and then select *Upload from Memory Pen* in *Memory Pen* menu of the TROVIS-VIEW Operator Interface to display and check the data stored in the memory pen.

To activate the control operation with the new setting data, reset the selector switch (2) on the positioner to operating mode 3.

The setting data can only be transferred for operating mode **3**.
Transferring setting data to the positioner in operating modes **1** or **2** is not possible (exception: unit selection mA/V for input variable and position feedback signal).

Reading the setting data of the positioner is possible for both the memory pen and for the operator interface from every operating mode. All the setting data of the operating modes are usually read.

Note: *Select* Additional settings *in the* Setting *folder to set the travel and closed position of the control valve when using the memory pen.*

5.1 Downloading data to the positioner

Note: *Before you download data from the SAMSON memory pen to the positioner, you must first mount the actuator onto the control valve as described in section 2.2 and establish the electrical connections as described in section 3 of the Mounting and Operating Instructions EB 8331-1 EN.*

1. Turn selector switch (2) to operating mode **0** = 
   (control switched off, see Fig. 3 on page 5)
2. Check if the rated travel indicated on top of the potentiometer gear (12.2) corresponds with the rated travel of the control valve.

The inscription for rated travel ("Nennhub") is 15 (for 6 to 20 mm travel) on one side or 30 (for 6 to 35 mm travel) on the other side of the potentiometer gear.

If the rated travel indicated on top of the potentiometer gear and hence the mounting position of the gear (see Fig. 2) does not correspond with the rated travel of the control valve, pull the gear off the shaft and put it back on again with the other side facing upward, allowing the mating gear to engage properly.

Make sure that the shaft of the potentiometer (12) is not altered.

Note: *Actuators with fail-safe action "actuator stem retracts or extends" are only designed for rated travel 15 mm. Do not rearrange the gear in this case.*

3. Switch on auxiliary power.
4. Plug the SAMSON memory pen into the jack (11) of the positioner board and wait until the signal lamp (9) stops blinking and remains illuminated.
5. If you want to use the travel value and the closed position of the control valve indicated in Additional settings of the *Setting* subfolder, initialize the travel calibration by activating the travel calibration button (4).
   If, however, this is not the case, disconnect the memory pen from the jack, set the selector switch (2) to operating mode **3** and perform the travel calibration according to section 4.3 of the Mounting and Operating Instructions EB 8331-1 EN.

CAUTION!
The automatic travel calibration lasts approximately twice as long as the actuator's transit time. During this, the valve moves out of its present position. Perform the travel calibration on the test bench or when the shut-off valves in the plant are closed.

After activating the travel calibration button (4), both signal lamps (8 and 9) remain illuminated at the same time to indicate the beginning of the travel calibration. The actuator stem extends as far as the closed position of the valve.
The mounting position of the potentiometer gear (12.2) is determined automatically and signalized by the illumination of the signal lamp (8) for 6 to 35 mm travel and the signal lamp (9) for 6 to 20 mm travel.
The actuator stem retracts as far as the open position (maximum travel). When the maximum travel position is reached, the travel calibration has been completed. The actuator starts its control operation and the actuator stem moves to the valve position determined by the reference variable.

CAUTION!
If one signal lamp starts to blink slowly after the travel calibration button has been activated and the actuator stem has extended as far as the closed position, the potentiometer (12) has been wrongly positioned and must be readjusted manually.
However, do not alter the potentiometer until the closed position is actually reached. The closed position is indicated by the associated limit contact located on the board and activated by the tag. To proceed, use a screwdriver to turn the shaft of the potentiometer gradually clockwise or counterclockwise until the signal lamp stops blinking and remains illuminated. Turn the screwdriver counterclockwise in accordance with the symbols (7) if the upper signal lamp (8) blinks and turn it clockwise if the lower signal lamp (9) blinks.
The travel calibration does not continue until both signal lamps are lit at the same time.

Note: *If both signal lamps start to blink at the same time during the travel calibration, disconnect the memory pen from the jack and cancel the calibration by pressing the travel calibration button.*
Recheck the mounting position of the potentiometer gear (12.2) and/or the travel value indicated in Additional settings of the Setting folder.
If there is no travel movement during the calibration (due to a loose or missing potentiometer gear, for example), both signal lamps blink in alternating sequence. In this case, cancel the travel calibration by pressing the travel calibration button (4), remedy the error and restart the calibration by pressing the travel calibration button (4) again.

6. Disconnect the memory pen from the jack.
7. Set the selector switch (2) to operating mode **3**.

Note: *The travel calibration only needs to be performed once to start up the valve.*

5.2 Uploading data to the memory pen

1. Plug the SAMSON memory pen into the jack of the positioner board and wait until the signal lamp (9) stops blinking and is then lit continuously.

2. Disconnect the SAMSON memory pen from the jack (11).

The setting data of the positioner is stored in the memory pen and can be transferred to other actuators or can be downloaded to the PC.

Note: *You can only transfer the setting data from the positioner to the SAMSON memory pen if you have selected one of the operating modes **1, 2** or **3**!*

Principle of operation (Fig. 3)

The pressure-tight actuator housing (1) also serves as oil reservoir and incorporates the cylinder housing (2), cylinder (5.1) and piston, motor (6.1), pump (6.2) and solenoid pilot valves (6.4). The required electric lines are oil-tight and pressure-tight and lead from the terminal box (3) to the actuator housing.

The oil pump (6.2) driven by the motor (6.1) feeds compressed oil to the corresponding cylinder chamber over the check valve (6.3) and pilot valve (6.4). The solenoid valves are closed in the de-energized state. They open when the controller issues a signal.

Depending on the version, the actuators are equipped without compression springs or with one or two compression springs (5.10, 5.11). These springs are used to return the actuator to its fail-safe position.

The motor is controlled by a relay in its electronics section. The relay is directly connected to the power supply. Therefore, the contacts of the controller are subjected to a load of maximum two solenoid valves, while the electronics section of the motor is only subjected to a low load.

When reaching an end position or when the nominal actuating force is exceeded due to external forces, the force-dependent switches (4.3) or (4.4) deactivate the motor.

CAUTION: Do not open housing cover (1.1)! The hydraulic equipment does not need any maintenance and an oil change is not necessary.

Versions with fail-safe action have a spring return mechanism and an additional safety solenoid valve which opens when the power supply is interrupted, reducing the pressure on the cylinder chamber. In this case, electric override is not possible.

Override

The actuators are fitted with optionally an electric or mechanical override.

Versions with fail-safe action are supplied only with electric override.

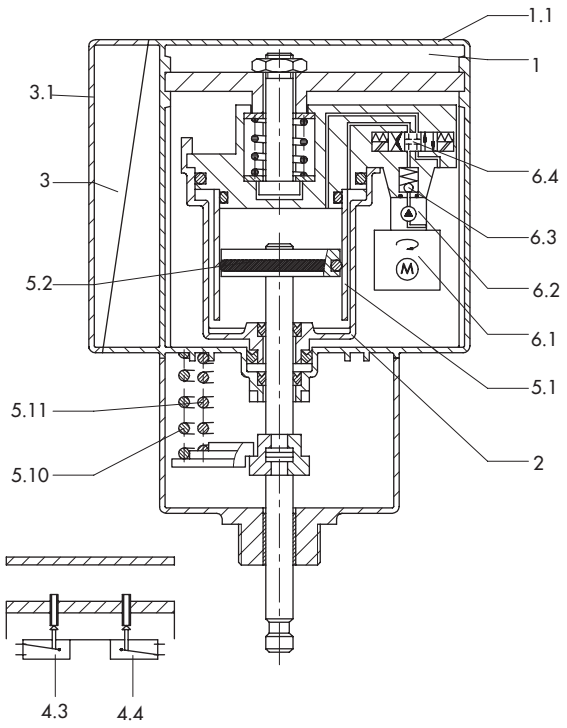
Electric override · There are two pushbuttons on the terminal box (3). Any travel position can be reached independent of the control signal.

After the pushbutton is released, the actuator reacts again according to the controller signal. The control signal can be interrupted by opening the isolator terminal (81 in Figs. 4 to 6).

Mechanical override · The release button on the top of the actuator housing must be activated. An Allen key (SW 24) can be used for adjustment. As soon as the button is released, the actuator reacts again according to the controller signal.

Additional electrical equipment

All the electrical equipment can be accessed in the terminal box (3). Table 2 shows the maximum amount of equipment.



1	Actuator housing and oil reservoir	5.1	Cylinder
1.1	Housing cover	5.2	Piston
2	Cylinder housing	5.10	Compression spring
3	Terminal box	5.11	Compression spring
3.1	Cover	6.1	Motor
4.3	Limit switch (extending)	6.2	Oil pump
4.4	Limit switch (retracting)	6.3	Check valve
		6.4	Pilot valve

Fig. 3: *Functional diagram of Type 3274 Actuator*

Positioner · The positioner compares the controller signal to the signal issued by a resistance transmitter. This signal is proportional to the travel. The output variable produced by the positioner is a three-point stepping control signal.

Zero and span for normal and split-range operation are adjustable within a broad range.

The operating direction (increasing/increasing or increasing/decreasing) can be selected. An external NO contact can be used to reach the end position "retracted" or "extended". This does not affect the fail-safe function. The positioner has an additional output for valve position feedback.

Position transmitter · Output signal 0/2 to 10 V or 0/4 to 20 mA with 0 to 1000 Ω resistance transmitter for versions with three-point stepping signal.

Resistance transmitter · Actuators can be equipped with one or two resistance transmitters. Versions with a positioner require a resistance transmitter for valve position feedback to the positioner.

Electric limit contacts · Actuators can be equipped with maximum three overridable electric or inductive limit contacts on request. The limit contacts are activated over continuously adjustable cam disks.

Heating resistor · Heating the hydraulic oil extends the lower temperature range.

The heating resistor is not protected by the internal fuse. We recommend using an external fuse to match the power consumption data indicated on the nameplate.

Refer to the instructions for mounting positions in the Mounting and Operating Instructions EB 8340 EN.

Table 1: *Technical data*

Actuator	**Type 3274-**	**-11**	**-12**	**-13**	**-14**	**-15**	**-16**	**-17**	**-18**	**-21**	**-22**	**-23**
Version with override		Electric				Mechanical				Electric		
Fail-safe action		Without								With		
	Operating direction									Extends	Retracts	Extends
Rated travel		15 or 30 mm travel										
Transit time for rated travel, approx.		60 s for 15 mm; 120 s for 30 mm 60 s for 30 mm (not for actuators with 24 V power supply)										
Stroking speed for fail-safe action [mm/s]	Standard	–								1	1	1.3
	Optional									3.3	3.3	5
Actuating force (N) with travel	15 mm stem, Retracts	2100	500	4300	500	2100	500	4300	500	2100	1800	500
	15 mm stem, Extends	2000	3400	4300	7700	2000	3400	4300	7700	2000	2300	3400
	30 mm stem, Retracts	2100	500	4300	500	2100	500	4300	500	2100	1800	500
	30 mm stem, Extends	1800	3000	4300	7300	1800	3000	4300	7300	1800	2100	3000
Power supply		230 V, 110 V, 24 V; 50 or 60 Hz (both ±10 %)										
Power consumption with power supply		24 V, 110 V, 230 V/50 Hz 90 VA 24 V, 110 V, 230 V/60 Hz 110 VA 110 V, 230 V/50 Hz with faster motor 150 VA 110 V, 230 V/60 Hz with faster motor 185 VA Positioner 3 VA										
Permissible ambient temperature		–10 to +60 °C Extended range (with heating resistor): –35 to +60 °C										
Permissible storage temperature		–25 to +70 °C										
Degree of protection		IP 65 according to EN 60529										
Duty type		Intermittent periodic duty with starting (S4) according to EN 60034-1 with 50 % on-time										
Installation		Central attachment M30x1.5 · Special version for Type 3214 Valve, DN 150 to 250										
Weight	kg (approx.)	12				15				12		
Additional electrical equipment												
Electric positioner	Power supply	230 V, 110 V, 24 V; 50 or 60 Hz (both ±10 %)										
	Control signal	0 to 20 mA, 4 to 20 mA (R_i = 50 Ω) · 0 to 10 V, 2 to 10 V (R_i = 10 kΩ)										
	Zero shift	0 to 100 %										
	Change of range	30 to 100 %										
	Output (feedback)	0/4 to 20 mA, R ≤ 200 Ω · 0/2 to 10 V, R ≥ 2 kΩ										
Resistance transmitters (other ranges on request)		0 to 1000 Ω, 0 to 200 Ω, 0 to 100 Ω, 0 to 275 Ω, 0 to 138 Ω (when the rated travel is at 80 % of its final value); permissible load 0.5 W										
Electric limit contacts		Maximum three separately adjustable limit contacts (see Table 2)										
	Permissible load	250 V~, 5 A										
Inductive limit contacts		SJ2-N proximity switch										
	Control circuit	Values according to downstream transistor relay (not included in delivery)										
Heating resistor, approx. 45 W		With thermostat, activated at approx. –10 °C, deactivated at approx. 0 °C										

Table 2: *Additional electrical equipment*

Accessories	Max. equipment combination (arranged by columns)							
Positioner	•	•	–	–	–	–	–	–
Position transmitter	–	–	•	•	–	–	–	–
Resistance transmitter 1	1000 Ω [1]	1000 Ω [1]	1000 Ω [1]	1000 Ω [1]	•	•	–	–
Resistance transmitter 2	•	•	•	•	•	•	–	–
Electric limit contact 1	–	–	–	–	–	–	•	•
Electric limit contact 2	•	–	•	–	•	–	•	–
Electric limit contact 3	•	–	•	–	•	–	•	–
Inductive limit contact 1	–	•	–	•	–	•	–	•
Inductive limit contact 2	–	•	–	•	–	•	–	•

[1] Required for position feedback for positioner/position transmitter

Table 3: *Materials*

Housing and housing cover	Die-cast aluminum, plastic-coated
Cylinder	Hydraulic cylinder tube
Piston	Steel/NBR combination
Piston rod	C45, hard chrome-plated
Actuator stem	1.4104
Hydraulic oil	Special HLP, silicone-free

Electrical connection (see Fig. 4 to Fig. 6)

Figs. 4 and 6 schematically illustrate the different means of connection, depending on how the version is equipped. The electric limit contacts are provided with screwed connections. They are connected directly, not over the terminal block.

Especially for 24 V actuators, lines with a sufficiently large cross-section must be laid in order to guarantee that the permissible voltage tolerances of ±10 % are kept.

The heating resistor is connected without additional terminals to L and N in the circuit.

Connections

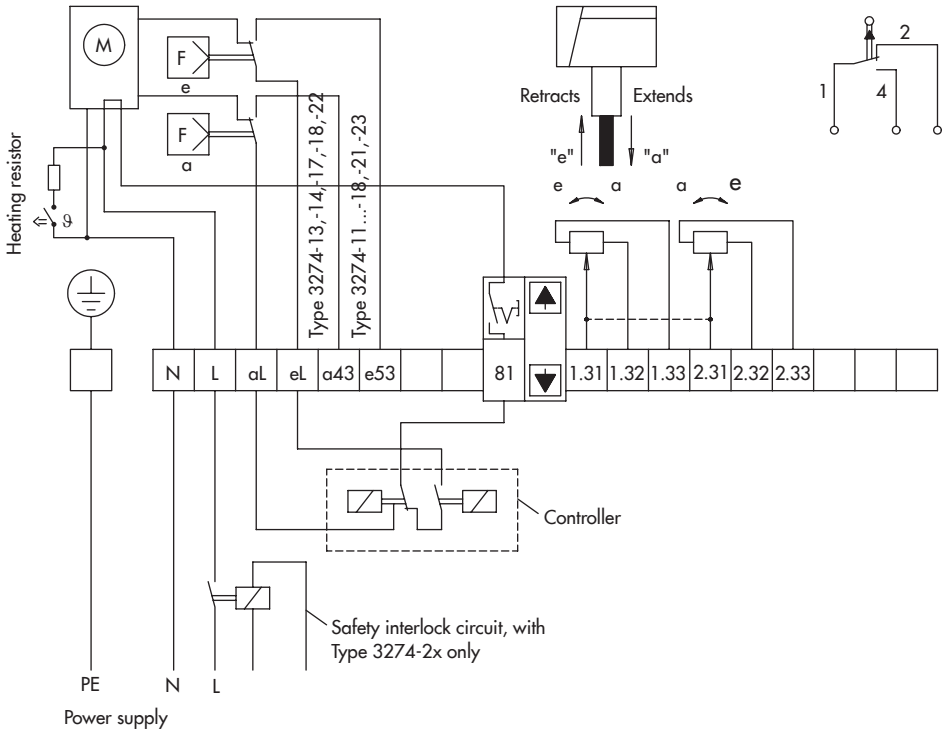


Fig. 4: *Circuit diagram for actuators with three-point stepping signal*

Connections

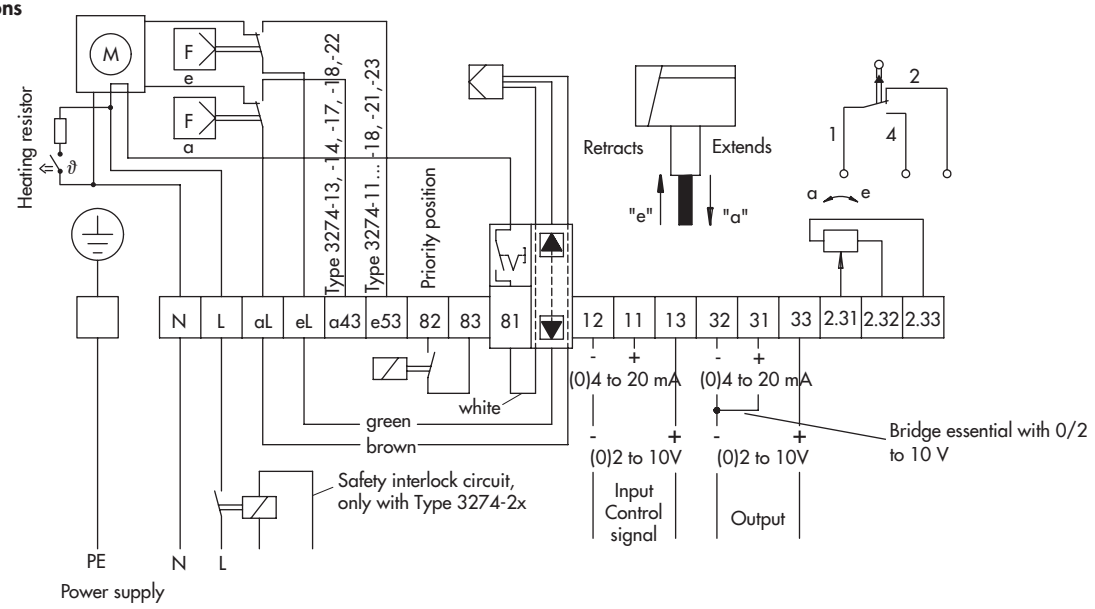


Fig. 5: *Circuit diagram for actuators with positioners*

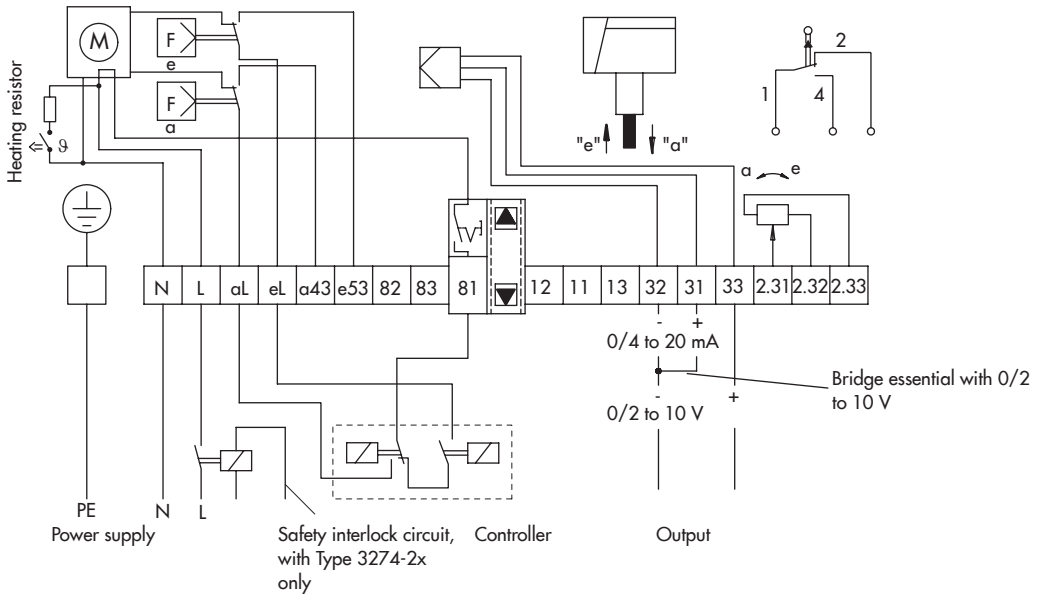
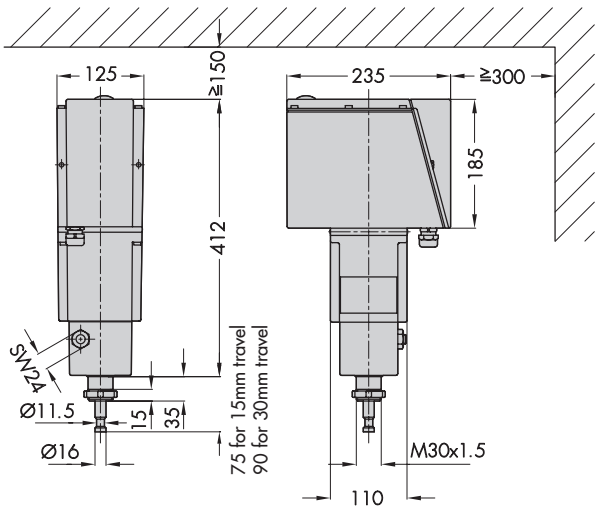
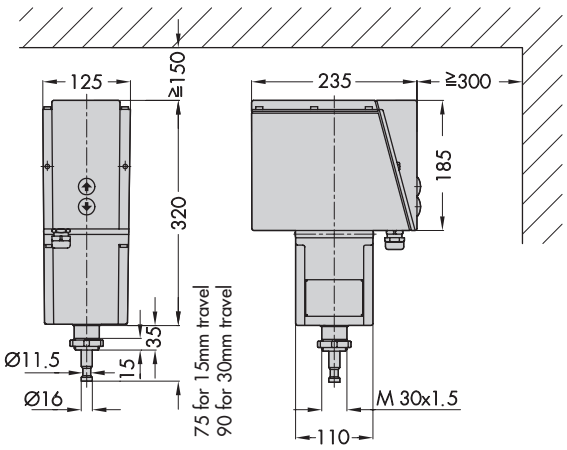


Fig. 6: *Circuit diagram for actuators with position transmitter*

Dimensions in mm



Type 3274-... Actuator with mechanical override



Type 3274-... Actuator with electric override

Ordering text

Type 3274-... Electrohydraulic Actuator

Rated travel	15/30 mm

Fail-safe action (only available with electric override)

Operating direction	Stem extends or retracts
Power supply	230/110/24 V; 50/60 Hz

Version for Type 3214 Valves, DN 150 to 250, if needed.

Additional electrical equipment (see Table 2)

Positioner

Input signal	0/2 to 10 V or 0/4 to 20 mA
Position transmitter	0/2 to 10 V or 0/4 to 20 mA
Resistance transmitter	0 to 1000 Ω
	0 to ... Ω
Limit contacts	Electric/inductive

Heating resistor for wider temperature range

9.7 Flow and Pressure Sensors

Refer to Yokogawa User's Manual
AXFA14G/C
Magnetic Flowmeter Remote Converter
[Hardware Edition/Software Edition]
AXF
Magnetic Flowmeter
Integral Flowmeter
[Software Edition] IM 01E20C02-01E

Refer to Yokogawa User's Manual
Model DY
Vortex Flowmeter
(Integral Type, Remote Type)
Model DYA
Vortex Flow Converter
(Remote Type) IM 1F6A0-01E

Refer to Yokogawa User's Manual
EJX510A and EJX530A
Absolute and Gauge
Pressure Transmitter
GS 01C25F01-01EN

User's Manual

AXFA14G/C
Magnetic Flowmeter Remote Converter
[Hardware Edition/Software Edition]

ADMAG AXF™

AXF
Magnetic Flowmeter
Integral Flowmeter
[Software Edition]

IM 01E20C02-01E

vigilantplant®

Contents

10th Edition: June 2012

1. INTRODUCTION

This instrument has been adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

NOTE

This manual describes the hardware and software configurations of the AXFA14 converter and the software configuration of the AXF integral flowmeter.

The contents of "basic operating procedures", "parameter description", "operation via BRAIN terminal (BT200)", "operation via HART communicator", and "actual operation" for the AXF integral flowmeter are the same as the AXFA14, see Chapter 5 to 9 in this manual.
For the hardware configuration of the AXF integral flowmeter, see the user's manual of the AXF Integral Flowmeter/Remote Flowtube [Hardware Edition] (IM 01E20D01-01E).
For FOUNDATION Fieldbus protocol (Output Signal and Communication suffix code; -F), please refer to IM 01E20F02-01E.
For PROFIBUS PA protocol (Output Signal and Communication suffix code; -G), please refer to IM01E20F12-01E.

■ Regarding This User's Manual

- This manual should be provided to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights are reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors or omissions are found, please inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- Please note that this user's manual may not be revised for any specification changes, construction changes or operating part changes that are not considered to affect function or performance.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

NOTE

Please refer to manual IM 01E20D01-01E for information of the AXF Remote Flowtube.

■ Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.
- The following safety symbol marks are used in this user's manual and instrument.

WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

⏚ Protective grounding terminal

⏚ Functional grounding terminal
(This terminal should not be used as a protective grounding terminal.)

~ Alternating current

⎓ Direct current

1.1 Using the Magnetic Flowmeter Safely

WARNING

(1) Installation
- Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The magnetic flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the magnetic flowmeter. When moving the magnetic flowmeter, always use a trolley and have at least two people carry it.
- When the magnetic flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the piping line for maintenance and so forth.
- Do not apply excessive weight, for example, a person stepping on the magnetic flowmeter.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring
- The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The protective grounding must be connected securely at the terminal with the ⏚ mark to avoid danger to personnel.

(3) Operation
- When opening the cover, wait for more than 10 minutes after turning off the power. Only expert engineer or skilled personnel are permitted to open the cover.
- Be sure to set parameters as "Protect" on the write protect function after finish of parameter setting work.
  Under extremely rare case, the infra-red switches may respond unexpectedly in such conditions as sticking ball of water or extraneous substances on the surface of display panel glass according to the principle of infra-red switch operation.
  Its probability rises in such cases as sticking rain water by storm or other similar situation and washing up work near flowmeter installation place.
  Either to illuminate or stop illuminating the infra-red switches by the flashlight may cause the mis-reaction.
  Refer to Chapter 6 "Menu P: Parameter Protection Items" and section "10.2.2" how to use the write protect function in detail.

(4) Maintenance
- Maintenance of the magnetic flowmeter should be performed by the trained personnel having knowledge of safety standard. No operator shall be permitted to perform any operations relating to maintenance.
- When opening the cover, wait for more than 10 minutes after turning off the power.
- Always conform to maintenance procedures outlined in this manual. If necessary, contact Yokogawa.

- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or data plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.

(5) Explosion Protected Type Instrument

- Magnetic flowmeters with the model name AXFA14C are products which have been certified as explosion proof type instruments. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these instruments. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations.
  Be sure to read Chapter 12 "EXPLOSION PROTECTED TYPE INSTRUMENT" before handling the instruments. The description in Chapter 12 is prior to the other description in this user's manual.
  For TIIS flameproof type instruments, be sure to read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual.
- Only trained persons use this instrument in the industrial location.
- The protective grounding ⏚ must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

1.2 Warranty

- The terms of this instrument that are guaranteed are described in the quotation. We will make any repairs that may become necessary during the guaranteed term free of charge.
- Please contact our sales office if this instrument requires repair.
- If the instrument is faulty, contact us with concrete details about the problem and the length of time it has been faulty, and state the model and serial number. We would appreciate the inclusion of drawings or additional information.
- The results of our examination will determine whether the meter will be repaired free of charge or on an at-cost basis.

■ The guarantee will not apply in the following cases:

- Damage due to negligence or insufficient maintenance on the part of the customer.
- Problems or damage resulting from handling, operation or storage that violates the intended use and specifications.
- Problems that result from using or performing maintenance on the instrument in a location that does not comply with the installation location specified by Yokogawa.
- Problems or damage resulting from repairs or modifications not performed by Yokogawa or someone authorized by Yokogawa.
- Problems or damage resulting from inappropriate reinstallation after delivery.
- Problems or damage resulting from disasters such as fires, earthquakes, storms, floods, or lightning strikes and external causes.

■ Trademarks:

ADMAG, AXF and ADMAG AXF are registered trademarks of Yokogawa Electric Corporation. Company names and product names used in this material are registered trademarks or trademarks of their respective owners.

1.3 Combination Remote Flowtubes

IMPORTANT

- The AXFA14 Magnetic Flowmeter Converter should be used in combination with the following remote flowtubes:
  AXFA14□⇔AXF002□-P to AXF400□-P
  Other flowtubes (size 500 to 2600 mm) cannot be combined with the AXFA14 converter.
- If the converter combined with the AXF magnetic flowmeter remote flowtube is changed from the AXFA11 to AXFA14 or vice versa, the meter factor of the remote flowtube must be readjusted according to its flow calibration.

CAUTION

In case of combination with the explosion proof type remote flowtube (AXF□□□C-P) for ATEX, FM, CSA, IECEx, and TIIS certification, please see the manual IM 01E20D01-01E. The construction of the instrument, installation, external wiring, maintenance, and repair are strictly restricted, and non-observance or negligence of these restriction would result dangerous condition.

1.4 ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

SK

Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

CZ

Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.

LT

Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokieèiø ir prancûzø kalbomis. Norëdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës "Yokogawa" biuru arba atstovu.

LV

Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu, vâcu un franèu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

EST

Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima Iokagava (Yokogawa) kontori või esindaja poole.

PL

Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja. obsługi w Państwa lokalnym języku, prosimy o kontakt z najbliższym biurem Yokogawy.

SLO

Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v angliščini, nemščini ter francoščini. Èe so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

H

Az ATEX Ex mûszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

BG

Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

RO

Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

M

Il-manwali kollha ta' l-istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bl-Ingliż, bil-Ġermaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta' Yokogawa.

2. HANDLING PRECAUTIONS

This instrument has been inspected carefully at the factory before shipment. When the instrument is delivered, visually check that no damage has occurred during transportation.

Read this section carefully as it contains important information on handling this instrument. Refer to the relevant sections for information not contained in this section. If you have any problems or questions, please contact Yokogawa sales office.

2.1 Checking Model and Specifications

The model code and specifications are found on the data plate located on the outside of the case. Check that the model code and specifications match what you have ordered.

Be sure you have your model number and serial number available when contacting Yokogawa.

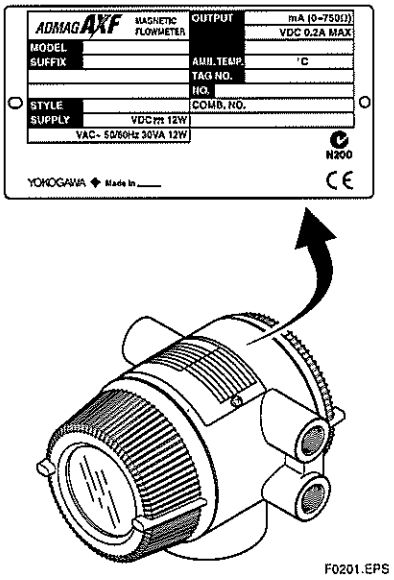


Figure 2.1.1 Data Plate

2.2 Accessories

Check that the parts shown below are included in the package:

- Mounting hardware: 1 set
- Hexagonal wrench: 1 piece (nominal size 3 mm)

2.3 Storage Precautions

If the instrument is to be stored for a long period of time after delivery, observe the following points.

- The instrument should be stored in its original packing condition in the storage location.
- Select a storage location that fulfils the following conditions:
  - A place where it will not be exposed to rain or water
  - A place subject to minimal vibrations or shocks
  - Temperature and humidity levels should be as follows:
    Temperature: -30 to 70°C
    Humidity: 5 to 80% RH (no condensation)
    The preferred ambient temperature and humidity levels are 25°C and approximately 65% RH.
- If the AXFA14 converter is transferred to the installation site and stored without being installed, its performance may be impaired due to the infiltration of rainwater and so forth. Be sure to install and wire the AXFA14 as soon as possible after transferring it to the installation location.

2.4 Installation Location Precautions

Select the installation location with consideration to the following items to ensure long-term stable operation of the instrument.

- **Ambient Temperature:**
  Avoid installing the instrument in locations with constantly fluctuating temperatures. If the location is subject to radiant heat from the plant, provide heat insulation or improve ventilation.
- **Atmospheric Condition:**
  Avoid installing the instrument in a corrosive atmosphere. In situations where this is unavoidable, consider ways to improve ventilation and to prevent rainwater from entering and being retained in the conduit pipes.
- **Vibrations or Shocks:**
  Avoid installing the instrument in a place subject to shocks or vibrations.
- **Explosion protected type:**
  Explosion protect types can be installed in hazardous areas according to the types of gases for which they are certified. See the description in Chapter 12 "EXPLOSION PROTECTED TYPE INSTRUMENT" and "INSTALLATION AND OPERATING PRECAUTION FOR TIIS FLAMEPROOF EQUIPMENT" in this user's manual.

3. INSTALLATION

WARNING

Installation of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.

3.1 Installation Location

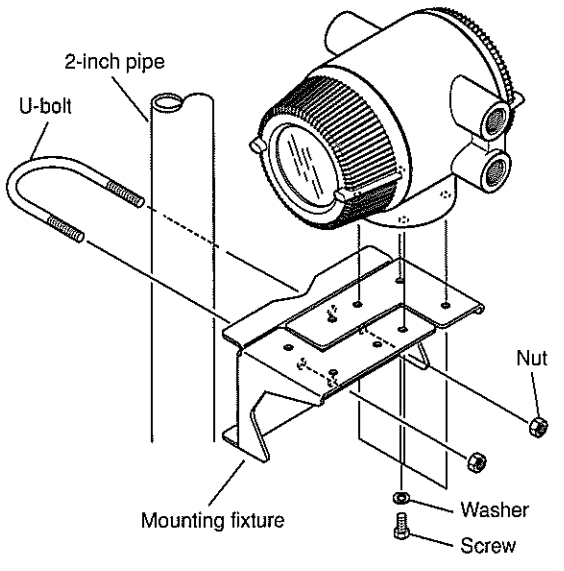
IMPORTANT

Install the instrument in a location where it is not exposed to direct sunlight. For ambient temperature, refer to Chapter 11 "OUTLINE".
The instrument may be used in an ambient humidity where the RH ranges from 0 to 100%. However, avoid long-term continuous operation at relative humidity above 95%.

3.2 Mounting

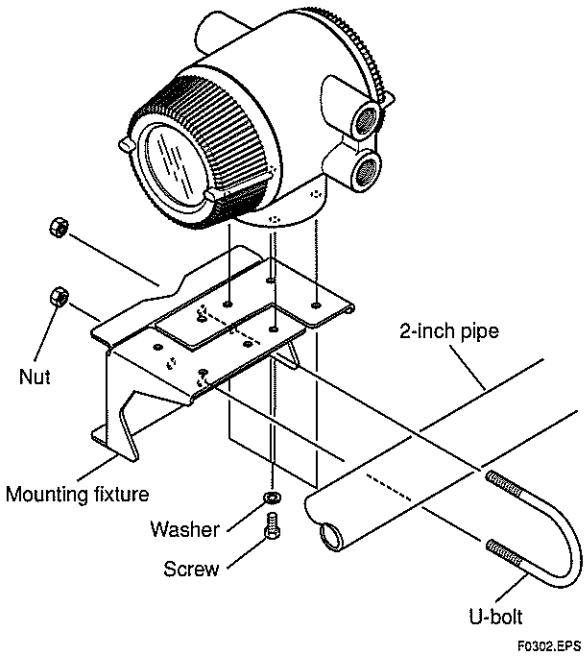
This instrument can be mounted on a 2-inch pipe in a vertical or horizontal position depending on the installation site.

● Vertical Mounting



1. Fix the instrument on the mounting fixture using four screws.
2. Fix the mounting fixture with the instrument installed on a 2-inch pipe using a U-bolt.

● Horizontal Mounting



1. Fix the instrument casing on the mounting fixture using four screws.
2. Fix the mounting fixture with the instrument installed on a 2-inch pipe using a U-bolt.

Figure 3.2.1 2-inch Pipe Mounting

4. WIRING

This chapter describes the wiring on the converter side only. For information relating to wiring on the flowtube side, refer to the user's manual of the AXF Remote Flowtube (IM 01E20D01-01E).

⚠ WARNING

The wiring of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

⚠ CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

4.1 Wiring Precautions

Be sure to observe the following precautions when wiring:

⚠ CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
- Always route the power and output signal cables in separate steel conduit tubes, except when the power supply voltage is 24 V and four-core cables are used for wiring. Keep conduits or flexible tubes watertight using sealing tape.
- Ground the remote flowtube and the converter separately.
- Cover each shield of the signal cable with vinyl tube or vinyl tape to avoid contact between two shields or between a shield and a case.
- When waterproof glands or union equipped waterproof glands are used, avoid tightening the glands with an excessive torque.
- In case of 24V power supply version, it comes with a plug. Use this plug to cover the unused wiring port when wiring the instrument with only one, four-core cable.
- Be sure to turn power off before opening the cover.
- Before turning the power on, tighten the cover securely.
- The terminal box cover is locked by the special screw. In case of opening the terminal box cover, use the hexagonal wrench attached. For handling the locking screw, refer to Figure 4.4.1.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover. For handling the locking screw, refer to Figure 4.4.12.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.

4.2 Cables

(1) Dedicated Signal Cable (AXFC)

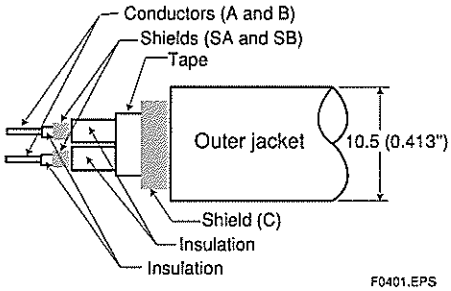


Figure 4.2.1 Dedicated Signal Cable AXFC

The flow signal is transmitted via this dedicated cable. The cable is constructed with double shielding over the two conductors, and heat-resistant vinyl is used for the outer jacket material.

Finished diameter: 10.5 mm (0.413")
Maximum length: 100 m (330 ft)
Maximum temperature: 80°C (176°F)

IMPORTANT

If the cable is longer than required, cut off any extra length rather than coiling it up, and terminate the conductors as shown in Figure 4.2.2. Avoid using junction terminal boards to extend the cable length, as this will interrupt the shielding.

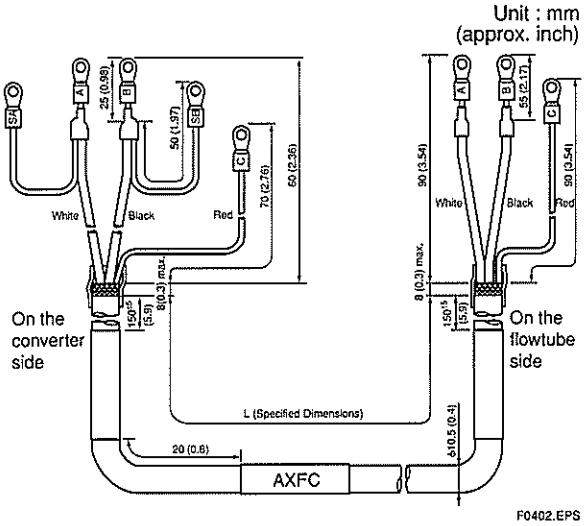


Figure 4.2.2 Treatment of Dedicated Signal Cables

CAUTION

- As crimp terminals A, B, SA, SB and C have their own electrical potentials, securely insulate them so as not to come in contact with one another.
- To prevent a shield from coming in contact with another shield or the case, cover each shield with a vinyl tube or wrap it in vinyl tape.

NOTE

Conductors A and B carry the signal from the electrodes, and C is at the potential of the liquid (signal common). Shields SA and SB are kept at the same potentials as the individual electrodes (these are actively driven shields.) This is done to reduce the effect of the distributed capacitance of the cable at long cable length. Note that, since the signals from the individual electrodes are impedance converted inside the converter, errors will result if they come in contact with any other component. Great care must be taken in the cable end treatment.

(2) Excitation Cable/Power Cable/Output Cable

JIS C3401 control cable equivalent
JIS C3312 power cable equivalent
14 AWG Belden 8720 equivalent

Outer Diameter:
With no gland option;
6.5 to 12 mm (0.26 to 0.47 in.)
With gland options EG, EU and EW;
10.5 or 11.5 mm (0.41 or 0.45 in.)
With gland options EP;
6 to 12 mm (0.24 to 0.47 in.)
Nominal Cross Section:
Single wire; 0.5 to 2.5 mm^2
Stranded wire; 0.5 to 1.5 mm^2

In case of power cable, Green/Yellow covered conductor shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS. Conform to IEC227, IEC245 or equivalent national authorization.

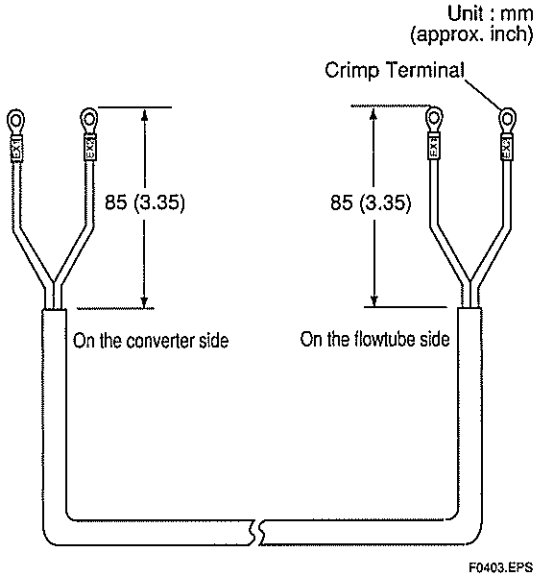


Figure 4.2.3 End Treatment of Excitation Cable

NOTE

- For excitation and power cables, always use a crimp terminal with an insulation cover.
- Use crimp tools from the manufacturer of the crimp terminal you want to use to connect the crimp terminal and cable.
- Use crimp tools that are appropriate for the diameter of the cable to be connected.

4.3 Wiring Ports

This instrument is of watertight construction as stipulated in JIS C0920. It is shipped with a wiring bracket (waterproof gland or waterproof gland with union) or a plastic gland attached, only in cases where an optional specification is selected for the wiring port. In case of the explosion proof type, refer to chapter 12.

IMPORTANT

The wiring port is sealed with a cap (not water-proof). Do not remove the cap from the unused wiring port. If waterproof property is necessary, please use waterproof glands.

(1) When waterproof property is unnecessary (When there are no particular optional specifications)

The wiring port is sealed with a cap (not water-proof) that must be removed before wiring. At this time, handle the wiring port in accordance with the JIS C0920 mentioned above. Do not remove the cap from the unused wiring port.

(2) When waterproof property is necessary (Wiring using waterproof glands)

IMPORTANT

To prevent water or condensation from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

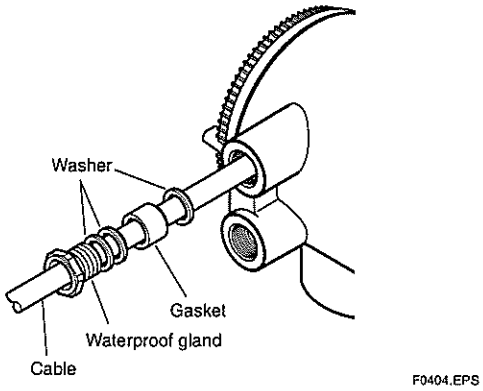


Figure 4.3.1 Waterproof Gland (Optional code EG)

For working on the electric wire tubes or the flexible tubes (PF1/2), remove the waterproof gland and attach them directly to the wiring port.

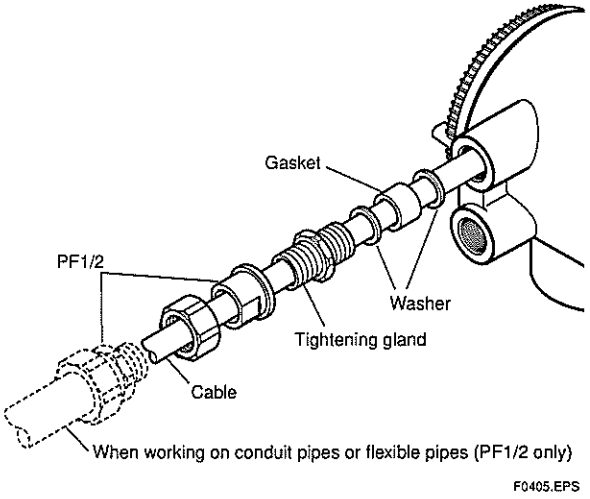


Figure 4.3.2 Waterproof Gland with Union Joint (Optional code EU)

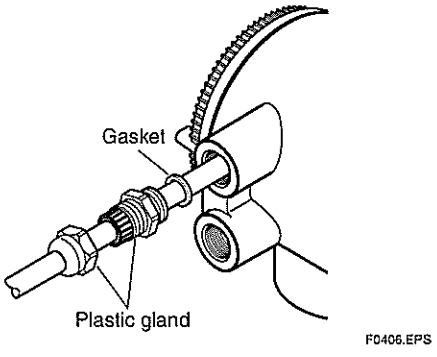


Figure 4.3.3 Plastic Gland (Optional code EP)

(3) Conduit Wiring

When wiring the conduits, pass the conduit through the wiring connection port, and utilize the waterproof gland to prevent water from flowing in. Place the conduit pipe on an angle as shown in Figure 4.3.4. Install a drain valve at the low end of the vertical pipe, and open the valve regularly.

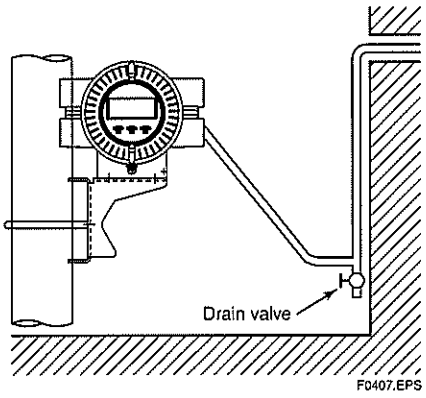


Figure 4.3.4 Conduit Wiring

4.4 Wiring Connections

4.4.1 Removing Cover

Loosen cover locking screw 2 clockwise using a hexagonal wrench (nominal size 3 mm) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is unlocked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

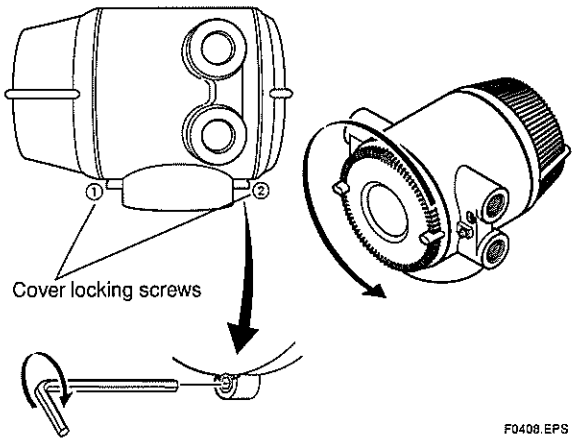


Figure 4.4.1 Removing the Terminal Box Cover

4.4.2 Terminal Configuration

When the cover is removed, the connection terminals will be visible. The terminal configuration labels are attached in the locations shown in Figure 4.4.2.

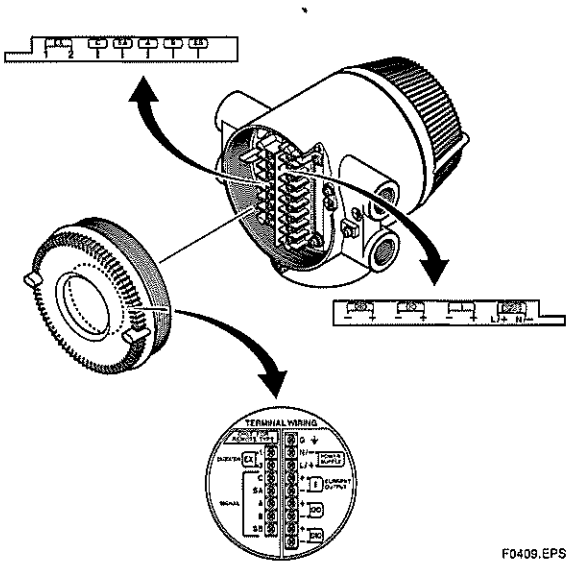


Figure 4.4.2 Terminal Layout Labels Position

The description of the terminal symbols is shown in Table 4.1.1.

For FOUNDATION Fieldbus protocol, please refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, please refer to IM 01E20F12-01E.

Table 4.1.1 Terminal Symbols

Terminal Symbols	Description
EX1 EX2	Excitation current output
C SA A B SB	Flow singal input

Terminal Symbols	Description
⏚	Functional grounding
N/– L/+	Power supply
I+ I–	Current output 4 to 20mA DC
DO+ DO–	Pulse output/ Alarm output/ Status output
DIO+ DIO–	Alarm output/ Status output/ Status input
⏚	Protective grounding (Outside of the terminal)

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4.4.3 Precautions for Wiring of Power Supply Cables

When connecting to the power supply, observe the points below. Failure to comply with these warnings may result in an electric shock or damage to the instrument.

WARNING

- Ensure that the power supply is OFF in order to prevent electric shocks.
- Ensure the protective grounding terminal is grounded before turning the power on.
- Use insulating sleeve crimp terminals (for 4-mm screws) for the power supply wiring and protective grounding wiring.
- Install an external switch or circuit breaker as a means to turn the powe off (capacitance; 15A, conforming to IEC947-1 and IEC947-3). Locate this switch either near the instrument or in other places facilitating easy operation. Affix a "Power Off Equipment" label to this external switch or circuit breaker.

Wiring Procedure

1. Turn the instrument's power off.
2. Wire the power supply cable and the functional grounding cable to the power supply terminals.

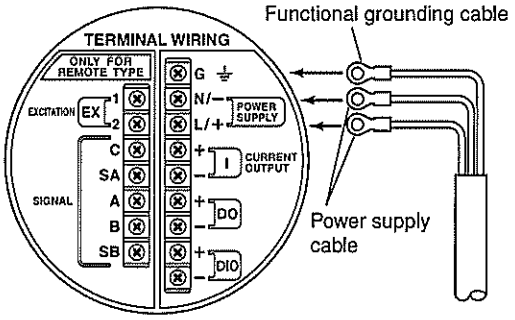


Figure 4.4.3 Electric Cable Wiring

4.4.4 DC Power Connection

When using DC power as the power supply for the converter, give attention to the following points.

(1) Connecting Power Supply

IMPORTANT

Do not connect power supply with reversed polarities.
L/+ terminal: connect +
N/− terminal: connect −

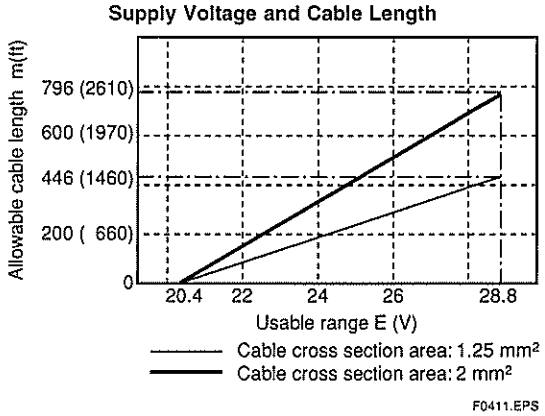
IMPORTANT

Do not connect power supply with 100 to 240 V AC or 100 to 120 V DC in the case of a 24 V power supply version (power supply code 2). It will give a damage to the converter.

(2) Required Power Supply Voltages

IMPORTANT

When using a 24 V power supply, the specification for the supply voltage is 24 V (−15% to +20%), but the input voltage of the converter drops due to cable resistance therefore it must be used within the following ranges.



(3) Setting Power Supply Frequency

IMPORTANT

Set the local Commercial power frequency in order to eliminate the effect of induction noise from the Commercial power supply.
Refer to "Chapter 6: Parameter Description" in this manual.
Parameter No.: **J30** and **J31**

4.4.5 Grounding

CAUTION

Be sure to connect the protective grounding of the AXFA14 with a cable of 2mm² or larger cross section in oder to avoid electrical shock to the operators and maintenance engineers and to prevent the influence of external noise.
Connect the grounding wire to the ⏚ mark.
The grounding should satisfy Class D requirements (ground resistance, 100 Ω or less).
In case of TIIS Flameproof type, the grounding should satisfy Class C requirements (ground resistance, 10 Ω or less) or class A requirements (ground resistance, 10 Ω or less).
For explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.

IMPORTANT

When optional code A (lighting protector) is selected, the ground should satisfy Class C requirements (grounding resistance, 10 Ω or less).

- The protective grounding terminals ⏚ are located on the inside and outside of the terminal area. Either terminal may be used.
- Use 600V vinyl insulation wires as the grounding wires.

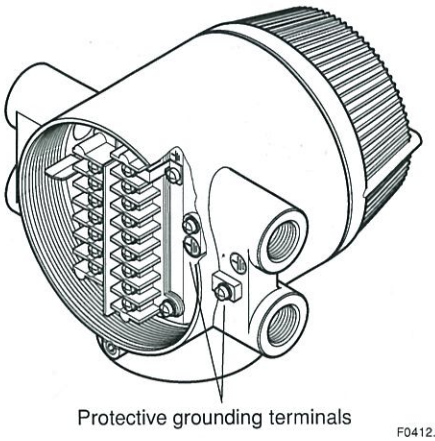


Figure 4.4.4 Protective Grounding Terminal Location

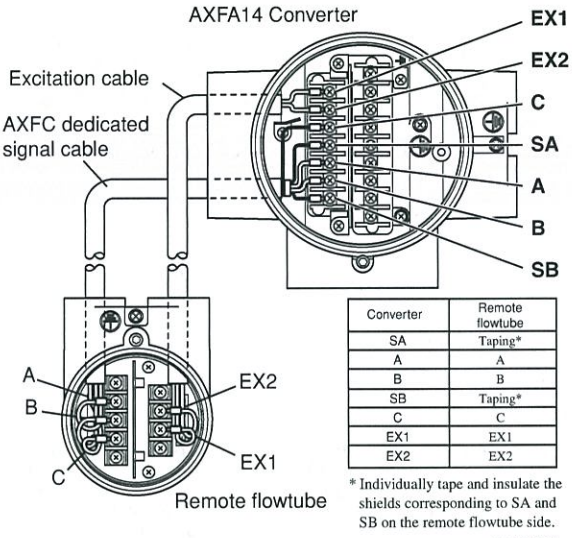
4.4.6 Wiring the Remote Flowtube with the AXFA14 Converter

WARNING

Before wiring, be sure that the power supply for AXFA14 converter has been turned off to prevent an electrical shock.

(1) Connection with the Remote Flowtube (General-Purpose Use, Submersible Type, Sanitary Type, Size 2.5 to 400 mm (0.1 to 16 in.))

Connect wiring as shown in the figure below.



Converter	Remote flowtube
SA	Taping*
A	A
B	B
SB	Taping*
C	C
EX1	EX1
EX2	EX2

* Individually tape and insulate the shields corresponding to SA and SB on the remote flowtube side.

Figure 4.4.5 Wiring Diagram

(2) Connection with the Remote Flowtube (Explosion proof Type, Size 2.5 to 400 mm (0.1 to 16 in.))

In case of explosion proof type for ATEX, FM, CSA, IECEx and TIIS certification, connect wiring as shown in the figure below.

In case of the explosion proof type, the protective grounding ⏚ of remote flowtube must be connected to a suitable IS grounding system. In that case, ⏚ (functional grounding terminal) need not be connected.

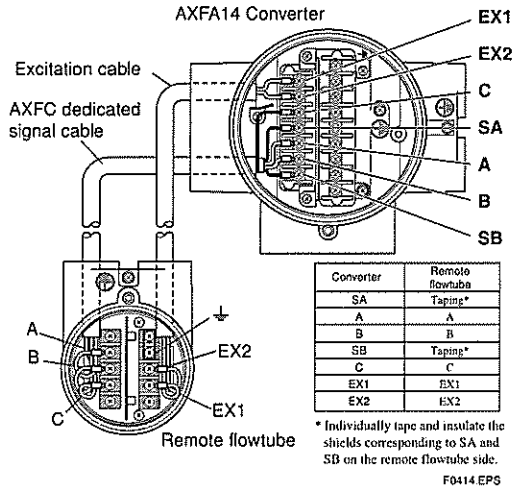


Figure 4.4.6 Wiring Diagram

4.4.7 Connecting to External Instruments

WARNING

Before wiring with external instruments, be sure to turn off the power supply for AXFA14 converter and any external instruments.

Connect the AXFA14 terminal to external instruments, giving attention to the following points.

For FOUNDATION Fieldbus protocol, please refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, please refer to IM 01E20F12-01E.

● 4 to 20 mA DC Current Output

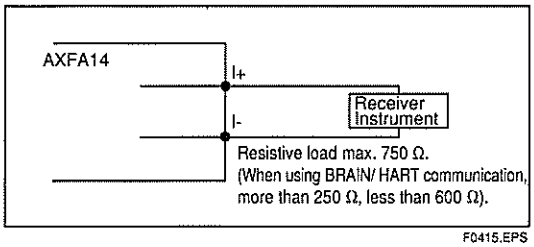


Figure 4.4.7 4 to 20 mA DC Output Connection

● Pulse Output

IMPORTANT

- As this is a transistor contact (insulated type), give attention to proper voltage and polarity when wiring.
- Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.
- When input filter constant of the electronic counter is large in relation to the pulse width, the signal will decrease and the count will not be accurate.
- If the input impedance of the electronic counter is large, an induction noise from the power supply may result in inaccurate counts. Use a shield cable or sufficiently reduce the input impedance of the electronic counter within the electromagnetic flowmeter pulse output specification range.
- The active pulse output (Optional code EM) cannot be used in conjunction with the standard pulse output.
- When the active pulse output (Optional code EM) is selected, do not be short-circuit between the DO+ and DO– terminals to avoid damaging the instrument.
- When the active pulse output (Optional code EM) is selected, the range of pulse rate must be set to 2 pps maximum.
- To avoid communication (BRAIN/ HART) failure, it is recommended to use the shield cable.

NOTE

For pulse output from the DO terminals, parameters must be set. Refer to "Chapter 6: Parameter Description" in this manual.

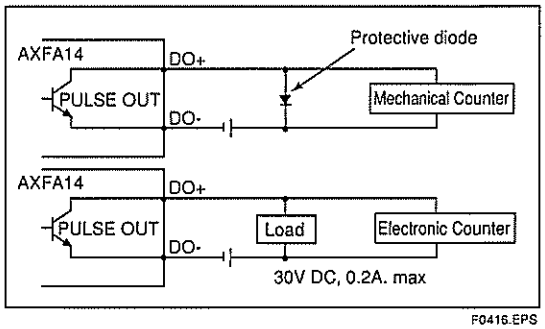


Figure 4.4.8 Pulse Output Connection

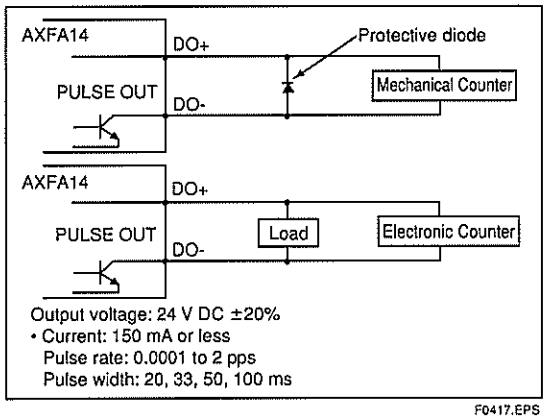


Figure 4.4.9 Active Pulse Output Connection (Optional code EM)

● Status Input

IMPORTANT

Status inputs are designed for use with no-voltage (dry) contacts. Be careful not to connect the status to any signal source carrying voltage. Applying voltage may damage the input circuit.

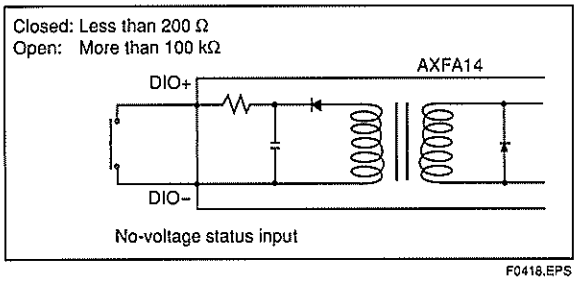


Figure 4.4.10 Status Input Connection

NOTE

For status input to the DIO terminals, parameters must be set. Refer to "Chapter 6: Parameter Description" in this manual.

● Status Output / Alarm Output

IMPORTANT

Since this is an isolated transistor output, be careful of voltage and polarity when wiring. Do not apply a voltage larger than 30V DC or a current larger than 0.2A in order to prevent damage to the instrument.

This output cannot switch an AC load. To switch an AC load, an intermediate relay must be inserted as shown in Figure 4.4.11.
*The alarm output operates from open (normal) to closed (alarm occurrence) in the default value (as setup upon plant shipment). Changes can be made via the parameter settings.

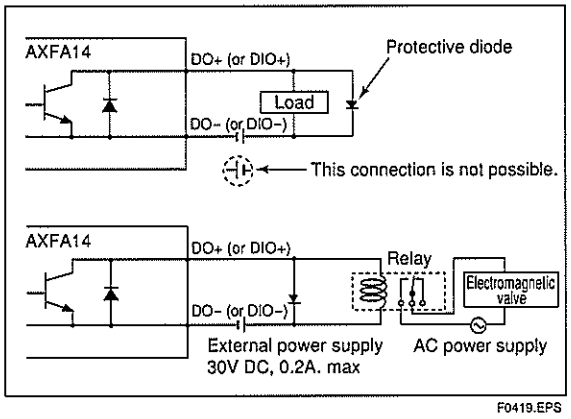


Figure 4.4.11 Status Output/Alarm Output Connection

NOTE

For status and alarm outputs from the DO or DIO terminals, parameters must be set. Refer to "Chapter 6: Parameter Description" in this manual.

4.4.8 Installing the Cover

Install the cover to the flowmeter by turning it in the direction of the arrow as shown below. Tighten cover locking screw 2 counterclockwise using a hexagonal wrench (nominal size 3 mm) to lock the cover.

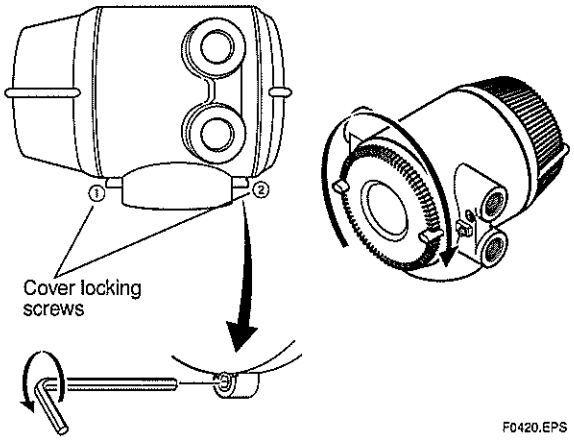


Figure 4.4.12 Installing the Terminal Box Cover

5. BASIC OPERATING PROCEDURES (USING THE DISPLAY UNIT)

The modification of data settings from the display unit can be carried out using the three setting switches (infra-red switches) - namely, the SET, SHIFT, and switches. The infra-red switches enable the user to set parameters without opening the cover.
This chapter will provide a description of basic data configuration and the methods to be used with the three setting switches. The AXFA14 or the AXF integral flowmeter can also be operated using a handheld Brain Terminal (BT200) or a HART Communicator. (Please refer to Chapter 7 for operation via Brain Terminal and Chapter 8 for operation via HART Communicator.)

For FOUNDATION Fieldbus protocol, please refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, please refer to IM 01E20F12-01E.

WARNING

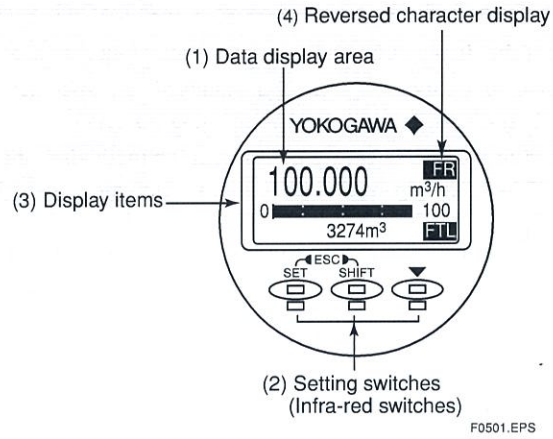
Be sure to set parameters as "Protect" on the write protect function after finish of parameter setting work.
Under extremely rare case, the infra-red switches may respond unexpectedly in such conditions as sticking ball of water or extraneous substances on the surface of display panel glass according to the principle of infra-red switch operation.
Its probability rises in such cases as sticking rain water by storm or other similar situation and washing up work near flowmeter installation place.
Either to illuminate or stop illuminating the infra-red switches by the flashlight may cause the mis-reaction.
Refer to Chapter 6 "Menu P: Parameter Protection Items" and section "10.2.2" how to use the write protect function in detail.

IMPORTANT

Operate the display unit under the condition where direct sunlight, etc... do not shine to the setting switches directly when the parameter setting operation is carried out.

NOTE

(1) Always use the setting switches with the cover of the AXFA14 or the AXF integral flowmeter closed.
(2) Use these switches with them covered by the glass window.
(3) If dirt, dust or other substances surfaces on the display panel glass, wipe them clean with a soft dry cloth.
(4) The operation with dirty gloves may cause a switch response error.



5.1 Operating Panel Configuration and Functions

(1) Data display area

1st line (Display Select1), 2nd line (Display Select2), and 3rd line (Display Select3) can be displayed using parameter settings. The content corresponding to selected item is shown with the reversed-character on the right of the line.

(2) Setting switch operations

SET: Move the layer down, select, and confirm

SHIFT + SET: Move the layer up
(Press the SET switch while holding down the SHIFT switch)

▼: Move the cursor down (for selection-type parameters) or increase values (for numeric-type parameters)

SHIFT: Move the cursor to the right (for numeric-type parameters)

SHIFT + ▼: Move the cursor up (for selection-type parameters)

(3) Display items

Displayed items and reversed-character indication		Content	Disp Select1	Disp Select2 Disp Select3
Instantaneous flow rate: %	FR	Displays the instantaneous flow rate for the span as a percentage.	○	○
Actual instantaneous flow rate	FR	Displays the actual reading for instantaneous flow rate.	○	○
Instantaneous flow rate: mA	FR	Displays the instantaneous flow rate for the span as a current output value.	○	○
Bar graph indicating instantaneous flow rate	None	Displays the instantaneous flow rate for the span as a percentage using bar graph.	×	○
Totalized forward-direction flow rate	FTL	Displays the totalized value for flow rate in the forward direction.	○	○
Totalized reverse-direction flow rate	RTL	Displays the totalized value for flow rate in the reverse direction.	○	○
Totalized differential flow rate	DTL	Displays the differential totalized value for flow rate between forward totalization and reverse totalization.	○	○
Tag number	TAG	Display the tag number (using up to 16 characters).	×	○
Diagnosis of electrode adhesion	ADH	Displays the adhesion condition in the form of a bar graph. (See the description for parameters K10 through K15 from Chapter 6: Parameter Description for more details.)	×	○
Communication type	COM	Displays the communication type.	×	○

(4)

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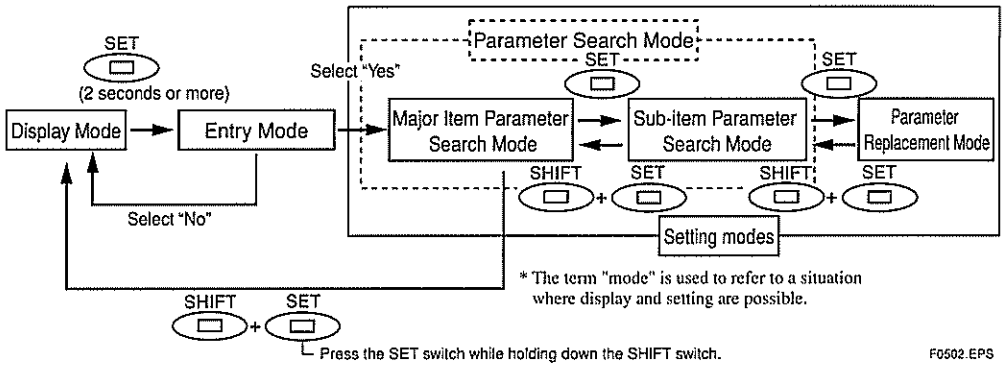
5.2 Display Unit Setting Methods

NOTE

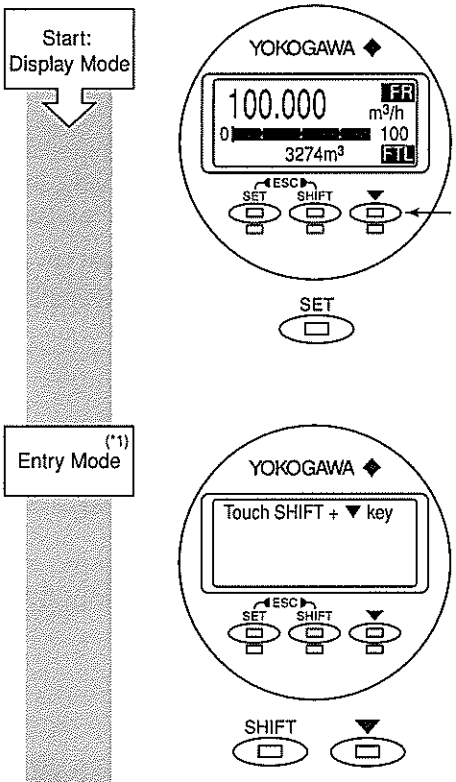
Before changing any settings, be sure to check the corresponding setting details in Chapter 6: Parameter Description.

5.2.1 Display Mode → Setting Mode

Display Mode will be adopted when the power is turned on, and the Setting Mode can be activated using the following procedure.



Sample Display: Procedure for moving from Display Mode to Setting Mode



1st line: Actual instantaneous flow rate [FR]

2nd line: Bar graph indicating instantaneous flow rate

3rd line: Totalized forward flow rate [FTL]

Hold the SET switch for 2 seconds.

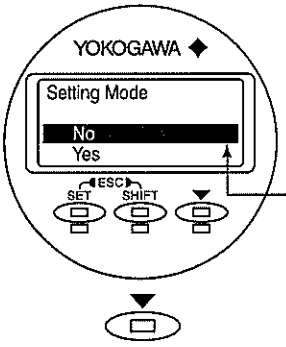
Touch SHIFT and ▼ switches simultaneously.

NOTE

When other operations are carried out, the system will automatically return to the Display Mode.
When no operations in this display are carried out for 20 seconds, the system will automatically return to the Display Mode.

NOTE (*1)

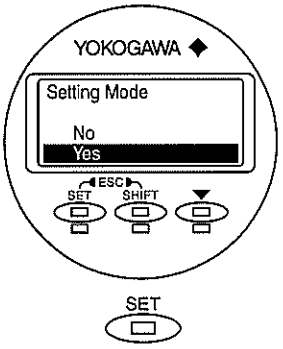
The Major Item Parameter which is set just before will be shown when entrying the Setting Mode again within 1 minute after returning from Setting Mode to Display Mode.



A screen is displayed to confirm whether or not the system is to enter Setting Mode.

Press the ▼ switch and select [Yes].

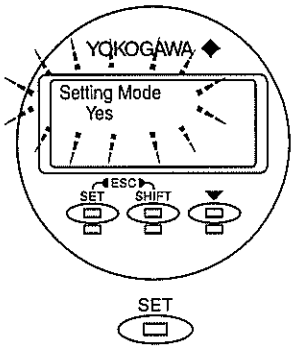
The reversed-character (i.e. the cursor position) indicates the item that is currently selected.



When [Yes] has been selected, touch the SET switch.

NOTE

When the operations except SET and ▼ switches are carried out, the system will automatically return to the Display Mode.
When no operations in this display are carried out for 20 seconds, the system will automatically return to the Display Mode.



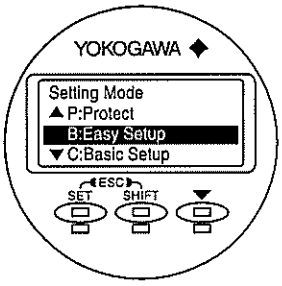
In order to request confirmation, the entire display flashes on and off.

Touch the SET switch once again at this time to fix your selection.

NOTE

When no operations in the flashed display are carried out for 20 seconds, the system will automatically return to the Display Mode.
When the operations except SET are carried out, the system will automatically return to the Display Mode.

Setting Mode



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The system enters Setting Mode.

Parameters to be set can be selected.

To Parameter Search Mode

This completes the procedure for changing from the Display Mode to the Parameter Search Mode.

5.2.2 Setting Mode

When the Setting Mode has been activated using the procedure from Section 5.2.1, parameters can be selected for setting.

NOTE

If no operations are carried out for a period of 10 minutes in Setting Mode, the system will automatically return to the Display Mode.

Format for Parameter Data

Depending on the type of parameter, data is formatted in one of the following three ways.

Format	Typical display	Content
(i) Selection-type	B21:Base Flow Unit m^3 ▲m^3 ▼kl(Kiloliter)	The desired data item is selected from a predefined list.
(ii) Numeric-type	B23:Flow Span 100 l/min 000100 l/min Rng:0.00001 → 32000	Data is set using the values in each digit and using the decimal point.
(iii) Alphanumeric-type	C10:Tag No FI-1101 FI-1201	Data is composed using alphanumeric characters (in the case of tag numbers, special units, and the like). With this format, setting can be carried out using up to 16 of the characters shown below.

Regarding the alphanumeric-type format (iii), the following alphanumerics are displayed in the following sequence:

#%&*+-./0123456789:<>ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghij klmnopqrstuvwxyz[space]

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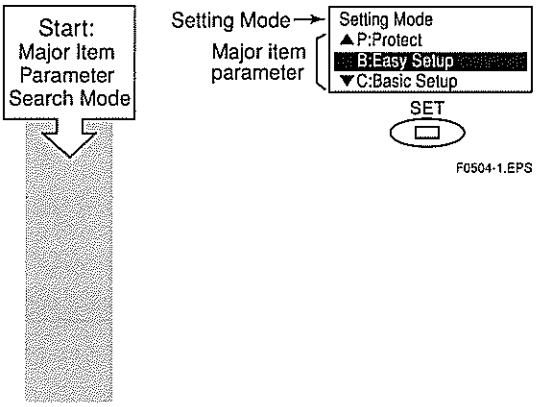
5.3 Parameter Setting Procedure

Once the system is in Setting Mode, the parameters for setting can be selected. Parameters that are frequently used have been grouped together in Easy Setup in Menu B. This section provides a description of the parameter setting procedure using **B: Easy Setup** and **C: Basic Setup**.

For more details regarding parameter content, please refer to Section 6: Parameter Description.

5.3.1 Setting Example for Selection-Type Data: Flow rate units

This example describes the setting of the flow rate units for the selection-type parameter **B21: Base Flow Unit** from m^3 to l (Liter).

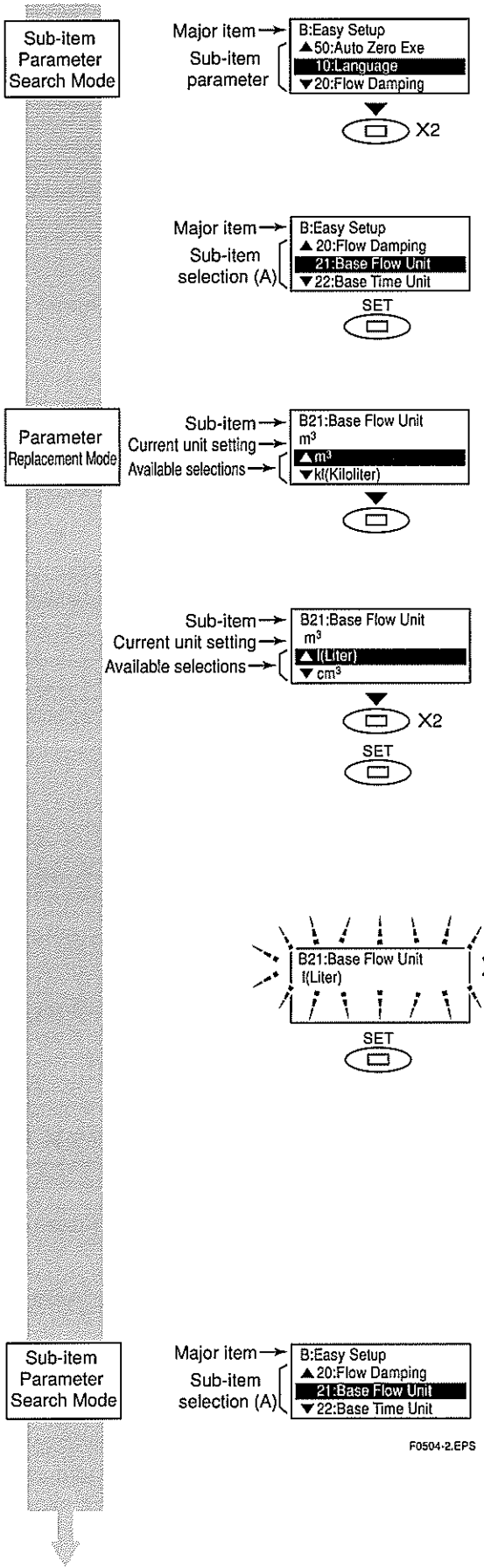


Major Item Parameter Search Mode has been accessed in this screen.

Touch the SET switch to access **B: Easy Setup**.

NOTE

The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the ▼ switch to cycle through these items.



Sub-item Parameter Search Mode has been accessed in this screen.

Touch the switch to move the cursor to **B21: Base Flow Unit.**

The cursor has been moved to **B21: Base Flow Unit** in this screen. (Sub-item selection screen (A))

In this screen, Parameter Replacement Mode has been called up using the SET switch.

Touch the switch to move the cursor to the unit item for selection. In this example, the switch is touched twice to select l (Liter)

When l (Liter) has been selected, touch the SET switch.

In order to request confirmation, the entire display flashes on and off. Touch the SET switch once again at this time to fix your selection.

NOTE

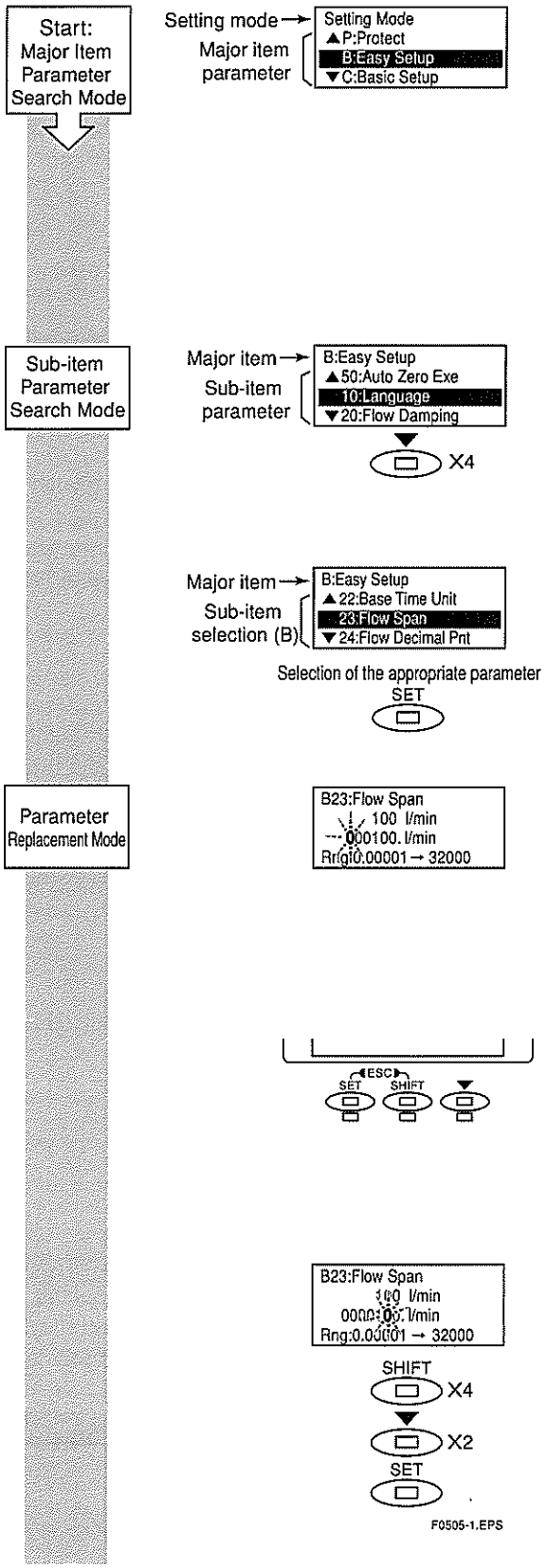
When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode.

When the operations except SET are carried out, the parameter cannot be set.

The system automatically returns to sub-item selection screen (A).

5.3.2 Setting Example for Numeric-Type Data: Flow rate span

This example describes the setting of the flow rate span for the numeric-type parameter **B23: Flow Span** from 100 l/min to 120 l/min.



Setting Mode Condition

Touch the SET switch to access **B: Easy Setup**.

NOTE

The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the ▼ switch to cycle through these items.

Sub-Item Parameter Search Mode has been accessed in this screen.

Touch the ▼ switch to move the cursor to **B23: Flow Span**.

The cursor has been moved to **B23: Flow Span** in this screen. (Sub-item selection screen (B))

Touch the SET switch to access Parameter Replacement Mode.

Once Parameter Replacement Mode has been selected, the digit that can be replaced will be flashed on and off. When in this condition, confirm the relevant setting range as displayed at the bottom of the screen and then set the parameter as required.

In this example, the parameter will be set to "120 l/min".

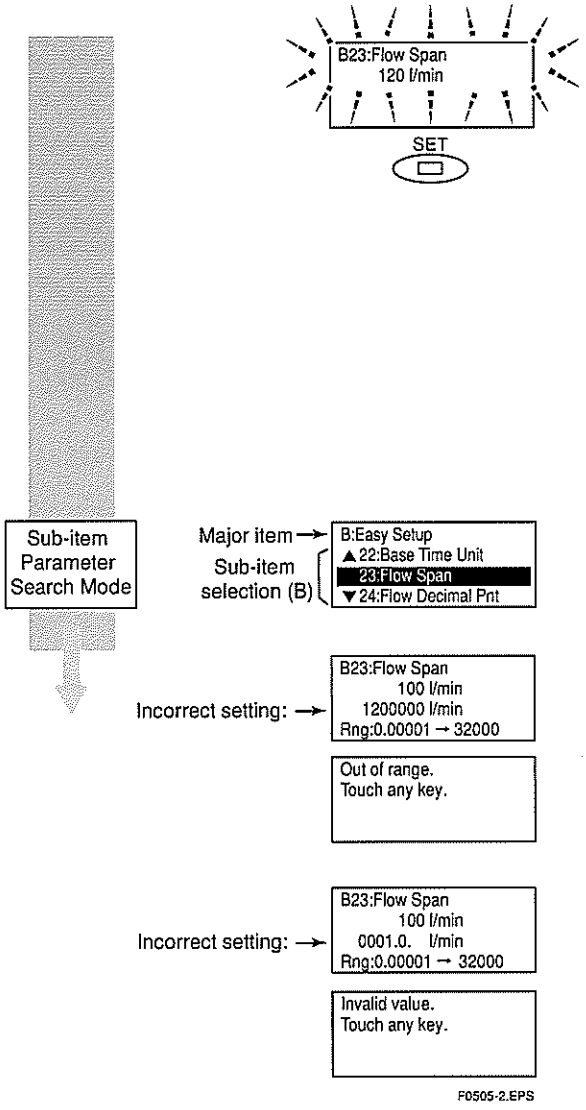
NOTE

When setting a new value, use the SHIFT switch to move from digit to digit, and use the ▼ switch to cycle through values for each individual digit. In addition to digit, it is also possible to select a decimal point, and this allows the position of the decimal point to be changed.

Modify the value to "120 l/min" as follows:

Touch the SHIFT switch to move the cursor to the position for multiples of 10. Then, touch the ▼ switch to change the value at this position from "0" to "2".

When the value of "120" has been setup, touch the SET switch.



When the SET switch is touched, the entire display flashes on and off. Confirm that the setting has been correctly changed to "120", and then fix this value by touching the SET switch once again.

NOTE

When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode.

When the operations except SET are carried out, the parameter cannot be set.

The system automatically returns to sub-item selection screen (B).

NOTE

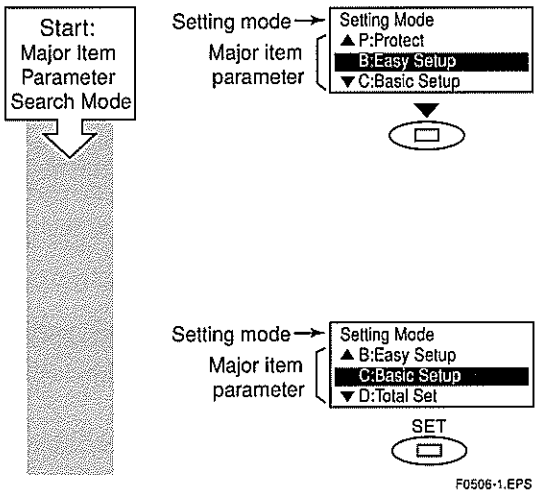
If the input value is outside the valid selection range, the message "Out of range. Touch any key." will be displayed. In such a case, touch any switch to return to Parameter Replacement Mode and redo the setting.

NOTE

If more than one decimal point has been input, the message "Invalid value. Touch any key." will be displayed. In such a case, touch any switch to return to Parameter Replacement Mode and redo the setting.

5.3.3 Setting Example for Alphanumeric-Type Data: Tag number

This example describes the setting of the tag number for the alphanumeric-type parameter **C10: Tag No.** from "FI-1101" to "FI-1201."



Setting Mode Condition

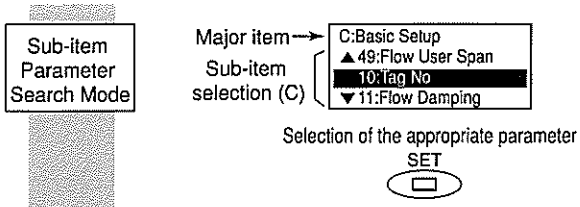
Touch the ▼ switch to access **C: Basic Setup.**

NOTE

The ▲ and ▼ symbols to the left of the parameters indicate that additional setting items to those being currently displayed may also be selected. Use the ▼ switch to cycle through these items.

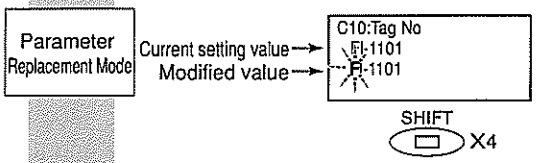
The cursor has been moved to **C: Basic Setup** in this screen.

Touch the SET switch to enter **C: Basic Setup.**

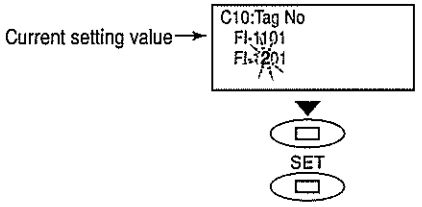


Upon selection of **C: Basic Setup**, the cursor will be positioned at **C10: Tag No.** (Sub-item selection screen (C))

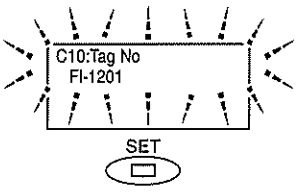
Touch the SET switch to access Parameter Replacement Mode.



The cursor will flash on and off on the left of the tag number. As "FI-1201" is to be setup in this example, touch the SHIFT switch to move the cursor to the position for multiples of 100.



At the position for multiples of 100, touch the ▼ switch to change the "1" to "2". When the setting has been changed to "FI-1201", touch the SET switch.

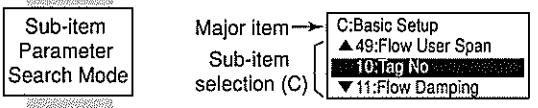


When the SET switch is touched, the entire display flashes on and off. Confirm that the setting has been correctly changed to "FI-1201", and then fix this setting by touching the SET switch once again.

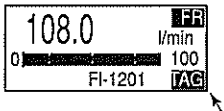
NOTE

When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode.

When the operations except SET are carried out, the parameter cannot be set.



The system automatically returns to sub-item selection screen (C).



After returning to Display Mode by touching using the (SET and SHIFT) twice as escape switches, it will be possible to confirm the modified content (if Display Select has been setup to display the tag number.)

Indicates selection of Tag No display for B42: Display Select3.

6. PARAMETER DESCRIPTION

6.1 Parameters

With the exception of parameters that were specified by the customer upon ordering, all of the internal parameters will initially be set to default values. Actions such as the modification of display details can then be carried out whenever necessary.

For FOUNDATION Fieldbus protocol, please refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, please refer to IM 01E20F12-01E.

IMPORTANT

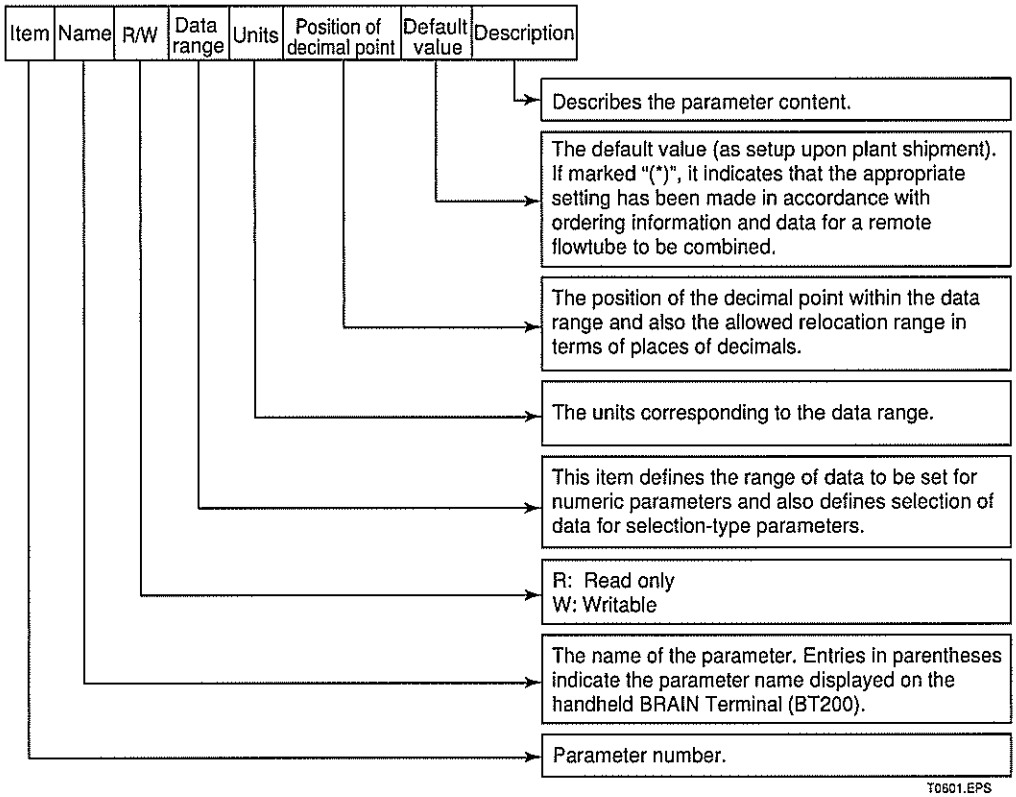
Make sure to keep the instrument's power on at least for 30 seconds after you set the parameters. If you turn the power off immediately after the parameters are set, the settings will be canceled.

NOTE

In order to ensure that correct flow rate data can be acquired, it is crucial that the nominal size, flow rate span, and meter factor of the combined remote flowtube are set. In cases where a remote flowtube is ordered at the same time as the AXFA14, or where the AXF integral flowmeter is ordered, the nominal size and meter factor will be set upon shipment from the manufacturing plant, and these will not require additional setting. If the AXFA14 is ordered separately, the default value will be set for the meter factor; accordingly, it will be necessary to change this setting to the meter factor indicated on your remote flowtube data plate.
If a flow rate span was specified upon ordering, this will be set before shipment. If this is not the case, however, it will be necessary for the appropriate value to be set by the user.

6.2 Parameter Lists

Parameter lists are comprised of the following items.



6.3 Parameter List Overview

(1) Item A (Menu A): Display items

Menu A contains the instantaneous flow rate, totalization values, and other items relevant to display.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
A00	Display (DISPLAY)						
A10	FR (FLOW RATE (%))	R	-110.0 to 110.0	%	1		For Display Mode only
A20	FR (FLOW RATE)	R	-999999 to 999999	B21/B22 (C40/C41)	0 to 3		For Display Mode only
A21	FR (FLW RATE (mA))	R	2.400 to 21.600	mA	3		For Display Mode only
A30	FTL (TOTAL)	R	0 to 99999999	B30 (D10)	0 to 7		For Display Mode only
A31	RTL (REV TOTAL)	R	0 to 99999999	B30 (D10)	0 to 7		For Display Mode only
A32	DTL (DIF TOTAL)	R	-99999999 to 99999999	B30 (D10)	0 to 7		For Display Mode only
A60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(2) Item B (Menu B): Easy Setup items

Those parameters with a high frequency of use have been grouped together in Menu B. All basic functions can be controlled using only the parameters from this block.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
B00	Easy Setup (EASY SETUP)						
B10	Language (LANGUAGE)	W	English Japanese French German Italian Spanish			English	Selects the language used for the display unit. Linked with H30.
B20	Flow Damping (FLOW DAMPING)	W	0.1 to 200.0	s	1	3.0 s	Sets damping time. Linked with C11.
B21	Base Flow Unit (FLOW UNIT)	W	Ml(Megaliter) m^3 kl (Kiloliter) l (Liter) cm^3 m t kg g kcf cf mcf Mgal (US) kgal (US) gal (US) mgal (US) kbbl (US Oil) bbl (US Oil) mbbl (US Oil) ubbl (US Oil) kbbl (US Beer) bbl (US Beer) mbbl (US Beer) ubbl (US Beer) ft klb (US) lb (US)			m (*)	Selects flow units for the flow rate span. Linked with C40.

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Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
B22	Base Time Unit (TIME UNIT)	W	/d /h /min /s			/s (*)	Selects time units for the flow rate span. Linked with C41.
B23	Flow Span (FLOW SPAN)	W	0.0001 to 32000	B21/B22 (C40 /C41)	0 to 4	1 m/s (*)	Sets flow rate span (with units from B21 and B22). Linked with C42.
B24	Flow Decimal Pnt (FLOW DECIMAL)	W	Auto 0 1 2 3			Auto (*)	Selects decimal point position for the display unit's instantaneous flow rate. Linked with C43.
B30	Total Unit (TOTAL UNIT)	W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/P Pulse/s			Pulse/s (*)	Selects the flow rate unit per one pulse as used for totalization display. Linked with D10.
B31	Total Scale (TOTAL SCALE)	W	0 to 32000	B30 (D10)	0 to 4	0 (*)	Sets the flow rate per one pulse as used for the totalization display. Linked with D11.
B32	Pulse Unit (PULSE UNIT)	W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/ Pulse/s			Pulse/s (*)	Selects the flow rate unit per one pulse as used for pulse output. Linked with E10.
B33	Pulse Scale (PULSE SCALE)	W	0 to 32000	B32 (E10)	0 to 4	0 (*)	Sets the flow rate per one pulse as used for pulse output. Linked with E11.
B40	Display Select1 (DISP SELECT1)	W	Flow Rate(%) Flow Rate Flow Rate(mA) Forward Total Reverse Total Dif Total			Flow Rate	Selects content of the first line for Display Mode. Linked with H10.
B41	Display Select2 (DISP SELECT2)	W	Off Flow Rate(%) Flow Rate Flow Rate(mA) Flow Rate(Bar) Forward Total Reverse Total Dif Total Tag No Adhesion Check Communication			Off	Selects content of the second line for Display Mode. Linked with H11.
B42	Display Select3 (DISP SELECT3)	W	Same as B41 (Display Select2)			Off	Selects content of the third line for Display Mode. Linked with H12.
B50	Auto Zero Exe (AUTOZERO EXE)	W	No Execution Execution			No Execution	Selects whether or not automatic zero adjustment is carried out. Linked with M10.
B60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(3) Item C (Menu C): Basic Setting items

Menu C principally contains the basic setting items for the flowtube.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
C00	Basic Setup (BASIC SETUP)						
C10	Tag No (TAG NO)	W	ASCII 16 characters				Sets Tag number up to 16 characters.
C11	Flow Damping (FLOW DAMPING)	W	0.1 to 200.0	s	1	3.0 s	Sets damping time. Linked with B20.
C20	Measure Mode (MEASURE MODE)	W	Standard DF Enhanced DF			Standard DF	Selects measurement mode for dual frequency excitation
C21	Low MF (LOW MF)	W	0.0100 to 3.0000		4	1.0000 (*)	Sets low-frequency meter factor for standard dual frequency excitation
C22	High MF (HIGH MF)	W	0.0100 to 3.0000		4	1.0000 (*)	Sets high-frequency meter factor for standard dual frequency excitation
C23	Low MF(EDF) (LOW MF(EDF))	W	0.0000 to 3.0000		4	1.0000 (*)	Sets low-frequency meter factor for enhanced dual frequency excitation
C24	High MF(EDF) (HIGH MF(EDF))	W	0.0000 to 3.0000		4	1.0000 (*)	Sets high-frequency meter factor for enhanced dual frequency excitation
C31	Nominal Size Unit (SIZE UNIT)	W	mm inch			mm inch	Selects the nominal size units for the flowtube.
C32	Nominal Size (NOMINAL SIZE)	W	0.99 to 3000.1 0.01 to 120.1	mm inch	0 to 2	100 (*)	Sets flowtube nominal size in selected unit at C31.
C40	Base Flow Unit (FLOW UNIT)	W	Ml(Megaliter) m^3 kl(Kiloliter) l(Liter) cm^3 m t kg g kcf cf mcf Mgal (US) kgal (US) gal (US) mgal (US) kbbl (US Oil) bbl (US Oil) mbbl (US Oil) ubbl (US Oil) kbbl (US Beer) bbl (US Beer) mbbl (US Beer) ubbl (US Beer) ft klb (US) lb (US)			m (*)	Selects flow units for the flow rate span. Linked with B21.
C41	Base Time Unit (TIME UNIT)	W	/d /h /min /s			/s (*)	Selects time units for the flow rate span. Linked with B22.
C42	Flow Span (FLOW SPAN)	W	0.0001 to 32000	C40/C41 (B21 /B22)	0 to 4	1 m/s (*)	Sets flow rate span (with units from C40 and C41). Linked with B23.
C43	Flow Decimal Pnt (FLOW DECIMAL)	W	Auto 0 1 2 3			Auto (*)	Selects decimal point position for the display unit's instantaneous flow rate. Linked with B24.

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Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
C44	Velocity Check (VELOCITY CHK)	R	0.000 to 99.999	m/s	3		Display of the span setting using flow velocity (m/s).
C45	Density Unit (DENSITY UNIT)	W	kg/m^3 lb/gal lb/cf			kg/m^3	Sets units for density when mass flow rate is selected.
C46	Mass Flow Density (MASS DENSITY)	W	0 to 32000	C45	0 to 4	0	Sets density when mass flow rate is selected (with units from C45).
C47	User Span Select (USER SPN SEL)	W	No Yes			No	Selects whether or not special units are used for flow rate units.
C48	Flow User Unit (FL USER UNIT)	W	8 alphanumeric characters				Sets the special flow rate units.
C49	Flow User Span (FL USER SPAN)	W	0.0001 to 32000	C48	0 to 4	100	Sets span when using special flow rate units.
C60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(4) Item D (Menu D): Total Setting items

Menu D contains setting items such as the totalization scale and the forward/reverse totalized values.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
D00	Total Set (TOTAL SET)						
D10	Total Unit (TOTAL UNIT)	W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/P Pulse/s			Pulse/s (*)	Selects the flow rate unit per one pulse as used for totalization display. Linked with B30.
D11	Total Scale (TOTAL SCALE)	W	0 to 32000	D10 (B30)	0 to 4	0 (*)	Sets the flow rate per one pulse as used for totalization display. Linked with B31.
D12	Total Decimal Pnt (TL DECIMAL)	W	0 1 2 3 4 5 6 7			0	Selects position of decimal point for totalization display
D13	Total Low Cut (TOTAL LOWCUT)	W	0 to 100	%	0	3 %	Sets the range in vicinity of 0% within which the totalization display will be halted.
D20	Total Execution (TOTAL EXEC)	W	Start Stop Preset Total Preset Rev Total			Start	Executes "Start" or "Stop" of the totalization function, or executes "Preset Total" or "Preset Rev Total".
D21	Ttl Set Val Lower (TL SET VAL L)	W	0 to 999999		0	0	Sets the totalization preset value in the lower 6 digits of the 8-digit totalized value.
D22	Ttl Set Val Upper (TL SET VAL U)	W	0 to 99		0	0	Sets the totalization preset value in the upper 2 digits of the 8-digit totalized value.
D23	Ttl Switch Lower (TL SWITCH LO)	W	0 to 999999		0	0	Sets the totalization switch value in the lower 6 digits of the 8-digit totalized value.
D24	Ttl Switch Upper (TL SWITCH UP)	W	0 to 99		0	0	Sets the totalization switch value in the upper 2 digits of the 8-digits totalized value.
D30	Ttl User Select (TL USER SEL)	W	No Yes			No	Selects whether or not special units are used as totalized units.
D31	Ttl User Unit (TL USER UNIT)	W	8 alphanumeric characters				Sets the special totalized units.
D60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(5) Item E (Menu E): Pulse Setting items

Menu E contains items relevant to pulse output. This is used to set parameters such as the pulse scale and width.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
E00	Pulse Set (PULSE SET)						
E10	Pulse Unit (PULSE UNIT)	W	n Unit/P u Unit/P m Unit/P Unit/P k Unit/P M Unit/P Pulse/s			Pulse/s (*)	Selects the flow rate unit per one pulse as used for pulse output. Linked with B32.
E11	Pulse Scale (PULSE SCALE)	W	0 to 32000	E10 (B32)	0 to 4	0 (*)	Sets the flow rate per one pulse as used for pulse output. Linked with B33.
E12	Pulse Width (PULSE WIDTH)	W	50% Duty 0.05 ms 0.1ms 0.5 ms 1 ms 20 ms 33 ms 50 ms 100 ms			50% Duty	Selects the pulse width for pulse output.
E13	Pulse Low Cut (PULSE LOWCUT)	W	0 to 100	%	0	3 %	Sets the range in vicinity of 0% within which pulse output will be halted.
E60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Function".

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(6) Item F (Menu F): Status Functions Setting items

Menu F contains items relevant to multiplex range output and other status Input/Output.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
F00	Status Function (STATUS FUNC)						
F20	DO Function (DO FUNCTION)	W	No Function Pulse Output Alarm Output Warning Output Total Switch (O) H/L Alarm (O) HH/LL Alarm (O) Fwd/Rev Rngs (O) Auto 2 Rngs (O) Auto 3 Rngs (O) Auto 4 Rngs (O) Ext 2 Answer (O)			Pulse Output	Selects function for the DO terminal
F21	DIO Function (DIO FUNCTION)	W	No Function Alarm Output Warning Output Total Switch (O) H/L Alarm (O) HH/LL Alarm (O) Fwd/Rev Rngs (O) Auto 2 Rngs (O) Auto 3 Rngs (O) Auto 4 Rngs (O) Ext 2 Answer (O) 0% Singal Lock (I) Ext Auto Zero (I) Ext Ttl Set (I) Ext R Ttl Set (I) Ext 2 Ttl Set (I)			No Function	Selects function for the DIO terminal

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Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
F22	DO Active Mode (DO ACT MODE)	W	Closed(On) Act Open(Off) Act			Closed(On) Act	Selects whether DO terminal will be set to "On Active" or "Off Active".
F23	DIO Active Mode (DIO ACT MODE)	W	Closed/Short Act Open/Open Act			Closed/Short Act	Selects whether DIO terminal will be set to "Closed/Short Active" or"Open/Open Active".
F30	Forward Span2 (FWD SPAN2)	W	0.0001 to 32000	C40 /C41	0 to 4	1	Sets flow rate span for forward No. 2 range
F31	Forward Span3 (FWD SPAN3)	W	0.0001 to 32000	C40 /C41	0 to 4	1	Sets flow rate span for forward No. 3 range
F32	Forward Span4 (FWD SPAN4)	W	0.0001 to 32000	C40 /C41	0 to 4	1	Sets flow rate span for forward No. 4 range
F33	Reverse Span1 (REV SPAN1)	W	0.0001 to 32000	C40 /C41	0 to 4	1	Sets flow rate span for reverse No. 1 range
F34	Reverse Span2 (REV SPAN2)	W	0.0001 to 32000	C40 /C41	0 to 4	1	Sets flow rate span for reverse No. 2 range
F40	Auto Range Hys (AUTO RNG HYS)	W	0 to 15	%	0	10 %	Sets hysteresis width for automatic range switching
F41	Bi Direction Hys (BI DIREC HYS)	W	0 to 8	%	0	2 %	Sets hysteresis width for forward/reverse switching
F60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Function".

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(7) Item G (Menu G): Alarm Setting items

Menu G contains setting items relevant to alarm output, burnout, alarm record, etc.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
G00	Alarm (ALARM)						
G10	Low Alarm (LOW ALARM)	W	-110 to 110	%	0	-110	Sets level setting value for low flow rate limit (L)
G11	High Alarm (HIGH ALARM)	W	-110 to 110	%	0	110	Sets level setting value for high flow rate limit (H)
G12	Low Low Alarm (LO LO ALARM)	W	-110 to 110	%	0	-110	Sets level setting value for low-low flow rate limit (LL)
G13	High High Alarm (HI HI ALARM)	W	-110 to 110	%	0	110	Sets level setting value for high-high flow rate limit (HH)
G14	H/L Alarm Hys (H/L ALM HYS)	W	0 to 10	%	0	5 %	Sets hysteresis width for high-low flow rate limit alarm
G21	4-20mA Alarm Out (4-20 ALM OUT)	W	2.4mA or Less 4.0mA Hold 21.6mA or More			21.6mA or More	Selects the current output during alarm occurrence.
G22	4-20mA Burn Out (4-20 BURNOUT)	R	High Low			—	Displays the current output during a CPU failure.
G30	Alm-Setting (ALM-SETTING)	W	No Yes			Yes	Selects whether a setting alarm is to be specified as an alarm.
G31	Alm-Sig Over (ALM-SIG OVER)	W	No Yes			Yes	Selects whether a signal overflow alarm is to be specified as an alarm.
G32	Alm-Emp Pipe (ALM-EMP PIPE)	W	No Yes			Yes	Selects whether an empty pipe alarm is to be specified as an alarm.
G33	Alm-HH/LL (ALM-HH/LL)	W	No Yes			No	Selects whether a flow rate high-high or low-low alarm is to be specified as an alarm.
G34	Alm-Adhesion (ALM-ADHESION)	W	No Yes			No	Selects whether an electrode adhesion alarm is to be specified as an alarm.

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Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
G40	Operation Time (OPERATE TIME)	R	0D 00:00 to 99999D 23:59				Operation time
G41	Alm Record1 (ALM RECORD1)	R	10:uP Fault 11:EEPROM Fault 12:A/D(H) Fault 13:A/D(L) Fault 14:A/D(Z) Fault 15:Coil Open 16:EEPROM Dflt 18:Power Off 19:Inst Pwr Fail 28:WDT 30:Sig Overflow 31:Empty Pipe 33:Adhesion Alm				Displays the content of the most recent alarm.
G42	Alm Record Time1 (ALM TIME 1)	R	0D 00:00 to 99999D 23:59				Displays the operation time at the occurrence of the most recent alarm.
G43	Alm Record2 (ALM RECORD2)	R	Same as G41 (Alm Record Time1)				Displays the content of the second most recent alarm.
G44	Alm Record Time2 (ALM TIME 2)	R	0D 00:00 to 99999D 23:59				Displays the operation time at occurrence of the second most recent alarm.
G45	Alm Record3 (ALM RECORD3)	R	Same as G41 (Alm Record Time1)				Displays the content of the third most recent alarm.
G46	Alm Record Time3 (ALM TIME 3)	R	0D 00:00 to 99999D 23:59				Displays the operation time at the occurrence of the third most recent alarm.
G47	Alm Record4 (ALM RECORD4)	R	Same as G41 (Alm Record Time1)				Displays the content of the fourth most recent alarm.
G48	Alm Record Time4 (ALM TIME 4)	R	0D 00:00 to 99999D 23:59				Displays the operation time at the occurrence of the fourth most recent alarm.
G60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(8) Item H (Menu H): Display Setting items

Menu H contains setting items that are relevant to display on the display unit.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
H00	Display Set (DISP SET)						
H10	Display Select1 (DISP SELECT1)	W	Flow Rate(%) Flow Rate Flow Rate(mA) Forward Total Reverse Total Dif Total			Flow Rate(%)	Selects content of the first line for Display Mode. Linked with B40.
H11	Display Select2 (DISP SELECT2)	W	Off Flow Rate(%) Flow Rate Flow Rate(mA) Flow Rate(Bar) Forward Total Reverse Total Dif Total Tag No Adhesion Check Communication			Off	Selects content of the second line for Display Mode. Linked with B41.
H12	Display Select3 (DISP SELECT3)	W	Same as H11 (Display Select2)			Off	Selects content of the third line for Display Mode. Linked with B42.
H20	Display Cycle (DISP CYCLE)	W	200ms 400ms 1s 2s 4s 8s			400ms	Selects the display cycle.
H30	Language (LANGUAGE)	W	English Japanese French German Italian Spanish			English	Selects the language used by the display unit. Linked with B10.
H60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(9) Item J (Menu J): Auxiliary Function Setting items

Menu J contains setting items such as the flow direction, rate limits, and low cut.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
J00	Aux (AUX)						
J10	4-20mA Low Cut (4-20 LOW CUT)	W	0 to 10	%	0	0%	Sets the range in vicinity of 0% within which the current output will be 4 mA.
J11	4-20mA Low Lmt (4-20 LOW LMT)	W	-20.0 to 100.0	%	1	-20.0%	Sets the low limit for current output
J12	4-20mA High Lmt (4-20 HI LMT)	W	0.0 to 120.0	%	1	120.0%	Sets the high limit for current output
J20	Flow Direction (FLOW DIRECT)	W	Forward Reverse			Forward	Selects the flow direction.
J21	Rate Limit (RATE LIMIT)	W	0 to10	%	0	5%	Sets the level to reduce output fluctuation.
J22	Dead Time (DEAD TIME)	W	0 to 15	s	0	0s	Sets the dead time to reduce output fluctuation. When "0" is set, rate limit function is not available.
J23	Pulsing Flow (PULSING FLOW)	W	No Yes			No	Selects whether pulsing flow is to be supported.
J24	T/P Damp Select (T/P DAMP SEL)	W	Damping No Damping			Damping	Selects whether the flow rate value obtained through damping calculation for total/pulse or the instantaneous flow rate value (no damping) for total/pulse is to be used.

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Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
J30	Power Synch (POWER SYNCH)	W	No Yes			Yes	Selects whether or not the internal frequency is to be synchronized with the power supply frequency.
J31	Power Frequency (POWER FREQ)	R/W	47.00 to 63.00	Hz	2	50.00	Displays the power-supply frequency (for Power Synch = "Yes"), or sets the power-supply frequency (for Power Synch="No").
J40	Memo 1 (MEMO 1)	W	ASCII 16 characters				Memo field
J41	Memo 2 (MEMO 2)	W	ASCII 16 characters				Memo field
J42	Memo 3 (MEMO 3)	W	ASCII 16 characters				Memo field
J50	Software Rev No (SOFTWARE REV)	R	—				Software revision number
J60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(10) Item K (Menu K): Diagnostic Function Setting items

Menu K contains items that are relevant to the diagnosis of insulation adhesion to the electrode.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
K00	Diagnosis (DIAGNOSIS)						
K10	Adhesion Check (ADHESION CHK)	W	No Yes			No	Selects whether or not to perform diagnosis of adhesion to the electrode.
K11	Adhesion Level1 (ADH LEVEL1)	W	0.00 to 100.00	M ohm	2	0.10	Sets the resistance value for adhesion Level 1 to the electorode.
K12	Adhesion Level2 (ADH LEVEL2)	W	0.00 to 100.00	M ohm	2	0.50	Sets the resistance value for adhesion Level 2 to the electorode.
K13	Adhesion Level3 (ADH LEVEL3)	W	0.00 to 100.00	M ohm	2	1.00	Sets the resistance value for adhesion Level 3 to the electorode.
K14	Adhesion Level4 (ADH LEVEL4)	W	0.00 to 100.00	M ohm	2	3.00	Sets the resistance value for adhesion Level 4 to the electorode.
K15	Adh Measure Value (ADH MEAS VAL)	R	—	M ohm	2		Displays the resistance value for adhesion to the electrode.
K60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(11) Item M (Menu M): Automatic Zero-Adjustment Function Setting items

Menu M contains items that are relevant to automatic zero adjustment.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
M00	Adjustment (ADJUSTMENT)						
M10	Auto Zero Exe (AUTOZERO EXE)	W	No Execution Execution			No Execution	Selects whether or not automatic zero adjustment is carried out. Linked with B50.
M11	Magflow Zero (MAGFLOW	R/W	-99.999 to 99.999		3	0.000	Displays the result of the automatic zero adjustment, or sets the zero point.
M60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

T0612.EPS

(12) Item N (Menu N): Loop Test Setting items

Menu N contains items that are relevant to the execution of loop testing.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
N00	Test (TEST)						
N10	Test Mode (TEST MODE)	W	Normal Test			Normal	Selects whether mode will be set to "Normal" or "Test".
N11	Test Output Value (TEST OUT VAL)	W	-10 to 110	%	0	0%	Sets the test output value.
N30	Test DO (TEST DO)	W	Open(Off) Closed(On) Pulse			Open(Off)	Selects the test condition for DO terminal.
N31	Test DIO (O) (TEST DIO (O))	W	Input Mode Open(Off) Closed(On)			Input Mode	Selects the test condition for DIO terminal used for output.
N32	Test DIO (I) (TEST DIO (I))	R	Open Short				Displays the test condition for DIO terminal used for input.
N60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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(13) Item P (Menu P): Parameter Protection items

Menu P contains items that are relevant to write protection and passwords.

Item	Name Display unit (BRAIN)	R/W	Data range Display unit /BRAIN	Units	Position of decimal point	Default value (*): Indicated item	Description
P00	Protect (PROTECT)						
P10	Key Code (KEY CODE)	W	0 to 9999			0	Parameter of the display restriction
P20	Write Protect (W PROTECT)	R	No Yes			No	Displays whether or not overwriting of parameter data is prohibited.
P21	Enable Wrt Passwd (ENABLE WRITE)	W	ASCII 8 characters				Sets the correct password so that write protection function will be released.
P22	New Password (NEW PASSWORD)	W	ASCII 8 characters				Sets the password for write protection funcion
P23	Software Seal (SOFT SEAL)	R	Break Keep			Keep	Displays whether or not a Joker password was used (Break).
P60	— (SELF CHECK)	R	Good Error				See "6.5 Alarm Functions".

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6.4 Parameter Description

(1) Menu B: Easy Setup items

Those parameters with a high frequency of use have been grouped together in Easy Setup. All basic functions can be controlled using only the parameters from this block. Parameters from Menu B share identical names with those from other menus; however, modification of one such parameter will result in the other being automatically modified.

[B10: Language] Selection of language used for the display unit
→ This setting is linked with that of parameter **H30**.
One of the following languages can be selected for the display unit.

Data Range

Setting item	Description
English	All parameters, alarm messages, etc. displayed in English.
Japanese	All parameters, alarm messages, etc. displayed in Japanese katakana.
French	All parameters, alarm messages, etc. displayed in French.
German	All parameters, alarm messages, etc. displayed in German.
Italian	All parameters, alarm messages, etc. displayed in Italian.
Spanish	All parameters, alarm messages, etc. displayed in Spanish.

T0614.EPS

[B20: Flow Damping] Setting of the damping time constant
→ This setting is linked with that of parameter **C11**.
The damping time constant should be modified to suppress an output fluctuation or to change the response time. This time constant has an effect on analog output and on the flow rate display (i.e., actual instantaneous flow rate, %, current value), and in addition, it also affects pulse output and totalization. However, when "No Damping" has been set for **J24: T/P Damp Select**, there will be no effect on pulse output or totalization.

* Time constant: The time required for the output to reach 63.2% from 0%.

[B21: Base Flow Unit] Selection of flow units for the flow rate span
→ This setting is linked with that of parameter **C40**.
This parameter selects the flow units for the flow rate span. (In case of mass flow, the setting of density is also required. Refer to **C46: Mass Flow Density** for more details.)

[B22: Base Time Unit] Selection of time units for the flow rate span
→ This setting is linked with that of parameter **C41**.
This parameter selects the time units for the flow rate span; however, if "m" has been selected for the flow rate units, "/s" is automatically set for this parameter.

[B23: Flow Span] Setting of the flow rate span
→ This setting is linked with that of parameter **C42**.
The span can be set for the forward flow rate in the range 0 to 32,000 (although this does not include 0). The units set using **B21/C40: Base Flow Unit** and **B22/C41: Base Time Unit** will be displayed at this time.

NOTE

If the flow rate units, time units, and flow rate span are specified upon ordering, these parameters will be setup before shipment; however, if this is not the case, it will be necessary for the appropriate values to be set up by the user.

NOTE

Flow rate span is the value for instantaneous flow rate that corresponds to a current output of 20 mA. The following factors should be taken into consideration when deciding on the flow rate span.

- In the case of applications with large variations in flow rate, the maximum flow rate should be set. If a flow rate in excess of the flow rate span was to occur, output would be possible up to an upper limit of 108%, and beyond this, error would occur. Note that the same applies to pulse output and totalization.
- In the case of applications that have a relatively stable flow rate, a flow rate span of 1.5 to 2.0 times larger than the normal flow rate may be considered suitable.
- The flow rate to be adopted should - upon conversion to flow velocity - correspond to a value within the range of 0.1 to 10 m/s. The flow velocity can be confirmed using sizing data or with parameter **C44: Velocity Check**, and in the latter case, the value obtained when span is converted to flow velocity will be displayed.
- Regardless of the position of the decimal point, the largest value that can be set on the display unit is 32,000. Furthermore, it is not possible to set a number of 4 or greater for the highest-order digit. Similarly, if 3 is set for this highest-order digit, it will not be possible to set a

number of 2 or greater for the next digit to the right, regardless of the position of the decimal point.
Example: A value of 333.33 is represented by the character string 33333, and since this exceeds 32000, it cannot be set. In such a case, the value 333.3 should be set instead.

[B24: Flow Decimal Pnt] Setting of the decimal point position for the instantaneous flow rate
→ This setting is linked with that of parameter **C43**.
This parameter sets the position of the decimal point for instantaneous flow rate values in terms of the number of digits. When set using "Auto", the decimal point position will be automatically determined in accordance with the setting value for **B23/C42: Flow Span** as shown below.

Flow Span ≤ 9	Decimal point position: 3 digits
9 < Flow Span ≤ 90	Decimal point position: 2 digits
90 < Flow Span ≤ 900	Decimal point position: 1 digit
900 < Flow Span	Decimal point position: no digits (i.e., no decimal point)

When an item other than "Auto" is set, the selected number of digits for the decimal point position is used.

With the decimal point removed, 6 digits are available for the instantaneous flow rate value, and display is possible up to 999,999. If an overflow occurs as a result of the setting adopted for decimal point position, the warning **84: Disp Over Wng** will be displayed to provide notification of this condition.

Example: When 1000 m³/h is set for B23/C42: Flow Span

Item	Display content for instantaneous flow rate value
Auto	1000 m³/h
0	1000 m³/h
1	1000.0 m³/h
2	1000.00 m³/h
3	With the decimal point removed, 7 digits are not available for the instantaneous flow rate value; therefore, a warning is displayed.

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[B30: Total Unit] Setting of units for totalization scale
→ This setting is linked with that of parameter **D10**.
This parameter selects the flow rate units for use in totalization.

Item	Description
n Unit/P	10^{-9}×FU
u Unit/P	10^{-6}×FU.
m Unit/P	10^{-3}×FU
Unit/P	FU
k Unit/P	10^{3}×FU
M Unit/P	10^{6}×FU
Pulse/s	Number of pulses to be counted for one second at 100% output.

FU: Flow rate unit selected in B21/C40: Base Flow Unit.

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[B31: Total Scale] Setting of the totalization scale
→ This setting is linked with that of parameter **D11**.
The flow rate is totalized in individual counts in accordance with this parameter's setting. If 0 is selected, it indicates that the totalization function is not to be used.

NOTE

If a totalization scale is specified upon ordering, this parameter is set up before shipment; however, if this is not the case, it will be necessary for the appropriate value to be set up by the user.

NOTE

- By setting the totalization scale, the totalized value is displayed on the display unit. The totalization scale is determined in accordance with the settings of **B30/D10: Total Unit** and **B31/D11: Total Scale**.
- The maximum value that can be displayed is 99999999, and if this is exceeded, the value 0 is counted once again. However, counting stops at 99999999 when the totalization switch function is used.
- If multiple ranges are being used, the flow rate span for the smallest range becomes the standard for the **D13: Total Low Cut** setting value.
- Totalization for the reverse flow rate and for the differential flow rate is carried out only when "Fwd/Rev Ranges" is selected for **F20: DO Function** or **F21: DIO Function**.
- The totalized units are indicated on the display unit when **B31/D11** is 0.001, 0.01, 0.1, 1, 10, 100, or 1000. In the case of other setting values, the totalized units are not indicated.

Example 1: To count in 1 Ml (mega-liter) steps with flow rate span = 100 m^3/h
Since 1 Ml = 10^3 x m^3, k Unit/P is set for **B30/D10**, and 1 is set for **B31/D11**. "x10^3 m^3" is indicated for the totalized units in the Display Mode.

Example 2: To count in 10 l (liter) steps with flow rate span = 100 m^3/h
Since 1 l = 10^{-3} x m^3, m Unit/P is set for **B30/D10**, and 10 is set for **B31/D11**. "x10^{-2} m^3" is indicated for the totalized units in the Display Mode.

Example 3: To count in 5 l (liter) steps with flow rate span = 100 m^3/h
Since 1 l = 10^{-3} x m^3, m Unit/P is set for **B30/D10**, and 5 is set for **B31/D11**. Since **B31/D11** is not 0.001, 0.01, 0.1, 1, 10, 100, or 1000, there is no indication of totalized units in the Display Mode.

- Setting of totalization scale is not possible when specific selections have been made for **B30/D10: Total Unit**, **B31/D11: Total Scale**, and **B23/C42: Flow Span**. In such a case, a setting alarm will be displayed, and parameters should be changed in accordance with the instructions given.

[B32: Pulse Unit] Setting of the pulse units
→ This setting is linked with that of parameter **E10**.
This parameter selects the flow rate units to be used for pulse output.

Item	Description
n Unit/P	10^{-9}×FU
u Unit/P	10^{-6}×FU
m Unit/P	10^{-3}×FU
Unit/P	FU
k Unit/P	10^{3}×FU
M Unit/P	10^{6}×FU
Pulse/s	Number of pulses to be output for one second at 100% output.

FU: Flow rate unit selected in B21/C40: Base Flow Unit.

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[B33: Pulse Scale] Setting of pulse scale
→ This setting is linked with that of parameter **E11**.
Pulse output is performed in individual counts in accordance with this parameter's setting. If 0 is selected, it indicates that the pulse output function is not to be used.

NOTE

If a pulse scale is specified upon ordering, this parameter is setup before shipment; however, if this is not the case, it will be necessary for the appropriate value to be setup by the user.

NOTE

- By setting the pulse scale, pulse output performs. The pulse scale is determined in accordance with the settings of **B32/E10: Pulse Unit** and **B33/E11: Pulse Scale**.
- If multiple ranges are being used, the flow rate span for the smallest range becomes the standard for the **E13: Pulse Low Cut** setting value.
- Pulse output for the reverse flow rate is carried out only when "Fwd/Rev Ranges" is selected for **F20: DO Function** or **F21: DIO Function**.
- Setting of pulse scale is not possible when specific selections have been made for **B32/E10: Pulse Unit**, **B33/E11: Pulse Scale**, **E12: Pulse Width** and **B23/C42: Flow Span**. In such a case, a setting alarm will be displayed, and parameters should be changed in accordance with the instructions given.

Example 1: To perform pulse output in 1 Ml (mega-liter) steps with flow rate span = 100 m^3/h
Since 1 Ml = 10^3 x m^3, k Unit/P is set for **B32/E10**, and 1 is set for **B33/E11**.

Example 2: To perform pulse output in 10 l (liter) steps with flow rate span = 100 m^3/h
Since 1 l = 10^{-3} x m^3, m Unit/P is set for **B32/E10**, and 10 is set for **B33/E11**.

Example 3: To perform pulse output in 5 l (liter) steps with flow rate span = 100 m^3/h
Since 1 l = 10^{-3} x m^3, m Unit/P is set for **B32/E10**, and 5 is set for **B33/E11**.

[B40: Display Select1] Setting of the first line for display unit
→ This setting is linked with that of parameter **H10**.
This parameter selects the display content of the first line for display unit. The size of the characters which are displayed will depend on the selections made for

B41/H11: Display Select2 and **B42/H12: Display Select3** as described below. (For more details, refer to Chapter 5: Basic Operating Procedures.)

CAUTION

It is not possible to set Display Select1 to "Off".

[B41: Display Select2] Setting of the second line for display unit
→ This setting is linked with that of parameter **H11**. This parameter selects the display content of the second line for display unit. When "Off" is selected, one-line display will be adopted regardless of the setting made for **B42/H12: Display Select 3**.

[B42: Display Select3] Setting of the third line for display unit
→ This setting is linked with that of parameter **H12**. This parameter selects the display content of the third line for display unit. When "Off" is selected for this parameter, two-line display is adopted.

[B50: Auto Zero Exe] Execution of the automatic zero adjustment function
→ This setting is linked with that of parameter **M10**. This parameter executes the automatic zero adjustment function: If "Execution" is selected, this function will be started. "Now Auto Zero Executing..." is indicated while the Auto Zero function is being carried out. The result of the automatic zero adjustment is confirmed using **M11: Magflow Zero**, and if the result exceeds the rated value, the warning **82: Auto Zero Wng** will be displayed. (For more details, refer to Chapter 9: Operation.)

Setting	Function
No Execution	No execution
Execution	Automatic zero adjustment is started.

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(2) Menu C: Basic Setting items

Menu C principally contains the basic setting items for the flowtube.

NOTE

In order to ensure that correct flow rate data can be acquired, it is crucial that the nominal size, flow rate span, and meter factor of the combined remote flowtube are set. In cases where a remote flowtube is ordered at the same time as the AXFA14, or where the AXF integral flowmeter is ordered, the nominal size and meter factor will be set upon shipment from the manufacturing plant, and these will not require additional setting. If the AXFA14 is ordered separately, the default value will be set for the meter factor; accordingly, it will be necessary to set the meter factor indicated on your remote flowtube data plate.
If a flow rate span was specified upon ordering, this will be set before shipment. If this is not the case, however, it will be necessary for the appropriate value to be set by the user.

[C10: Tag No] Setting of the tag number
→ The setting for this parameter corresponds to one of the ordered items.
Up to a maximum of 16 characters can be entered for the display unit. For more details regarding the actual characters that can be used, refer to Section 5.2.2: Setting Mode.

NOTE

If a tag number is specified upon ordering, this parameter is set up before shipment; however, if this is not the case, it will be necessary for the appropriate value to be set up by the user.

[C11: Flow Damping] Setting of the damping time
→ Refer to the description of parameter **B20**.

[C20: Measure Mode] Selection of dual frequency excitation mode

Item	Description
Standard DF	Standard dual frequency excitation
Enhanced DF	Enhanced dual frequency excitation

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Enhanced DF (i.e., enhanced dual frequency excitation) is set to stabilize measurement for difficult applications, such as for high concentration slurries or low conductivity fluid. Note that this parameter is only valid when this product is used in combination with an AXF flowtube, as only supports enhanced dual frequency excitation. (Optional code HF1 or HF2)

NOTE

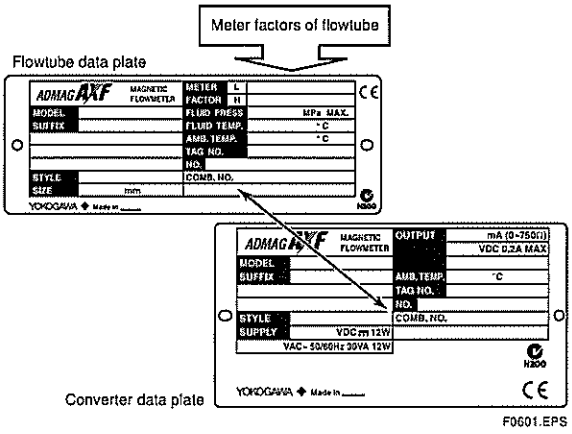
- When this product is used in combination with any flowtube that does not support enhanced dual frequency excitation and "Enhanced DF" is selected, a setting alarm will be displayed. The setting should be returned to "Standard DF" in such a case.
- When dual frequency excitation mode is changed, perform zero adjustment. For details on zero adjustment, refer to chapter 9.

[C21: Low MF] Setting of the low-frequency meter factor
This parameter sets the low-frequency meter factor for standard dual frequency excitation.

[C22: High MF] Setting of the high-frequency meter factor
This parameter sets the high-frequency meter factor for standard dual frequency excitation.

NOTE

Meter Factor Settings



(1) Confirm that the serial number indicated by COMB. NO. on the AXFA14 converter's data plate corresponds with the AXF remote flowtube's serial number.
(2) Set the values that are marked in the METER FACTOR fields on the data plate for the Remote Flowtube.
(3) The meter factors are crucial in ensuring that the electromotive force is correctly in proportion to the flow velocity and are determined at the manufacturing plant by actual-flow calibration.

[C23: Low MF (EDF)] Setting of the low-frequency meter factor for EDF
This parameter sets the low-frequency meter factor as required when Enhanced DF (i.e., enhanced dual frequency excitation) is selected. If "Standard DF" has been selected for **C20: Measure Mode**, neither **C23: Low MF (EDF)** nor **C24: High MF (EDF)** is displayed, and if "Enhanced DF" is selected, the four parameters from **C21** to **C24** will be displayed.

NOTE

For the AXF integral flowmeter, refer to "Section 6.6: Precautions for the AXF integral flowmeter."

[C24: High MF (EDF)] Setting of the high-frequency meter factor for EDF
This parameter sets the high-frequency meter factor as required when Enhanced DF (i.e., enhanced dual frequency excitation) is selected.

[C31: Nominal Size Unit] Setting of the nominal size units
This parameter selects the units used for setting of the nominal size.

[C32: Nominal Size] Setting of the nominal size
This parameter sets the nominal size of flowtube.

[C40: Base Flow Unit] Selection of flow units for the flow rate span
→ Refer to the description of parameter **B21**.

[C41: Base Time Unit] Selection of time units for the flow rate span
→ Refer to the description of parameter **B22**.

[C42: Flow Span] Setting of the flow rate span
→ Refer to the description of parameter **B23**.

[C43: Flow Decimal Pnt] Setting of the decimal point position for the instantaneous flow rate
→ Refer to the description of parameter **B24**.

[C44: Velocity Check] Display of the flow rate span velocity
This parameter displays the flow rate span for the maximum range in m/s units.

[C45: Density Unit] Setting of the density units for mass flow rate
This parameter selects the units for density as required when making settings using **C46: Mass Density**.

[C46: Mass Density] Setting of the density for mass flow rate
This parameter is necessary in situations where t, kg, g, klb or lb has been selected as the mass unit in **B21/C40: Base Flow Unit**. If a mass unit is selected in **B21/C40: Base Flow Unit** and a value of 0 is set for this parameter, the setting alarm "**57: Dens Set Err**" will be displayed. In such a case, ensure that the density is set correctly.

[C47: User Span Select] Selection of the use of special flow rate units
This parameter selects whether or not special units are used for instantaneous flow rate. Actual setting of these units is carried out using **C48: Flow User Unit** and **C49: Flow User Span**.

[C48: Flow User Unit] Setting of the special flow rate units
This parameter is used to select the special units (up to maximum 8 characters in length). These units are displayed when instantaneous flow rate is selected in the Display Mode, and they are displayed for **A20: FLOW RATE** when BRAIN communication is being carried out.

[C49: Flow User Span] Setting of the special flow rate span
This parameter sets the special span to be displayed for 100% output in the maximum range.

NOTE

Example : To set the special flow rate span to 100 dl/s
Since 100 dl (deci-liter)=10 l (liter),
"l (Liter)" is set for **B21/C40: Base Flow Unit**,
"/s" is set for **B22/C41: Base Time Unit**,
"10" is set for **B23/C42: Flow Span**,
"Yes" is set for **C47: User Span Select**,
"dl/s" is set for **C48: Flow User Unit**,
"100" is set for **C49: Flow User Span**.
"100 dl/s" is indicated for 100% output in the Display Mode.

(3) Menu D: Total Setting items

Menu D contains parameters that are relevant to totalization function settings.

[D10: Total Unit] Setting of units for totalization scale
→ Refer to the description of parameter **B30**.

[D11: Total Scale] Setting of the totalization scale
→ Refer to the description of parameter **B31**.

[D12: Total Decimal Pnt] Setting of the decimal point position for the totalization display
This parameter sets the position of the decimal point for totalization display in terms of the number of digits. Except in cases where 0 is selected, the totalized units are not displayed.

Example: When totalized value is 12345678 m^3

Item	Totalization display
0	12345678 m^3
1	1234567.8
2	123456.78
3	12345.678
4	1234.5678
5	123.45678
6	12.345678
7	1.2345678

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[D13: Total Low Cut] Setting of the totalization stop range
This parameter allows the settings to be made that prevent totalization when the flow rate is at or below the low-cut setting value. In cases where there are multiple ranges or forward/reverse ranges, low cut is carried out at the setting value for the smallest span (i.e., an integer between 0 and 10%).
Example: When the first range = 10 m^3/h, the second range = 100 m^3/h, and the Total Low Cut = 3%, no totalization is carried out at flow rates of 0.3 m^3/h or lower.

[D20: Total Execution] Operation setting for the totalization function
This parameter sets "Start" and "Stop" of the totalization function, in addition to performing the preset function for the forward totalized value and the reverse totalized value.
*: The preset function starts the count for totalization from the set value.

Item	Description
Start (initial value)	Starts totalization
Stop	Stops totalization
Preset Total	Sets the preset value for totalization display that has been specified as the forward totalized value. Preset value are determined using **D21: Ttl Set Val Lower** and **D22: Ttl Set Val Upper**. In case that "Start" is sellected, the count for totalization starts from the preset value. Setting of zero as the preset value allows the zero-reset function to be implemented.
Preset Rev Total	Sets the preset value for totalization display that has been specified as the reverse totalized value. Preset value are determined using **D21: Ttl Set Val Lower** and **D22: Ttl Set Val Upper**. In case that "Start" is sellected, the count for totalization starts from the preset value. Setting of zero as the preset value allows the zero-reset function to be implemented.

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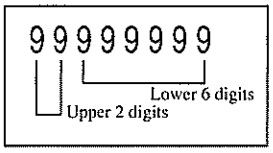
NOTE

Totalization presets can also be set up by using status input. For details regarding the setting method, refer to the descriptions of **F21**.

[D21: Ttl Set Val Lower] Setting of the totalization preset value (lower 6 digits)
This parameter sets a totalization preset value in the lower 6 digits of the 8-digit totalized value. If zero is to be set as the preset value, "000000" should be set here.

[D22: Ttl Set Val Upper] Setting of the totalization preset value (upper 2 digits)
This parameter sets a totalization preset value in the upper 2 digits of the 8-digit totalized value. If zero is to be set as the preset value, "00" should be set here.



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[D23: Ttl Switch Lower] Setting of the totalization switch value (lower 6 digits)
The totalization switch function operates to set the status output terminal (i.e., DO or DIO) to "Closed (On)" when the forward internal totalized value reaches or exceeds the totalization switch value. (For details regarding the setting method for the status output, refer to the descriptions of parameters **F20** and **F21**.)

If this function is set up, the totalization count will stop at 99999999.
D23 sets the lower 6 digits of the 8-digit totalization switch value.

[D24: Ttl Switch Upper] Setting of the totalization switch value (upper 2 digits)
This parameter sets the upper 2 digits of the 8-digit totalization switch value.

[D30: Ttl User Select] Selection of the use of special totalization unit
This parameter specifies whether or not special units are used for totalization unit. Actual setting of these units is carried out using **D31: Ttl User Unit**.

[D31: Ttl User Unit] Setting of special totalization units
Units of up to maximum 8 characters in length can be specified using this parameter. The units set with this parameter are displayed whenever totalization (i.e., FTL, RTL, DTL) is selected in the Display Mode, and they are displayed for **A30: TOTAL, A31: REV TOTAL**, and **A32: DIF TOTAL** when BRAIN communication is being carried out.

NOTE

Example: To count in 1 dl (deci-liter) steps with flow rate span=10 l/s.
Since 1 dl (deci-liter) = 0.1 l (liter),
"l (Liter)" is set for **B21/C40: Base Flow Unit**,
"/s" is set for **B22/C41: Base Time Unit**,
"10" is set for **B23/C42: Flow Span**,
"Unit/P" is set for **B30/D10: Total Unit**,
"0.1" is set for **B31/D11: Total Scale**,
"Yes" is set for **D30: Ttl User Select**,
"dl" is set for **D31: Ttl User Unit**.
"dl" is indicated for the totalized units in the Display Mode and is counted in 1 dl steps.

(4) Menu E: Pulse Setting items

Menu E contains items relevant to pulse output.

NOTE

For pulse output from the DO terminal, set **F20: DO Function** to "Pulse Output."

[E10: Pulse Unit] Setting of the pulse units
→ Refer to the description of parameter **B32: Pulse Unit**

[E11: Pulse Scale] Setting of the pulse scale
→ Refer to the description of parameter **B33: Pulse Scale**

[E12: Pulse Width] Setting of the pulse width
This parameter selects the pulse width (i.e., m/s : millisecond) that is output.

Data Range

Setting	Pulse Rate (pps)	
	Maximum Value	Minimum Value
(0) 50% Duty	11000	0.0001
(1) 0.05ms	10000	(pps: pulses per second)
(2) 0.1ms	5000	
(3) 0.5ms	1000	
(4) 1ms	500	
(5) 20ms	25	
(6) 33ms	15	
(7) 50ms	10	
(8) 100ms	5	

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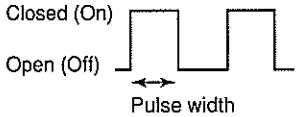
NOTE

*:The pulse width with the exception of "50% Duty" is the "Closed (On)" time for each pulse in case that "Closed (On) Act" is selected for **F22: DO Active Mode**



F0603.EPS

A limit applies to the maximum pulse scale that can be set with respect to the pulse width. If a value in excess of this limit is set, a setting alarm will be displayed.

[E13: Pulse Low Cut] Setting of the pulse output stop range
This parameter allows the settings to be made which prevent pulse output when the flow rate is at or below the low-cut setting value. In cases where there are multiple ranges or forward/reverse ranges, low cut is carried out at the setting value for the smallest span (i.e., an integer between 0 and 10%).
Example: When the first range = 10 m^3/h, the second range = 100 m^3/h, and the Pulse Low Cut = 3%, no pulse output is carried out at flow rates of 0.3 m^3/h or lower.

(5) Menu F: Status Functions Setting items

Menu F contains setting items relevant to status Input/Output functions.

[F20: DO Function] Setting of the function for the DO status output terminal

This parameter sets the function for the DO (status output) terminal.

Setting	Function	Description
No Function	Stops output (i.e., inactive condition)	As no function is set, there is no output.
Pulse Output	Pulse output	Pulse output is carried out.
Alarm Output	Output upon alarm	Refer to Alarms (Section 6.5).
Warning Output	Output upon warning	
Total Switch(O)	Totalization switch output	Status output is carried out when the forward internal totalized value reaches or exceeds the totalization switch value. The totalization switch value is determined using **D23: Ttl Switch Lower** and **D24: Ttl Switch Upper**.
H/L Alarm(O)	H/L alarm output	Status output is carried out when the instantaneous flow rate equals or falls below the low flow rate limit (L), or when it equals or exceeds the high flow rate limit (H). These limit values are determined using **G10: Low Alarm** and **G11: High Alarm**.
HH/LL Alarm(O)	HH/LL alarm output	Status output is carried out when the instantaneous flow rate equals or falls below the low-low flow rate limit (LL), or when it equals or exceeds the high-high flow rate limit (HH). These limit values are determined using **G12: Low Low Alarm** and **G13: High High Alarm**.To output "HH/LL Alarm" as an alarm, set **G33: Alm-HH/LL** to "Yes."
Fwd/Rev Rngs(O)	Forward/reverse flow rate measurement	When flow is in the reverse direction, switching to the reverse range is carried out automatically, measurement is performed, and status output is carried out.
Auto 2 Rngs(O)	Automatic 2 ranges switching	This function ensures that when the instantaneous flow rate exceeds 100% of the range, transition to the next range is carried out automatically. Status output is carried out upon range switching.
Auto 3 Rngs(O)	Automatic 3 ranges switching (Note 1)	
Auto 4 Rngs(O)	Automatic 4 ranges switching (Note 1)	
Ext 2 Answer(O)	Answerback: 2 ranges switching via external status input	When range switching is carried out in response to external status input, status output is performed in the form of an answerback to indicate the range currently being used.

Note 1: When these functions are selected, two terminals become necessary for status output, the DO and DIO terminals which cannot be used for other functions. Accordingly, the setting for **F20: DO Function** is automatically adopted as the setting for **F21: DIO Function**. (Setting of these two functions is not possible using **F21: DIO Function**.)

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[F21: DIO Function] Setting of the function for the DIO status input/output terminal
This parameter sets the function for the DIO (status input/output) terminal.

Setting	Function	Description
No Function	No function	As no function is set, there is no input and output.
Alarm Output	Output upon alarm	Refer to Alarms (Section 6.5).
Warning Output	Output upon warning	
Total Switch(O)	Totalization switch output	Status output is carried out when the forward internal totalized value reaches or exceeds the totalization switch value. The totalization switch value is determined using **D23: Ttl Switch Lower** and **D24: Ttl Switch Upper**.
H/L Alarm(O)	H/L alarm output	Status output is carried out when the instantaneous flow rate equals or falls below the low flow rate limit (L), or when it equals or exceeds the high flow rate limit (H). These limit values are determined using **G10: Low Alarm** and **G11: High Alarm**.
HH/LL Alarm(O)	HH/LL alarm output	Status output is carried out when the instantaneous flow rate equals or falls below the low-low flow rate limit (LL), or when it equals or exceeds the high-high flow rate limit (HH). These limit values are determined using **G12: Low Low Alarm** and **G13: High High Alarm**. To output "HH/LL Alarm" as an alarm, set **G33: Alm-HH/LL** to "Yes."
Fwd/Rev Rngs(O)	Forward/reverse flow rate measurement	When flow is in the reverse direction, switching to the reverse range is carried out automatically, measurement is performed, and status output is carried out.
Auto 2 Rngs(O)	Automatic 2 ranges switching	This function ensures that when the instantaneous flow rate exceeds 100% of the range, transition to the next range is carried out automatically. Status output is carried out upon range switching.
Auto 3 Rngs(O)	Automatic 3 ranges switchings (Note 1)	
Auto 4 Rngs(O)	Automatic 4 ranges switchings (Note 1)	
Ext 2 Answer(O)	Answerback: 2 ranges switching via external status input	When range switching is carried out in response to external status input, status output is performed in the form of an answerback to indicate the range currently being used.
0% Signal Lock(I)	0% signal lock via external status input	Based on the external status input, the instantaneous flow rate indication is forcibly set to 0% (i.e., 4 mA), and both totalization and pulse outputs are halted. This setting has precedence over the output signal whenever an alarm occurs. When the 0% signal lock is canceled, the instantaneous flow rate is restored in accordance with the time constant originally set using **B20/C11: Flow Damping**.
Ext Auto Zero(I)	Automatic zero adjustment via external status input	Automatic zero adjustment is carried out in response to external status input. For more details regarding automatic zero adjustment, refer to Chapter 9: Operation.
Ext Ttl Set(I)	Forward totalization preset via external status input	The totalization display value is preset or reset to zero in accordance with the external status input. The preset value is determined using **D21: Ttl Set Val Lower** and **D22: Ttl Set Val Upper**. In case that "Start" is selected for **D20: Total Execution**, the count for totalization starts from the preset value.
Ext R Ttl Set(I)	Reverse totalization preset via external status input	
Ext 2 Ranges(I)	2 ranges switching via external status input	This function allows the switching of 2 ranges in response to status input for a single direction only.

Note 1: When these functions are selected, two terminals become necessary for status output, the DO and DIO terminals which cannot be used for other functions.

T0623.EPS

[F22: DO Active Mode] Setting of the active mode for DO terminal

Operations are performed in accordance with the following table when the active mode has been set to "Closed (On) Act" using this parameter. Operating patterns are reversed when the active mode has been set to "Open (Off) Act."

Selected function	Condition of DO terminal	
	Open (Off)	Closed (On)
Pulse Output (see Example 1)	Open (Off) when pulses are output.	Closed (On) when pulses are output.
Alarm Output (see Example 2)	Good (normal)	Alarm status
Warning Output	Good (normal)	Warning status
Total Switch(O) (see Example 3)	Below setting value	Equal or above setting value
H/L Alarm(O)	Normal	H/L alarm status
HH/LL Alarm(O)	Normal	HH/LL alarm status
Fwd/Rev Rngs(O)	Forward direction	Reverse direction

Note: For "Auto 2 Rngs(O)," "Auto 3 Rngs(O)", "Auto 4 Rngs(O)", and "Ext 2 Answer(O)", see the **Multiple ranges setting** section.

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[F23: DIO Active Mode] Setting of the active mode for DIO terminal

Operations are performed in accordance with the following table when the active mode has been set to "Closed/Short Act" using this parameter. Operating patterns are reversed when the active mode has been set to "Open/Open Act."

Selected function	Condition of DIO (O) terminal	
	Open (Off)	Closed (On)
Alarm Output (see Example 2)	Good (normal)	Alarm status
Warning Output	Good (normal)	Warning status
Total Switch(O) (see Example 3)	Below setting value	Equal or above setting value
H/L Alarm(O)	Normal	H/L alarm status
HH/LL Alarm(O)	Normal	HH/LL alarm status
Fwd/Rev Rngs(O)	Forward direction	Reverse direction

Note: For "Auto 2 Rngs(O)," "Auto 3 Rngs(O)", "Auto 4 Rngs(O)", and "Ext 2 Answer(O)", see the **Multiple ranges setting** section.

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Selected function	Condition of DIO (I) terminal	
	Open	Short
0% Signal Lock (I) (see Example 4)	Normal	Signal locked status
Ext Auto Zero (I)	Normal	Start of automatic zero adjustment
Ext Ttl Set (I)	Normal	Forward totalization preset
Ext R Ttl Set (I)	Normal	Reverse totalization preset

Note: For "Ext 2 Ranges(I)," see the **Multiple ranges setting** section.
*: "DIO (O)" indicates DIO function is used for output. "DIO (I)" indicates DIO function is used for input.

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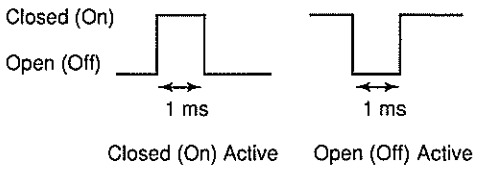
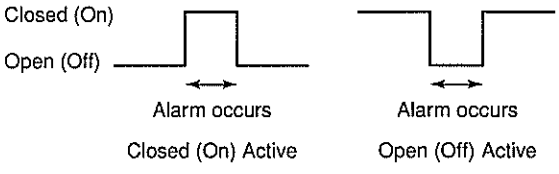
Example 1: When the "Pulse Output" function is selected for the DO terminal and the **E12: Pulse Width** is "1 ms", the following signals are output from the terminal.



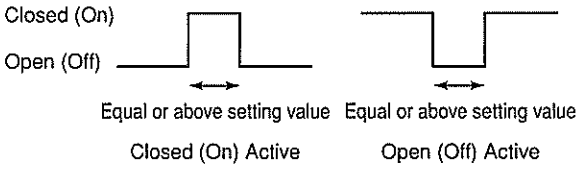
F0604-1.EPS

Example 2: When the "Alarm Output" function is selected for the DO or DIO (O) terminal, the following signals are output from the terminal.



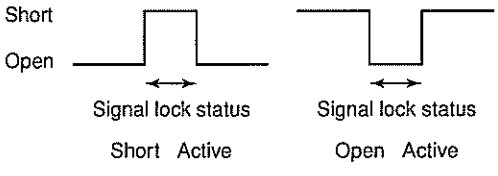
F0604-2.EPS

Example 3: When the "Total Switch (O)" function is selected for the DO or DIO (O) terminal, the following signals are output from the terminal.



F0604-3.EPS

Example 4: When the "0% Signal Lock (I)" function is selected for the DIO (I) terminal, the following signals are input to the terminal.



F0604-4.EPS

NOTE

Multiple ranges setting

Parameters from **F30** to **F41** are used with the automatic multiple ranges and the multiple ranges switching via an external status input. The followings will describe the setting method for each range.

The multiple ranges use the following parameters:

[B23: Flow Span] Setting of the flow rate span (Setting of the forward No.1 range)

[F30: Forward Span 2] Setting of the forward No.2 range

[F31: Forward Span 3] Setting of the forward No.3 range

[F32: Forward Span 4] Setting of the forward No.4 range

[F33: Reverse Span 1] Setting of the reverse No.1 range

[F34: Reverse Span 2] Setting of the reverse No.2 range

[F40: Auto Range Hys] Setting of the automatic multiple ranges hysteresis width.

[F41: Bi Direction Hys] Setting of the forward/ reverse flow measurement hysteresis width

Multiple Ranges Setting 1: Automatic multiple ranges switching

- When the instantaneous flow rate exceeds 100% of the range, transition to the next range (up to four ranges) is carried out automatically. Furthermore, when the flow is in reverse, the reverse range is automatically selected.
- Range switching can be confirmed according to the status of the DO and DIO status output terminals. Refer to Table 6.4.1: Status Output for Automatic Multiple Ranges Switching for details of status output conditions for each range.

Status Output for Automatic Multiple Ranges Switching

Operations are performed in accordance with the following table when the active mode has been set to "Closed (On) Act" using **F22: DO Active Mode** or "Closed/Short Act" using **F23: DIO Active Mode**. Operating patterns are reversed when the active mode has been set to "Open (Off) Act" using **F22: DO Active Mode** or "Open/Open Act" using **F23: DIO Active Mode**.

Table 6.4.1 Status Output for Automatic Multiple Ranges Switching

Parameter setting		Function		Status output		
				DO	DIO	
F20	F21				DIO (O)	DIO (I)
No Function	No Function	Forward single range		–	–	–
Fwd/Rev Rngs (O)	No Function	Auto forward/ reverse 1 range	Forward	Open	–	–
			Reverse	Closed	–	–
No Function	Fwd/Rev Rngs (O)		Forward	–	Open	–
			Reverse	–	Closed	–
Auto 2 Rngs (O)	No Function	Auto forward 2 ranges	Forward 1 range	Open	–	–
			Forward 2 range	Closed	–	–
No Function	Auto 2 Rngs (O)		Forward 1 range	–	Open	–
			Forward 2 range	–	Closed	–
Auto 3 Rngs (O)	Auto 3 Rngs (O)	Auto forward 3 ranges	Forward 1 range	Open	Open	–
			Forward 2 range	Closed	Open	–
			Forward 3 range	Open	Closed	–
Auto 4 Rngs (O)	Auto 4 Rngs (O)	Auto forward 4 ranges	Forward 1 range	Open	Open	–
			Forward 2 range	Closed	Open	–
			Forward 3 range	Open	Closed	–
			Forward 4 range	Closed	Closed	–
Fwd/Rev Rngs (O)	Auto 2 Rngs (O)	Auto forward/ reverse 2 ranges	Forward 1 range	Open	Open	–
			Forward 2 range	Open	Closed	–
			Reverse 1 range	Closed	Open	–
			Reverse 2 range	Closed	Closed	–
Auto 2 Rngs (O)	Fwd/Rev Rngs (O)		Forward 1 range	Open	Open	–
			Forward 2 range	Closed	Open	–
			Reverse 1 range	Open	Closed	–
			Reverse 2 range	Closed	Closed	–

*: "No Function" is the default value. Only DO or DIO terminals are used for single or dual ranges; accordingly, the unused terminal remains at the default value (i.e., No Function) and can therefore be used for other functions.

*: "DIO (O)" indicates DIO function is used for output.

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Parameter setting sequence (for automatic multiple ranges switching)

F20: DO Function
Select a function.

F21: DIO Function
Select a function.

F22: DO Active Mode
Select whether DO output is to be "Closed (On) Act" or "Open (Off) Act".

F23: DIO Active Mode
Select whether DIO output is to be "Closed/Short Act" or "Open/Open Act".

Select a function (Note 1)
No Function: Output is stopped (other functions may be selected)
Fwd/Rev Rngs(O): Forward/reverse flow rate measurement
Auto 2 Rngs(O): Automatic 2-ranges switching
Auto 3 Rngs(O): Automatic 3-ranges switching
Auto 4 Rngs(O): Automatic 4-ranges switching

Refer to Table 6.4.1 and set **F20** or **F21**.
Note 1: "DIO (O)" indicates DIO function is used for output.

B23: Flow Span Forward No.1 range	**F30: Forward Span 2** Forward No.2 range	**F31:Forward Span 3** Forward No.3 range
F32:Forward Span 4 Forward No.4 range	**F33:Reverse Span 1** Reverse No.1 range	**F34:Reverse Span 2** Reverse No.2 range

Set the spans for the ranges to be used.
No.1 range≦No.2 range≦No.3 range≦No.4 range

If "instantaneous flow rate % (FR)" is selected for Display Mode and **A10: FLOW RATE (%)** is selected for BRAIN communication, the instantaneous flow rate % and following symbols will be displayed only for multiple ranges and forward/reverse flow measurement.
Forward No.1 range: [F1] Reverse No.1 range: [R1]
Forward No.2 range: [F2] Reverse No.2 range: [R2]
Forward No.3 range: [F3]
Forward No.4 range: [F4]

F0605.EPS

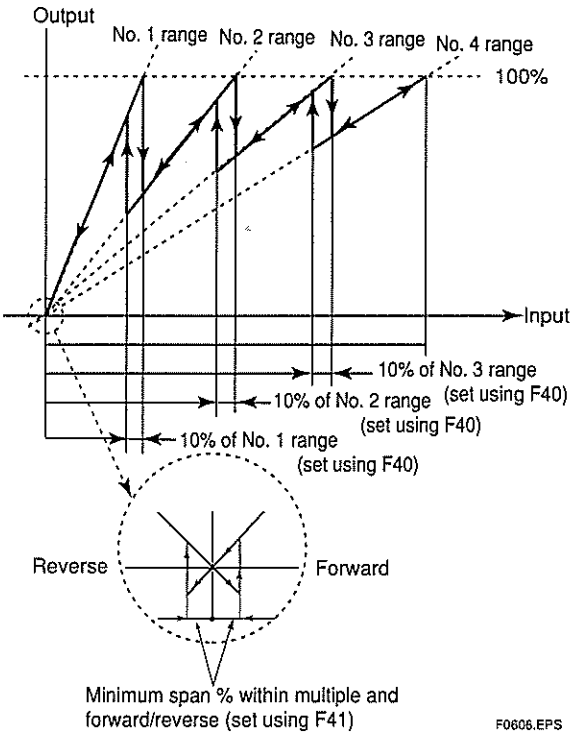


Figure 6.4.1 Multiple Ranges and Hysteresis Widths

NOTE

For more details regarding the setting of hysteresis width, refer to the description of setting parameter for **F40: Auto Range Hys** and **F41: Bi Direction Hys**.

Multiple Ranges Setting 2: Multiple ranges switching via external status input

- For both the forward and reverse directions, switching of up to two ranges can be carried out based on a status input; however, switching between directions is not possible. Switching between forward and reverse ranges is carried out automatically only when the flow direction reverses.
- DIO terminal is used for multiple ranges switching. For more details, refer to Table 6.4.2: Multiple Ranges Switching via External Status Input.

Multiple Ranges Switching via External Status Input

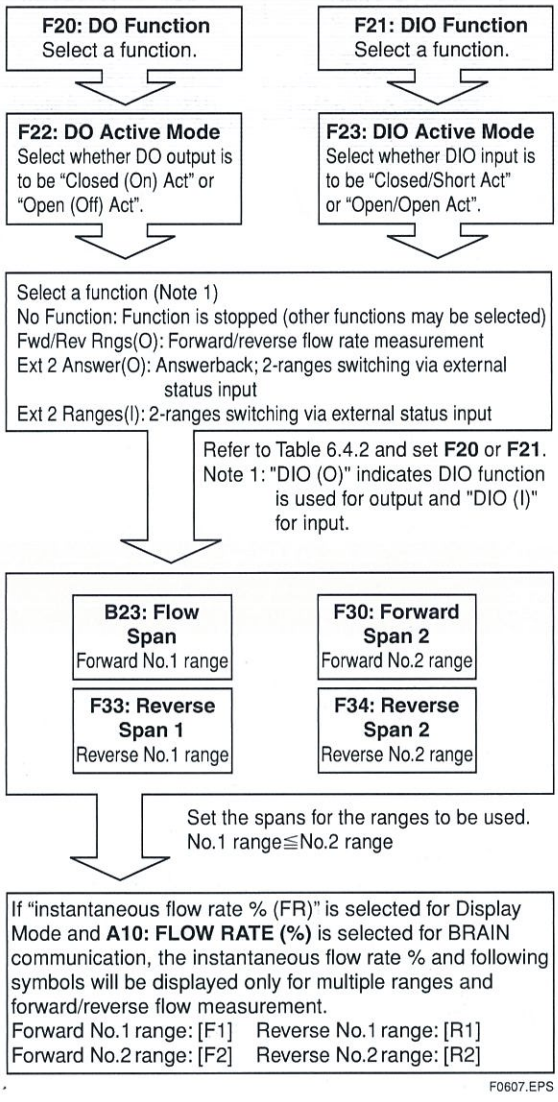
Operations are performed in accordance with the following table when the active mode has been set to "Closed (On) Act" using **F22: DO Active Mode** or "Closed/Short Act" using **F23: DIO Active Mode**. Operating patterns are reversed when the active mode has been set to "Open (Off) Act" using **F22: DO Active Mode** or "Open/Open Act" using **F23: DIO Active Mode**.

Table 6.4.2 Multiple Ranges Switching via External Status Input

Parameter setting		Function		Status output		
				DO	DIO	
F20	F21				DIO (O)	DIO (I)
No Function	Ext 2 Ranges(I)	External forward 2 ranges	Forward 1 range	–	–	Open
			Forward 2 range	–	–	Short
Fwd/Rev Rngs(O)	Ext 2 Ranges(I)	External forward/ reverse 2 ranges	Forward 1 range	Open	–	Open
			Forward 2 range	Open	–	Short
			Reverse 1 range	Closed	–	Open
			Reverse 2 range	Closed	–	Short
Ext 2 Answer(O)	Ext 2 Ranges(I)	External forward 2 ranges, with answerback	Forward 1 range	Open	–	Open
			Forward 2 range	Closed	–	Short

*: "No Function" is the default value. Only DIO terminal is used for dual ranges; accordingly, the unused DO terminal remains at the default value (i.e., No Function) and can therefore be used for other functions.
*: "DIO (I)" indicates DIO function is used for input. T0628.EPS

Parameter setting sequence (for multiple ranges switching via external status input)



F0607.EPS

[F40: Auto Range Hys] Setting of automatic range-switching hysteresis width
Automatic switching takes place for multiple range switching when 100% of the range is exceeded, and this parameter allows a hysteresis width to be set for this switching.
Refer to Figure 6.4.1: Multiple Ranges and Hysteresis Widths.

[F41: Bi Direction Hys] Setting of forward/reverse flow measurement hysteresis width
This parameter sets the hysteresis for forward/reverse flow rate measurement as a % value of the minimum flow span.
Refer to Figure 6.4.1: Multiple Ranges and Hysteresis Widths.

(6) Menu G: Alarm Setting items

(Refer to Section 6.5: Alarm Functions for more details.)

Menu G principally contains setting items relevant to alarms.

[G10: Low Alarm] Low alarm setting

This parameter sets the low limit (L) alarm value, and this is done using a % value of the maximum span.

- A setting value of -110% indicates that the alarm is disabled.

[G11: High Alarm] High alarm setting

This parameter sets the high limit (H) alarm value, and this is done using a % value of the maximum span.

- A setting value of 110% indicates that the alarm is disabled.

[G12: Low Low Alarm] Low-low alarm setting

This parameter sets the low-low limit (LL) alarm value, and this is done using a % value of the maximum span.

- A setting value of -110% indicates that the alarm is disabled.

[G13: High High Alarm] High-high alarm setting

This parameter sets the high-high limit (HH) alarm value, and this is done using a % value of the maximum span.

- A setting value of 110% indicates that the alarm is disabled.

NOTE

Setting of -110% or 110% results in the corresponding function being disabled; accordingly, settings can be combined to implement only high alarms or low alarms, etc.

Output Example 1

The high-high alarm (HH) is set to 90% or more of the flow rate span; the low-low alarm (LL), to 20% or less; the high alarm (H), to 80% or more; and the low alarm (L), to 30% or less.

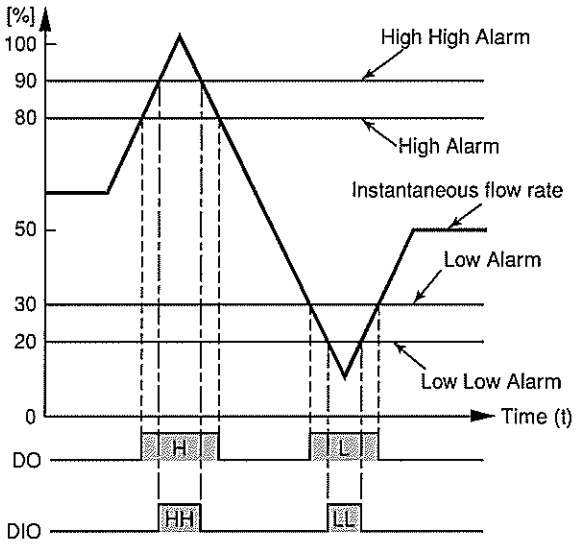
Settings are:

G10: Low Alarm = 30%

G11: High Alarm = 80%

G12: Low Low Alarm = 20%

G13: High High Alarm = 90%



Select "H/L Alarm(O)" for **F20: DO Function**
Select "HH/LL Alarm(O)" for **F21: DIO Function**
Select "Closed (On) Act" for **F22: DO Active Mode**
Select "Closed/Short Act" for **F23: DIO Active Mode**

F0608.EPS

Output Example 2

The high alarm (H) is set to 80% or more of the flow rate span; the low-low alarm (LL), to 20% or less.

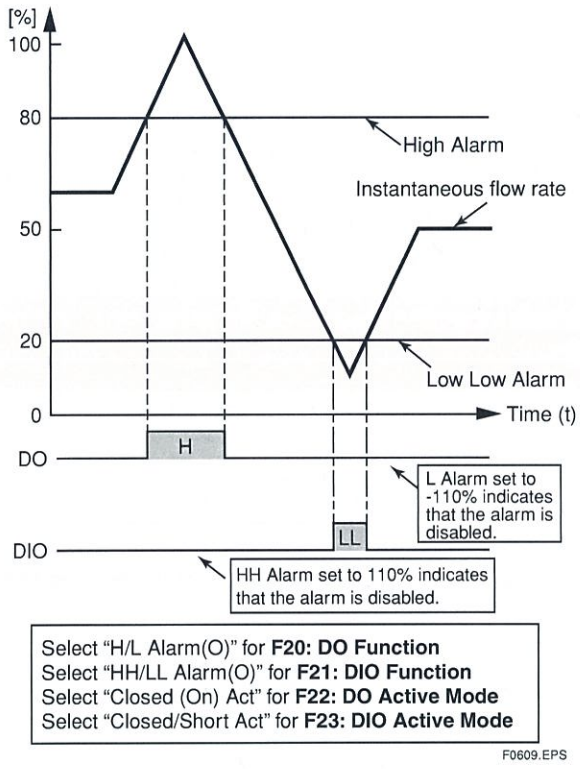
Settings are:

G10: Low Alarm = -110%

G11: High Alarm = 80%

G12: Low Low Alarm = 20%

G13: High High Alarm = 110%



Output Example 3

The high alarm (H) is set to 80% or more of the flow rate span; the high-high alarm (HH), to 90% or more.

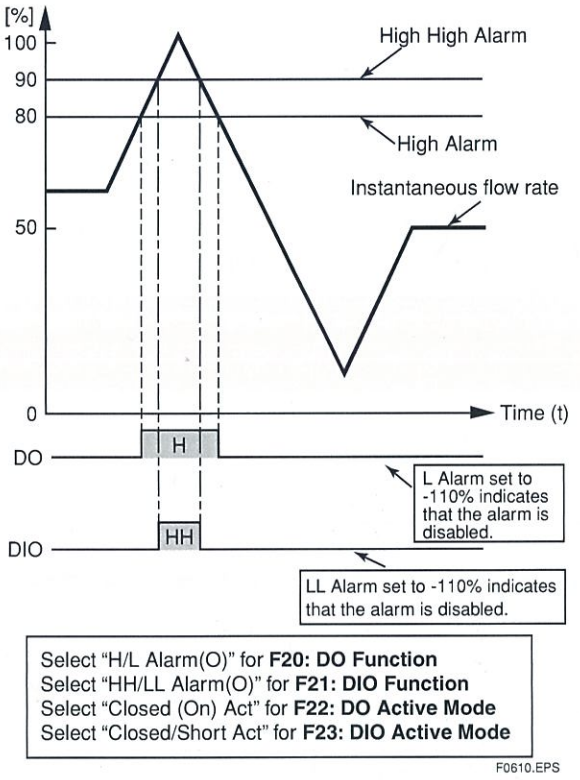
Settings are:

G10: Low Alarm = -110%

G11: High Alarm = 80%

G12: Low Low Alarm = -110%

G13: High High Alarm = 90%



NOTE

- Although the same items can be selected using the DO terminal (selected for **F20**) and the DIO terminal (selected for **F21**), output is identical for both.
- Setting values of -110% and 110% are used to disable corresponding functions; and accordingly, status output can be customized for specific purposes.

[G14: H/L Alarm Hys] Setting of upper/lower alarm value hysteresis width
This parameter sets the hysteresis width for upper and lower alarm value, using a % value of the maximum span.

Output Example

The hysteresis width is set to 5%.

Settings are:

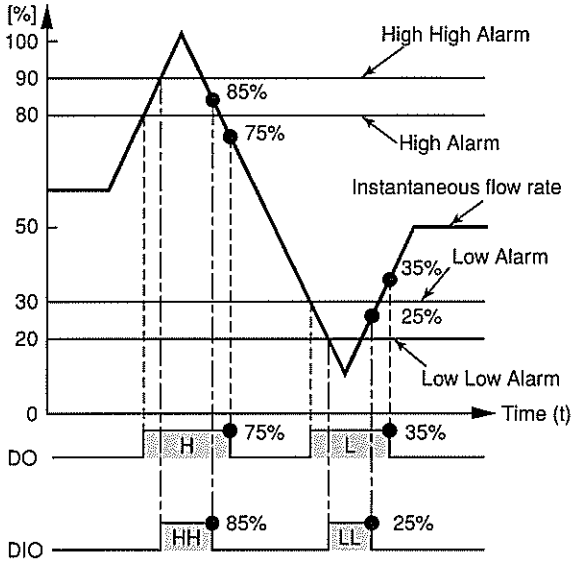
G10: Low Alarm = 30%

G11: High Alarm = 80%

G12: Low Low Alarm = 20%

G13: High High Alarm = 90%

G14: H/L Alarm Hys = 5%



Select "H/L Alarm(O)" for **F20: DO Function**
Select "HH/LL Alarm(O)" for **F21: DIO Function**
Select "Closed (On) Act" for **F22: DO Active Mode**
Select "Closed/Short Act" for **F23: DIO Active Mode**

F0611.EPS

[G21: 4-20mA Alarm Out] Setting of the current output during an alarm occurrence
This parameter can be used to set up the current output during alarm occurrence in advance.

Setting	Function
2.4mA or Less	Fixed at 2.4 mA or less
4.0mA	Fixed at 4 mA
Hold	Fixed current value when an alarm occured.
21.6mA or More	Fixed at 21.6 mA or more

T0629.EPS

[G22: 4-20mA Burn Out] Display of the current output during a CPU failure
This parameter displays the current output direction for a CPU failure (i.e., burnout). Note that communication will not be possible if such a failure occurs.
With the standard specification, this is set to High and 25mA is output when a failure occurs. Low is setup for optional code C1, and in such a case, 0mA is output when a failure occurs.

NOTE

The current output direction for a CPU failure (i.e., burnout) can be changed. Refer to selection 10.2.1: Setting of Burnout Switch.

[G30: Alm-Setting] Alarm recognition of "Setting Alarm"
This parameter specifies whether the setting alarm will be recognized as an alarm.

Setting	Function
No	Not recognized as an alarm
Yes	Recognized as an alarm

T0630.EPS

[G31: Alm-Sig Over] Alarm recognition of "Signal Overflow Alarm"
This parameter specifies whether the signal overflow in process alarms will be recognized as an alarm. A signal overflow occurs when there is an error in the input signal.

Setting	Function
No	Not recognized as an alarm
Yes	Recognized as an alarm

T0631.EPS

[G32: Alm-Emp Pipe] Alarm recognition of "Empty Pipe Alarm"
This parameter specifies whether the empty pipe (flowtube is not filled with fluid) in process alarms will be recognized as an alarm.

Setting	Function
No	Not recognized as an alarm
Yes	Recognized as an alarm

T0632.EPS

[G33: Alm-HH/LL] Alarm recognition of "HH/LL Alarm" (Refer to the descriptions of **G12** and **G13** for more details regarding HH and LL alarms.)
This parameter specifies whether HH/LL alarm in process alarms will be recognized as an alarm.

Setting	Function
No	Not recognized as an alarm
Yes	Recognized as an alarm

T0633.EPS

NOTE

To set "HH/LL Alarm" as an alarm, it is necessary to set "HH/LL Alarm(O)" according to **F20: DO Function** or **F21: DIO Function**, and set **G12: Low Low Alarm** or **G13: High High Alarm** as well.

[G34: Alm-Adhesion] Alarm recognition of "Adhesion Alarm"
This parameter specifies whether the electrode adhesion alarm in process alarms will be recognized as an alarm.

Setting	Function
No	Not recognized as an alarm
Yes	Recognized as an alarm

T0634.EPS

NOTE

The AXFA14 or the AXF integral flowmeter has three different type of alarm (i.e., system alarms, process alarms, and setting alarms). For setting alarms and process alarms, settings are made with **G30**, **G31**, **G32**, **G33** and **G34** to specify whether these will be recognized as an alarm. Refer to Section 6.5: Alarm Functions for more details regarding the content of each alarm and the effect of alarm recognition on output.

[G40: Operation Time] Display of operation time
This parameter is used to display the operation time. The operation time is the total time that is counted while the device works actually.
When the power supply is off, the operation time is not counted.
For example, "1D23:45" indicates an operation time of 1 day, 23 hours, and 45 minutes.

IMPORTANT

Use this value as a rough guideline because the operation time has an error.

[G41: Alm Record1] Alarm record1
This parameter is used to display the most-recent alarm, and the alarms that can be displayed are as follows.

Alarm Items

Item	Description
: 16 space characters (i.e., no display)	No issuing of alarms
10 : uP Fault	Microprocessor (CPU) failure
11 : EEPROM Fault	EEPROM failure
12 : A/D(H) Fault	A/D converter failure (at high frequency
13 : A/D(L) Fault	A/D converter failure (at low frequency side)
14 : A/D(Z) Fault	A/D converter failure (detection of adhesion)
15 : Coil Open	Flowtube coil is open-circuit
16 : EEPROM Dflt	EEPROM returns to default values
18 : Power off	Power supply is off.
19 : Inst Pwr Fail	Instantaneous power fail for tens of milliseconds. After this fail is released, outputs reach the previous value immediately.
28 : WDT	The return from excessive instantaneous noise. After the noise is released, output return the normal condition.
30 : Sig Overflow	Input signal error
31 : Empty Pipe	Flowtube is not filled with fluid
33 : Adhesion Alm	Insulation adhered to electrode

T0635.EPS

NOTE

Records for "30: Sig Overflow" are kept only when **G31** specifies that this condition is to be recognized as an alarm (i.e., "Yes" is selected).
Records for "31: Empty Pipe" are kept only when **G32** specifies that this condition is to be recognized as an alarm (i.e., "Yes" is selected).
Records for "33: Adhesion Alm" are kept only when **G34** specifies that this condition is to be recognized as an alarm (i.e., "Yes" is selected).

[G42: Alm Record Time1] Display the operation time of alarm record1
This parameter is used to display the operation time at which the alarm indicated by **G41: Alm Record1** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

IMPORTANT

Use these values as a reference because the time of alarm records (1 to 4) have an error.

[G43: Alm Record2] Alarm record2
This parameter is used to display the second most-recent alarm, and the alarms that can be displayed are the same as those for **G41: Alm Record1**.

[G44: Alm Record Time2] Display the operation time of alarm record2
This parameter is used to display the operation time at which the alarm indicated by **G43: Alm Record2** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

[G45: Alm Record3] Alarm record3
This parameter is used to display the third most-recent alarm, and the alarms that can be displayed are the same as those for **G41: Alm Record1**.

[G46: Alm Record Time3] Display the operation time of alarm record3
This parameter is used to display the operation time at which the alarm indicated by **G45: Alm Record3** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

[G47: Alm Record4] Alarm record4
This parameter is used to display the fourth most-recent alarm, and the alarms that can be displayed are the same as those for **G41: Alm Record1**.

[G48: Alm Record Time4] Display the operation time of alarm record4
This parameter is used to display the operation time at which the alarm indicated by **G47: Alm Record4** was occurred. For example, "1D23:45" indicates that an alarm was occured at the operation time of 1 day, 23 hours, and 45 minutes.

(7) Menu H: Display Setting items

Menu H contains setting items relevant to the display unit.

[H10: Display Select1] Setting of the first line for display unit
→ Refer to the description for parameter **B40**
This parameter selects the display content of the first line for display unit.

[H11: Display Select2] Setting of the second line for display unit
→ Refer to the description for parameter **B41**
This parameter selects the display content of the second line for display unit.

[H12: Display Select3] Setting of the third line for display unit
→ Refer to the description for parameter **B42**
This parameter selects the display content of the third line for display unit.

[H20: Display Cycle] Setting of the display cycle
This parameter sets the cycle for the display-response speed of display unit. Settings should be made in accordance with the measurement environment by, for example, setting a longer display cycle when using the equipment in low temperatures.

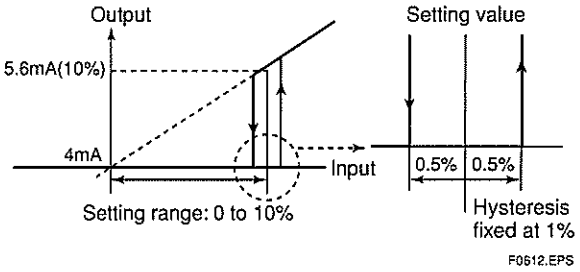
[H30: Language] Selection of language used for the display unit
→ Refer to the description for parameter **B10**
This parameter can be used to select the language for the display unit.

(8) Menu J: Auxiliary Function Setting items

Menu J contains setting items such as the flow direction, rate limits, and current output limits.

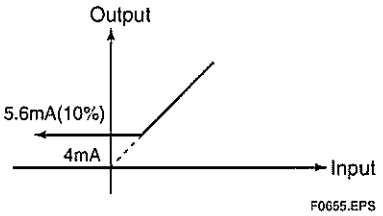
[J10: 4-20mA Low Cut] Setting of the low-cut range for current output
This parameter is used to force current output to 0% (i.e., 4mA) in the vicinity of 0% output, and setting for the current (4 to 20 mA) output low cut is made using a percentage of the smallest flow rate span. However, the low cut function will be terminated if this parameter is set to 0%.
The indications of the instantaneous flow rates (%, Actual instantaneous flow rate, mA, Bar graph) on the display unit are the same action.

Example: Situation where low cut is set to 10%



[J11: 4-20mA Low Lmt] Setting of the low limit for current output
This parameter is used to restrict low current portions of current (4 to 20mA) output, and it is initially set to -20%. Setting should be performed when a higher value is required for the lower limit.
The indications of the instantaneous flow rates (%, Actual instantaneous flow rate, mA, Bar graph) on the display unit are the same action.

Example: Situation where low limit is set to 10%



NOTE

If "2.4mA or less" has been set for **G21:4-20mA Alarm Out**, 2.4mA or less will be output upon an alarm occurrence, regardless of the low limit setting.

NOTE

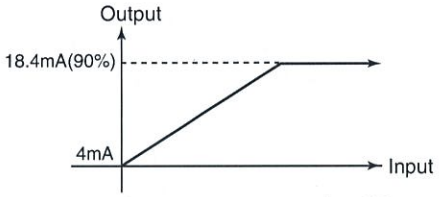
- If the setting value for the low limit is not less than the high limit value (as set using **J12: 4-20mA High Lmt**), the setting alarm "54: 4-20 Lmt Err" will be displayed.
- This parameter has no effect on pulse output or the totalization function.

[J12: 4-20mA High Lmt] Setting of the high limit for current output

This parameter is used to restrict high current portions of current (4 to 20mA) output, and it is initially set to 120%. Setting should be performed when a lower value is required for the higher limit.

The indications of the instantaneous flow rates (%, Actual instantaneous flow rate, mA, Bar graph) on the display unit are the same action.

Example: Situation where high limit is set to 90%



F0656.EPS

NOTE

If "21.6mA or more" has been set for **G21:4-20 mA Alarm Out**, 21.6mA or more will be output upon an alarm occurrence, regardless of the high limit setting.

[J20: Flow Direction] Setting of the flow direction

Upon shipment from the manufacturing plant, the system is setup such that flow in the same direction, as shown by the direction of the arrow mark on the flowtube, will be measured as forward flow; however, this parameter can be used to set "Reverse" so that flow in the opposite direction to the arrow mark will be treated as forward.

Note: This function does not apply to measurement in both the forward and reverse directions, although this can be setup using by selecting "Fwd/Rev Rngs(O)" from either **F20: DO Function** or **F21: DIO Function**.

Setting	Function
Forward	Forward direction corresponds with arrow mark.
Reverse	Forward direction is opposite to arrow mark.

T0638.EPS

[J21: Rate Limit] Setting of the rate limit value

- This parameter is used in situations where sudden noise cannot be eliminated by increasing the damping time constant.
- In situations where step signals or sudden noise signals caused by slurries or the like are entered, this parameter is used to set the standard for determining whether an input corresponds to a flow measurement or noise. Specifically, this determination is made using upper and lower rate limits and using the dead time.
- Rate limit values are set using a percentage of the smallest range. The range of deviation per one calculation cycle should be input.

[J22: Dead Time] Setting of dead time

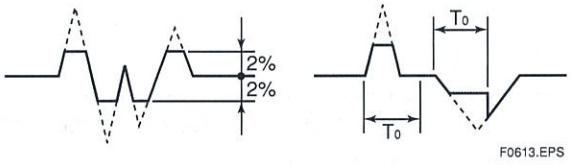
This parameter sets the time for application of the rate limit, and if a value of 0 is set, the rate limit function will be terminated.

NOTE

Determining rate limit value and dead time

Rate limit value:
Determines the level for output fluctuation cutoff. For example, if this is set to 2%, noise above 2% will be eliminated as shown in the diagram.

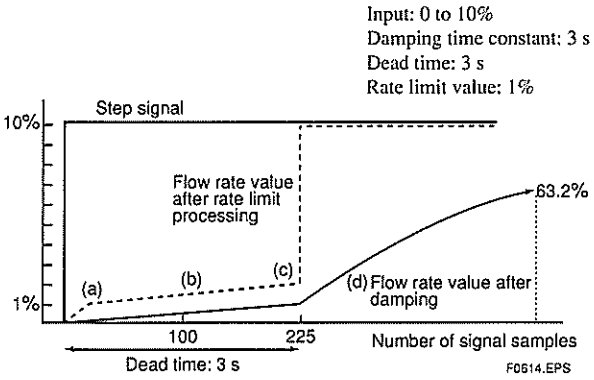
Dead time (T_0):
This is to be determined using the output fluctuation width. If noise exceeds the dead time as shown in the diagram below, the dead time should be made longer.



F0613.EPS

- Signal processing method:
  A fixed upper and lower limit value is setup with respect to the primary delay response value for the flow rate value obtained during the previous sampling, and if the currently sampled flow rate is outside these limits, then the corresponding limit is adopted as the current flow rate value. In addition, if signals which breach the limits in the same direction occur over multiple samples (i.e., within the dead time), it is concluded that the corresponding signal is a flow rate signal.

Example 1: Step input



(1) In comparison with the previous value at (a), it is determined that the signal is in excess of the rate limit value and the response becomes 1%. However, the actual output applies damping, and therefore the output turns out to be as indicated by the solid line.

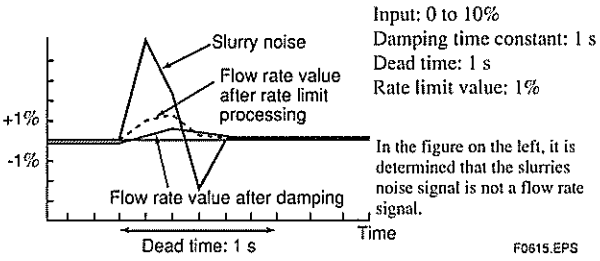
(2) Subsequent flow values within the dead time zone correspond to signals of post-damping flow value + rate limit value (1%).

(3) Since input signals do not return to within the rate limit value during the dead time, it is determined at (c) that this signal is a flow rate signal.

(4) The output signal becomes a damped curve and compliance with the step signal begins.

Three seconds after determination of a flow rate signal in the above figure, a level of 63.2% is reached.

Example 2: Slurry noise



[J23: Pulsing Flow] Selection of pulsing flow support

In a situation where pulsating flow causes error in the average flow value, due to the application of a plunger pump, this parameter provides functionality whereby calculation is controlled and variations in flow rate are followed.

Setting	Function
No	Normal
Yes	Support for pulsing flow

T0637.EPS

[J24: T/P Damp Select] Setting of damping operation

This parameter is used to select that the flow rate value obtained through damping calculation for totalization and pulse output or the instantaneous flow rate value (no damping) for totalization and pulse output.

Setting	Function
Damp	Damping
No Damp	No damping

T0653.EPS

[J30: Power Synch] Setting of power synchronization

This parameter sellects whether or not the internal frequency is to be synchronized with that of the power supply.

Setting	Function
No	Not synchronized
Yes	Synchronized

T0639.EPS

[J31: Power Frequency] Setting of power frequency

When "Yes" (i.e., in synchrony) has been selected for **J30: Power Synch**, this parameter is used to display the power supply frequency. If "No" (i.e., not synchronized) has been selected, the power supply frequency is to be specified.

IMPORTANT

In situations where a DC power supply is used for converters, set the local commercial power frequency in area where the converter is installed.
Set "No" for **J30: Power Synch** and the local commercial power frequency for **J31: Power Frequency**.

Following settings are necessary by power supply and by flow tube size.

Power Supply Code 1

(100 to 240 V AC or 100 to 120 V DC)

		Size 2.5 mm (0.1 in.) to 400 mm (16 in.)
AC power supply	J30	Power synchronous (Yes)
	J31	No setting
DC power supply	J30	Power asynchronous (No)
	J31	Local commercial power frequency

T0642-1.EPS

Power Supply Code 2 (24 V AC/DC)

		Size 2.5 mm (0.1 in.) to 400 mm (16 in.)
AC power supply	J30	Power asynchronous (No)
	J31	Local commercial power frequency
DC power supply	J30	Power asynchronous (No)
	J31	Local commercial power frequency

T0642-2.EPS

[J40: Memo 1] Setting of memo 1

[J41: Memo 2] Setting of memo 2

[J42: Memo 3] Setting of memo 3

These parameters are used with the memo function, and up to 16 characters can be set for each.

[J50: Software Rev No] Display of software revision
This parameter is used to display the software's revision number.

(9) Menu K: Diagnostic Function Setting items

Menu K contains items that are relevant to the diagnosis of insulation adhesion to the electrode.

[K10: Adhesion Check] Setting of adhesion diagnostic function
This parameter selects whether or not the adhesion diagnostic function will be carried out.

Setting	Function
No	Halt the adhesion diagnostic function
Yes	Carry out the adhesion diagnostic function

T0640.EPS

NOTE

Adhesion Diagnostic Function

- This function diagnose adhesion using electrode resistance values.
- When "Adhesion check" has been set for **B41/H11: Display Select 2** or **B42/H12: Display Select 3**, the diagnose adhesion is indicated on the display unit using four different levels.
- If the judgment value for Level 3 is exceeded, a warning is displayed; and if the value for Level 4 is exceeded, an alarm is displayed.
- Available conductivity for this function is limited to:
  Nominal size 10 mm or smaller: 30 μS/cm
  Nominal size 15 mm or larger: 10 μS/cm
  Make sure to use the adhesion diagnostic function with the greater conductivity than the above mentioned value.

F0616.EPS

[K11: Adhesion Level1] Setting the resistance value for adhesion diagnostic level1
This parameter sets the resistance value (in M ohm) for judgment of Level 1.

[K12: Adhesion Level2] Setting the resistance value for adhesion diagnostic level2
This parameter sets the resistance value (in M ohm) for judgment of Level 2.

[K13: Adhesion Level3] Setting the resistance value for adhesion diagnostic level3
This parameter sets the resistance value (in M ohm) for judgment of Level 3.
*: The warning **80: Adhesion Wng** is displayed when the adhension level reaches Level 3.
*: If "Warning Output" has been selected for **F20: DO Function** or **F21: DIO Function**, then status output will be performed when the adhesion level reaches Level 3.

[K14: Adhesion Level4] Setting the resistance value for adhesion diagnostic level4
This parameter sets the resistance value (in M ohm) for judgment of Level 4.
*: The process alarm **33: Adhesion Alm** is displayed when the adhension level reaches Level 4.
*: Alarm output will be preformed if "Alarm Output" has been selected for **F20: DO Function** or **F21: DIO Function**, and "Yes" for **G34: Alm-Adhesion**.

[K15: Adh Measure Value] Displays the resistance value for adhesion diagnose
This parameter displays the value measured using the adhesion diagnostic function (in M ohm).
When "No" is selected for **K10: Adhesion Check**, this parameter displays the indetermination value.

(10) Menu M: Automatic Zero Adjustment Function Setting items

Menu M contains items that are relevant to automatic adjustment of the zero point.

[M10: Auto Zero Exe] Execution of automatic zero adjustment function
→ Refer to the description of parameter **B50**.

[M11: Magflow Zero] Results of automatic zero adjustment
This parameter is used to display the results obtained from **B50/M10: Auto Zero Exe**. Specifically, the correction value displayed, and it is also possible to directly enter correction value.

(11) Menu N: Loop Test Setting items

Menu N contains items that are relevant to loop testing.

[N10: Test Mode] Setting for loop test execution

Setting	Function
Normal	No execution of loop testing.
Test	Loop testing is started

T0641.EPS

IMPORTANT

(1) Test output has priority over flow rate measurement signals. When carrying out flow rate measurements, be sure to always return to "Normal".
(2) Upon entry to the Test Mode, all output terminals will simultaneously adopt test condition.
(3) "Normal" will be restored when the power is turned off or when 30 minutes have elapsed since entry to Test Mode.
(4) In Test Mode, the warning **83: Fix Cur Wng** will be displayed as a warning message. (For more details, refer to Section 6.5 Alarm Functions.)

[N11: Test Output Value] Setting for test output values

During loop testing, current output (4 to 20mA), totalization, and pulse will be output in accordance with this parameter's setting, and values can be set when "Test" has been selected for **N10: Test Mode**. With multiple ranges or when performing forward/reverse flow measurements, setting should be done using a percentage of the maximum range.

[N30: Test DO] Setting for DO terminal condition during testing

This parameter sets the condition of the DO terminal during loop testing. Setting is possible when "Test" has been selected for **N10: Test Mode**.

Setting	Function
Open (Off)	DO terminal in Open (Off) condition
Closed (On)	DO terminal in Closed (On) condition
Pulse	Outputs pulses as were specified with Menu E.*

T0642.EPS

*: If the pulse scale is 0 pps or there is a pulse setting error, the DO terminal is "Open (Off)."

[N31: Test DIO (O)] Setting for the DIO terminal condition during testing

This parameter sets the condition of the DIO terminal during loop testing. Setting is possible when "Test" has been selected for **N10: Test Mode**.

Setting	Function
Input mode	Must be set when **N32: Test DIO (I)** is used to display the condition of the DIO terminal.
Open (Off)	DIO terminal in Open (Off) condition
Closed (On)	DIO terminal in Closed (On) condition

T0643.EPS

[N32: Test DIO (I)] Display for DIO terminal condition during testing

This parameter is used to display the condition of the DIO terminal. Setting is possible when "Test" has been selected for **N10: Test Mode**.

Setting	Function
Open	DIO terminal in Open condition
Short	DIO terminal in Short condition

T0644.EPS

(12) Menu P: Parameter Protection items

Menu P contains items that are relevant to write protection and passwords.

[P10: Key Code] Parameter of the display restriction

This parameter restricts access to the Service Mode.

NOTE

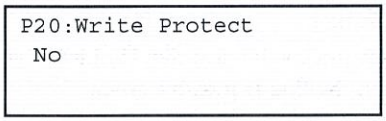
Write Protect function

- The parameters **P20** through **P23** are set when using the write protect function. Specifically, this function responds to a hardware switch or the setting of a software password, and it protects parameters from being overwritten.
- If the hardware switch is set to "Protect", it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to "Enable".
- For more details regarding hardware switch settings, refer to Section 10.2.2: Setting of Write Protect Switch.

[P20: Write Protect] Setting of password to release the write protection function

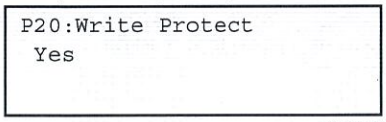
This parameter is used to indicate whether or not write protection is currently on.

Default setting (Enable)



F0617.EPS

Write protection (Protect)



F0618.EPS

[P21: Enable Wrt Passwd] Setting of password to release the write protection function
When the correct password is input, write protection will be released for a period of 10 minutes; furthermore, this period will be extended by a further 10 minutes each time a parameter is overwritten.

F0619.EPS

The cursor will flash when entering Parameter Replacement Mode, and the password set with **P22: New Password** should be input at this time.

[P22: New Password] Setting of a new password
This parameter sets the password required for the release of write protection. When set, it will be possible to make write protect settings on the software side.

Default setting

F0620.EPS

The default setting for this parameter is a string of 8 spaces (i.e., Enable), and thus, the password field will be empty. When the cursor is flashing, the password should be input. Press the SET key twice to confirm the password. The display will then change to "********".

After password setting

F0621.EPS

To change a password, first of all use the password originally set with **P21: Enable Wrt Passwd** to release the write protect function, and then set the new password. Alternatively, if it is desired to return to the condition where no password is set, enter a string of 8 spaces.

[P23: Software Seal] Display the software seal
When the joker password has been used to release write protection, this parameter displays "Break", and when protection is cancelled using the password set using **P22: New Password**, it returns to "Keep".

NOTE

If you should forget your password, the joker password can be used to temporarily release write protection function. To obtain the joker password, please contact your nearest YOKOGAWA sales office.

6.5 Alarm Functions

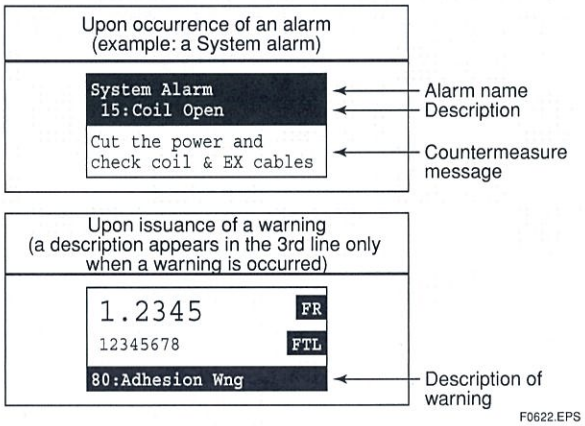
6.5.1 Alarm Levels

Alarms are classified into the following four different types based on level.

Alarm	Level	Description
System alarm	Major breakdown	Device breakdown or inability to obtain correct measurements. Replacement will be required.
Process alarm	Intermediate level break down	Device is normal but process-related errors make correct measurement impossible. Maintenance or the like will be required.
Setting alarm	Minor breakdown	Device is normal but errors have been made in the setting of parameters. Functions not related to the incorrect settings are operating normally. The incorrect settings must be corrected.
Warning	Warning	Device and measurements are normal but a warning is occurred.

T0645.EPS

When an alarm has been occurred, the corresponding alarm name, description, and suitable countermeasure will be displayed on the display unit. The normal Display Mode and Alarm Mode may be displayed alternatively. When a warning has been issued, the corresponding content will be shown in the third line in the Display Mode.



F0622.EPS

6.5.2 Alarm Selection

The display and output differs depending on the alarm levels. Certain types of alarm may or may not be recognized as alarms, according to the settings of certain parameters. The parameters that are relevant to this function as follows.

[F20: DO Function] Setting of the function for the DO status output terminal

[F21: DIO Function] Setting of the function for the DIO status input/output terminal

[F22: DO Active Mode] Setting of the active mode for DO terminal

[F23: DIO Active Mode] Setting of the active mode for DIO terminal

[G21: 4-20mA Alarm Out] Setting of the current output during an alarm occurring.

[G30: Alm-Setting] Alarm recognition of "Setting Alarm"

[G31: Alm-Sig Over] Alarm recognition of "Signal Overflow Alarm"

[G32: Alm-Emp Pipe] Alarm recognition of "Empty Pipe alarm"

[G33: Alm-HH/LL] Alarm recognition of "HH/LL Alarm" (Refer to the descriptions of **G12** and **G13** for more details regarding HH and LL alarms.)

[G34: Alm-Adhesion] Alarm recognition of "Adhesion Alarm"

[G41: Alm Record1] Alarm record1

[G43: Alm Record2] Alarm record2

[G45: Alm Record3] Alarm record3

[G47: Alm Record4] Alarm record4

(1) Display and output condition for system alarms

		Alarm description	Alarm output	4-20 mA output	Totali-zation	Pulse	Display unit	Alarm record
	Normal		Closed (On)	Normal	Normal	Normal	Display Mode	No
10	μP Fault	Microprocessor(CPU)failure	Open (Off)	0mA or 25mA (*)	Indeter-mination	Stopped	Indetermination	Indeter-mination
11	EEPROM Fault	EEPROM failure						
12	A/D(H) Fault	A/D converter failure	Open (Off)	Fixed (G21 selection)	Stopped	Stopped	Alarm Mode (display of system alarm message)	Recorded
13	A/D(L) Fault							
14	A/D(Z) Fault							
15	Coil Open	Flowtube coil is open-circuit						
16	EEPROM Dflt	EEPROM default values						

Note: • Alarm is output only when **F20: DO Function** or **F21: DIO Function** is set to "Alarm Output."
• The operation when "Open (Off) Act" is set for **F22: DO Active Mode**, or "Open/Open Act" is set for **F23: DIO Active Mode** is shown in above table.
• 4-20mA output upon the occurrence of an alarm will be fixed at the value selected with **G21: 4-20mA Alarm Out**.
*The output value is performed in accordance with the setting of the burnout switch. For information about this switch, see Section 10.2.1.

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(2) Display and output condition for process alarms

		Alarm description	Selection (parameter number)	Alarm output	4-20 mA output	Totali-zation	Pulse output	Display unit	Alarm record
30	Sig Overflow	Input signal error	YES (G31)	Open (Off)	Fixed	Stopped	Stopped	Alarm Mode (Message)	Recorded
			NO (G31)	Closed (On)	Continu-ous (*)	Continu-ous (*)	Continu-ous (*)	Display Mode	No
31	Empty Pipe	Flowtube is not filled with fluid	YES (G32)	Open (Off)	Fixed	Stopped	Stopped	Alarm Mode (Message)	Recorded
			NO (G32)	Closed (On)	Continu-ous (*)	Continu-ous (*)	Continu-ous (*)	Display Mode	No
32	HH/LL Alm	HH/LL Alarm	YES (G33)	Open (Off)	Normal operation	Normal operation	Normal operation	Alarm Mode (Message)	No
			NO (G33)	Closed (On)				Display Mode	
33	Adhesion Alm	Electrode adhesion alarm	YES (G34)	Open (Off)	Fixed	Stopped	Stopped	Alarm Mode (Message)	Recorded
			NO (G34)	Closed (On)	Continu-ous (*)	Continu-ous (*)	Continu-ous (*)	Display Mode	No

Note: • Alarm is output only when **F20: DO Function** or **F21: DIO Function** is set to "Alarm Output."
• The operation when "Open (Off) Act" is set for **F22: DO Active Mode** or "Open/Open Act" is set for **F23: DIO Active Mode** is shown in above table.
• 4-20mA output upon the occurrence of an alarm will be fixed at the value selected with **G21: 4-20mA Alarm Out**.
*: Although outputs are continuous, output values are not guaranteed.

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(3) Display and output condition for setting alarm occurrences

		Alarm description	Selection (parameter number)	Alarm output	4-20 mA output	Totali-zation	Pulse output	Display unit	Alarm record
50	Span > 10m/s	Span flow velocity setting is 11 m/s or more	NO (G30)	Closed (On)	Fixed	Stopped	Stopped	Alarm Mode (message)	No
51	Span < 0.1m/s	Span flow velocity setting is 0.05 m/s or less							
52	TTL>10000p/s	Totalization rate is 11000 pps or more		Closed (On)	Normal operation	Stopped	Normal operation	Alarm Mode (message)	No
53	TTL<0.0001p/s	Totalization rate is 0.00005 pps or less							
54	4-20 Lmt Err	The condition [4-20 low limit (J11) < 4-20 high limit (J12)] is not satisfied.		Closed (On)	Fixed	Normal operation	Normal operation	Alarm Mode (message)	No
55	Multi Rng Err	The condition [No. 1 range < No. 2 range < No. 3 range < No. 4 range] is not satisfied for multiple ranges.		Closed (On)	Fixed	Stopped	Stopped	Alarm Mode (message)	No
56	H/L HH/LL Set	The condition [High Alarm (G11) – Low Alarm (G10) > H/L Alarm Hys (G14)] or the condition [High High Alarm (G13) – Low Low Alarm (G12) > H/L Alarm Hys (G14)] is not satisfied.		Closed (On)	Normal operation	Normal operation	Normal operation	Alarm Mode (message)	No
57	Dens Set Err	Mass units have been selected for Base Flow Unit (C40) but density is set to 0.		Closed (On)	Fixed	Stopped	Stopped	Alarm Mode (message)	No
60	PLS >10000p/s	Pulse rate is 11000 pps or more with 50% duty selection.		Closed (On)	Normal operation	Normal operation	Stopped	Alarm Mode (message)	No
		Pulse rate is 10000 pps or more with 0.05 ms selection.							
61	PLS > 5000p/s	Pulse rate is 5000 pps or more with 0.1 ms selection.							
62	PLS > 1000p/s	Pulse rate is 1000 pps or more with 0.5 ms selection.							
63	PLS > 500p/s	Pulse rate is 500 pps or more with 1 ms selection.							
64	PLS > 25p/s	Pulse rate is 25 pps or more with 20 ms selection.							
65	PLS > 15p/s	Pulse rate is 15 pps or more with 33 ms selection.							
66	PLS > 10p/s	Pulse rate is 10 pps or more with 50 ms selection.							
67	PLS > 5p/s	Pulse rate is 5 pps or more with 100 ms selection.							
70	PLS<0.0001p/s	Pulse rate is 0.00005 pps or less.							
71	Meas Mod Set	Measure Mode (C20) is set to Enhanced DF without selecting an optional code HF1 or HF2.		Closed (On)	Fixed	Stopped	Stopped	Alarm Mode (message)	No
72	Size Set Err	A value of 3000.1 mm or more is set for Nominal Size (C32).		Closed (On)	Fixed	Stopped	Stopped	Alarm Mode (message)	No
73	Adh Set Err	The condition [Level:1< Level:2<Level:3<Level:4] is not satisfied for adhesion diagnostic level.		Closed (On)	Normal operation	Normal operation	Normal operation	Alarm Mode (message)	No
	Occurring of any alarm from 50 through 73	–	YES (G30)	Open (Off)	Fixed	Stopped	Stopped	Alarm Mode (message)	No

Note: • Alarm is output only when **F20: DO Function** or **F21: DIO Function** is set to "Alarm Output."
• The operation when "Open (Off) Act" is set for **F22: DO Active Mode** or "Open/Open Act" is set for **F23: DIO Active Mode** is shown in above table.
• 4-20mA output upon the occurrence of an alarm will be fixed at the value selected with **G21: 4-20mA Alarm Out.**

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6.5.3 Alarms & Warning Messages

System Alarms (Device breakdown or inability to obtain correct measurements.)			
Display unit/BRAIN (□60) content	Alarm countermeasure message on display unit	Alarm description	Countermeasure
10:uP Fault	Contact nearest office or service center	Microprocessor (CPU) failure	Contact your nearest Yokogawa office or service center.
11:EEPROM Fault	Contact nearest office or service center	EEPROM failure	
12:A/D(H) Fault	Contact nearest office or service center	A/D converter failure	
13:A/D(L) Fault	Contact nearest office or service center		
14:A/D(Z) Fault	Contact nearest office or service center		
15:Coil Open	Cut the power and check coil & EX cable	Flowtube coil is open-circuit	Turn off the AXFA14 power supply and examine the excitation cable for breakage. If there is no breakage, contact your nearest Yokogawa office or service center. In case of the AXF integral flowmeter, the excitation cable cannot be examined. Contact your nearest Yokogawa office or service center.
16:EEPROM Dflt	Contact nearest office or service center	EEPROM default values	Contact your nearest Yokogawa office or service center.

T0649.EPS

Process Alarms (Device is normal but process-related errors make correct measurement impossible.)			
Display unit/BRAIN (□60) content	Alarm countermeasure message on display unit	Alarm description	Countermeasure
30:Sig Overflow	Check signal cable and grounding	Input signal error	Carry out an investigation as follows: • Check the signal cable for breakage. • Check for contact between signal cable, power cable, and excitation cable. • Check for stray currents in the fluid. • Check the grounding.
31:Empty Pipe	Fill flow tube with fluid	Flowtube is not filled with fluid	Fill the flowtube with fluid.
32:HH/LL Alm	Check the flow rate and setting value	Flow rate alarm for greater than High-High limit value or less than Low-Low limit value.	Check the flow rate and setting value of High High limit and Low Low limit.
33:Adhesion Alm	Clean electrodes	Electrode adhesion alarm	Clean the electrodes.

T0650.EPS

Setting Alarms (Device is normal but errors have been made in the setting of parameters.)			
Display unit/BRAIN (□60) content	Alarm countermeasure message on display unit	Alarm description	Countermeasure
50:Span > 10m/s	Check parameter C40, C41, and C42	Span flow velocity setting is 11 m/s or more	Check whether parameters C40, C41, and C42 are correct. In case that multiple range or forward and reverse flow measurement functions is used, check whether parameters F30 through F34 are correct.
51:Span < 0.1m/s	Check parameter C40, C41, and C42	Span flow velocity setting is 0.05 m/s or less	
52:TTL>10000p/s	Check parameter D10 and D11	Totalization rate is 11000 pps or more	Check whether parameters D10 and D11 are correct.
53:TTL<0.0001p/s	Check parameter D10 and D11	Totalization rate is 0.00005 pps or less	
54:4-20 Lmt Err	Check parameter J11and J12	The condition [4-20 low limit (J11) < 4-20 high limit (J12)] is not satisfied.	Check whether parameters J11 and J12 are correct.
55:Multi Rng Err	Check parameter F30 to F34	The condition [No. 1 range < No. 2 range < No. 3 range < No. 4 range] is not satisfied for multiple ranges.	Check whether parameters F30 through F34 are correct.
56:H/L HH/LL Set	Check parameter G10 to G14	The condition [High Alarm (G11) – Low Alarm (G10) > H/L Alarm Hys (G14)] or the condition [High High Alarm (G13) – Low Low Alarm (G12) > H/L Alarm Hys (G14)] is not satisfied.	Check whether parameters G10 through G14 are correct.
57:Dens Set Err	Check parameter C40, C45, and C46	Mass units have been selected for Base Flow Unit (C40) but density is set to 0.	Check whether parameters C40, C45, and C46 are correct.
60:PLS > 10000p/s	Check parameter E10, E11, and E12	Pulse rate is 11000 pps or more with 50% duty selection. Pulse rate is 10000 pps or more with 0.05 ms selection.	Check whether parameters E10, E11, and E12 are correct.
61:PLS > 5000p/s	Check parameter E10, E11, and E12	Pulse rate is 5000 pps or more with 0.1 ms selection.	
62:PLS > 1000p/s	Check parameter E10, E11, and E12	Pulse rate is 1000 pps or more with 0.5 ms selection.	
63:PLS > 500p/s	Check parameter E10, E11, and E12	Pulse rate is 500 pps or more with 1 ms selection.	
64:PLS > 25p/s	Check parameter E10, E11, and E12	Pulse rate is 25 pps or more with 20 ms selection.	
65:PLS > 15p/s	Check parameter E10, E11, and E12	Pulse rate is 15 pps or more with 33 ms selection.	
66:PLS > 10p/s	Check parameter E10, E11, and E12	Pulse rate is 10 pps or more with 50 ms selection.	
67:PLS > 5p/s	Check parameter E10, E11, and E12	Pulse rate is 5 pps or more with 100 ms selection.	
70:PLS<0.0001p/s	Check parameter E10, E11, and E12	Pulse rate is 0.00005 pps or less.	
71:Meas Mod Set	Check parameter C20	Measure Mode (C20) is set to Enhanced DF without selecting an optional code HF1 or HF2.	Check whether parameter C20 is correct.
72: Size Set Err	Check parameter C32	A value of 3000.1 mm or more is set for Nominal Size (C32).	Check whether parameter C32 is correct.
73: Adh Set Err	Check parameter K11 to K14	The condition in Adhesion detection level, Level:1<Level:2<Level:3<Level:4 is not satisfied.	Check whether parameters K11, K12, K13 and K14 are correct.

T0651.EPS

Setting Alarms (Device and measurements are normal but a warning is issued.)			
Display unit/BRAIN (□60) content	Alarm countermeasure message on display unit	Alarm description	Countermeasure
80:Adhesion Wng	–	Slight adhesion to electrodes.	Clean and check the electrodes. Refer to parameter K13.
82:Auto Zero Wng	–	Results of automatic zero adjustment are higher than the rated values.	Carry out adjustment as follows: • Check if the flowtube is filled with fluid. • Check if the flow velocity is completely zero. • Check the condition of grounding.
83:Fix Cur Wng	–	The current value is fixed.	Confirm whether the flow rate is in excess of the upper limit (108%) or below the lower limit (-8%), or whether upon entry to the Test Mode or not.
84:Disp Over Wng (only for display unit)	–	Overflow in the display digits during instantaneous flow rate display.	Check whether parameter C43 is correct.
90:Disp SW Wng (only for display unit)	–	Display unit switches are not operating.	Investigate whether the display unit cover is fitted or whether the cover's glass surface is dirty.

T0652.EPS

6.6 Precautions for the AXF Integral Flowmeter

Although the AXF integral flowmeter's software configurations are the same as the AXFA14, care must be taken in setting the following parameters:

[C31: Nominal Size Unit] Setting of the nominal size units
[C32: Nominal Size] Setting of the nominal size

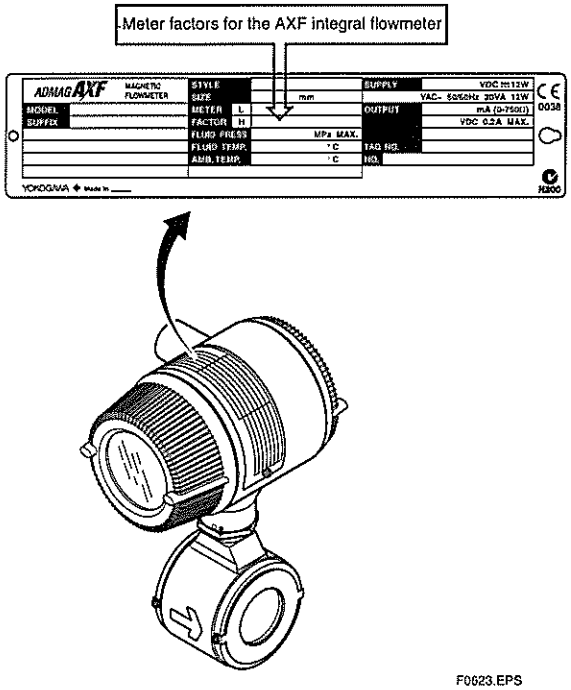
NOTE

The nominal size unit, nominal size and meter factor have been properly set upon shipment from the manufacturing plant. Do not change these parameters.

[C21: Low MF] Setting of the low-frequency meter factor
[C22: High MF] Setting of the high-frequency meter factor
[C23: Low MF (EDF)] Setting of the low-frequency meter factor for enhanced DF (i.e., enhanced dual frequency excitation)
[C24: High MF (EDF)] Setting of the high-frequency meter factor for enhanced DF (i.e., enhanced dual frequency excitation)

NOTE

Setting the meter factor



(1) Confirm that the meter factors indicated on your AXF integral flowmeter's data plate has been set to the parameters.
(2) The meter factors are crucial in ensuring that the electromotive force is correctly in proportion to the flow velocity and are determined at the manufacturing plant by actual-flow calibration.

NOTE

For the hardware configuration of the AXF integral flowmeter, see the user's manual of the AXF Integral Flowmeter [Hardware Edition] (IM 01E20D01-01E).

7. OPERATION VIA BRAIN TERMINAL (BT200)

NOTE

This chapter describes the AXFA14 converter as an example. The same attention must be paid to the AXF integral flowmeter.

7.1 BT200 Basic Operations

7.1.1 Key Layout and Display

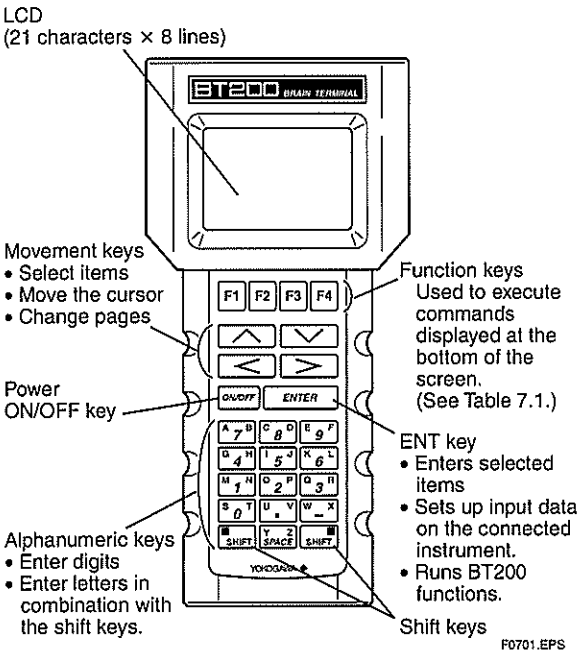
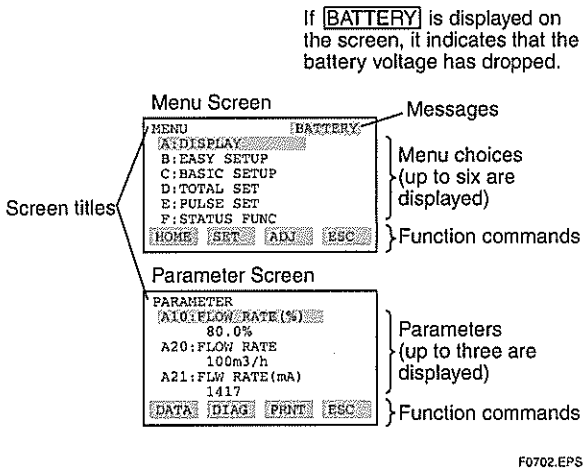


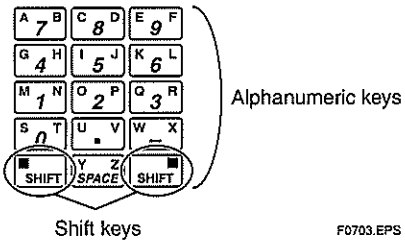
Figure 7.1 Key Layout



7.1.2 Key Descriptions

(1) Alphanumeric keys and shift keys

You can use the alphanumeric keys in conjunction with the shift keys to enter letters, digits, and symbols.



a) Entering digits, symbols, and spaces [i.e., 0-9, period (.), hyphen (-), underscore (_)]

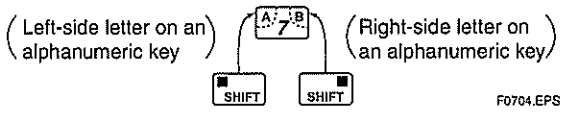
Simply press the required alphanumeric key.

Entry	Key-in sequence
−4	[_ -] [G 4 H]
0.3	[S 0 T] [U . V] [Q 3 R]
1 _ −9	[M 1 N] [Y Z SPACE] [W _ X] [E 9 F]

T0701.EPS

b) Entering letters (i.e., A through Z)

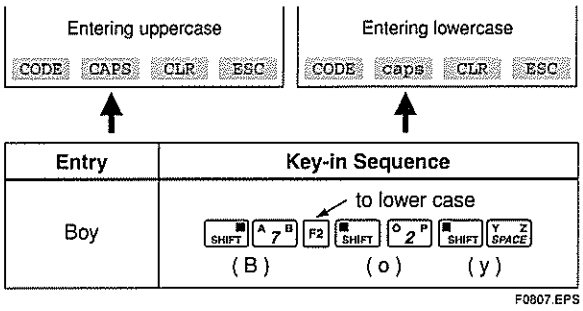
Press an alphanumeric key following a shift key to enter the letter shown on the same side as the shift key. The shift key must be pressed for each letter being input.



Entry	Key-in sequence
W	[SHIFT] [W _ X]
IC	[SHIFT] [I 5 J] [SHIFT] [C 8 D]
J. B	[SHIFT] [I 5 J] [U . V] [SHIFT] [A 7 B]

T0702.EPS

Use the function key [F2] CAPS to select between uppercase and lowercase (for letters only). The case toggles between uppercase and lowercase each time you press [F2] CAPS.

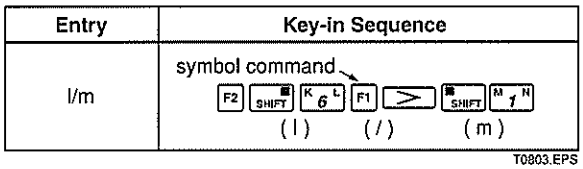


F0807.EPS

Use the function key [F1] CODE to enter symbols. The following symbols will appear in sequence, one at a time, at the cursor each time you press [F1] CODE:

/ . – , + *) (' & % $ # " !

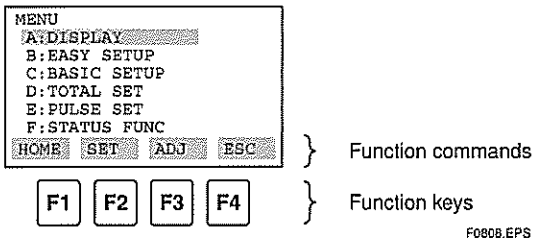
To enter characters next to these symbols, press [>] to move the cursor.



T0803.EPS

(2) Function Keys

The functions of the function keys depend on the function commands on display.



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Function Command List

Command	Function
ADJ	Displays the ADJ menu
CAPS/caps	Selects uppercase or lowercase
CODE	Selects symbols
CLR	Erases input data or deletes all data
DATA	Updates parameter data
DEL	Deletes one character
DIAG	Calls the self-check panel
ESC	Returns to the most recent display
HOME	Displays the menu panel
NO	Quits setup and returns to the previous display
OK	Proceeds to the next panel
PARM	Enters the parameter number setup mode
SET	Displays the SET menu
SLOT	Returns to the slot selection panel
UTIL	Calls the utility panel
*COPY	Prints out parameters on display
*FEED	Paper feed
*LIST	Lists all parameters in the menu
*PON/POFF	Automatic printout mode on or off
*PRNT	Changes to the print mode
*GO	Starts printing
*STOP	Cancels printing

* Available on BT200-P00 (with printer).

T0804.EPS

7.2 AXFA14 Operation Using a BT200

This section describes procedures for setting parameters using a BRAIN Terminal (BT200). For more details regarding AXFA14 functions, refer to Chapter 6: Parameter Description; and for more details regarding BT200 operation methods, refer to the BT200 User's Manual (IM 01C00A11-01E).

7.2.1 BT200 Connection

Connection to a 4 to 20 mA DC signal line

The communication signal is superimposed onto the 4 to 20 mA DC analog signals to be transmitted.

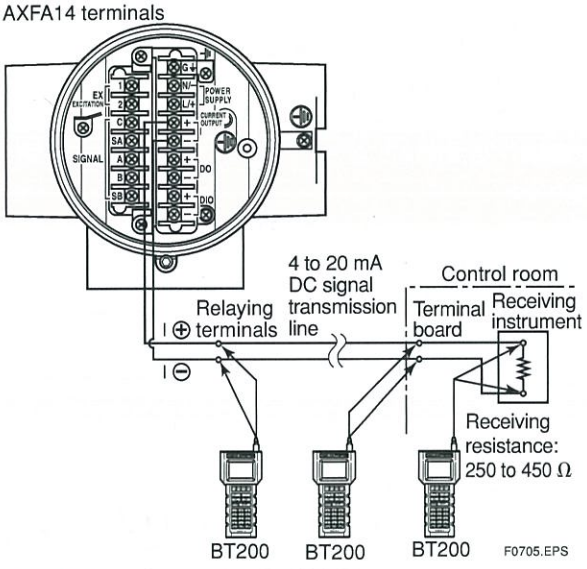

Figure 7.2 Connecting the BT200

WARNING

Be sure to set parameters as "Protect" on the write protect function after finish of parameter setting work.
Under extremely rare case, the infra-red switches may respond unexpectedly in such conditions as sticking ball of water or extraneous substances on the surface of display panel glass according to the principle of infra-red switch operation.
Its probability rises in such cases as sticking rain water by storm or other similar situation and washing up work near flowmeter installation place.
Either to illuminate or stop illuminating the infra-red switches by the flashlight may cause the mis-reaction.

Refer to Chapter 6 "Menu P: Parameter Protection Items" and section "10.2.2" how to use the write protect function in detail.

IMPORTANT

Restrictions exist with regard to the distance over which communication is possible. (See Chapter 11: Outline.)

IMPORTANT

If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, please keep the power on for at least 30 seconds after setting parameters.

IMPORTANT

After approximately 5 minutes of inactivity, the Auto Power-Off function will operate to turn your BT200 off.

NOTE

In case of BT200, the parameters are displayed in English only.
Even if the language with the exception of English is selected at **B10/H30: Language**, the parameters are displayed in English upon BT200.

7.2.2 The data update and upload/ download function of BT200

(1) The data update of BT200

When the following parameters are displayed, the measured data is updated automatically every seven seconds.

Item	Name (BRAIN)	Item	Name (BRAIN)
A10	FLOW RATE (%)	G42	ALM TIME 1
A20	FLOW RATE	G43	ALM RECORD2
A21	FLW RATE (mA)	G44	ALM TIME 2
A30	TOTAL	G45	ALM RECORD3
A31	REV TOTAL	G46	ALM TIME 3
A32	DIF TOTAL	G47	ALM RECORD4
C44	VELOCITY CHK	G48	ALM TIME 4
G22	4-20 BURNOUT	N32	TEST DIO (I)
G40	OPERATE TIME	P20	W PROTECT
G41	ALM RECORD1	P23	SOFT SEAL

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(2) Upload/download function of BT200

Upload function is used when the parameters of one AXFA14 are copied to the BT200. And download function is used when the parameters copied to the BT200 are set to another AXFA14.
For details, refer to BT200 User's Manual (IM 01C00A11-01E).
The targeted parameters for upload and download are following.

Item	Name (BRAIN)	Item	Name (BRAIN)
C11/B20	FLOW DAMPING	D10/B30	TOTAL UNIT
C31	SIZE UNIT	D11/B31	TOTAL SCALE
C32	NOMINAL SIZE	E10/B32	PULSE UNIT
C40/B21	FLOW UNIT	E11/B33	PULSE SCALE
C41/B22	TIME UNIT	H10/B40	DISP SELECT1
C42/B23	FLOW SPAN	H11/B41	DISP SELECT2
C43/B24	FLOW DECIMAL	H12/B42	DISP SELECT3

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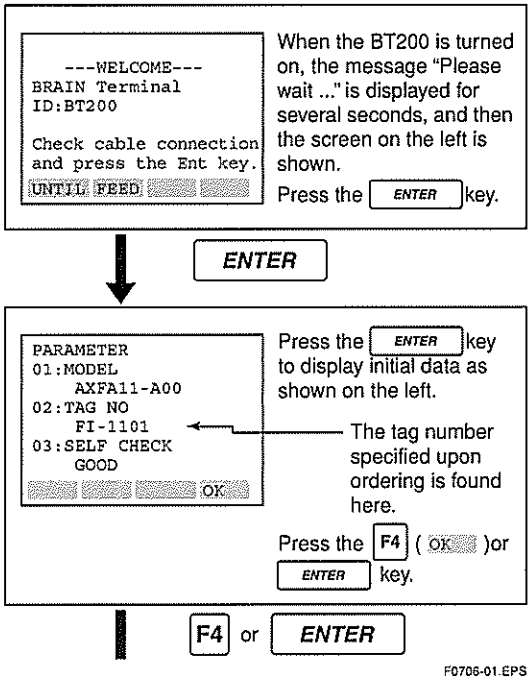
7.2.3 BT200 Screens & Flow Rate Data Display

Use the following procedure to display flow rate data on the BT200.

• The display of flow rate data is updated every 5 seconds.



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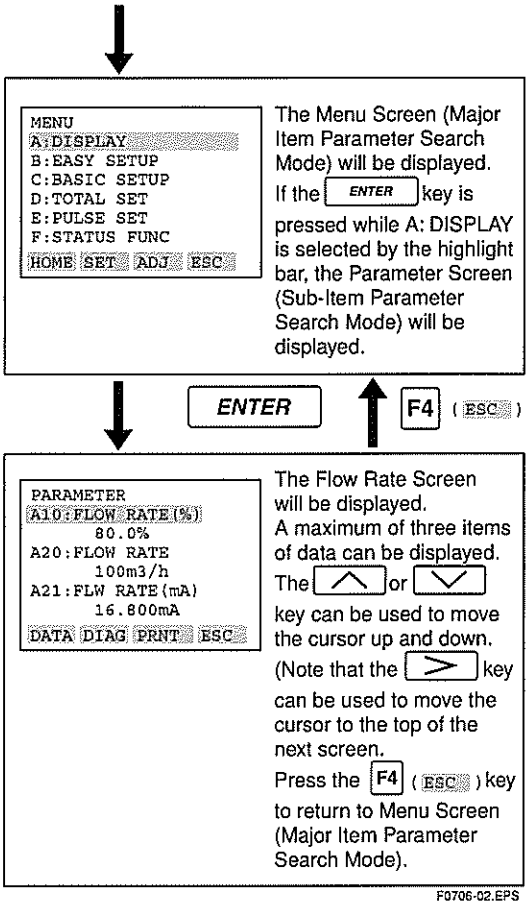

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7.3 Parameter Setting Using a BT200

This section describes the procedure for setting of parametes using a BT200.

IMPORTANT

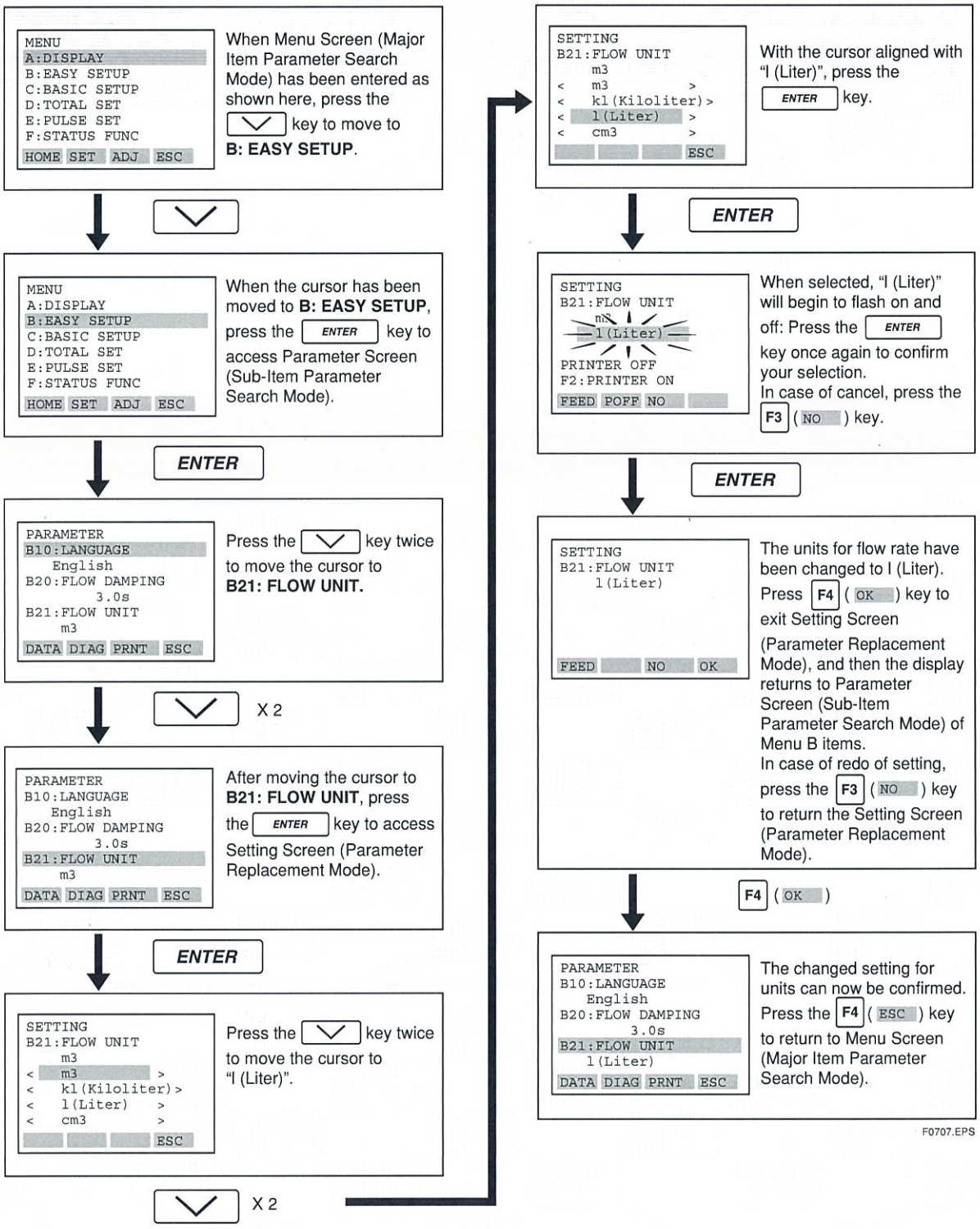
If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, please keep the power on for at least 30 seconds after setting parameters.

NOTE

Before updating any setting, remember to always check the data content you want to change as described in Chapter 6: Parameter Description.

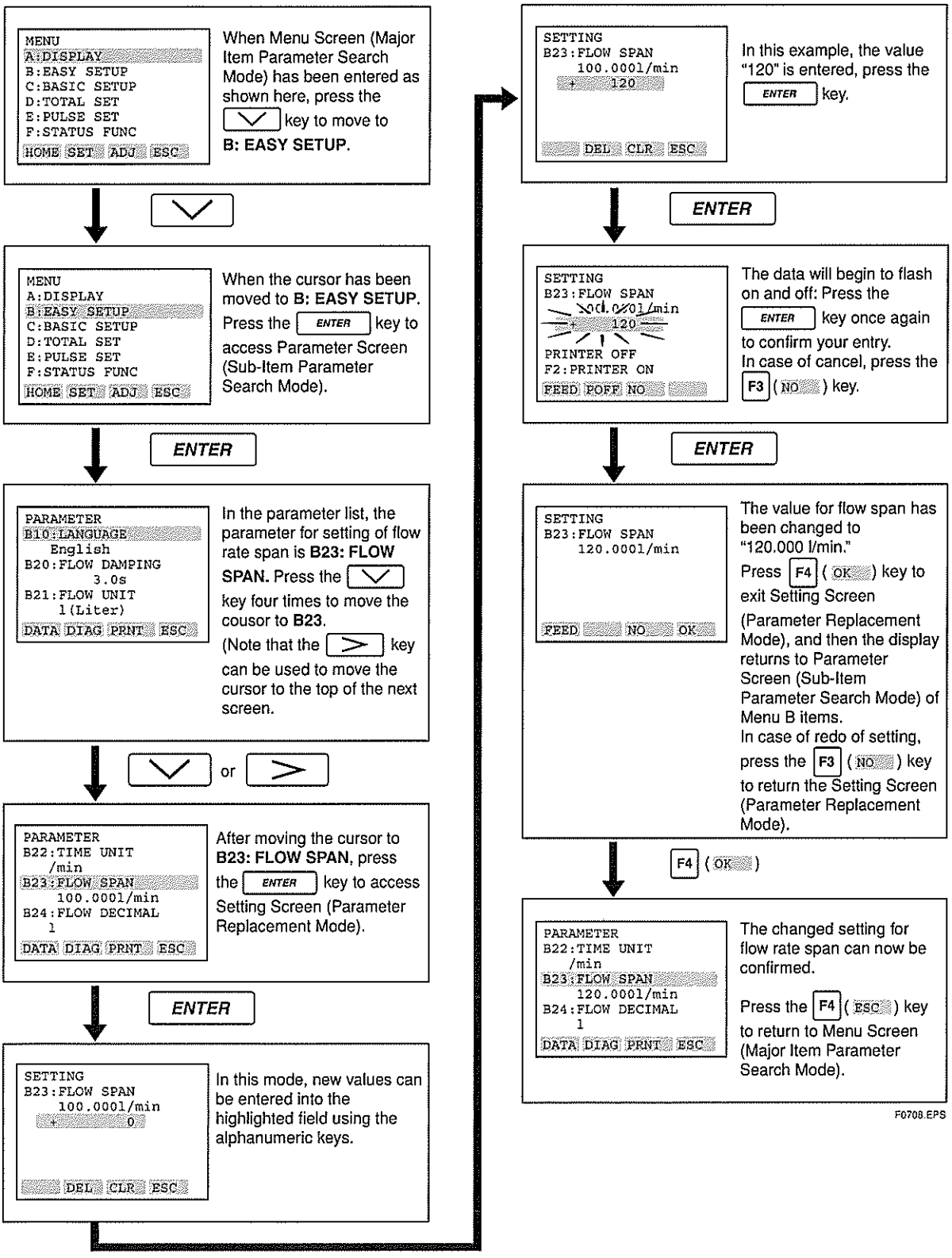
7.3.1 BT200 Setting of Selection-Type Data: Flow rate units

In this example, the flow rate units specified by the selection-type parameter **B21: Flow Unit** are changed from m^3 to l (Liter).



7.3.2 BT200 Setting of Numeric-Type Data: Flow rate span

In this example, the flow rate span specified by the numeric-type parameter **B23: Flow Span** is changed from 100.000 l/min. to 120.000 l/m.



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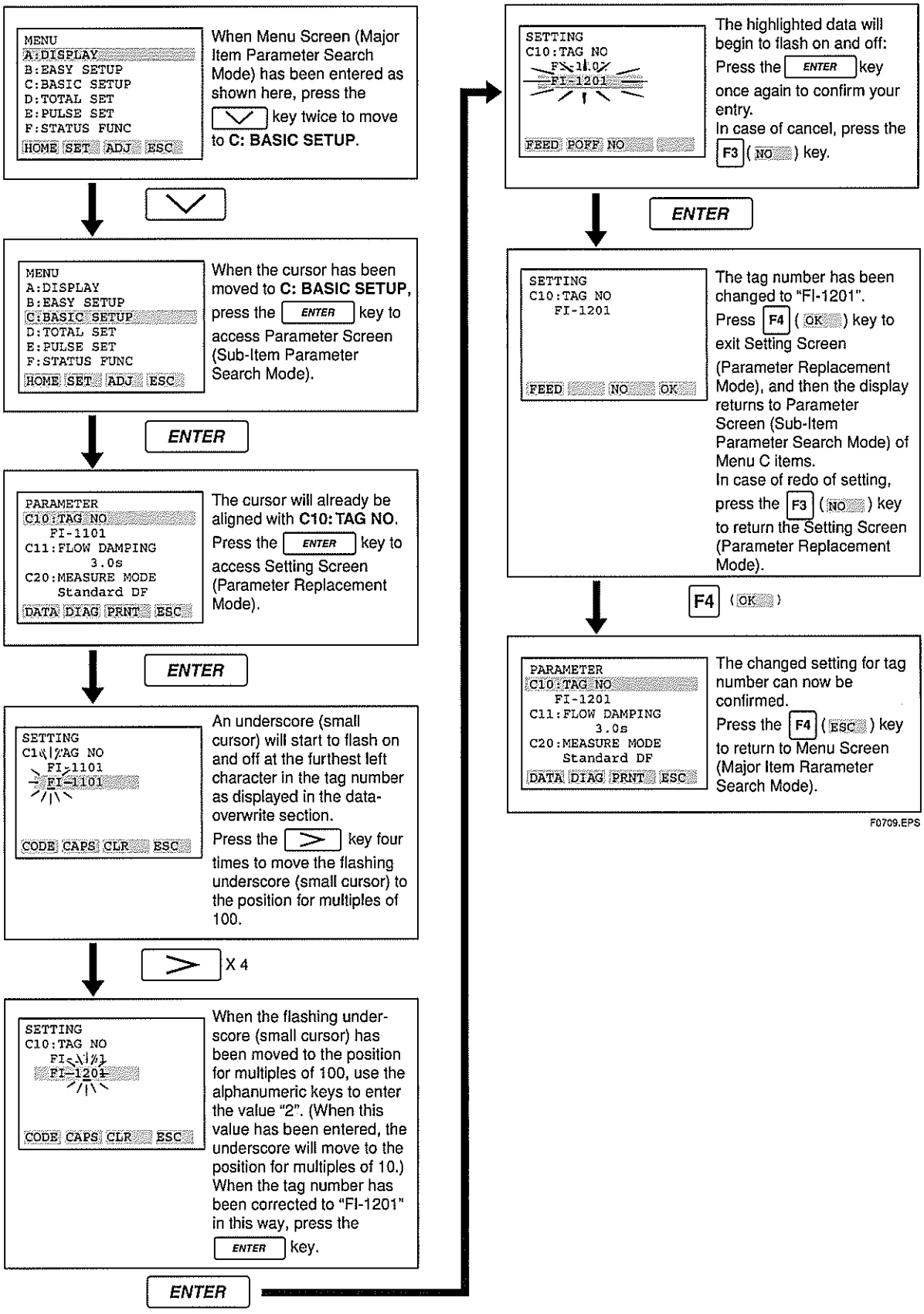
7.3.3 BT200 Setting of Alphanumeric-Type Data: Tag number

In this example, the tag number specified by the alphanumeric-type parameter **C10: TAG NO** is changed from "FI-1101" to "FI-1201".



F0709.EPS

8. OPERATION VIA HART COMMUNICATOR

NOTE

This chapter describes the AXFA14 as an example.

Note: HART is a registered trademark of the HART Communication Foundation.

8.1 Matching of instrument (AXFA14) DD and HART Configuration Tool's DD

Before using the HART Configuration Tool (such as FieldMate), confirm that the DD (Device Description) of the AXFA14 is installed in the Configuration Tool before using.
About the DD, use the device type, device revision and DD Revision shown in follows.

Model Name	DTM Name	Device Type	Device Revision
AXFA14	AXFA14 V1.1	AXFA14 (0x0052)	2

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The DD revisions for AXFA14 and Configuration Tool's can confirm in accordance with the following steps.
If the correct DD is not installed in the HART Configuration Tool, download them from the official HART programming sites, otherwise, contact the respective vendors of the Configuration Tool for its upgrade information.

1. Confirmation of the device revision for AXFA14

   (1) Connect the Configuration Tool to the AXFA14. The device revision can be checked as follows.

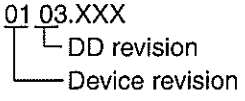
DD	Device Setup → Review → Review4 → Fld dev rev
DTM	Configuration → HART → Fld dev rev

T0802.EPS

2. Confirmation of the device revision for the HART Configuration Tool

   (1) Turn on the power of the Configuration Tool under the standalone condition.

   (2) Confirm the installed DD revision in accordance with the procedure of the Configuration Tool. Refer to its manual how to confirm it in detail.
   The first 2 digits of the DD file are expressed the device revision, and its last 2 digits are expressed the DD revision.



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8.2 Interconnection between AXFA14 and HART Configuration Tool

The HART Configuration Tool can interface with the AXFA14 from the control room, the AXFA14 site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 250 V between the connection and the receiving instrument. To communicate, it must be connected in parallel with the AXFA14, and the connections must be non-polarized. Figure 8.2.1 illustrates the wiring connections for a direct interface at the AXFA14 site. The HART Configuration Tool can be used for remote access from any terminal strip as well.

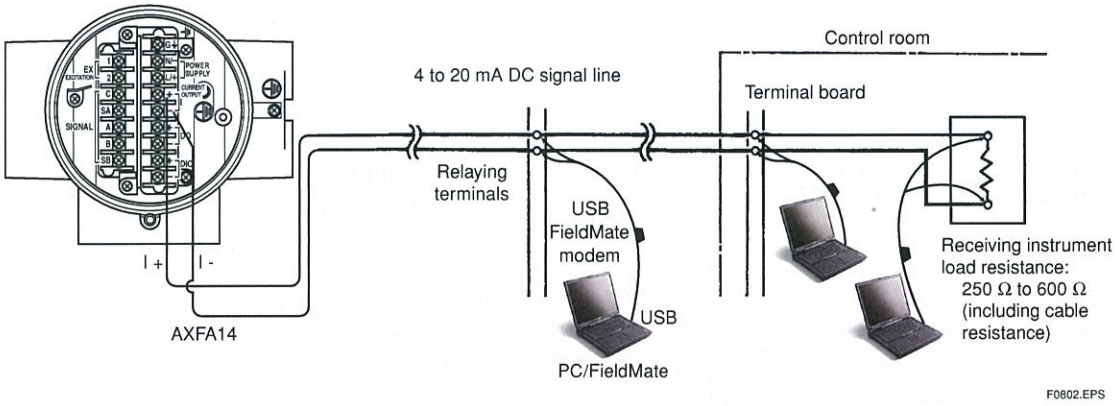

Figure 8.2.1 Interconnection Diagram

WARNING

Be sure to set parameters as "Protect" on the write protect function after finish of parameter setting work.
Under extremely rare case, the infra-red switches may respond unexpectedly in such conditions as sticking ball of water or extraneous substances on the surface of display panel glass according to the principle of infra-red switch operation.
Its probability rises in such cases as sticking rain water by storm or other similar situation and washing up work near flowmeter installation place.
Either to illuminate or stop illuminating the infra-red switches by the flashlight may cause the mis-reaction.
Refer to Chapter 6 "Menu P: Parameter Protection Items" and section "10.2.2" how to use the write protect function in detail. This menu in the 275 is located at [Hot key] → [2 Wrt Protect Menu].

IMPORTANT

If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, please keep the power on for at least 30 seconds after setting parameters.

NOTE

Before updating any setting, remember to always check the data content you want to change as described in Chapter 6: Parameter Description.

NOTE

In case of HART Configuration, the parameters are displayed in English only.
Even if the language with the exception of English is selected at "Language" setting display, the parameters are displayed in English upon HART Configuration Tool.

8.3 Basic Setup

■ Tag and Device Information

The tag number and device information can be checked as follows:

- The location for the tag number and device information

(DD)

Tag	Device Setup → Detailed Setup → Basic setup → **Tag**
Descriptor	Device Setup → Detailed Setup → Device info → Field device info → **Descriptor**
Message	Device Setup → Detailed Setup → Device info → Field device info → **Message**
Date	Device Setup → Detailed Setup → Device info → Field device info → **Date**

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(DTM)

Tag	Easy Setup → Tag or Configuration → HART → **Tag**
Descriptor	Configuration → Device infomation → **Descriptor**
Message	Configuration → Device infomation → **Message**
Date	Configuration → Device infomation → **Date**

T0804.EPS

When changing the tag number or device information, enter the information directly within the following limitations.

Item	Number and characters
Tag	8
Descriptor	16
Message	32
Date	2/2/2 (mm/dd/yy) • mm : month • dd : day • yy : year

T0805.EPS

8.4 Parameters

8.4.1 Parameter configuration

The parameter structure of the HART configuration tool is hierarchical.

Refer to 8.4.6, Menu Tree Example for the corresponding parameters. The menu tree shows a cross-reference of the parameters for HART and BRAIN.

See "Chapter 6 Parameter Description" for the functions of parameters.

Note that some display parameters of AXFA14 are different from those of HART configuration tools.

8.4.2 Data Renewing

There are two methods to load the AXFA14 data from/to HART Configuration Tool --- periodic data renewing and discretionary data renewing. Refer to the 8.4.6 menu tree for each corresponding parameter.

(1) Periodic Data Renewing
The data is updated 0.5 to 2 second cycles. The parameter of this type is marked as "P" in the 8.4.6 menu tree.

(2) Discretionary Data Renewing
The data can be loaded from/to the AXFA14 when the data save is finished to the Configuration Tool. The parameter of this type is marked as "u/d" in the 8.4.6 menu tree.

NOTE

The AXFA14 is not able to set parameters via its display unit during a communication of the HART Configuration Tool.

8.4.3 Self-diagnostic

The self-diagnostic function of the AXFA14 is explained in Section 6.5 "Alarm Functions."
The HART configuration tool can be used to run self-diagnostics on a device and check for incorrect data settings.

(1) Using DD

The **Self test** and **Status** commands are available for self-diagnostics. When **Self test** is run, the display unit shows an error code and alarm message if the device detects any illegal parameter settings or functional faults.

- Procedure to call up the **Self test** display

Device Setup → Diag/Service → Test → Self test

If no error is detected, "Self test OK" is displayed on the configuration tool.
If the specific diagnostic item is known for the check, you can directly call up the item by using the **Status** command.
The status is categorized from 1 to 7.
Show an example below to confirm the status of Status group 1.

- Procedure to call up the **Status** display

Device Setup → Diag/Service → Status → Status group 1

If no error is detected, "Off" is displayed on the configuration tool.
If there is an error, "On" is displayed on the configuration tool, and a countermeasure for that error is necessary.

Example of display:	Span > 10 m/s	On
	Span < 0.3 m/s	Off
	TTL > 10000 p/s	Off
	TTL < 0.0001 p/s	Off
	4-20 Lmt Err	Off

The HART configuration tool diagnoses at each communication.
When an improper operation is performed, the error message is displayed.

(2) Using DTM

The **Device Status** commands are used for self-diagnostics. When **Device Status** is run, the display unit shows an error code and alarm message if the AXFA14 detects any illegal parameter settings or functional faults.

- Procedure to call up the **Device Status** display

Device Status

If no error is detected, "Status: Normal" is displayed on the configuration tool.
If the specific diagnostic item is known for the check, you can directly call up the item by using the Diagnostic List in the Device Status display.
The Diagnostic List is categorized to Device Status, Hardware Failure, Transducer Status, Diag Status, and Configuration.
If no error is detected, color symbol which shows Normal State is displayed on top of the error message.
If color symbol which shows Error State is displayed, there is an error and a countermeasure for that error is necessary.

The HART configuration tool diagnoses at each communication.
When an improper operation is performed, the error message is displayed.

8.4.4 HART Specific Functions

■ Trim Analog Output

This function is used to adjust the analog output at 4 mA and 20 mA with the D/A trim or Scaled D/A trim.

(1) D/A trim
Connect a calibration digital ammeter, and then enter the read value of the ammeter for each output of AXFA14.

- Procedure to call up the **D/A trim** display

DD	Device Setup → Diagnosis/Service → Adjustment → D/A trim
DTM	Calibration → D/A trim

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(2) Scaled D/A trim
The output is adjusted by using a voltmeter or other types of meters with 0 to 100% scale.
Example using a voltmeter:
4 mA DC → 1 V
20 mA DC → 5 V
Connect this meter, and enter the read value of the meter for each output of AXFA14.

- Procedure to call up the **Scaled D/A trim** display

DD	Device Setup → Diagnosis/Service → Calibration → Analog output trim →Scaled D/A trim
DTM	Calibration → Scaled D/A trim

T0809.EPS

IMPORTANT

The D/A trim should be executed only at single range mode. If the D/A trim is executed at Bi direction mode, it is possible that the current output becomes 108%.

IMPORTANT

When "**D/A trim**" or "**Scaled D/A trim**" is carried out, the warning message "**83: Fix Cur Wng**" is displayed on the display unit.

CAUTION

The output adjustment function can match the 4mA and 20mA output to the reference meter such as a voltmeter. In the output adjustment, it is necessary to use the calibrated voltmeter and resistance.

■ Fixed Current Output

This feature can be used to output a fixed current for loop checks.

● In the case of using DD

Call up the test output parameter (Loop test) and select the output signal.

• Procedure to call up the display

DD	Device Setup → Diagnosis/Service → Test → Loop test →
→ 4mA	Output a 4mA DC signal
→ 20mA	Output a 20mA DC signal
→ Other	Set a desired output signal value
→ End	Exit

T0806.EPS

● In the case of using DTM

Call up the test output parameter (Loop test) and select either manual test or auto test, and set the current value.

• Procedure to call up the display

DTM	Diag and Service → Output Test → Loop test →
→ Manual Test	Set the current value or % value at **Test output value**, then click the Start button.
→ Auto Test	Set the interval and rate of change of current output at **Auto Test Setting**, then click the Start button.

T0807.EPS

■ Burst Mode

AXFA14 continuously sends the data via HART communication when the burst mode is set on (any one of PV, % range/current, or process vars/crnt). The data is sent intermittently as a digital signal at 3 times a second.

The burst mode is set as follows.

(1) Setting the data to be sent

• Procedure to call up the display

DD	Device Setup → Detailed setup → HART output → Burst option
DTM	Configuration → HART → Burst option

T0810.EPS

Select the type of data to be sent from the following options:

- Instantaneous flow rate (PV)
- Output in % and current output (% range/current)
- Instantaneous flow rate, totalization value* and current output (Process vars/crnt)

* "Totl," "Reverse Totl" or "Dif Totl"

(2) Setting the burst mode

• Procedure to call up the display

DD	Device Setup → Detailed setup → HART output → Burst mode
DTM	Configuration → HART → Burst mode

T0811.EPS

Then, select "**On**" at the menu to start the burst mode.

To release from the burst mode, call up the burst mode display, and set to "**Off.**"

The default setting is "**Off.**"

■ Multidrop Mode

When set in the multidrop mode, up to 15 field devices in a single communications line can be connected. To activate multidrop communication, the address of the field devices must be set to a number from 1 to 15. This deactivates the 4 to 20 mA analog output, fixing it to 4 mA. Burn out is also disabled.

Note that the accuracy for multidrop mode is different from that for other modes. Refer to Chapter 11: Outline.

The multidrop mode is set as follows.

(1) Setting the polling address

• Procedure to call up the display

DD (HART 5)	Device Setup → Detailed setup → Output condition → HART output →
DTM (HART 5)	Configuration → HART →
→ Poll addr	Enter the number from 1 to 15

T0812.EPS

(2) Activating the multidrop mode
About the procedure to call up the **Polling** display, please refer to the User's Manual of each configuration tool.

NOTE

When the same polling address is assigned for two or more field devices in multidrop mode, communication with these field devices is disabled.

(3) Communication when set in the multidrop mode

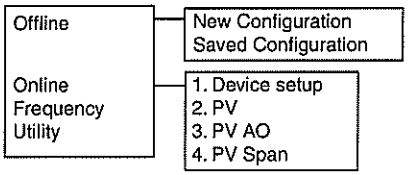
1. The HART configuration tool searches a field device that is set in the multidrop mode when the HART configuration tool is turned on. When the HART configuration tool is connected to the field device, the polling address and the tag will be displayed.
2. Select the field device, and then communication with it is possible. The communication speed is slow in this case.
3. To communicate with another field device, turn off the power once and then turn it back on, or call up "**Online**" menu, and select "**Online.**" The polling address and the tag will appear. Select the field device.

(4) Release of the multidrop mode
Call up the "**Poll addr**" display, and set the address to "**0.**"

8.4.5 Other operations for the HART configuration tool

Regarding other operations for the HART configuration tool, refer to the HART configuration tool operations manual.

8.4.6 Menu Tree for DD (HART 5)



					Read/Write	Parameter of BRAIN protocol	Data(*1)
1 Device setup	1 Process Variables	PV % rnge			R	A10	P
		PV			R	A20	P
		PV AO			R	A21	P
		Totl			R	A30	P
		Reverse Totl			R	A31	P
		Dif Totl			R	A32	P
	2 Diag/Service	1 Test/Status	1 Status	Status group 1(System alarms)	R	See Section 6.5 "Alarm Functions"	–
				Status group 3(Process alarms)	R		–
				Status group 5(Setting alarms)	R		–
				Status group 6(Setting alarms)	R		–
				Status group 7(Setting alarms)	R		–
				Status group 8(Warnings)	R		–
			2 Self test		W	–	–
		2 Adjustment	1 Auto Zero Exe		W	M10/B50	–
			2 Magflow Zero		R/W	M11	–
			3 D/A trim		W	–	–
			4 Scaled D/A trim		W	–	–
		3 Output Test	1 Loop test	4mA	W	–	–
				20mA			
				Other			
				End			
			2 Test Mode		W	N10	–
			3 Test DO		W	N30	–
			4 Test DIO (O)		W	N31	–
			5 Test DIO (I)		R	N32	P
		4 Diagnosis	1 Adhesion Check		W	K10	–
			2 Adhesion Level1		W	K11	–
			3 Adhesion Level2		W	K12	–
			4 Adhesion Level3		W	K13	–
			5 Adhesion Level4		W	K14	–
			6 Adh Measure Value		R	K15	–
	3 Easy Setup	1 Language			W	B10/H30	u/d
		2 PV Damping			W	B20/C11	u/d
		3 Base Flow Unit			W	B21/C40	u/d
		4 Base Time Unit			W	B22/C41	u/d
		5 PV Span			W	B23/C42	u/d
		6 Flow Decimal Pnt			W	B24/C43	u/d
		7 Total Unit			W	B30/D10	u/d
		8 Total Scale			W	B31/D11	u/d
		9 Pulse Unit			W	B32/E10	u/d
		Pulse Scale			W	B33/E11	u/d
		Display Select1			W	B40/H10	u/d
		Display Select2			W	B41/H11	u/d
		Display Select3			W	B42/H12	u/d
		Auto Zero Exe			W	B50/M10	–

(continued on next page)

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4 Detailed Setup	1 Basic Setup				Read/Write	Parameter of BRAIN protocol	Data(*1)
		1 Tag			W	C10	u/d
		2 PV Damping			W	C11/B20	u/d
		3 MF Set	Standard DF		W	C20	–
				Low MF	W	C21	–
				High MF	W	C22	–
			Enhanced DF		W	C20	–
				Low MF (EDF)	W	C23	–
				High MF (EDF)	W	C24	–
		4 Nominal Size unit			W	C31	u/d
		5 Nominal Size			W	C32	u/d
		6 Base Flow Unit			W	C40/B21	u/d
		7 Base Time Unit			W	C41/B22	u/d
		8 PV Span			W	C42/B23	u/d
		9 Flow Decimal Pnt			W	C43/B24	u/d
		Velocity Check			R	C44	P
		Density Unit			W	C45	u/d
		Mass Flow Density			W	C46	u/d
		User Span Select			W	C47	u/d
		Flow User Unit			W	C48	u/d
		Flow User Span			W	C49	u/d
	2 Total	1 Total Unit			W	D10/B30	u/d
		2 Total Scale			W	D11/B31	u/d
		3 Total Decimal Pnt			W	D12	u/d
		4 Total Low Cut			W	D13	u/d
		5 Total Execution			W	D20	u/d
		6 Ttl Set Val Lower			W	D21	u/d
		7 Ttl Set Val Upper			W	D22	u/d
		8 Ttl Switch Lower			W	D23	u/d
		9 Ttl Switch Upper			W	D24	u/d
		Ttl User Select			W	D30	u/d
		Ttl User Unit			W	D31	u/d
	3 Pulse	1 Pulse Unit			W	E10/B32	u/d
		2 Pulse Scale			W	E11/B33	u/d
		3 Pulse Width			W	E12	u/d
		4 Pulse Low Cut			W	E13	u/d
	4 Function Set	1 Status Function	1 DO Function		W	F20	u/d
			2 DIO Function		W	F21	u/d
			3 DO Active Mode		W	F22	u/d
			4 DIO Active Mode		W	F23	u/d
			5 Forward Span2		W	F30	u/d
			6 Forward Span3		W	F31	u/d
			7 Forward Span4		W	F32	u/d
			8 Reverse Span1		W	F33	u/d
			9 Reverse Span2		W	F34	u/d
			Auto Range Hys		W	F40	u/d
			Bi Direction Hys		W	F41	u/d
		2 Alarm	1 Low Alarm		W	G10	u/d
			2 High Alarm		W	G11	u/d
			3 Low Low Alarm		W	G12	u/d
			4 High High Alarm		W	G13	u/d
			5 H/L Alarm Hys		W	G14	u/d
			6 4-20 Alarm Out		W	G21	u/d
			7 4-20 Burn Out		R	G22	–
			8 Alm-Setting		W	G30	u/d
			9 Alm-Sig Over		W	G31	u/d
			Alm-Emp Pipe		W	G32	u/d
			Alm-HH/LL		W	G33	u/d
			Alm-Adhesion		W	G34	u/d

(continued on next page)

F0804.EPS

4 Detailed setup	4 Function Set	3 Alm Record	1 Operation Time		R	G40	P
			2 Alm Record1		R	G41	P
			3 Alm Record Time1		R	G42	P
			4 Alm Record2		R	G43	P
			5 Alm Record Time2		R	G44	P
			6 Alm Record3		R	G45	P
			7 Alm Record Time3		R	G46	P
			8 Alm Record4		R	G47	P
			9 Alm Record Time4		R	G48	P
		4 Display Set	1 Display Select1		W	H10/B40	u/d
			2 Display Select2		W	H11/B41	u/d
			3 Display Select3		W	H12/B42	u/d
			4 Display Cycle		W	H20	u/d
			5 Language		W	H30/B10	u/d
		5 Aux	1 4-20mA Low Cut		W	J10	u/d
			2 4-20mA Low Lmt		W	J11	u/d
			3 4-20mA High Lmt		W	J12	u/d
			4 Flow Direction		W	J20	u/d
			5 Rate Limit		W	J21	–
			6 Dead Time		W	J22	–
			7 Pulsing Flow		W	J23	–
			8 T/P Damp Select		W	J24	–
			9 Power Synch		W	J30	–
			Power Frequency		R/W	J31	P
			Memo 1		W	J40	–
			Memo 2		W	J41	–
			Memo 3		W	J42	–
			Software Rev No		R	J50	–
	5 HART output	1 Poll addr			W	–	–
		2 Num req preams			R	–	–
		3 Burst mode			W	–	–
		4 Burst option	1 PV		W	–	–
			2 % range/current		W	–	–
			3 Process vars/crnt		W	–	–
	6 Device info	1 Field device info	1 Manufacturer		R	–	–
			2 Tag		W	–	u/d
			3 Descriptor		W	–	u/d
			4 Message		W	–	u/d
			5 Date		W	–	u/d
			6 Dev id		R	–	–
			7 Write protect		R	–	P
			8 Revision #'s	1 Universal rev	R	–	–
				2 Fld dev rev	R	–	–
				3 Software rev	R	–	–
		2 Model specific	1 Use		W	–	–
			2 Lining		W	–	–
			3 Electrode Material		W	–	–
			4 Electrode Struct		W	–	–
			5 Grounding Ring		W	–	–
			6 Process Connect		W	–	–
			7 Lay Length		W	–	–
			8 Electrical Conn		W	–	–
			9 Sensor Serial No		W	–	–

(continued on next page)

F0805.EPS

		Read/Write	Parameter of BRAIN protocol	Data(*1)
5 Review	1 Review1	R	–	–
	2 Review2	R	–	–
	3 Review3	R	–	–
	4 Review4	R	–	–
Hot key	1 PV Span	W	B23/C42	u/d
	2 Wrt Protect Menu	R	P20	P
	1 Write protect	W	P21	–
	2 Enable Wrt 10min	W	P22	–
	3 New Password	R	P23	–
	4 Software Seal			

*1 : Data Renewing
P : Periodic Date Renewing
u/d : Discretionary Renewing
– : Other (Method etc...)

F0806.EPS

Review 1
Tag
PV Damping
Measure Mode
Low MF
High MF
Low MF(EDF)
High MF(EDF)
Nominal Size unit
Nominal Size
Base Flow Unit
Base Time Unit
PV Span
Flow Decimal Pnt
Velocity Check
Density Unit
Mass Flow Density
User Span Select
Flow User Unit
Flow User Span
Total Unit
Total Scale
Total Decimal Pnt
Total Low Cut
Total Execution
Ttl Set Val Lower
Ttl Set Val Upper
Ttl Switch Lower
Ttl Switch Upper
Ttl User Select
Ttl User Unit
Pulse Unit
Pulse Scale
Pulse Width
Pulse Low Cut

Review 2
DO Function
DIO Function
DO Active Mode
DIO Active Mode
Forward Span2
Forward Span3
Forward Span4
Reverse Span1
Reverse Span2
Auto Range Hys
Bi Direction Hys
Low Alarm
High Alarm
Low Low Alarm
High High Alarm
H/L Alarm Hys
4-20 Alarm Out
4-20 Burn Out
Alm-Setting
Alm-Sig Over
Alm-Emp Pipe
Alm-HH/LL
Alm-Adhesion
Operation Time
Alm Record1
Alm Record Time1
Alm Record2
Alm Record Time2
Alm Record3
Alm Record Time3
Alm Record4
Alm Record Time4

Review 3
Display Select1
Display Select2
Display Select3
Display Cycle
Language
4-20mA Low Cut
4-20mA Low Lmt
4-20mA High Lmt
Flow Direction
Rate Limit
Dead Time
Pulsing Flow
T/P Damp Select
Power Synch
Power Frequency
Memo1
Memo2
Memo3
Software Rev No
Use
Lining
Electrode Material
Electrode Struct
Grounding Ring
Process Connect
Lay Length
Electrical Conn
Sensor Serial No
Adhesion Check
Adhesion Level1
Adhesion Level2
Adhesion Level3
Adhesion Level4
Adh Measure Value

Review 4
Poll addr
Num req preams
Burst mode
Burst option
Manufacturer
Tag
Descriptor
Message
Date
Dev id
Write protect
Universal rev
Fld dev rev
Software rev

Status 1
uP Fault
EEPROM Fault
A/D(H) Fault
A/D(L) Fault
A/D(Z) Fault
Coil Open
EEPROM Dflt

Status 3
Sig Overflow
Empty Pipe
HH/LL Alm
Adhesion Alm

Status 5
Span > 10m/s
Span < 0.1m/s
TTL>10000p/s
TTL<0.0001p/s
4-20 Lmt Err
Multi Rng Err
H/L HH/LL Set
Dens Set Err

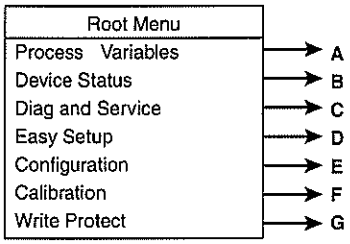
Status 6
PLS>10000p/s
PLS > 5000p/s
PLS > 1000p/s
PLS > 500p/s
PLS > 25p/s
PLS > 15p/s
PLS > 10p/s
PLS > 5p/s

Status 7
PLS<0.0001p/s
Meas Mod Set
Size Set Err
Adh Set Err

Status 8
Adhesion Wng
Auto Zero Wng
Fix Cur Wng

F0807.EPS

8.4.7 Menu Tree for DTM (HART 5)



A

Process Variables	PV	R	A20	P
	PV % rnge	R	A10	P
	PV AO	R	A21	P
	PV Span	R	B23	P
	PV Damping	R	C11/B20	P
	Totl	R	A30	P
	Reverse Totl	R	A31	P
	Dif Totl	R	A32	P

Read/Write	Parameter of BRAIN protocol	Data Renewing (*1)

B

Device Status	Process Variable	PV
		PV % rnge
		Totl
		Reverse Totl
		Dif Totl
	Diagnostic List	Device Status
		Hardware Failure
		Transducer Status
		Configuration
		Warning

F0808.EPS

C

Diag and Service	Output Test	Loop test	–	–	–
		Test Mode	W	N10	–
		Test DO	W	N30	–
		Test DIO (I)	R	N32	P
		Test DIO (O)	W	N31	–
	Alarm Set	Low Alarm	W	G10	u/d
		High Alarm	W	G11	u/d
		Low Low Alarm	W	G12	u/d
		High High Alarm	W	G13	u/d
		H/L Alarm Hys	W	G14	u/d
		4-20mA Alarm Out	W	G21	u/d
		4-20mA Burn Out	R	G22	–
		Alm-Setting	W	G30	u/d
		Alm-Sig Over	W	G31	u/d
		Alm-Emp Pipe	W	G32	u/d
		Alm-HH/LL	W	G33	u/d
		Alm-Adhesion	W	G34	u/d
	Alarm Record	Operation Time	R	G40	P
		Alm Record1	R	G41	P
		Alm Record Time1	R	G42	P
		Alm Record2	R	G43	P
		Alm Record Time2	R	G44	P
		Alm Record3	R	G45	P
		Alm Record Time3	R	G46	P
		Alm Record4	R	G47	P
		Alm Record Time4	R	G48	P
	Adhesion	Adhesion Check	W	K10	–
		Adhesion Level1	W	K11	–
		Adhesion Level2	W	K12	–
		Adhesion Level3	W	K13	–
		Adhesion Level4	W	K14	–
		Adh Measure Value	R	K15	–

D

Easy Setup	Tag	W	C10	u/d
	Language	W	B10/H30	u/d
	PV Damping	W	B20/C11	u/d
	Base Flow Unit	W	B21/C40	u/d
	Base Time Unit	W	B22/C41	u/d
	PV Span	W	B23/C42	u/d
	Flow Decimal Pnt	W	B24/C43	u/d
	Total Unit	W	B30/D10	u/d
	Total Scale	W	B31/D11	u/d
	Pulse Unit	W	B32/E10	u/d
	Pulse Scale	W	B33/E11	u/d
	Display Select1	W	B40/H10	u/d
	Display Select2	W	B41/H11	u/d
	Display Select3	W	B42/H12	u/d
	Auto Zero Exe	–	–	–

F0809.EPS

E

Configuration	Characterize Meter	Nominal Size Unit	W	C31	u/d
		Nominal Size	W	C32	u/d
		Measure Mode	R	C20	–
		Low MF	R	C21	–
		High MF	R	C22	–
		Low MF (EDF)	R	C23	–
		High MF (EDF)	R	C24	–
		MF Set	–	–	–
	Flow Condition	PV Damping	W	C11/B20	u/d
		Base Flow Unit	W	C40/B21	u/d
		Base Time Unit	W	C41/B22	u/d
		PV Span	W	C42/B23	u/d
		Flow Decimal Pnt	W	C43/B24	u/d
		User Span Select	W	C44	P
		Flow User Unit	W	C45	u/d
		Flow User Span	W	C46	u/d
		Velocity Check	R	C47	u/d
		Density Unit	W	C48	u/d
		Mass Flow Density	W	C49	u/d
	Total Set	Total Unit	W	D10/B30	u/d
		Total Scale	W	D11/B31	u/d
		Total Decimal Pnt	W	D12	u/d
		Total Low Cut	W	D13	u/d
		Total Execution	W	D20	u/d
		Ttl Set Val Lower	W	D21	u/d
		Ttl Set Val Upper	W	D22	u/d
		Ttl Switch Lower	W	D23	u/d
		Ttl Switch Upper	W	D24	u/d
		Ttl User Select	W	D30	u/d
		Ttl User Unit	W	D31	u/d
	Pulse Set	Pulse Unit	W	E10/B32	u/d
		Pulse Scale	W	E11/B33	u/d
		Pulse Low Cut	W	E13	u/d
		Pulse Width	W	E12	u/d
	Status Function	DO Function	W	F20	u/d
		DIO Function	W	F21	u/d
		DO Active Mode	W	F22	u/d
		DIO Active Mode	W	F23	u/d
		Auto Range Hys	W	F40	u/d
		Bi Direction Hys	W	F41	u/d
		Forward Span2	W	F30	u/d
		Forward Span3	W	F31	u/d
		Forward Span4	W	F32	u/d
		Reverse Span1	W	F33	u/d
		Reverse Span2	W	F34	u/d

Read/Write	Parameter of BRAIN protocol	Data Renewing (*1)

(continued on next page)

F0810.EPS

Configuration	Display Set	Display Select1	W	H10/B40	u/d
		Display Select2	W	H11/B41	u/d
		Display Select3	W	H12/B42	u/d
		Display Cycle	W	H20	u/d
		Language	W	H30/B10	u/d
	Aux	4-20mA Low Cut	W	J10	u/d
		4-20mA Low Lmt	W	J11	u/d
		4-20mA High Lmt	W	J12	u/d
		Flow Direction	W	J20	u/d
		Rate Limit	W	J21	–
		Dead Time	W	J22	–
		Pulsing Flow	W	J23	–
		T/P Damp Select	W	J24	–
		Power Synch	W	J30	–
		Power Frequency	R/W	J31	P
		Memo 1	W	J40	–
		Memo 2	W	J41	–
		Memo 3	W	J42	–
		Software Rev No	R	J50	–
	Model Specification	Use	W	–	–
		Lining	W	–	–
		Electrode Material	W	–	–
		Electrode Struct	W	–	–
		Grounding Ring	W	–	–
		Process Connect	W	–	–
		Lay Length	W	–	–
		Electrical Conn	W	–	–
		Sensor Serial No	W	–	–
	Device Information	Model	R	–	–
		Manufacturer	R	–	–
		Hardware rev	R	–	–
		Software rev	R	–	–
		Descriptor	W	–	–
		Message	W	–	–
		Date	W	–	–
		Final asmbly num	W	–	–
	HART	Tag	W	–	u/d
		Poll addr	W	–	–
		Dev id	R	–	–
		Universal rev	R	–	–
		Fld dev rev	R	–	–
		Num req preams	R	–	–
		Physical signl code	R	–	–
		Burst mode	W	–	–
		Burst option	W	–	–

Read/Write	Parameter of BRAIN protocol	Data Renewing (*1)

F0811.EPS

F

		Read/Write	Parameter of BRAIN protocol	Data Renewing (*1)
Calibration	Auto Zero Exe	–	M10/B50	–
	Magflow Zero	R/W	M11	–
	D/A trim	–	–	–
	Scaled D/A trim	–	–	–

G

Write Protect	Write protect	R	P20	P
	Enable Wrt Password	W	P21	–
	New Password	W	P22	–
	Software Seal	R	P23	–

*1: Data Renewing
P : Periodic Data Renewing
u/d: Discretionary Data Renewing
– : Others (Method, etc...)

F0812.EPS

9. ACTUAL OPERATION

After you have installed the flowtube into the process piping, wired the input/output terminals, set up the required parameters, and performed a pre-operation zero adjustment, the magnetic flowmeter should output an accurate flow signal from its terminals as soon as flow of the fluid to be measured begins. This section describes zero adjustment and the corresponding procedures.

For FOUNDATION Fieldbus protocol, please refer to IM 01E20F02-01E.

For PROFIBUS PA protocol, please refer to IM 01E20F12-01E.

9.1 Pre-operation Zero Adjustment

Zero adjustment is carried out to ensure that the output for zero flow is 0% (i.e., 4 mA). Although adjustment to zero is performed at the manufacturing plant prior to shipment, this procedure must be carried out once again following the installation of piping in order to match the magnetic flowmeter to its operating conditions.

This section describes the zero adjustment procedure using display unit switches from the converter and using the external status input; accordingly, one of these methods should be selected and implemented.

IMPORTANT

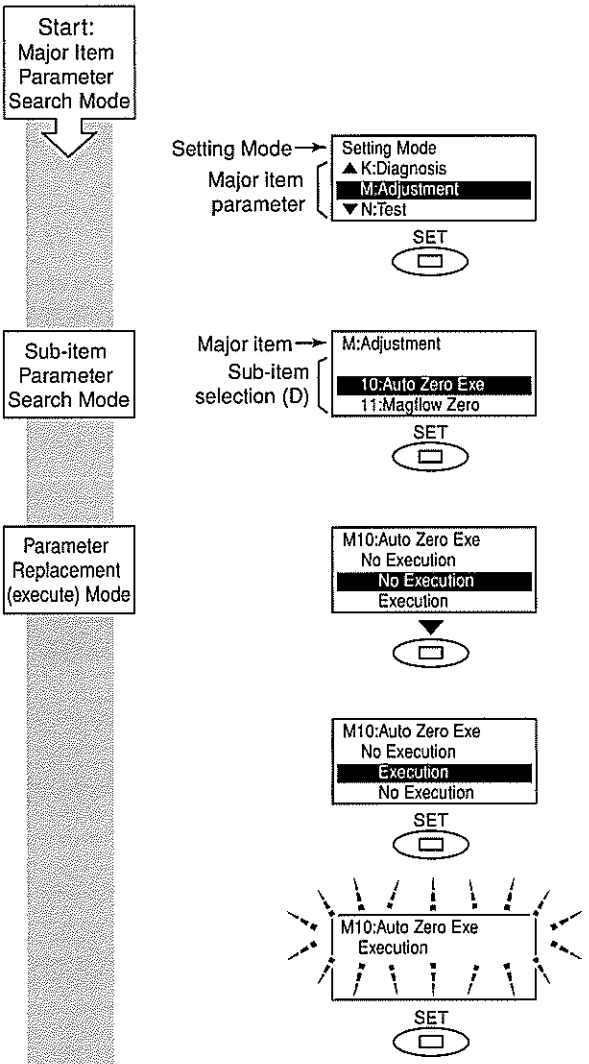
- Zero adjustment should be carried out before actual operation. Note that setting and update functions cannot be carried out during this procedure (i.e., for approximately 30 seconds).
- Zero adjustment should only be carried out when the flowtube has been filled with measurement fluid and the fluid velocity is completely zero by closing the valve.
- Each time that the fluid being measured is changed, it will be necessary for zero adjustment to be carried out for the new fluid.

9.1.1 Zero Adjustment Using Display Unit Switches

This section describes the procedure for zero adjustment using the display unit switches. (For more details regarding setting methods using these switches, refer to Chapter 5: Basic Operating Procedures.)

The parameters for zero adjustment are **B50/M10: Auto Zero Exe** (and either of these can be used to carry out this procedure). For more details regarding these parameters, refer to Chapter 6: Parameter Description.

The parameter **M10: Auto Zero Exe** will be used in the following description.



Once in Setting Mode, use the ▼ switch to move the cursor to **M: Adjustment.**

Touch the SET switch to access Sub-item Parameter Search Mode.

Upon selection of **M: Adjustment**, the cursor will be positioned at **M10: Auto Zero Exe**. (Sub-item selection (D))
Touch the SET switch to access Parameter Replacement Mode.

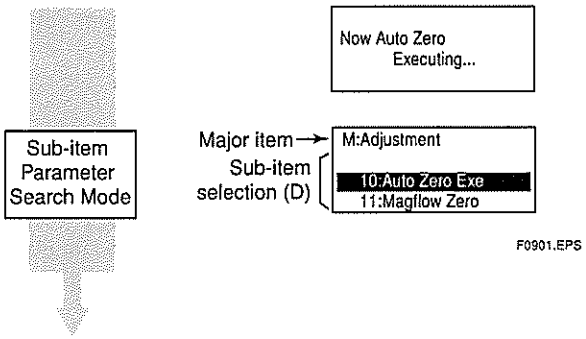
Touch the ▼ switch to move the cursor to "Execution".

Touch the SET switch to select the "Execution".

In order to request confirmation, the entire display flashes on and off. Touch the SET switch once again at this time to fix selection of the automatic zero adjustment function.

NOTE

When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode.
When the operations except SET are carried out, the parameter cannot be set.



Auto zero adjustment function is being executed (about 30 seconds).

When zero adjustment function has been completed, the system automatically returns to the sub-item selection screen (D).

NOTE

The results of **M10: Auto Zero Exe** can be displayed using **M11: Magflow Zero**. Alternatively, if the results of the automatic zero adjustment exceed the rated value, the warning **82: Auto Zero Wng** will be displayed.

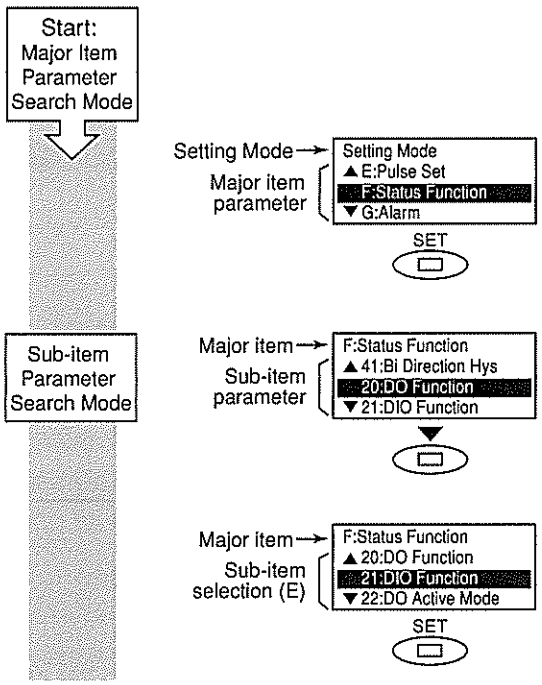
9.1.2 Zero Adjustment via External Status Input

This section describes the procedure for zero adjustment via external status input. (For more details regarding external status input, refer to Chapter 6: Parameter Description.)

CAUTION

In certain cases where the multiple range function is being used with other status inputs, it may not be possible to perform settings for automatic zero adjustment. For more details, refer to the description of multiple ranges from Chapter 6: Parameter Description.

In order to carry out zero adjustment via external status input, it will be necessary to set "Ext Auto Zero (I)" using **F21: DIO Function**. The following describes the setting procedure:

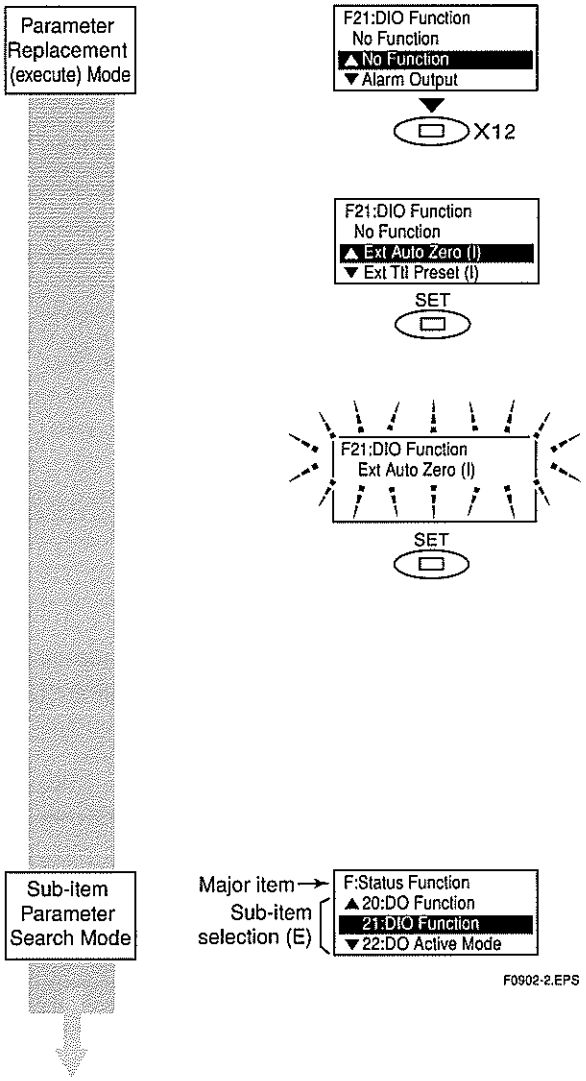


Once in Setting Mode, use the ▼ switch to move the cursor to **F: Status Function**.

Touch the SET switch to access Sub-item Parameter Search Mode.

Touch the ▼ switch once to move the cursor to **F21: DIO Function**.

The cursor has been moved to **F21: DIO Function** in this screen. (Sub-item selection screen (E))
Touch the SET switch to access Parameter Replacement Mode.



F0902-2.EPS

Touch the ▼ switch twelve times to move the cursor to "Ext Auto Zero (I)".

Touch the SET switch to select "Ext Auto Zero (Zero adjustment via external status input)".

In order to request confirmation, the entire display flashes on and off. Touch the SET switch once again at this time to fix selection of the automatic zero adjustment function.

NOTE

When no operations are carried out for 20 seconds in the flashing state, the system will automatically return to the Sub-item Parameter Search Mode.

When the operations except SET are carried out, the parameter cannot be set.

The system automatically returns to sub-item selection screen (E).

Zero adjustment will be started if the DIO terminals are shorted (when the active mode has been set to "Closed/Short Act" using **F23: DIO Active Mode**).

This process will end after approximately 30 seconds.

F0902-3.EPS

Auto zero adjustment function is being executed. (about 30 seconds.)

NOTE

When the DIO terminals continue to be shorted, this zero adjustment is automatically repeated.

10. MAINTENANCE

10.1 Maintenance

WARNING

- Maintenance work must be carried out by the trained personnel having knowledge of safety standard and not by operators.
- When opening the cover, wait for more than 10 minutes after turning off the power. Furthermore, opening of the cover must also be carried out by the trained personnel having knowledge of safety standard.

CAUTION

- Explosion protected type must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state.
- The display cover is locked by the special screw. In case of opening the display cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the special screw using the hexagonal wrench attached after installing the cover.

IMPORTANT

- As a rule, maintenance of this flowmeter should be implemented in a maintenance service shop where the necessary tools are provided.
- The amplifier assembly contains sensitive parts that may be damaged by static electricity. Excercise care so as not to directly touch the electronic parts or circuit patterns on the board, for example, by preventing static electrification by using grounded wrist straps when handing the assembly.

10.1.1 Fuse Replacement

CAUTION

Please contact Yokogawa's service office for fuse replacement. Also be sure to use the fuse that was supplied by Yokogawa's sales or service offices.

10.1.2 Changing the Direction of the Display Unit

10.1.2.1 Removing the Cover

(1) Turn off the power.

(2) Loosen cover locking screw 1 clockwise using a hexagonal wrench (nominal size 3) to unlock the cover. (Upon shipment from the manufacturing plant, the cover is locked.) Hold the flowmeter with your hand and remove the cover by turning it in the direction of the arrow as shown below.

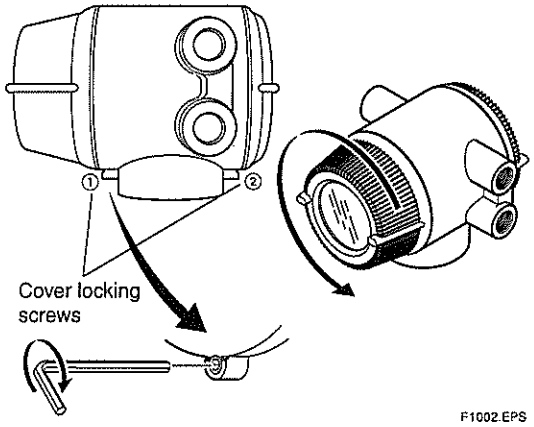


Figure 10.1.1 Removing the Display Cover

10.1.2.2 Changing the Display Unit Direction 90 Degrees

(1) Hold the display unit with your hand and remove the two mounting screws.

(2) Turn the display unit 90 degrees clockwise and confirm the assembling position, taking care of the connector and wire of the display unit.
At this time, do not remove the connector.

(3) Secure the display unit using its two mounting screws.

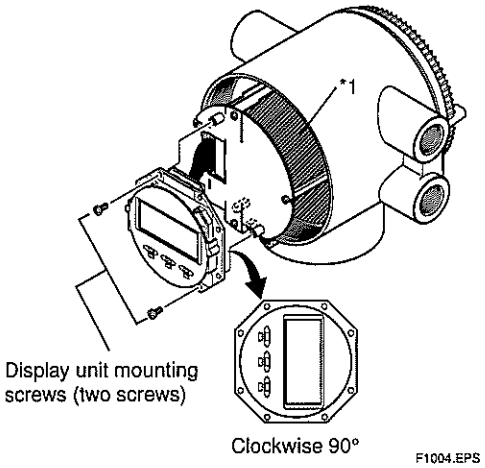


Figure 10.1.2 Changing the Display Unit Direction 90 Degrees

IMPORTANT

*1: To preserve the safety, do not touch the electrical circuit and cable of shaded area.

10.1.2.3 Installing the Cover

(1) Taking care not to entangle the cables, install the cover to the flowmeter by turning it in the direction of the arrow as shown below.

(2) Tighten cover locking screw 1 counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

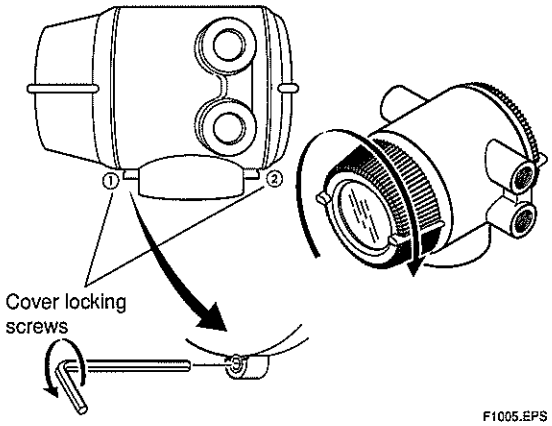


Figure 10.1.3 Installing the Display Cover

10.2 Setting of Switches

IMPORTANT

- Removing and installing cover are necessary for setting switches. Perform removing and installing of the cover as described in section 10.1.2.1 and 10.1.2.3.
- To preserve the safety, do not touch the electrical circuit and the cables except the setting switches.

10.2.1 Setting of Burnout Switch

The burnout function sets the direction of current output in situations where the CPU has become damaged. Upon shipment from the manufacturing plant, the burnout direction is set to High (i.e., 25 mA); however, in cases where the optional code C1 has been specified, the output direction will be set to Low (i.e., 0 mA).

Modification of the burnout direction must be carried out using the setting switch from the amplifier's CPU board (i.e., Switch 1) (See Figure 10.2.1).

Table 10.2.1 Output Setting Pins for Burnout

Position of Pin	Burnout Direction	Burnout Output	Remarks
Low High	High	25 mA	Set to High before shipment
Low High	Low	0 mA	Set to Low for optional code C1

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NOTE

- On the amplifier's CPU board, the burnout setting switch (i.e., Switch 1) and the write protect switch (i.e., Switch 2) are located adjacent to each other. Accordingly, special care should be taken when making switch settings.
- In the case of Fieldbus communication type, burnout setting swich is not applied.

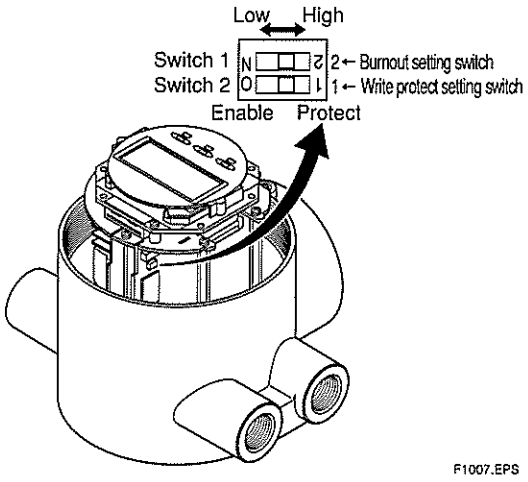

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Figure 10.2.1 Switch Configuration

10.2.2 Setting of Write Protect Switch

By setting the write protect function to "Protect" it is possible to prevent the overwriting of parameters. Write protection can be carried out using either the hardware switch on the CPU board (i.e., Switch 2) or software parameter settings. If either of these items is set to "Protect," the overwriting of parameters will be prohibited.

NOTE

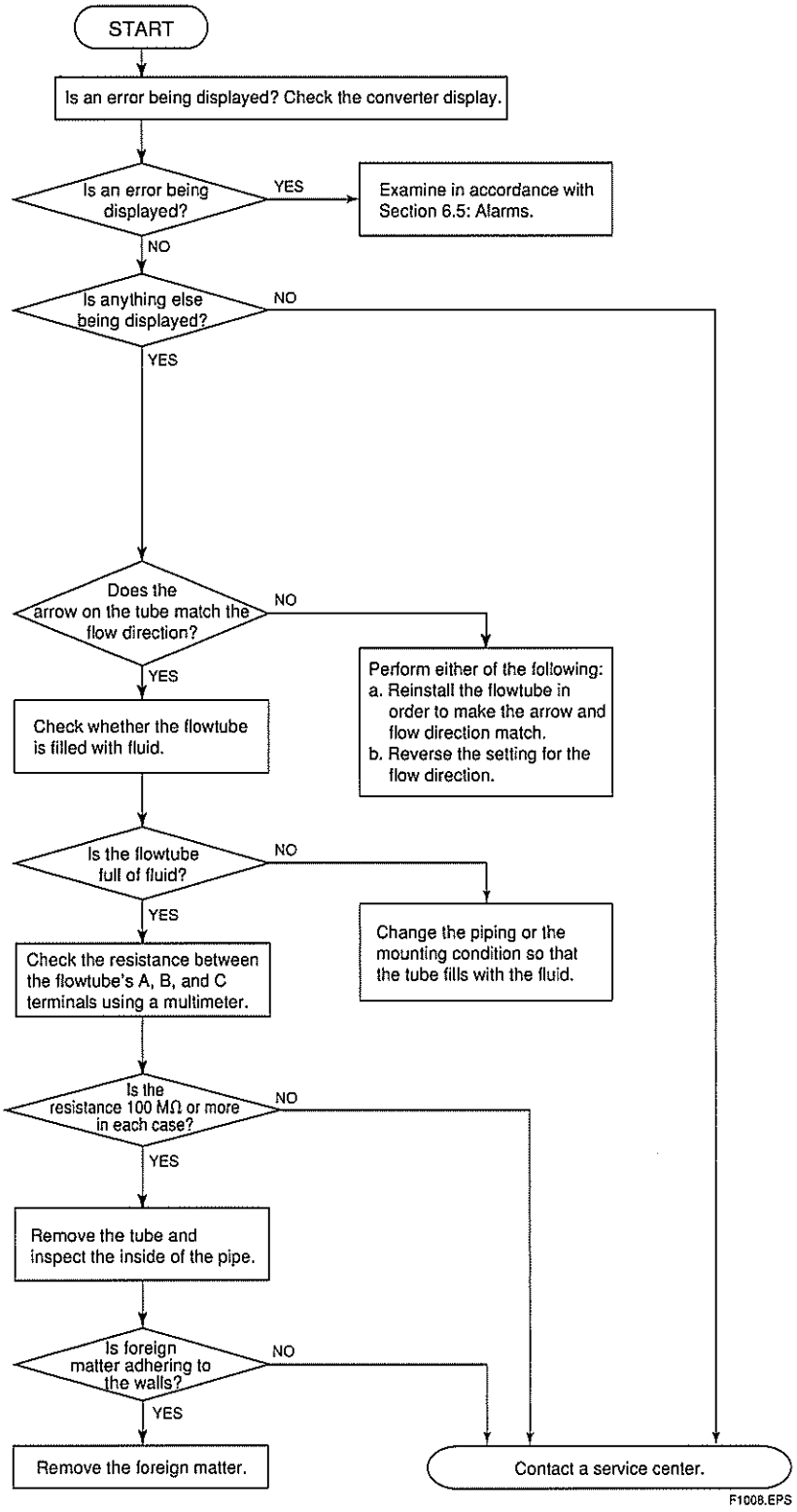
- If the hardware switch is set to "Protect," it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to "Enable."
- In the case of Fieldbus communication type, write protect setting switch is always be set as "Enable".

For more details regarding usage of the write protect function and the software's parameter switches, refer to "Chapter 6: Parameter Description" in this user's manual.

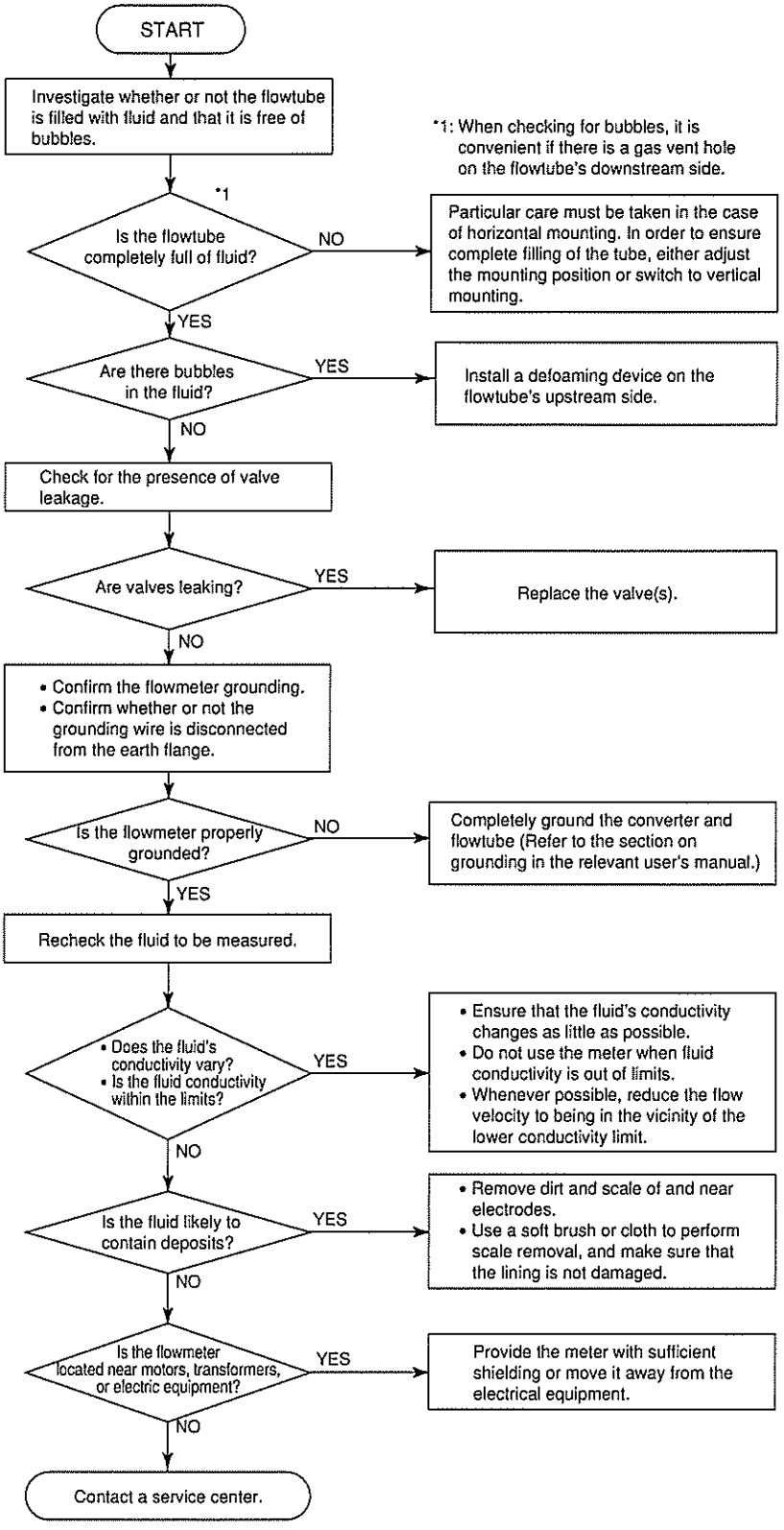
10.3 Troubleshooting

Although magnetic flowmeters rarely require maintenance, failures may occur when the instrument is not operated correctly. This section describes troubleshooting procedures where the cause of the breakdown is identified through receiver indication.

10.3.1 No Indication



10.3.2 Unstable Zero



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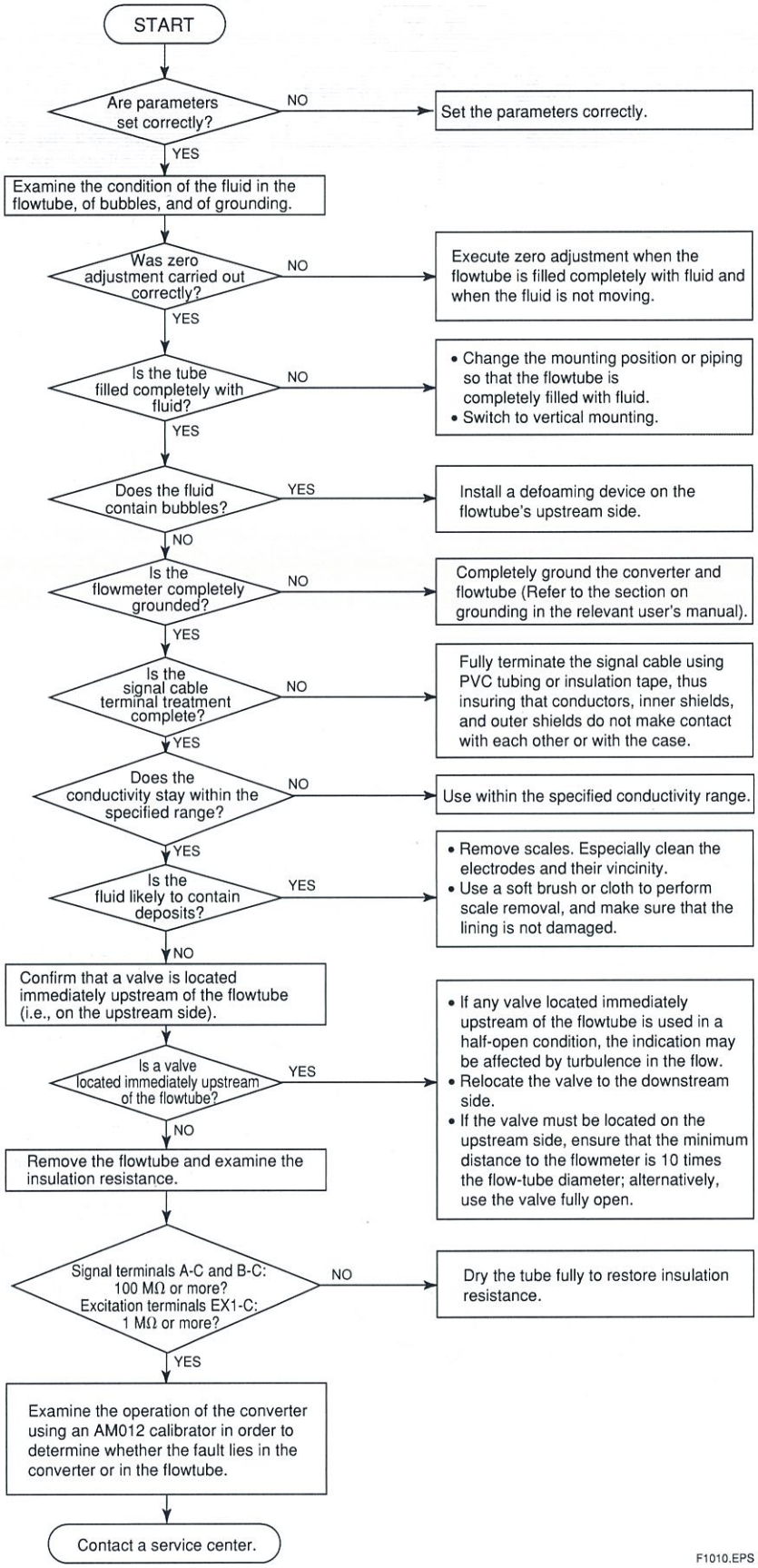
10.3.3 Disagreement Between Indication and Actual Flow



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11. OUTLINE

■ STANDARD SPECIFICATIONS

Refer to IM 01E20F02-01E for FOUNDATION Fieldbus communication type and IM 01E20F12-01E for PROFIBUS PA communication type marked with "◇"

● Converter

*1: Select two points from: one pulse output, one alarm output, one status input, or two status outputs.
*2: For models without an indicator, the hand-held terminal is necessary to set parameters.

Excitation Method: (Combined with AXF Remote Flowtube)
- Standard dual frequency excitation:
  Size 2.5 to 400 mm (0.1 to 16 in.)
- Enhanced dual frequency excitation:
  Size 25 to 200 mm (1.0 to 8.0 in.)
  (Optional code HF1 or HF2)

Input Signal (*1) "◇":
One Status Input: Dry contact
Load resistance: 200 Ω or less (ON), 100 kΩ or more (OFF)

Output Signals "◇":
- One Current Output: 4 to 20 mA DC (load resistance: 750 Ω maximum, including cable resistance)
- One Pulse Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
  Output rate: 0.0001 to 10,000 pps (pulse/second)
- One Alarm Output (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)
- Two Status Outputs (*1):
  Transistor contact output (open collector)
  Contact capacity: 30 V DC (OFF), 200 mA (ON)

Communication Signals "◇":
BRAIN or HART communication signal
(Superimposed on the 4 to 20 mA DC signal)
Distance from power line: 15 cm (6 in.) or more (Parallel wiring should be avoided.)

BRAIN:

Communication Distance:
Up to 1.5 km (0.93 miles), when polyethylene insulated PVC-sheathed cables (CEV cables) are used.
Communication distance varies depending on the type of cable and wiring used.

Load Resistance:
250 to 450 Ω (including cable resistance)

Load Capacitance: 0.22 μF or less

Load Inductance: 3.3 mH or less

Input Impedance of Communicating Device:
10 kΩ or more (at 2.4 kHz)

HART:

Load Resistance:
250 to 600 Ω (including cable resistance)
Note: HART is a registered trademark of the HART Communication Foundation.

Data Security During Power Failure:
Data (parameters, totalizer value, etc.) storage by EEPROM. No back-up battery required.

Indicator (*2):
Full dot-matrix LCD (32×132 pixels)

Lightning Protector "◇":
The lightning protector is built into the excitation current output, the current output, the signal common, pulse/alarm/status input and output terminals. When optional code A is selected, the lightning protector is built into the power terminals.

Protection:
General-purpose Use/Sanitary Type/TIIS Flameproof type: IP66, IP67
Explosion proof type except TIIS:
In case of explosion proof type except TIIS, refer to description of "Enclosure" in "HAZARDOUS AREA CLASSIFICATION".

Coating:
Case and Cover: Corrosion-resistant coating
Coating Color; Mint green (Munsell 5.6 BG 3.3/2.9 or its equivalent)

Converter Material:
Case and Cover: Aluminum alloy

Mounting/Shapes:
- Mounting: 2-inch pipe
- Electrical Connection: ANSI 1/2 NPT female
  ISO M20 ×1.5 female
  JIS G1/2 (PF1/2) female
- Terminal Connection: M4 size screw terminal

Grounding:
Grounding resistance 100 Ω or less
When optional code A is selected, grounding resistance 10 Ω or less shall be applied.
* In case of explosion proof type except TIIS, follow the domestic electrical requirements as regulated in each country.
* In case of TIIS Flameproof type, refer to description of "HAZARDOUS AREA CLASSIFICATION".

Combined Remote Flowtube:
- AXFA14 Converter can be combined with size 2.5 to 400 mm (0.1 to 16 in.) of AXF Remote Flowtube.
- If a combined converter is changed from AXFA14 to AXFA11 or vice versa, a new meter factor must be adjusted by flow calibrations.
- In case that size 250 mm (10 in.) or larger is used in low conductivity or high concentration slurries, please use the AXFA11 Converter.

Functions "◇"

How to Set Parameters (*2):
The indicator's LCD and three infra-red switches enable users to set parameters without opening the case cover. Parameters can also be set with the configuration tool (Such as HHT (handheld terminal) or FieldMate, etc.). The language for the HHT is English only.

Displayed Languages (*2):
Users can choose a language from among English, Japanese, German, French, Italian, Spanish.

Instantaneous Flow Rate/Totalized Value Display Functions (for models with an indicator) (*2):
The full dot-matrix LCD enables user selections of displays from one line to three lines for:
- Instantaneous flow rate
- Instantaneous flow rate (%)
- Instantaneous flow rate (bar graph)
- Current output value (mA)
- Totalized forward-direction flow rate
- Totalized reverse-direction flow rate
- Totalized differential flow rate
- Tag No.
- Results of electrode adhesion diagnostics
- Communication type

Totalizer Display Function (*2):
The flow rate is counted one pulse at a time according to the setting of totalization pulse weights. For forward and reverse flow measurement functions, the totalized values of the flow direction (forward or reverse) and the flow direction are displayed on the indicator together with the units. The difference of totalized values between the forward and reverse flow rate can be displayed. Totalization for the reverse flow rate is carried out only when "Forward and reverse flow measurement functions" is selected.

Damping Time Constant (*2):
Time constant can be set from 0.1 second to 200.0 seconds (63% response). The default is 3 seconds.

Span Setting Function (*2):
Span flows can be set in units such as volume flow rate, mass flow rate, time, or flow rate value. The velocity unit can also be set.
Volume Flow Rate Unit: kcf, cf, mcf, Mgal (US), kgal (US), gal (US), mgal (US), kbbl (US)*, bbl (US)*, mbbl (US)*, µbbl (US)*, Ml (megaliter), m^3, kl (kiloliter), l (liter), cm^3
Mass Flow Rate Unit (Density must be set.): klb (US), lb (US), t (ton), kg, g
Velocity Unit: ft, m (meter)
Time Unit: s (sec), min, h (hour), d (day)
* "US Oil" or "US Beer" can be selected.

Pulse Output (*1)(*2):
Scaled pulse can be output by setting a pulse weight.
Pulse Width: Duty 50% or fixed pulse width (0.05, 0.1, 0.5, 1, 20, 33, 50, 100 ms) can be selected.
Output Rate: 0.0001 to 10,000 pps (pulse/second)

Multi-range Function (*1)(*2):
- Range switching via status input
  Status input enables the switching of up to two ranges.
- Automatic range switching
  When the flow rate exceeds 100 % of the range, transition to the next range (up to four ranges) is carried out automatically. Range switching can be confirmed by status outputs and indicator.

Forward and Reverse Flow Measurement Functions (*1)(*2):
Flows in both forward and reverse directions can be measured. The reverse flow measurement can be confirmed by status output and indicator.

Totalization Switch (*1)(*2):
The status output is carried out when output if a totalized value becomes equal to or greater than the set value.

Preset Totalization (*1)(*2):
The parameter setting or status input enables a totalized value to be preset to a setting value or zero.

0% Signal Lock (*1)(*2):
Status input forcibly fixes the instantaneous flow rate display, current output, pulse output, and flow rate totalization to 0%.

Alarm Selection Function (*2):
Alarms are classified into System Alarms (hard failures), Process Alarms (such as 'Empty Pipe', 'Signal Overflow' and 'Adhesion Alarm'), Setting Alarms, and Warnings. Whether alarms should be generated or not can be selected for each item.
The current output generated for an alarm can be selected from among 2.4 mA or less, fixed to 4 mA, 21.6 mA or more, or HOLD.

Alarm Output (*1)(*2):
Alarms are generated only for the items selected via the 'Alarm Selection Function' if relevant failures occur.

Self Diagnostics Functions (*2):
If alarms are generated, details of the System Alarms, Process Alarms, Setting Alarms and Warnings are displayed together with concrete descriptions of countermeasures.

Flow Upper/Lower Limit Alarms (*1)(*2):
If a flow rate becomes greater or smaller than the set value, this alarm is generated. In addition, two upper limits (H, HH) and two lower limits (L, LL) can be set.
If a flow rate becomes greater or smaller than any of the set values, the status is output.

Electrode Adhesion Diagnostics Function (*1) (*2):
This function enables monitoring of the adhesion level of insulating substances to the electrodes. Depending on the status of adhesion, users are notified by a warning or an alarm via status outputs. If replaceable electrodes are used, they can be removed and cleaned when adhesion occurs.

■ HAZARDOUS AREA CLASSIFICATION

Refer to Chapter 12.

■ STANDARD PERFORMANCE

Accuracy (Combined with AXF Remote Flowtube)

Note: The accuracy of a product before shipment is defined as totalized value at the result of calibration test in our water actual flow test facility.
Calibrated conditions in our water actual test facility are as follows:

Fluid temperature;	20 ± 10°C
Ambient temperature;	20 ± 5°C
Length of straight runs;	10 D or more on the upstream side; 5 D or more on the downstream side
Reference conditions;	Similar to BS EN29104 (1993); ISO 9104 (1991)

Accuracy (Combined with AXF Remote Flowtube)

Pulse Output:

PFA/Ceramics Lining:

Size mm (in.)	Flow Velocity V m/s (ft/s)	Standard Accuracy (Calibration code B)	Flow Velocity V m/s (ft/s)	High grade Accuracy (Calibration code C)
2.5 (0.1) to 15 (0.5)	V < 0.3 (1)	±1.0 mm/s	—	
	0.3 ≦ V ≦ 10 (1) (33)	±0.35% of Rate		
25 (1.0) to 200 (8.0)	V < 0.15 (0.5)	±0.5 mm/s	V <0.15 (0.5)	±0.5 mm/s
	0.15 ≦ V ≦ 10 (0.5) (33)	±0.35% of Rate	0.15 ≦ V <1 (0.5) (3.3)	±0.18% of Rate ±0.2mm/s
			1 ≦ V ≦10 (3.3) (33)	±0.2% of Rate
250 (10) to 400 (16)	V < 0.15 (0.5)	±0.5 mm/s	—	
	0.15 ≦ V ≦ 10 (0.5) (33)	±0.35% of Rate		

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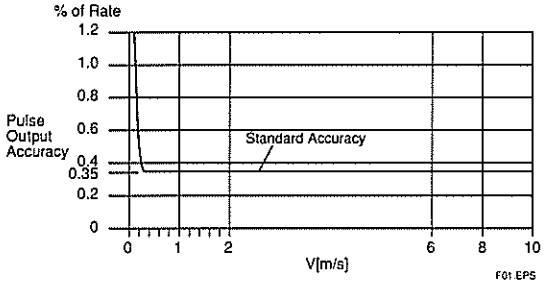
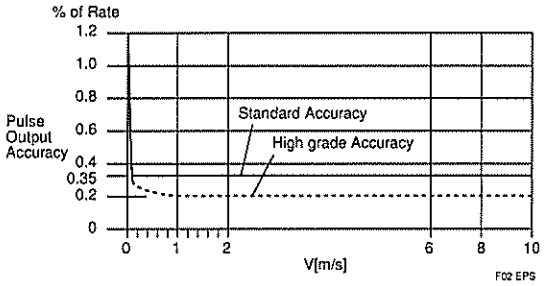
Enhanced dual frequency excitation (Option code HF2):
Standard accuracy ± 1 mm/ s

Size 2.5 mm (0.1 in.) to 15 mm (0.5 in.)



Size 25 mm (1.0 in.) to 400 mm (16 in.)



Polyurethane Rubber/Natural Soft Rubber/EPDM Rubber Lining

Size mm (in.)	Flow Velocity V m/s (ft/s)	Standard Accuracy (Calibration code B)
25 (1.0) to 400 (16)	V < 0.3 (1.0)	±1.0 mm/s
	0.3 ≦ V ≦ 10 (1.0) (33)	±0.35% of Rate

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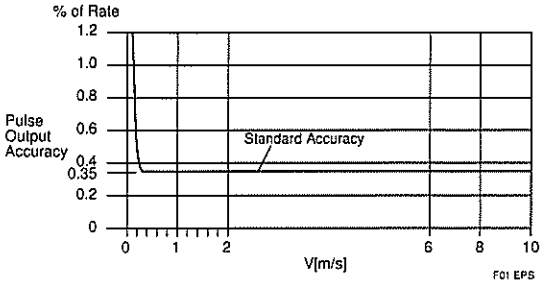
Enhanced dual frequency excitation (Optional code HF2):
Standard accuracy ± 1 mm/ s

Size 25 mm (1.0 in.) to 400 mm (16 in.)



Current Output "◇": Pulse output accuracy plus ±0.05% of Span

Repeatability:
±0.1% of Rate (V ≧ 1 m/s (3.3 ft/s))
±0.05% of Rate ±0.5 mm/s (V < 1 m/s (3.3 ft/s))

Maximum Power Consumption:
Combined with AXF Remote Flowtube: 12 W

Insulation Resistance(*1) :
Between power supply terminals and ground terminal: 100MΩ at 500V DC
Between power supply terminals and input/output/ excitation current terminals : 100MΩ at 500V DC
Between ground terminal and input/output/excitation current terminals: 20MΩ at 100V DC
Between input/output/excitation current terminals :20MΩ at 100V DC

Withstand Voltage(*1) :
Between power supply terminals and groundterminal: 1390V AC for 2 seconds
Between power supply terminals and input/output terminals: 1390V AC for 2 seconds
Between excitation current terminal and ground terminal: 160V AC for 2 seconds
Between excitation current terminal and input /output terminals: 200V AC for 2 seconds

⚠ CAUTION

*1: When performing the Insulation Resistance Test or the Withstand Voltage Test, please obey the following caution.
- Following the relevant test, wait for more than 10 seconds after the power supply has been turned off before removing the cover.
- Remove all wires from terminals before testing.
- When the power terminal has a lighting protector (optional code A), remove the short bar at the ground terminal.
- After testing, be sure to discharge by using a resistance and return all wires and the short bar to its correct position.
- Screws must be tightened to a torque of 1.18 N-m or more.
- After closing the cover, the power supply can be restored.

Safety Requirement Standards:
EN61010-1
- Altitude at installation site: Max. 2000 m above sea level
- Installation category based on IEC1010:
  Overvoltage category II ("II" applies to electrical equipment which is supplied from a fixed installation-like distribution board.)
- Pollution degree based on IEC1010
  Pollution degree 2 ("Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to a normal indoor atmosphere.)

EMC Conformity Standards: CE , N200
EN61326-1 Class A, Table 2 (For use in industrial locations)
EN61326-2-3
EN61000-3-2 ClassA
EN61000-3-3

CAUTION

This instrument is a Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.

■ NORMAL OPERATING CONDITIONS

Ambient Temperature: –40°C to +60°C (–40°F to +140°F)
- Indicator's operating range: –20°C to +60°C (–4°F to +140°F)
- Maximum temperature should be 50°C in the case of power supply code 2.

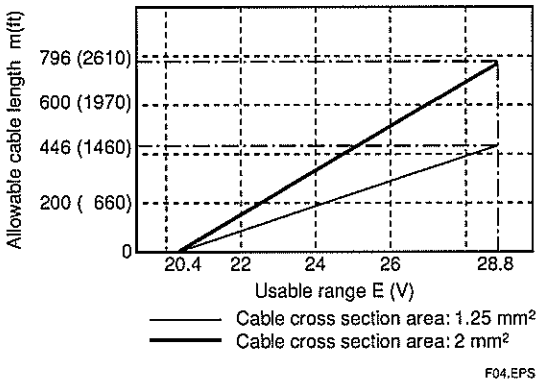
Ambient Humidity: 0 to 100%
Lengthy continuous operation at 95% or more is not recommended.

Power Supply

Power supply code 1:
- AC specifications
  Rated power supply: 100 to 240 V AC, 50/60 Hz
  (Operating voltage range: 80 to 264 V AC)
- DC specifications
  Rated power supply: 100 to 120 V DC
  (Operating voltage range: 90 to 130 V DC)

Power supply code 2:
- AC specifications
  Rated power supply: 24 V AC, 50/60 Hz
  (Operating voltage range: 20.4 to 28.8 V AC)
- DC specifications
  Rated power supply: 24 V DC
  (Operating voltage range: 20.4 to 28.8 V DC)

Supply Voltage and Cable Length for Power Supply Code 2



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Vibration Conditions:
Level of vibration in conformity with IEC 60068-2-6 (SAMA31. 1-1980)
9.8 m/s² or less (frequency of 500 Hz or less)
Note: Avoid locations with much vibration (with a vibration frequency of 500 Hz or more), which may cause damage to the equipment.

■ ACCESSORIES

Mounting bracket: 1 set
Hexagonal wrench: 1 pc.

■ MODEL AND SUFFIX CODE

AXFA14 Magnetic Flowmeter Remote Converter:

Model	Suffix Code		Description
AXFA14			Magnetic Flowmeter Remote Converter
Use (*2)	G		General-Purpose Use For AXF Remote Flowtube of Size 2.5 to 400 mm (0.1 in. to 16 in.)
	C		Explosion proof Type For Remote Flowtube of Size 2.5 to 400 mm (0.1 in. to 16 in.)
Output Signal and Communication	-D		4 to 20 mA DC, BRAIN Communication
	-E		4 to 20 mA DC, HART Communication
	-F		Digital communication (FOUNDATION Fieldbus protocol)(*5)
	-G		Digital communication (PROFIBUS PA protocol)(*6)
Power Supply		1	100 V to 240 V AC or 100 to 120 V DC
		2	24 V AC/DC
Electrical Connections (*3)		-0	JIS G1/2 female
		-2	ANSI 1/2 NPT female
		-4	ISO M20 × 1.5 female
Indicator (*1)(*4)		1	With Indicator (Horizontal)
		2	With Indicator (Vertical)
		N	None
Option		/□	Optional code (See the Table of Optional Specifications)

*1: 1 2 N

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*2: For explosion proof types, specify type of explosion proof certification using the optional codes. In case of the TIIS flameproof type, the remote flowtube is available only for combined use with the AXFA14. For the TIIS flameproof type with wiring using a flameproof packing adapter, select optional code G12 or G11. Available only for JIS G1/2 female electrical connections.
*3: JIS G1/2 female electrical connection is available only for TIIS flameproof type.
*4: In case of integral flowmeters of the TIIS flameproof type, select "with indicator"(code 1 or 2).
*5: For FOUNDATION Fieldbus protocol, refer to IM 01E20F02-01E
*6: For PROFIBUS PA protocol, refer to IM 01E20F12-01E

Signal Cable:

Model	Suffix Code	Description
AXFC	·····	Magnetic Flowmeter Dedicated Signal cable for the ADMAG AXF series
Termination	-0 ·····	No Termination.
	-4 ·····	A set of termination parts for M4 screws is attached. Terminated for the AXFA11/14 Remote Converter.
Cable Length	-L□□□ ·····	Designate the cable length, unit: m Following "L", specify the cable in three digits as multiple of 1 meter (e.g., 001, 002, or 005) for a length up to 5 m, or as a multiple of 5 meters (i.e., 005, 010, 015, or the like). The maximum cable length: 200 m for combined use with AXFA11 100 m for combined use with AXFA14
Option	/C□	With termination parts sets. Following "C", specify the q'ty of sets of termination parts in one digits.

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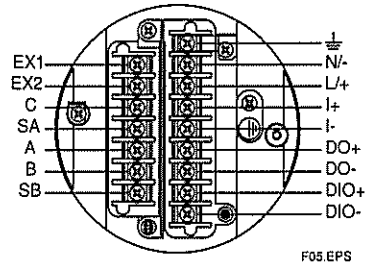
Note:

- The cable is constructed with double shielding over the two conductors, and uses heat-resistant vinyl as the outer covering material.
  Finished diameture: 10.5 mm (0.41 in.)
  Maximum temperature: +80°C (+175°F)
- Unnecessary to order the above cable for submersible type flowtube or for the optional code DHC flowtube because the flowtube is wired with 30 m (98 ft) cable.
- For excitation cable, prepare a two-core cable at the customer side.

● Terminal Configuration "◇"



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● Terminal Wiring "◇"

Terminal Symbols	Description
EX1 EX2	Excitation current Output
C SA A B SB	Flow singal input

Terminal Symbols	Description
⏚	Functional grounding
N/– L/+	Power supply
I+ I–	Current output 4 to 20mA DC
DO+ DO–	Pulse output/ Alarm output/ Status output
DIO+ DIO–	Alarm output/ Status output/ Status input
⏚	Protective grounding (Outside of the terminal)

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■ OPTIONAL SPECIFICATIONS FOR AXFA14 REMOTE CONVERTER "◇"

O: Available –: Not available

Item	Specification		Applicable Model: General-Purpose use (AXF***G-F G)	Applicable Model: Explosion proof Type (AXF***C-F G)	Code
Lightning Protector	A lightning protector is built into the power terminals.		O	O	A
DC Noise Cut Circuit	The DC Noise Cut Circuit is built in. Available for 15 mm (0.5 in.) and larger sizes, and for fluids with the conductivity of 50 μS/cm or higher. Nullifies the empty check and electrode adhesion diagnostic function.		O	O	ELC
Burn Out Down	The output level is set to 0 mA during a CPU failure and is set 2.4 mA (-10%) or less during an alarm. Standard products are delivered with a setting 25 mA during a CPU failure and 21.6 mA (110%) or more during an alarm.		O (*3)	O (*3)	C1
NAMUR NE43 Compliance	Output signal limits: 3.8 to 20.5 mA	Failure alarm down-scale: The output level is set to 0 mA during a CPU failure and is set 2.4 mA (–10%) or less during an alarm.	O (*3)	O (*3)	C2
		Failure alarm up-scale. The output level is set to 25 mA during a CPU failure and is set 21.6 mA (110%) or more during an alarm.	O (*3)	O (*3)	C3
Active Pulse Output	Active pulses are output in order to drive an external electromagnetic or electronic counter directly using the converter's internal power supply. (Nullfies the standard transistor contact pulse output.) Output voltage: 24 V DC ±20% Pulse specifications: • The drive current of 150 mA or less • Pulse rate: 0.0001 to 2 pps (pulse/second); Pulse width: 20, 33, 50, or 100 ms		O (*3)	O (*3)	EM
Waterproof Glands	Waterproof glands are attached to the electrical connections. Available only for JIS G1/2 female electric connections.		O	–	EG
Waterproof Glands with Union Joints	Waterproof glands with union joints are attached to the electrical connections. Available only for JIS G1/2 female electric connections.		O	–	EU
Plastic Glands	Plastic glands are attached to the electrical connections. Available only for JIS G1/2 female electric connections.		O	–	EP
Stainless Steel Mounting Bracket	Provided with a JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel mounting bracket in lieu of the standard carbon steel bracket.		O	O	SB
Stainless Steel Tag Plate	Screwed JIS SUS304 (AISI 304 SS/EN 1.4301 equivalent) stainless steel tag plate. Choose this option when an SS tag plate is required in addition to the standard nameplate with the tag number inscribed on it. Dimension (Height × Width): Appr. 12.5 (4.92) × 40 (15.7) mm (inch)		O	O	SCT
Painting Color Change	Coated in black (Munsell N1.5 or its equivalent.)		O	O	P1
	Coated in jade green (Munsell 7.5BG4/1.5 or its equivalent.)		O	O	P2
	Coated in metallic silver.		O	O	P7
Epoxy Resin Coating	Epoxy resin coating which has alkali-resistance instead of standard polyurethane resin coating. The color is same as standard type.		O	O	X1
High Anti-corrosion Coating	Three-layer coating (polyurethane coating on two-layer epoxy resin coating) in the same range as that for the standard coating. The color is same as standard type. Salt/alkali/acid/weather-resistance.		O	O	X2
Calibration Certificate	Level 2: The Declaration and the Calibration Equipment List are issued.		O	O	L2
	Level 3: The Declaration and the Primary Standard List are issued.		O	O	L3
	Level 4: The Declaration and the Yokogawa Measuring Instruments Control System are issued.		O	O	L4
FM Approval	FM Explosion proof See "HAZARDOUS AREA CLASSIFICATION"		–	O	FF1
ATEX Certification	ATEX Explosion proof See "HAZARDOUS AREA CLASSIFICATION"		–	O	KF2
CSA Certification	CSA Explosion proof See "HAZARDOUS AREA CLASSIFICATION"		–	O	CF1
IECEx Certification *2	IECEx Explosion proof See "HAZARDOUS AREA CLASSIFICATION"		–	O	SF2
TIIS Certification *1	TIIS Flameproof See "HAZARDOUS AREA CLASSIFICATION"		–	O	JF3

T05.EPS

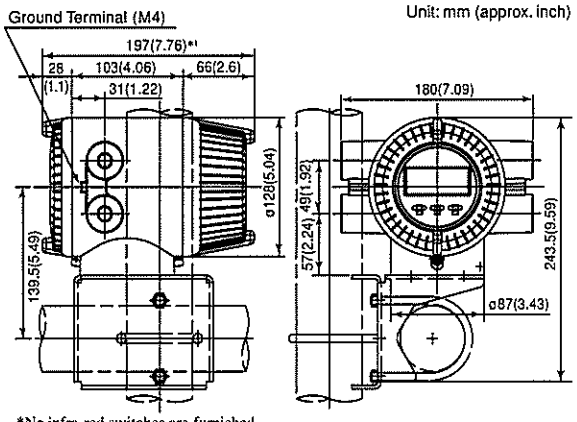
Item	Specification	Applicable Model		Code
		General-Purpose use	Explosion proof Type	
		AXF***G-D E F G	AXF***C-D E F G	
Flameproof packing adapter for TIIS Flameproof Type	Four flameproof packing adapters	–	○	G14
	Three flameproof packing adapters and one blind plug. Available only when a four-wires cable is used for power input and signal output with DC power supply.	–	○ (*3)	G13

*1: Select optional code G14 or G13 when TIIS Flameproof type with wiring using a flameproof packing adapter. Available only for JIS G1/2 female electric concections.
*2: Applicable only for Australia, New Zealand, Singapore and India.
*3: In the case of Fieldbus communication type, optional codes C1, C2, C3, EM and G13 are unable to select.

T05_02.EPS

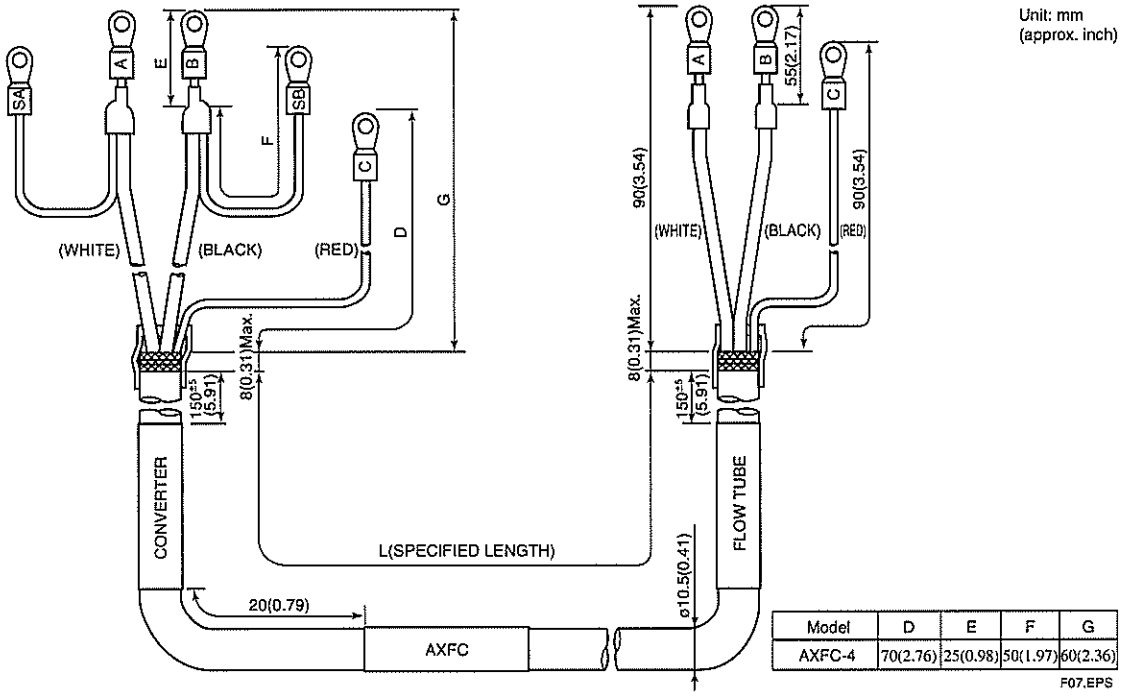
■ EXTERNAL DIMENSIONS

● Remote Converter AXFA14G/C



● Dedicated Signal Cable

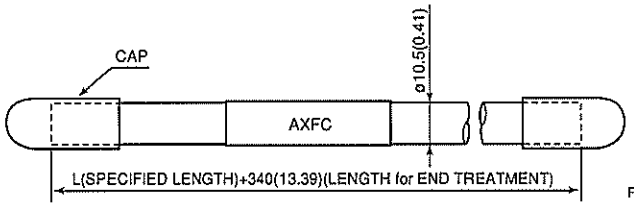
AXFC-4-L□□□



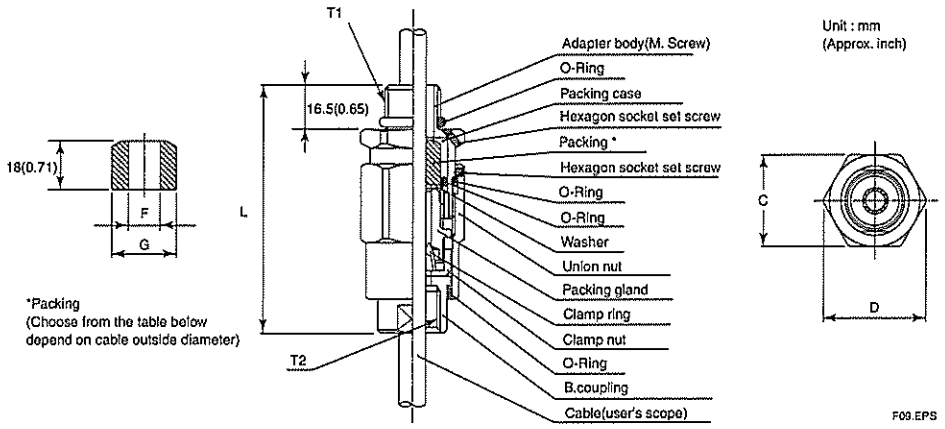
Model	D	E	F	G
AXFC-4	70(2.76)	25(0.98)	50(1.97)	60(2.36)

F07.EPS

AXFC-0-L□□□



● Flameproof packing adapter for TIIS Flameproof type (optional code G14 or G13)



Dimension					Cable outer diameter	Packing diameter		Identification mark	Weight kg (lb)
T1	T2	C	D	L		F	G		
G 1/2	G 1/2	35 (1.38)	39 (1.54)	94.5 (3.72)	ø8.0 to ø10.0 (0.31 to 0.39)	ø10.0(0.39)	ø20.0 (0.79)	16 8-10	0.26 (0.57)
					ø10.0 to ø12.0 (0.39 to 0.47)	ø12.0(0.47)		16 10-12	

T013.EPS

● Unless otherwise specified, difference in the dimensions are refer to the following table.

General tolerance in the dimensional outline drawing.

Unit : mm (approx.inch)

Category of basic dimension		Tolerance	Category of basic dimension		Tolerance
Above	Equal or below		Above	Equal or below	
	3 (0.12)	±0.7 (±0.03)	500 (19.69)	630 (24.80)	±5.5 (±2.17)
3 (0.12)	6 (0.24)	±0.9 (±0.04)	630 (24.80)	800 (31.50)	±6.25 (±0.25)
6 (0.24)	10 (0.39)	±1.1 (±0.04)	800 (31.50)	1000 (39.37)	±7.0 (±0.28)
10 (0.39)	18 (0.71)	±1.35 (±0.05)	1000 (39.37)	1250 (49.21)	±8.25 (±0.32)
18 (0.71)	30 (1.18)	±1.65 (±0.06)	1250 (49.21)	1600 (62.99)	±9.75 (±0.38)
30 (1.18)	50 (1.97)	±1.95 (±0.08)	1600 (62.99)	2000 (78.74)	±11.5 (±0.45)
50 (1.97)	80 (3.15)	±2.3 (±0.09)	2000 (78.74)	2500 (98.43)	±14.0 (±0.55)
80 (3.15)	120 (4.72)	±2.7 (±0.11)	2500 (98.43)	3150 (124.02)	±16.5 (±0.65)
120 (4.72)	180 (7.09)	±3.15 (±0.12)			
180 (7.09)	250 (9.84)	±3.6 (±0.14)			
250 (9.84)	315 (12.40)	±4.05 (±0.16)			
315 (12.40)	400 (15.75)	±4.45 (±0.18)			
400 (15.75)	500 (19.69)	±4.85 (±0.19)			

Remarks: The numeric is based on criteria of tolerance class IT18 in JIS B 0401.

12. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described.

WARNING

- Magnetic flowmeters with the model name AXFA14C are products which have been certified as explosion proof type instruments. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these instruments. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations.
  Be sure to read this chapter before handling the instruments.
  For explosion proof type instrument, the description in this chapter is prior to other description in this user's manual.
  For TIIS flameproof type instruments, be sure to read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual.

WARNING

The terminal box cover and display cover is locked by special screw. In case of opening the cover, please use the hexagonal wrench attached.
The covers of explosion proof type products are locked. Use the attached hexagonal wrench to open and close the cover. Before opening the cover, be sure to check that the power of flowmeter has been turned off. Once the cover is closed, be sure to re-lock the product.
Be sure to lock the cover with the special screw using the hexagonal wrench attached after tightening the cover.

12.1 ATEX

WARNING

Only trained persons use this instrument in industrial locations.

(1) Technical Data

Applicable Standard:
EN 50014: 1997, EN 50018: 2000,
EN 50281-1-1: 1998
Certificate: KEMA 03ATEX2435

ATEX Flameproof Type

Group: II
Category: 2G
EEx d IIC T6
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

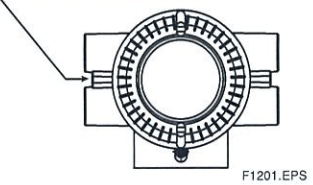
ATEX Type of Protection "Dust"

Group: II
Category: 1D
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Maximum surface temperature: T75°C (+167°F)
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

(2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port accordiing to the following codes.

Screw Size	Marking
ISO M20x1.5 female	⚠M
ANSI 1/2NPT female	⚠A



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(3) Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- In hazadous locations, the cable entry devices shall be of a certified ATEX flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is flameproof certified.)

(4) Operation

WARNING

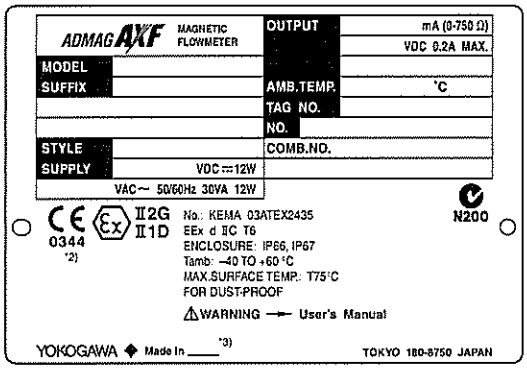
- After de-energizing, delay 20 minutes before opening.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(5) Maintenance and Repair

WARNING

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

(6) Data Plate



MODEL: Specified model code
SUFFIX: Suffix codes of the model code
STYLE: Specified style code
SUPPLY: Power supply voltage of apparatus
OUTPUT: Output signal of apparatus
AMB. TEMP., Tamb: Ambient temperature
No.: Manufacturing serial number *1)
CE: CE marking
II 2G: Group II Category 2 Gas atmosphere
II 1D: Group II Category 1 Dust atmosphere
No.: KEMA 03ATEX2435:
EC Type Examination certificate number
EEx d IIC T6: Protection type and temp. class
ENCLOSURE: Enclosure protection code

WARNING: Warning to apparatus
YOKOGAWA ◆ TOKYO 180-8750 JAPAN :
Name and address of manufacturer

*1) The third figure from the last shows the last one figure of the year of production. For example, the year of production of the product engraved as follows is year 2005.
No. S5EA05158 5**45**
↑
Produced in 2005

*2) The identification number of the notified body:
0344 KEMA Netherland

*3) The product-producing country

12.2 FM

(1) Technical Data

Applicable Standard:
FM3600, FM3615, FM3810, ANSI/NEMA 250
Explosion proof for Class I, Division 1, Groups A, B, C & D.
Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.
"SEAL ALL CONDUITS WITHIN 18 INCHES"
"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: NEMA 4X
Temperature Code: T6
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

(2) Installation

WARNING

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- In hazardous locations, wiring to be in conduit as shown in Figure 12.2.1.
- When installed in Division 2, "SEALS NOT REQUIRED"

(3) Operation

WARNING

- "OPEN CIRCUIT BEFORE REMOVING COVERS."
- "SEAL ALL CONDUITS WITHIN 18 INCHES" in hazardous locations.
- When installed in Division 2, "SEALS NOT REQUIRED"
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(4) Maintenance and Repair

WARNING

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of Factory Mutual Research Corporation.

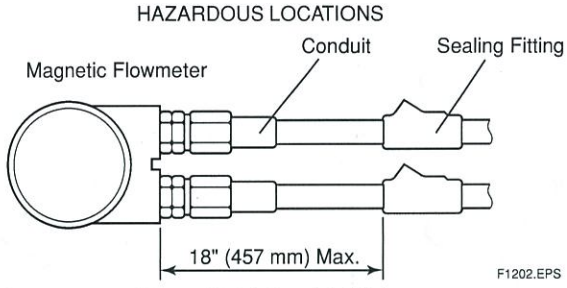


Figure 12.2.1 Conduit Wiring

12.3 CSA

(1) Technical Data

Applicable Standard:

For CSA C22.2 Series;

C22.2 No 0, C22.2 No 0.4, C22.2 No 0.5, C22.2 No 25, C22.2 No 30, C22.2 No 94, C22.2 No 1010.1

For CSA E79 Series;

CAN/CSA-E79-0, CAN/CSA-E79-1,

Certificate: 1481213

For CSA C22.2 Series

Explosion proof for Class I, Division 1, Groups A, B, C & D.

Dust-ignition proof for Class II/III, Division 1, Groups E, F & G.

"SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE"

"WHEN INSTALLED IN DIV. 2, SEALS NOT REQUIRED"

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: Type 4X

Temperature Code: T6

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

For CSA E79 Series

Flameproof for Zone 1, Ex d IIC T6

Maximum power supply voltage: 250 Vac/130 Vdc

Excitation Circuit: 140V max

Enclosure: IP66, IP67

Temperature Code: T6

Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

(2) Installation

For CSA C22.2 Series

WARNING

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in Figure 12.3.1.

WARNING : SEAL ALL CONDUITS WITHIN 50cm OF THE ENCLOSURE'. UN SCELLEMENT DOIT ÉTRE INSTALLÉ À MOINS DE 50cm DU BOÎTIER.

- When installed in Division 2, "SEALS NOT REQUIRED"

For CSA E79 Series

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- In hazadous locations, the cable entry devices shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is flameproof certified.)

(3) Operation

For CSA C22.2 Series

⚠ WARNING

WARNING : OPEN CIRCUIT BEFORE REMOVING COVER.
OUVRIR LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

For CSA E79 Series

⚠ WARNING

WARNING : AFTER DE-ENERGIZING, DELAY 20 MINUTES BEFORE OPENING.
APRÉS POWER-OFF, ATTENDRE 20 MINUTES AVANT D'OUVRIR.

- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(4) Maintenance and Repair

⚠ WARNING

The instrument modification or parts replacement by other than authorized representative of YOKOGAWA Electric Corporation or YOKOGAWA Corporation of AMERICA is prohibited and will void Canadian Standards Explosionproof Certification.

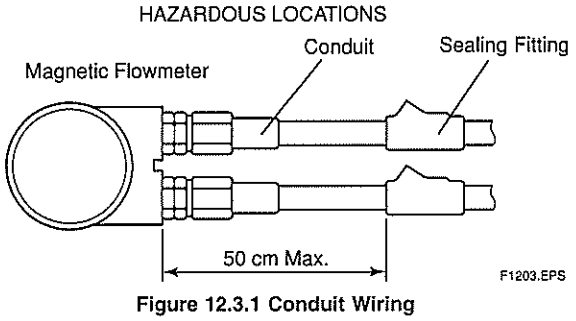


Figure 12.3.1 Conduit Wiring

12.4 IECEx

⚠ WARNING

Only trained persons use this instrument in industrial locations.

(1) Technical Data

Applicable Standard:
IEC60079-0: 2004, IEC60079-1: 2003,
IEC61241-0: 2004, IEC61241-1: 2004,
IEC60529: 1999 + Edition 2.1: 2001
Certificate: IECEx KEM 05.0018

IECEx Flameproof Type

Ex d IIC T6
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

IECEx Type of Protection "Dust"

Ex tD A21 IP6x T95°C
Maximum power supply voltage: 250 Vac/130 Vdc
Excitation Circuit: 140V max
Enclosure: IP66, IP67
Maximum surface temperature: T95°C (+203°F)
Ambient Temp.: –40°C to +60°C (–40°F to +140°F)

(2) Installation

⚠ WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- In hazadous locations, the cable entry devices shall be of a certified IECEx flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is certified as the flameproof and IP66 or IP67 as a part of this apparatus.)
- In case of ANSI 1/2 NPT plug, ANSI hexagonal wrench should be applied to screw in.

(3) Operation

WARNING

- After de-energizing, delay 20 minutes before opening.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(4) Maintenance and Repair

WARNING

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

12.5 TIIS

CAUTION

The model AXFA14C magnetic flowmeter remote converter with optional code JF3, which has obtained certification according to technical criteria for explosion-protected construction of electric machinery and equipment (Standards Notification No. 556 from the Japanese Ministry of Labor) conforming to IEC standards, is designed for hazardous areas where inflammable gases or vapors may be present. (This allows installation in Division 1 and 2 areas)
To preserve the safety of flameproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair activities. Users absolutely must read "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual.

(1) Technical Data

- Certificate: TC16678
- Construction: Ex d IIC T6
  : Explosion proof
- Ignition and Explosion Class of gas or vapour: IIC T6
- Ambient Temperature: –20 to 60°C (power supply code 1)
  : –20 to 50°C (power supply code 2)
- Maximum power supply voltage: 250V AC/130V DC
- Grounding: JIS Class C(grouding resistance 10Ω or less) or JIS Class A(grounding resistance 10Ω or less)

WARNING

In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.

WARNING

* In case of TIIS Flameproof type, a remote flowtube is available for combined use with the AXFA14 only.

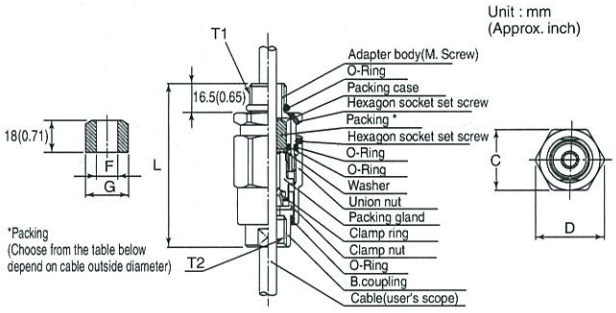
(2) Wiring Installation

For the external wiring of flameproof types, use a flameproof packing adapter approved by Yokogawa (refer to Figure 12.4.2) or cable wiring using a flameproof metal conduit (refer to Figure 12.4.4 and "INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT" at the end of this manual).

(2-1) Wiring Cable through Flameproof Packing Adapter

WARNING

For the TIIS flameproof type with wiring using a flameproof packing adapter, wire cables through the packing adapters approved by Yokogawa (optional code G14 or G13).



Dimension					Cable outer diameter	Packing diameter		Identification mark	Weight kg (lb)
T1	T2	C	D	L		F	G		
G 1/2	G 1/2	35 (1.38)	39 (1.54)	94.5 (3.72)	ϕ8.0 to ϕ10.0 (0.31 to 0.39)	ϕ10.0(0.39)	ϕ20.0 (0.79)	16 8-10	0.26 (0.57)
					ϕ10.0 to ϕ12.0 (0.39 to 0.47)	ϕ12.0(0.47)		16 10-12	

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Figure 12.4.1 Flameproof Packing Adapter

- Apply a nonhardening sealant to the terminal box connection port and to the threads on the flameproof packing adapter for waterproofing.
- The same wiring as described below is required for all of the terminal box connection ports except when a four-wire cable is used for power input and signal output with DC power supply.

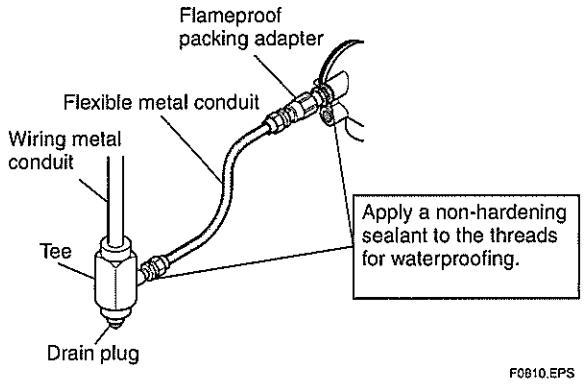


Figure 12.4.2 Typical Wiring Using Flexible Metal Conduit

Follow the procedure for flameproof packing adapter setting. (refer to Figure 12.4.3)

CAUTION

Before fighting, confirm cable length from terminal to flameproof packing adapter when setting. Once it is tightened, loosening and re-tightening may damage its sealing performance.

(a) Loosen the locking screw and remove the terminal box cover.
(b) Measure the cable outer diameter in two directions to within 0.1 mm.
(c) Calculate the average of the two diameters, and use packing with an internal diameter nearest to this value (see Table 12.4.1).
(d) Screw the flameproof packing adapter into the terminal box until the O-ring touches the wiring port (at least 6 full turns), and firmly tighten the lock nut.
(e) Insert the cable through the union cover, the union coupling, the clamp nut, the clamp ring, the gland, the washer, the rubber packing, and the packing box, in that order.
(f) Insert the end of the cable into the terminal box.
(g) Tighten the union cover to grip the cable. When tightening the union cover, tighten approximately one turn past the point where the cable will no longer move up and down.
Proper tightening is important. If it is too tight, a circuit break in the cable may occur; if not tight enough, the flameproof effectiveness will be compromised.
(h) Fasten the cable by tightening the clamp nut.
(i) Tighten the lock nut on the union cover.
(j) Connect the cable wires to each terminal.

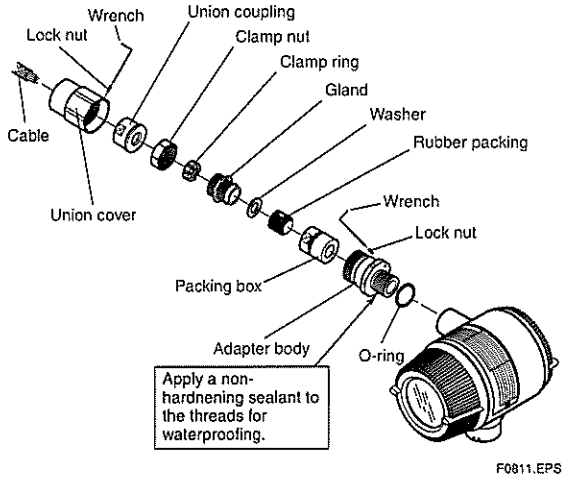


Figure 12.4.3 Installing Flameproof Packing Adapter

(2-2) Cable Wiring Using Flameproof Metal Conduit

- A seal fitting must be installed near the terminal box connection port for a sealed construction.
- Apply a non-hardening sealant to the threads of the terminal box connection port, flexible metal conduit and seal fitting for waterproofing.
- The same wiring as described below is required for all of the terminal box connection ports except when a four-wire cable is used for power input and signal output with DC power supply.

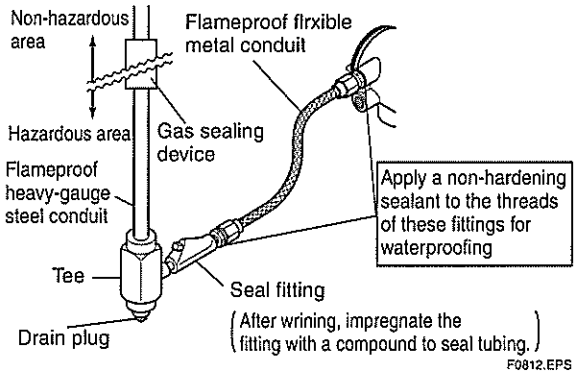


Figure 12.4.4 Typical Wiring Using Flameproof Metal Conduit

INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT

Apparatus Certified Under Technical Criteria
(IEC-compatible Standards)

1. General

The following describes precautions on electrical apparatus of flameproof construction (hereinafter referred to as flameproof apparatus) in explosion-protected apparatus.

Following the Labour Safety and Health Laws of Japan, flameproof apparatus is subjected to type tests to meet either the technical criteria for explosionproof electrical machinery and equipment (standards notification no. 556 from the Japanese Ministry of Labour) (hereinafter referred to as technical criteria), in conformity with the IEC Standards, or the "Recommended Practice for Explosion-Protected Electrical Installations in General Industries," published in 1979. These certified apparatus can be used in hazardous locations where explosive or inflammable gases or vapours may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements.

For electrical wiring and maintenance servicing, please refer to "Internal Wiring Rules" in the Electrical Installation Technical Standards as well as "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

To meet flameproof requirements, equipment that can be termed "flameproof" must:

(1) Be certified by a Japanese public authority in accordance with the Labour Safety and Health Laws of Japan and have a certification label in an appropriate location on its case, and
(2) Be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

2. Electrical Apparatus of Flameproof Type of Explosion-Protected Construction

Electrical apparatus which is of flameproof construction is subjected to a type test and certified by the Japanese Ministry of Labour aiming at preventing explosion caused by electrical apparatus in a factory or any location where inflammable gases or vapours may be present. The flameproof construction is of completely enclosed type and its enclosure shall endure explosive pressures in cases where explosive gases or vapours entering the enclosure cause explosion. In addition, the enclosure construction shall be such that flame caused by explosion does not ignite gases or vapours outside the enclosure.

In this manual, the word "flameproof" is applied to the flameproof equipment combined with the types of protection "e", "o", "i", and "d" as well as flameproof equipment.

3. Terminology

(1) Enclosure

An outer shell of an electrical apparatus, which encloses live parts and thus is needed to configure explosion-protected construction.

(2) Shroud

A component part which is so designed that the fastening of joint surfaces cannot be loosened unless a special tool is used.

(3) Enclosure internal volume

This is indicated by:— the total internal volume of the flameproof enclosure minus the volume of the internal components essential to equipment functions.

(4) Path length of joint surface

On a joint surface, the length of the shortest path through which flame flows from the inside to outside of the flameproof enclosure. This definition cannot be applied to threaded joints.

(5) Gaps between joint surfaces

The physical distance between two mating surfaces, or differences in diameters if the mating surfaces are cylindrical.

Note: The permissible sizes of gaps between joint surfaces, the path length of a joint surface and the number of joint threads are determined by such factors as the enclosure's internal volume, joint and mating surface construction, and the explosion classification of the specified gases and vapours.

4. Installation of Flameproof Apparatus

(1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

(2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from –20°C to +40°C (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to +60°C as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring or flameproof metal conduits for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. For metal conduits, attach sealing fittings as close to wiring connections as possible and completely seal the apparatus. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

(1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated form Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables, or cable connections with insulated cables inside the conduit pipes are made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

(2) Flameproof Metal Conduit Wiring

- For the flameproof metal conduit wiring or insulated wires shall be used as recommended by the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry, published in 1994.
- For conduit pipes, heavy-gauge steel conduits conforming to JIS C 8305 Standard shall be used.
- Flameproof sealing fittings shall be used in the vicinity of the wiring connections, and those fittings shall be filled with sealing compounds to complete sealing of the apparatus. In addition, to prevent explosive gases, moisture, or flame caused by explosion form being propagated through the conduit, always provide sealing fittings to complete sealing of the conduit in the following locations:
  (a) In the boundaries between the hazardous and non-hazardous locations.
  (b) In the boundaries where there is a different classification of hazardous location.
- For the connections of the apparatus with a conduit pipe or its associated accessories, G-type parallel pipe threads (JIS B 0202) shall be used to provide a minimum of five-thread engagement to complete tightness. In addition, since these parallel threads do not have sealing property, nonhardening sealant such as liquid gaskets shall thus be applied to those threads for ensuring waterproofness.
- If metal conduits need flexibility, use flameproof flexible fittings.

6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 "MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION" in the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

(1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

(a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.

(b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

(2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

(a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.

(b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.

⚠ CAUTION

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

(c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.

(d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

(3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

7. Selection of Cable Entry Devices for Flameproof Type

⚠ CAUTION

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

References:

(1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan

(2) USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

REVISION RECORD

Title: AXFA14G/C Magnetic Flowmeter Remote Converter
[Hardware Edition/Software Edition]
AXF Magnetic Flowmeter Integral Flowmeter [Software Edition]
Manual No.: IM 01E20C02-01E

Edition	Date	Page		Revised Item
6th	Oct. 2005	6-3 to 6-7	6.3	Corrected the data range from "0.00001" to "0.0001".(B23, C42, C49, F30 to F34) Corrected the position of decimal point from "0 to 5" to "0 to 4". (B23, B31, B33, C42, C46, C49, D11, E11, F30 to F34)" "Corrected the position of decimal point from "0 to 5" to "0 to 2".(C32)
		11-3		Added the "IECEx" to the hazardous area classification.
		11-7	SF2	Added the "IECEx Certification (SF2)" to the optional specifications.
		12-4	12.4	Added the "IECEx".
7th	June 2006	1-1		Added the postscript about FOUNDATION Fieldbus protocol type.
		4-4	4.4.2	Added the postscript about FOUNDATION Fieldbus protocol type.
		4-7	4.4.6 (2)	Added the "IECEx".
			4.4.7	Added the postscript about FOUNDATION Fieldbus protocol type.
		4-7		Added the important note on pulse rate range of active pulse output.
		5-1		Added the important note on "write protect".
		7-3	7.2.1	Added the important note on "write protect".
		8-1		Added the important note on "write protect".
		10-3	10.1.3	Added the postscript about FOUNDATION Fieldbus protocol type.
		10-4	10.2.1	Added the postscript about FOUNDATION Fieldbus protocol type.
			10.2.2	Added the postscript about FOUNDATION Fieldbus protocol type.
		11-1,2		Added the postscript about FOUNDATION Fieldbus protocol type.
		11-4 to 8		Added the postscript about FOUNDATION Fieldbus protocol type.
		11-5		Added the "-F" (FOUNDATION Fieldbus protocol)
8th	May 2007	1-2	(4)	Changed the warning note of "Maintenance".
		1-3	1.3	Added the IECEx to CAUTION.
		1-5	1.4	Added the ATEX documentation.
		4-3	4.3	Added the important note for the wiring ports.
		4-5	4.4.4	Added the important note for a 24 V power supply version (power supply code 2). Corrected the graph of "Supply Voltage and Cable Length".
		5-1		Changed the "SET", "SHIFT" and "▼" from character to figure.
		5-3	5.2	Corrected the flow chart. Changed the note of entry mode. Added the NOTE for display unit setting.
		5-4 to 5-6, 5-8, 5-9, 9-2, 9-4		Added the NOTE for display unit setting.
		6-30 to 6-31	J10, J11, J12	Added the sentence about indications action of display unit.
		6-32	J31	Added the parameter setting table for "Power supply code 2".
		8-2	8.1.2	Deleted the section of "Communication Line Requirements".
		10-1	10.1	Changed the warning note and important note of "Maintenance".
			10.1.1	Changed the caution note of "Fuse Replacement". Deleted the Figure 10.1.1.
		10-2	10.1.2	Changed the content of section "Display Unit Replacement" to "Changing the Direction of the Display Unit".
		10-3	10.1.3	Deleted the section "Display Unit Replacement" and section "Amplifier Replacement".
		10-4	10.2	Added the important note for "Setting of Switches".
		11-1		Deleted the "Communication Distance" and "Cable length for Specific Applications" from item of "HART". Added the "Mounting" to item of "Mounting/Shapes".
		11-3		Changed the certificate number of TIIS.
		11-5		Corrected the graph of "Supply Voltage and Cable Length for Power Supply Code 2".-
		11-7		Added the note to optional codes C1, C2, C3, EM, and G13.
		12-4		Added the "Excitation Circuit" to "IECEx Flameproof Type".
		12-5	12.5(1)	Changed the certificate number of TIIS.

Edition	Date	Page		Revised Item
9th	Jan. 2008	1-1		Added the postscript about PROFIBUS PA protocol type.
		1-2	1.1	Added the warning note on "write protect".
		4-4	4.4.2	Added the postscript about PROFIBUS PA protocol type.
		4-7	4.4.7	Added the postscript about PROFIBUS PA protocol type.
		5-1	5	Added the postscript about FOUNDATION Fieldbus protocol type and PROFIBUS PA protocol type.
				Added the warning note on "write protect".
		6-1	6.1	Added the postscript about FOUNDATION Fieldbus protocol type and PROFIBUS PA protocol type.
		7-3	7.2.1	Added the warning note on "write protect". Corrected the Figure 7.2.
		8-1	8	Added the warning note on "write protect".
		9-1	9	Added the postscript about FOUNDATION Fieldbus protocol type and PROFIBUS PA protocol type.
		9-3	9.1.2	Corrected the characters.
		10-4	10.3.1	Changed the flow chart.
		11-1		Added the postscript about PROFIBUS PA protocol type.
				Corrected the frequency of "Input Impedance of Communicating Device".
		11-4		Added the CAUTION to "EMC Conformity Standard".
		11-5		Changed the unit of "Vibration Conditions" from "G" to "m/s^2".
				Added the "-G" (PROFIBUS PA protocol).

Edition	Date	Page		Revised Item
10th	June 2012	1-3		Added the "Trademarks".
		2-1	2.2	Deleted the fuse from item of accessories.
		4-2	(2)	Added the recomended cable.
		4-3	4.3	Deleted the sentence of JIS C0920 standard.
				Corrected the Figure 4.3.1 and added two washers.
				Corrected the Figure 4.3.3 and added a gasket.
		4-8	4.4.7	Corrected the current range of Figure 4.4.9.
		5-1	5	Added the explanatory sentence of infra-red switches.
		5-4		Corrected the figures.
		6-11	P23	Added the "keep" to default value.
		6-14	B33	Corrected the unit from "M Unit/P" to "k Unit/P" of Exsample 1.
		6-29	G40, G42	Added the important note.
		7-3	7.2	Changed the IM number of BT200.
			7.2.1	Corrected the value of maximum receiving resistance of Figure 7.2.
		7-4	7.2.1 (3)	Changed the IM number of BT200.
		8-1 to 8-16	8	Changed the explanation of HART.
		10-1	10.1.1	Changed the caution note.
		11-1	11	Corrected the communication distance and the value of maximum load resistance of BRAIN.
				Changed the value of minimum load resistance of HART.
				Deleted the type by JIS C0920 of protection.
				Changed the kind of coating.
		11-2		Corrected item names of instantaneous flow rate/totalized value display functions.
				Added the default value of damping time constant.
				Abbreviated the HAZARDOUS AREA CLASSIFICATION.
				Changed the definition of accuracy.
		11-4		Changed the numbers of EMC conformity standards.
				Deleted the fuse from item of accessories.
		11-6		Corrected the current range of /EM.
		11-7	*2	Added the Singapore and India to applicable country of /SF2.
		12-1	12.1 (1)	Added the year to applicable standard numbers of CENELEC ATEX.

User's Manual

Model DY
Vortex Flowmeter
(Integral Type, Remote Type)
Model DYA
Vortex Flow Converter
(Remote Type)

digitalYEWFLO

IM 1F6A0-01E

vigilantplant.™

YOKOGAWA
Yokogawa Electric Corporation

IM 1F6A0-01E
8th Edition

CONTENTS

INTRODUCTION

The DY series of vortex flowmeters have been fine-tuned to your order specifications prior to shipment. Before use, read this manual thoroughly and familiarize yourself fully with the features, operations and handling of digitalYEWFLO to have the instrument deliver its full capabilities and to ensure its efficient and correct use.

■ Notices Regarding This Manual

- This manual should be passed to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without the written permission of Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa).
- This manual neither does warrant the marketability of this instrument nor it does warrant that the instrument will suit a particular purpose of the user.
- Every effort has been made to ensure accuracy in the contents of this manual. However, should any questions arise or errors come to your attention, please contact your nearest Yokogawa sales office that appears on the back of this manual or the sales representative from which you purchased the product.
- This manual is not intended for models with custom specifications.
- Revisions may not always be made in this manual in conjunction with changes in specifications, constructions and/or components if such changes are not deemed to interfere with the instrument's functionality or performance.

■ Notices Regarding Safety and Modification

- For the protection and safety of personnel, the instrument and the system comprising the instrument, be sure to follow the instructions on safety described in this manual when handling the product. If you handle the instrument in a manner contrary to these instructions, Yokogawa does not guarantee safety.
- If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- As for explosionproof model, if you yourself repair or modify the instrument and then fail to return it to its original form, the explosion-protected construction of the instrument will be impaired, creating a hazardous condition. Be sure to consult Yokogawa for repairs and modifications.

■ Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- The following safety symbol marks are used in this user's manual and instrument.

⚠ WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

⚠ CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

⏚ Functional grounding terminal

⎓ Direct current

Warranty

- The warranty of this instrument shall cover the period noted on the quotation presented to the Purchaser at the time of purchase. The Seller shall repair the instrument free of charge when the failure occurred during the warranty period.
- All inquiries on instrument failure should be directed to the Seller's sales representative from whom you purchased the instrument or your nearest sales office of the Seller.
- Should the instrument fail, contact the Seller specifying the model and instrument number of the product in question. Be specific in describing details on the failure and the process in which the failure occurred. It will be helpful if schematic diagrams and/or records of data are attached to the failed instrument.
- Whether or not the failed instrument should be repaired free of charge shall be left solely to the discretion of the Seller as a result of an inspection by the Seller.

■ The Purchaser shall not be entitled to receive repair services from the Seller free of charge, even during the warranty period, if the malfunction or damage is due to:

- improper and/or inadequate maintenance of the instrument in question by the Purchaser.
- handling, use or storage of the instrument in question beyond the design and/or specifications requirements.
- use of the instrument in question in a location not conforming to the conditions specified in the Seller's General Specification or Instruction Manual.
- retrofitting and/or repair by an other party than the Seller or a party to whom the Seller has entrusted repair services.
- improper relocation of the instrument in question after delivery.
- reason of force measure such as fires, earthquakes, storms/ floods, thunder/lightning, or other reasons not attributable to the instrument in question.

■ Using the Vortex Flowmeter Safely

⚠ WARNING

(1) Installation

- Installation of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The vortex flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the vortex flowmeter. When moving the vortex flowmeter, always use a trolley and have at least two people carry it.
- When the vortex flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the line for maintenance and so forth.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring

- The wiring of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The functional grounding must be connected securely at the terminal with the ⏚ mark to avoid danger to personnel.

(3) Operation

- Only expert engineer or skilled personnel are permitted to open the cover.

(4) Maintenance

- Maintenance on the vortex flowmeter should be performed by expert engineer or skilled personnel. No operator shall be permitted to perform any operations relating to maintenance.
- Always conform to maintenance procedures outlined in this manual. If necessary, contact Yokogawa.
- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or data plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.

(5) Explosion Protected Type Instrument

- For explosion proof type instrument, the description in Chapter 10 "EXPLOSION PROTECTED TYPE INSTRUMENT" is prior to the other description in this user's manual.
- Only trained persons use this instrument in the industrial location.
- The functional grounding ⏚ must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(6) European Pressure Equipment Directive (PED)

- When using the instrument as a PED-compliant product, be sure to read Chapter 11 before use.

1. HANDLING PRECAUTIONS

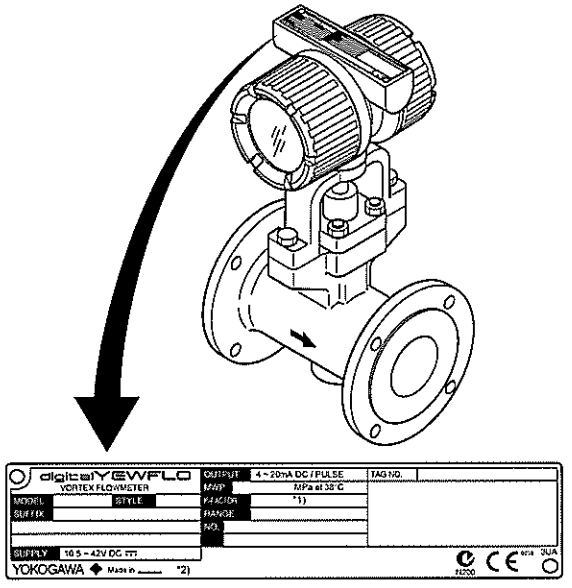
The Model DY Vortex Flowmeter and Model DYA Vortex Flow Converter are thoroughly tested at the factory before shipment. When these instruments are delivered, perform a visual check to ascertain that no damage occurred during shipment.

This section describes important cautions in handling these instruments. Read carefully before using them.

If you have any problems or questions, contact your nearest YOKOGAWA service center or sales representative.

1.1 Model and Specifications

The model and important specifications are indicated on the data plate attached to the case. Verify that they are the same as those specified in the original order, referring to paragraph 9.2 to 9.5. In any correspondence, always give model (MODEL), serial number (NO) and calibrated range (RANGE) from the data plate.



*1): K factor at 15°C
*2): The product - producing country.

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Figure 1.1(a) Example of Data Plate for Integral Type

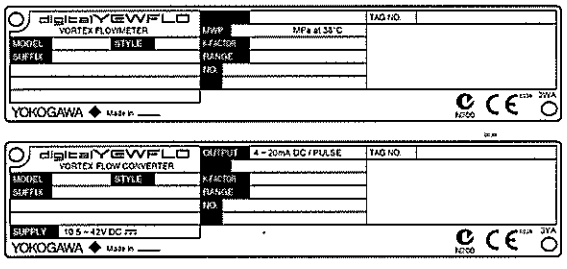

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Figure 1.1(b) Example of Data Plate for Remote Type

1.2 Precautions Regarding Transportation and Storage Location

To protect against accidental damage to digitalYEWFLO while transporting it to a new location, pack it in the original packing as when shipped from the Yokogawa factory.

⚠ WARNING

The Vortex Flowmeter is a heavy instrument. Please be careful to prevent persons from injuring when it is handled.

Deterioration in insulation or corrosion can occur for unexpected reasons if digitalYEWFLO is left uninstalled for a prolonged period after delivery. If digitalYEWFLO is likely to be stored over a prolonged period, observe the following precautions.

- Store the vortex flowmeter with forwarded statement.
- Choose a storage location that satisfies the following requirements:
  - Not exposed to rain or splashwater.
  - Less susceptible to mechanical vibration or shock.
  - Kept within the temperature and humidity ranges shown in the following table, preferably at normal temperature and humidity (approximately 25°C, 65%)

Temperature	–40°C to +80°C
Humidity	5 to 100% (no condensation)

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1.3 Precautions Regarding Installation Locations

(1) Ambient Temperature

Avoid an area which has wide temperature variations. When the installation area is subjected to heat radiation from process plant, ensure adequate heat prevention or ventilation.

(2) Atmospheric Conditions

Avoid installing the vortex flowmeter in a corrosive atmosphere. When the vortex flowmeter must be installed in a corrosive atmosphere, adequate ventilation must be provided.

(3) Mechanical Shock or Vibration

The vortex flowmeter is of sturdy construction, but select an area subject to minimize mechanical vibrations or impact shock. If the flowmeter is subject to vibrations, it is recommended that pipeline supports to be provided as shown in Figure 1.2.

(4) Other Considerations

- Choose a location where is sufficient clearance around digitalYEWFLO exist to allow such work as routine inspections.
- Choose a location that ensures easy wiring and piping.

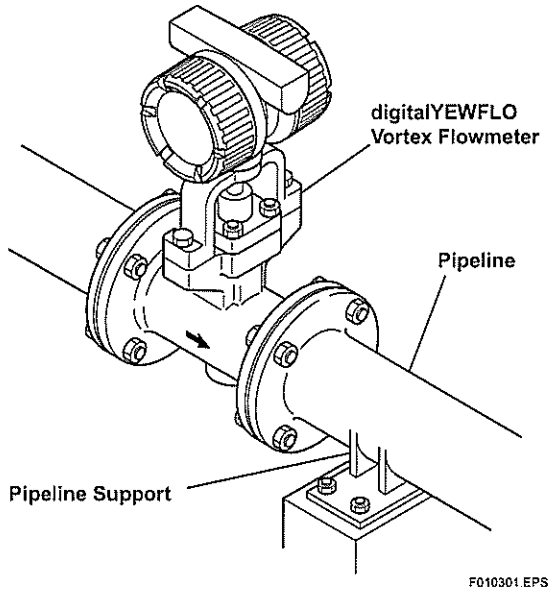


Figure 1.2

2. INSTALLATION

⚠ WARNING

This instrument must be installed by expert engineer or skilled personnel. The procedures described in this chapter are not permitted for operators.

2.1 Precautions Regarding Installation Locations

(1) Ambient Temperature

Avoid an area which has wide temperature variations. When the installation area is subjected to heat radiation from process plant, ensure adequate heat prevention or ventilation.

(2) Atmospheric Conditions

Avoid installing the vortex flowmeter in a corrosive atmosphere. When the vortex flowmeter must be installed in a corrosive atmosphere, adequate ventilation must be provided

(3) Mechanical Shock or Vibration

The vortex flowmeter is of sturdy construction, but select an area subject to minimize mechanical vibration or impact shock. If the flowmeter is subject to vibrations, it is recommended that pipeline supports to be provided as shown in Figure 2.1.

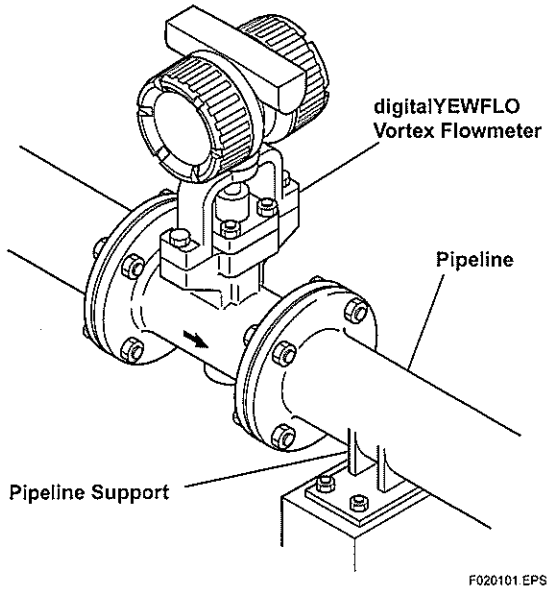


Figure 2.1

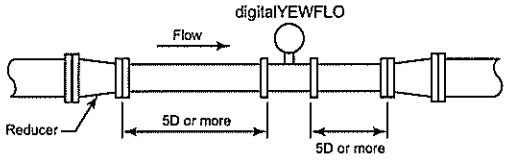
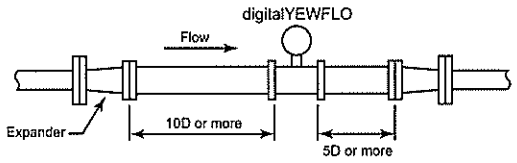
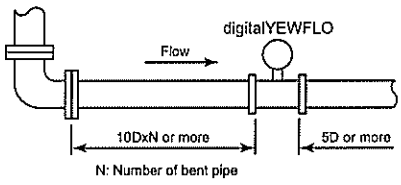
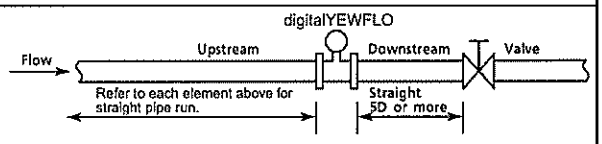
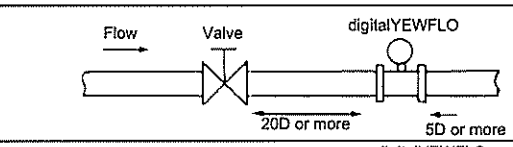
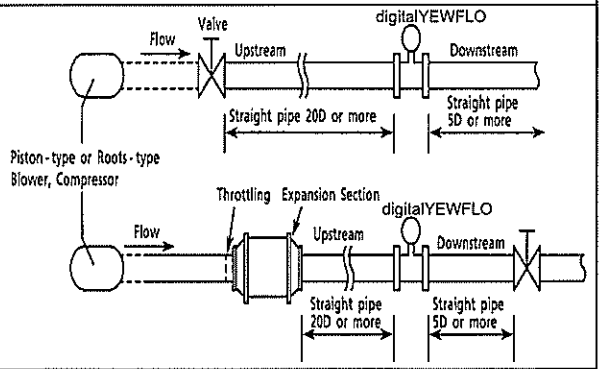
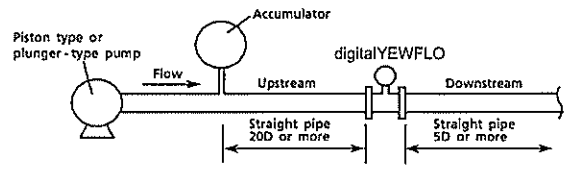
(4) Precautions Regarding Piping

(a) Ensure that the process connector bolts are tightened firmly.
(b) Ensure that no leak exists in the process connection pipeline.
(c) Do not apply a pressure higher than the specified maximum working pressure.
(d) Do not loosen or tighten the flange mounting bolts when the assembly is pressurized.
(e) Handle the vortex flowmeter carefully when measuring dangerous liquids, so that the liquids do not splash into eyes or on face. When using dangerous gases, be careful not to inhale them.

2.2 Piping

See Table 2.1 about Valve Position and Straight Pipe Length and so on.

Table 2.1 Installation

Description	Figure
Piping support: Typical vibration immunity level is 1G for normal piping condition. Piping support shoud be fixed in case of over 1G vibration level.	
Installation direction: If a pipe is always filled with liquids, the pipe can be installed vertically or at inclined angle.	
Adjacent pipes: The process pipline inner diameter should be larger than the digitalYEWFLO inner diameter. Use the following adjacent pipe. Norminal size 15mm up to 50mm : Sch 40 or less. Norminal size 80mm up to 300mm : Sch 80 or less.	
Reducer pipe: Ensure the upstream straight pipe length to be 5D or more, and the downstream straight pipe length to be 5D or more for per reducer pipe. (D: digitalYEWFLO nominal diameter)	
Expander pipe: Ensure the upstream straight pipe length to be 10D or more, and the downstream straight pipe length to be 5D or more for per expander pipe.	
Bent pipe and straight pipe length: Ensure the upstream straight pipe length to be 10D or more, and the downstream straight pipe length to be 5D or more for per bent pipe.	
Valve position and straight pipe length: ■ Install the valve on the downstream side of the flowmeter. The upstream straight pipe length dependent on the element located on the upstream such as reducer/expander, bent and etc., refer to description as above. Keep 5D or more for downstream straight pipe length. ■ In case the valve has to be installed on the upstream of the flowmeter, ensure the upstream straight pipe length to be 20D or more, and the downstream straight pipe length be 5D or more.	 
Fluid vibration: For a gas line which uses a position-type or roots-type blower compressor or a high-pressure liquid line (about 1MPa or more) which uses piston-type or plunger-type pump, fluid vibrations may be produced. In this case, install valve on the upstream side of digitalYEWFLO. For inevitable fluid vibration, put a vibration damping device such as throttling plate or expansion section in the upstream side of digitalYEWFLO.	
Piston-type or plunger pump: Install the accumulator on the upstream side of digitalYEWFLO to reduce fluid vibrations.	

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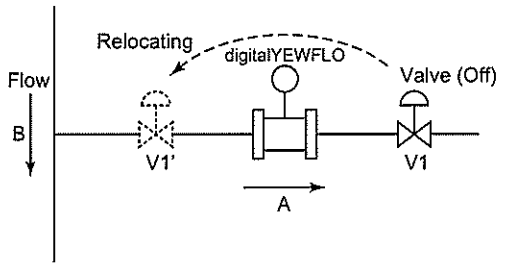
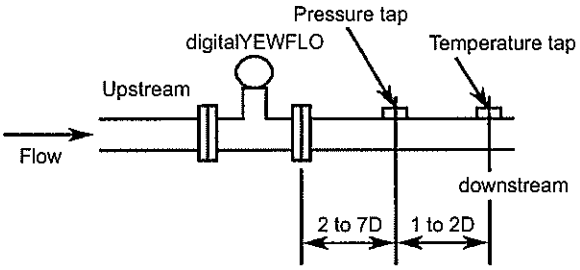
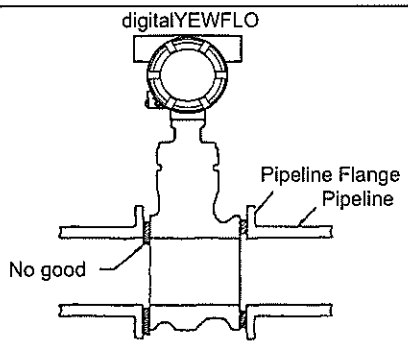
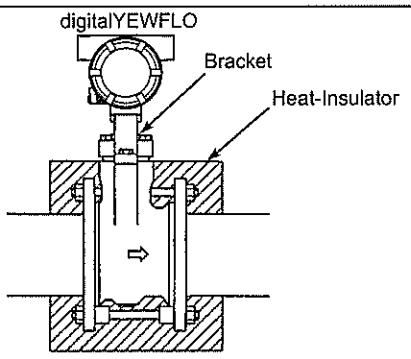
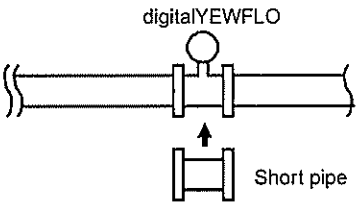
Description	Figure
Valve positon (T-type piping exist): When pulsation causes by a T-type piping exist, install the valve on the upstream of the flowmeter. Example:As shown in the figure, when the valve V1 is turned off, the fluid flow throught B as to meter A the flow is zero. But due to the pulsating pressure is detected, the meter is zero point become fluctuating. To avoid this, change the valve V1 location to V1'.	
Pressure and Temperature Taps: Pressure tap outlet: install this tap between 2D and 7D on the downstream side of a flowmeter. Temperature tap outlet: install this on the downstream side 1D to 2D away from a pressure tap.	
Mounting Gasket: Avoid mounting gaskets which protrude into the pipe line. This may cause inaccurate readings. Use the gaskets with bolt holes, even if digitalYEWFLO is the wafer type. When using a spiral gasket(without bolt holes), confirm the size with the gasket -manufacturer, as standard items may not be used for certain flange ratings.	
Heat-Insulation: When an integral-type flowmeter or a remote type detector is installed and the pipe carrying higt-temperature fluids is heat-insulated, do not wrap adiabatic materials around the installation bracket of the converter.	
Flushing of the pipe line: Flush and clean scale, incrustation and sludge on the inside of pipe for newly installed pipe line and repaired pipe line before the operation. For flushing, the flow should flow through bypass-piping to avoid damaging the flowmeter. If there is no bypass-piping, install short pipe instead of the flowmeter.	

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2.3 Precautions Regarding Installation

WARNING

In case of high process temperature, care should be taken not to burn yourself because the surface of body and case reach a high temperature.

(1) Gas or Steam Measuring Precautions

- **Piping to Prevent Standing Liquid**
  Mount digitalYEWFLO in a vertical pipeline to avoid liquid traps. When digitalYEWFLO is installed horizontally, raise that part of the pipeline in which the digitalYEWFLO is installed.

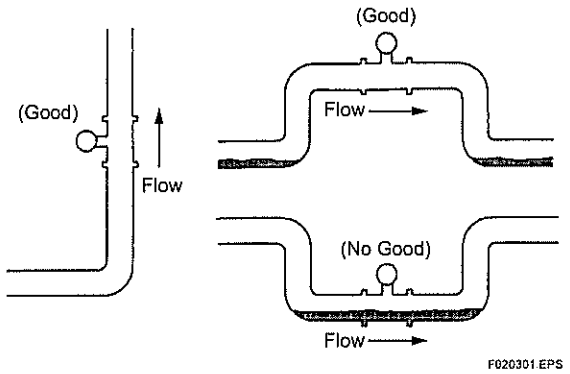


Figure 2.2

(2) Liquid Measurement Precautions

To insure accurate measurement, the digitalYEWFLO must always have a full pipe.

- **Piping Requirements for Proper Operation**
  Allow the flow to flow against gravity. When the flow is moving with gravity, lift the down-stream pipe length above the digitalYEWFLO installation level to maintain full pipeline.

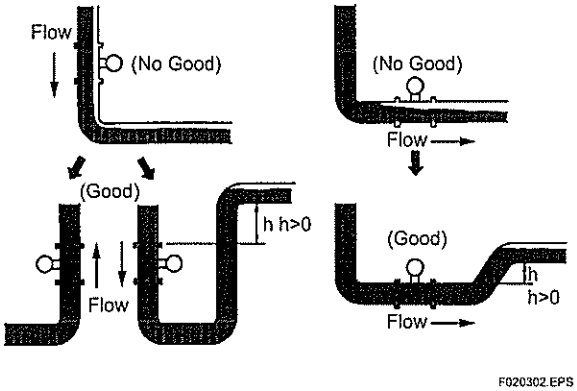


Figure 2.3

- **Piping for Avoiding Bubbles**
  Flows containing both gas and liquid cause problems. Avoid gas bubbles in a liquid flow. Piping should be carried out to avoid bubble generation.
  Install the valve on the downstream side of the flowmeter because pressure drop across the control valve may cause gas to come out of the solution.

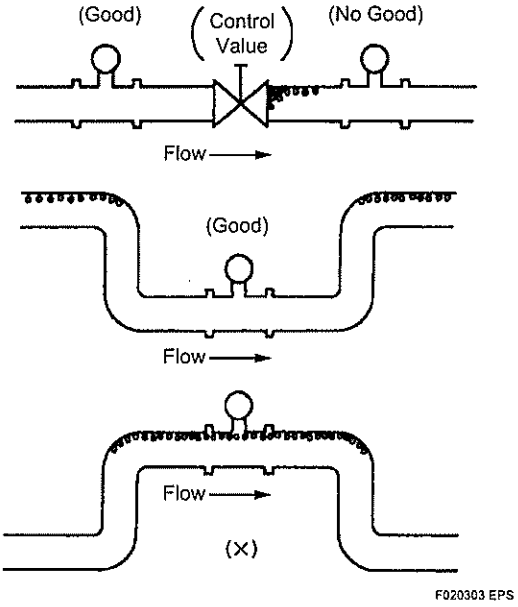


Figure 2.4

(3) Multi-Phase Flow

digitalYEWFLO can measure gas, liquid and steam when there is no change in state. However, accurate measurement of mixed flows (e.g. gas and liquid) is not possible.

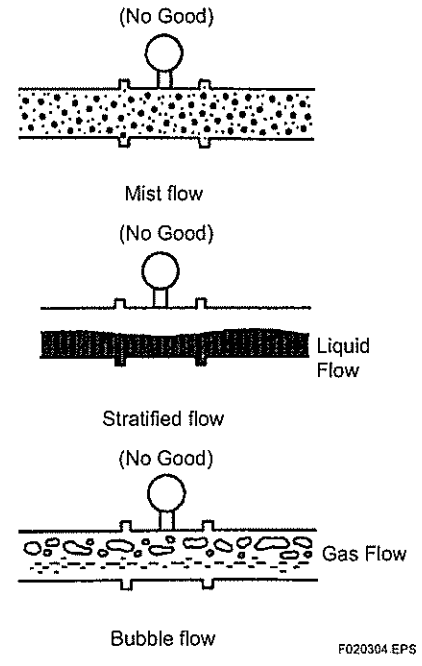


Figure 2.5

(4) Pipeline Diameter and digitalYEWFLO

The process pipeline inner diameter should be slightly larger than the vortex flowmeter inner diameter, schedule 40 or lower pipe should be used for 1/2 to 2 inch flowmeters and schedule 80 or lower pipes for 3 to 8 inch flowmeters.

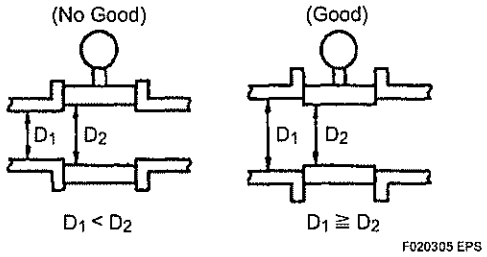


Figure 2.6

(5) Waterproof Construction

The vortex flowmeter is of IP67, NEMA4X tightprotection. However, it cannot be used under water.

2.4 Piping to Improve Durability

(1) Pipe cleaning

- Flushing of pipe line (Cleaning)
  Flush and clean scale, incrustation and sludge on the inside of pipe wall for newly installed pipe line and repaired pipe line before the operation.
- Fluid Carrying Solids
  Do not measure fluids that carry solids (e.g. sand and pebbles). Make sure users periodically remove solids adhering to the vortex shedder.
- Obstruction of flow fluids may cause to make a chemical reaction and the fluid will be crystallized and hardened, and be deposited on the pipe wall and shedder bar.
  In those cases, clean shedder bar.

(2) Bypass piping

Installing a bypass, as illustrated in the figure below, permits the digitalYEWFLO to be checked or cleaned conveniently (vortex shedder, etc.).

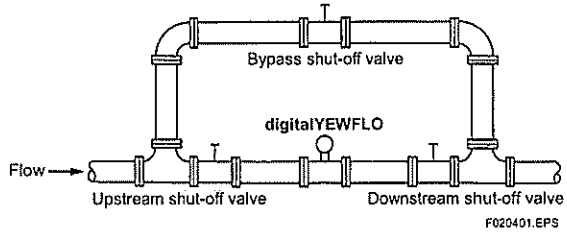


Figure 2.7

2.5 Cryogenic and High process Temperature Version Insulation

When you are using cryogenic type and high process temperature version of digitalYEWFLO Vortex Flowmeter (Option code/HT /LT), refer to illustrated insulation method as shown in Figure 2.8

(1) Installing Cryogenic Vortex Flowmeter

For cryogenic applications, use stainless steel mounting bolts and nuts to install the flowmeter. These can be ordered separately from YOKOGAWA. Cover the flowmeter body with heat insulating material so that the flowmeter can be maintained at ultra-low temperatures (refer to the Figure 2.8).

(2) Maintenance for Cryogenic Applications

DY/LT uses special materials that produce vortex flowmeter for cryogenic applications. When you are replacing a shedder bar, specify cryogenic type shedder bar. To avoid condensing in the terminal box, ensure that the wire connecting port is well sealed.

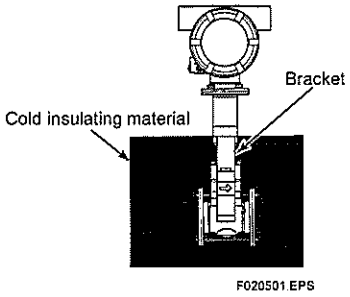


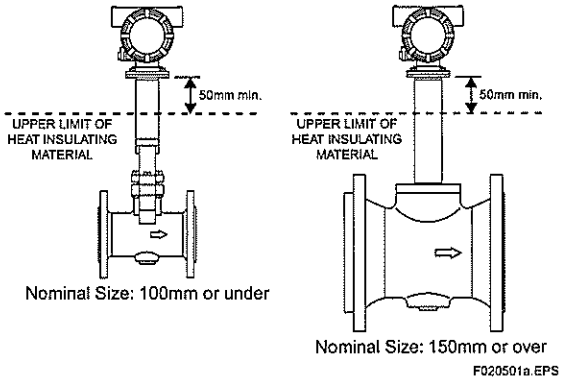
Figure 2.8

(3) Installing High Process Temperature Vortex Flowmeter

Installation of the flowmeter is the same as the standard type. Cover the flowmeter body with heat insulating material following instruction of "CAUTION".

⚠ CAUTION

Keep the upper limit of heat insulating material to prevent overheating of the terminal box.
Seal the heat insulating material to avoid hot-air leakage.



(4) Maintenance for High Process Temperature Applications

DY/HT uses special materials that produce vortex flowmeter for High Process Temperature applications When you are replacing a shedder bar or a gasket, specify High Process Temperature type.

2.6 Installing the Vortex Flowmeter

WARNING

The Vortex Flowmeter is a heavy instrument. Please be careful to prevent persons from injuring whin it is handled.

Before installing the instrument verify the following. The direction of flow should match to the arrow mark on the instrument body. When changing the orientation of the terminal box, refer to "7.1."

Installation of Vortex flowmeter of the wafer and flange type is shown in Table 2.3.

When installing the wafer type vortex flowmeter, it is important to align the instrument bore with the inner diameter of the adjacent piping.

To establish alignment, use the four collars supplied with the instrument.

1. Four collars are supplied for 1/2 inch (15mm) to 1- 1/ 2inch (40mm), 2 inch of JIS 10K or ANSI class 150 or JPI class 150, and 3 inch of ANSI class 150 or JPI class 150. Install the instrument as illustrated in Table 2.2.
2. If the adjacent flanges have eight bolt holes, insert the stud bolts in the holes on the instrument shoulder. Refer to Figure 2.9.
   Stainless steel stud bolts and nuts are available on order. When they are to be supplied by the user, refer to Table 2.2 for stud bolt length. Gaskets must be supplied by the user.
3. Gasket:
   Avoid mounting gaskets which protrude into the pipeline. This may cause inaccurate readings.
   Use gaskets with bolt holes, even if digitalYEWFLO is of the wafer type. Refer to Figure 2.10.
   When using a spiral gasket (without bolt holes), confirm the size with the gasket-manufacturer, as standard items may not be used for certain flange ratings.

Table 2.2

Size mm (inch)	Flange Rating	Major Diameter of External Threed of Stud Bolt d (mm)	Length ℓ (mm)
15mm (1/2B)	JIS 10K, 20K/DIN 10, 16,25,40	12	160
	JIS 40K	16	160
	ANSI 150, 300, 600	12.7	155
25mm (1B)	JIS 10K, 20K, 40K	16	160
	ANSI 150	12.7	155
	ANSI 300, 600	15.9	160
	DIN 10, 16, 25, 40	12	160
40mm (1-1/2B)	JIS 10K, 20K/DIN 10, 16, 25, 40	16	160
	JIS 40K	20	170
	ANSI 150	12.7	155
	ANSI 300, 600	19.1	170
50mm (2B)	JIS 10K, 20K, 40K/ DIN 10, 16, 25, 40	16	200
	ANSI 150, 300, 600	15.9	
80mm (3B)	JIS 10K/DIN 10, 16, 25, 40	16	220
	JIS 20K, 40K	20	240
	ANSI 150	15.9	
	ANSI 300, 600	19.1	
100mm (4B)	JIS 10K/DIN 10, 16	16	220
	JIS 20K/DIN 25, 40	20	240
	JIS 40K	22	270
	ANSI 150	15.9	240
	ANSI 300	19.1	240
	ANSI 600	22.2	270

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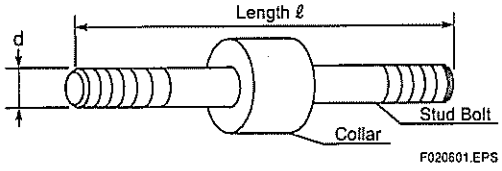


Figure 2.9

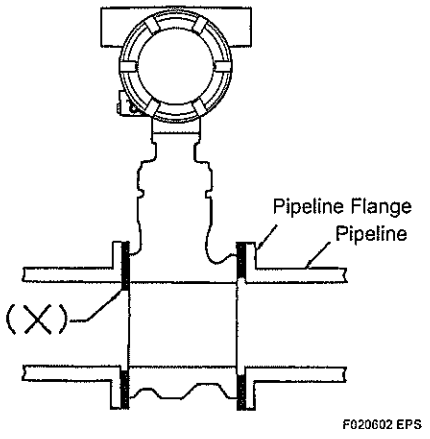


Figure 2.10

Table 2.3(a) Installation of Wafer Type Vortex Flowmeter

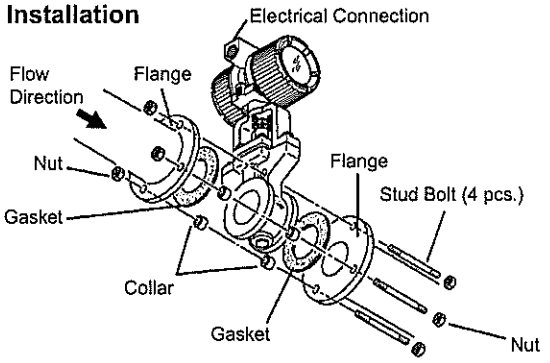
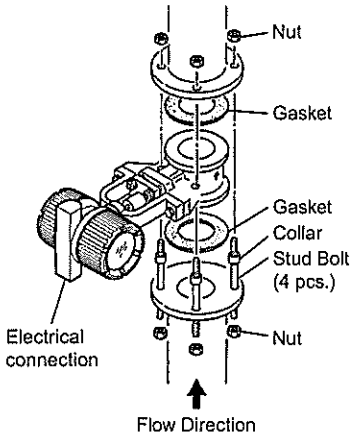
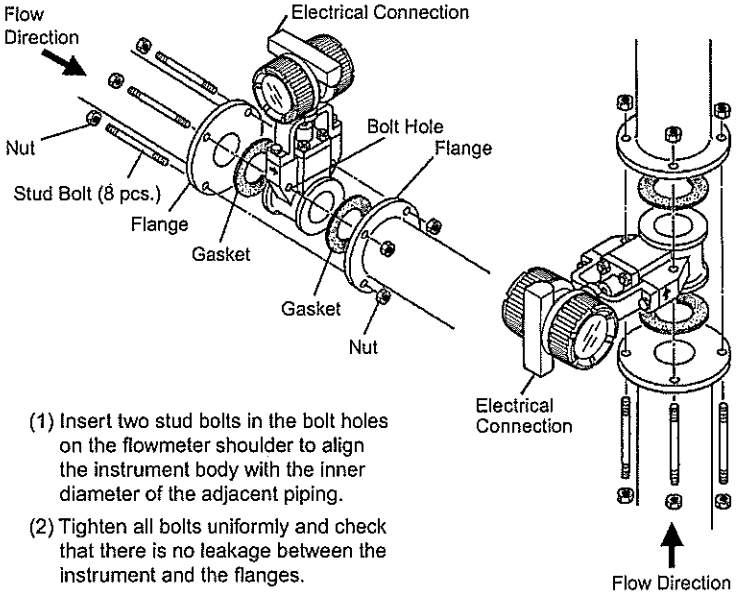
Wafer type	Description
When Installation Collar are required, the installation vortex flowmeters applied to the following line sizes and flange ratings. **Size mm(inch) / Flange Rating** 15 to 40 (1/2 to 1-1/2) / All ratings 50(2) / JIS 10K, ANSI class 150, DIN PN10 to PN40 80(3) / ANSI class 150, JPI class 150	**Horizontal Installation**  (1) Insert four collar on each of the four bolts and check that all four collars contact the outside diameter of the flowmeter body. (2) Tighten the four bolts uniformly. Check for leakage from the flange connections.
⚠ WARNING The inside diameter of the gasket must be larger than the pipe inner diameter so that it will not disturb the flow in the pipeline. **⚠ WARNING** When installing the Flowmeter vertically in the open air, change the electrical connection port direction to the ground. If the electrical connection port is installed upwards, rain water might leak in.	**Vertical Installation**  (1) Insert two each collars on each of the lower two bolts. (2) Place the flowmeter body on the lower two bolts. (3) Tighten the four bolts (including upper two bolts) and nuts uniformly. (4) Check for leakage from the flange connections.
When Installation Collars are not required,the installation vortex flowmeters applied to the following line sizes and flanges. **Size mm(inch) / Flange Rating** 50(2) / JIS 20K, 40K ANSI class 300,600 JPI class 300,600 80(3) / JIS 10K, 20K, 40K ANSI class 300, 600 JPI class 300,600 100(4) / JIS 10K, 20, 40K ANSI class 150, 300, 600 JPI class 150,300,600	**Horizontal Installation** **Vertical Installation**  (1) Insert two stud bolts in the bolt holes on the flowmeter shoulder to align the instrument body with the inner diameter of the adjacent piping. (2) Tighten all bolts uniformly and check that there is no leakage between the instrument and the flanges.

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Table 2.3(b) Installation of Flange Type Vortex Flowmeter

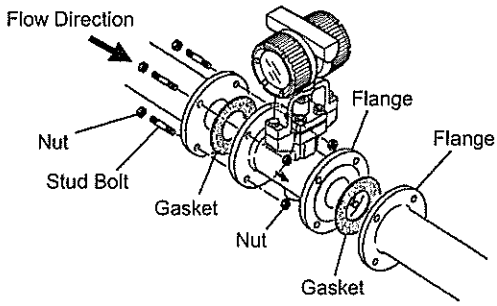
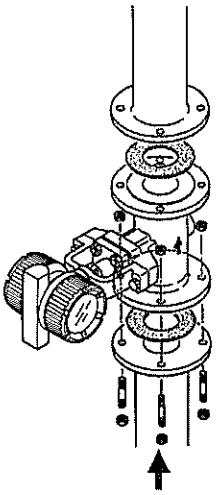
Flange type	Description
Use the stud bolts and nuts supplied with the flowmeter of the user. The gaskets should be supplied by the user. ⚠ **CAUTION** The inside diameter of the gasket must be larger than the pipe inner diameter so that it will not disturb the flow in the pipeline.	**Horizontal Installation**   **Vertical Installation**

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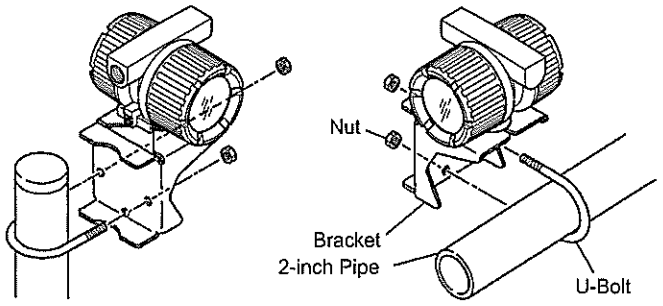
Table 2.3(c) Installation of remote Type Converter

Remote type converter	Description
⚠ **CAUTION** A signal cable (DYC) is used between the remote type flowmeter and the converter. The maximum signal cable length is 97.5ft (30m).	The converter is mounted on a 2-inch (60.5mm outer dia.) stanchion or horizontal pipe. Do not mount the converter on a vertical pipe. It makes wiring and maintenance difficult. The converter mounting orientation can be changed as illustrated below. **Stanchion Mounting** **Horizontal Pipe Mounting** 

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3. WIRING

WARNING

The wiring of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

3.1 Wiring Precautions

Be sure to observe the following precautions when wiring:

CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- Be sure to turn power off before opening the cover.
- Before turning the power on, tighten the cover securely.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.
- The terminal box cover is locked by the clamp. In case of opening the terminal box cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the clamp using the hexagonal wrench attached after installing the cover.

3.2 Wiring for Output Condition

Table 3.1 shows the connection method of several output conditions.

(1) Analog Output (4 to 20 mA DC)

This converter uses the same two wires for both, the signal and power supply. A DC power supply is required in a transmission loop. The total leadwire resistance including the instrument load and power distributor (supplied by the user) must conform to a value in the permissible load resistance range. Refer to Figure 3.1 shows.

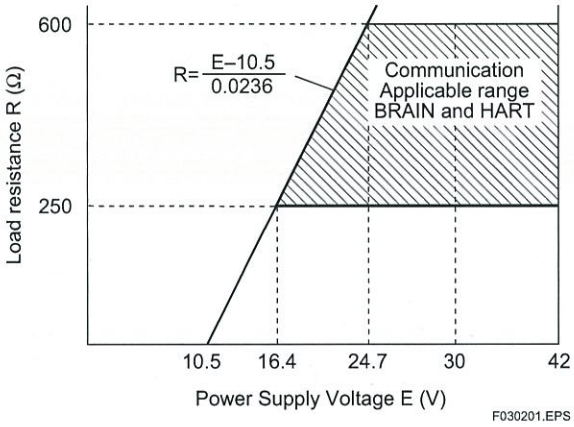


Figure 3.1 Relationship between Power Supply Voltage and Load Resistance (4 to 20 mA DC Output)

(2) Pulse output and Alarm, Status Output

This version uses three wires between the converter and the power supply. A DC power and load resistance are required, and pulse output is connected to a totalizer or an electric counter. Low level of the pulse output is 0 to 2V. No communication is possible over a transmission line. Communication via the amplifier board is always possible irrespective of the wiring condition.

(3) Simultaneous Analog-Pulse Output

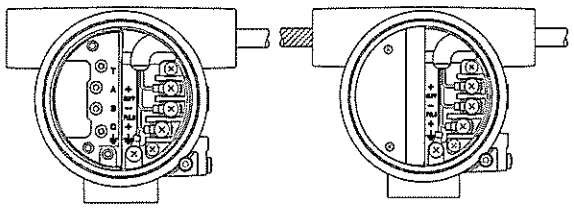
When using digitalYEWFLO in the simultaneous analog -pulse output mode, the communicable distance of the transmission line is restricted on the wiring method. Table 3.1 shows the examples of connection for this output mode. Communication via the amplifier board is always possible irrespective of the wiring condition.

IMPORTANT

For pulse output and the simultaneous analog-pulse output ,use the load resistance. Refer to Table 3.1.

3.3 Connection

Table 3.1 shows the connection sample of connection for power supply and load resistance. The terminal position of each connection is shown in Figure 3.2.



Integral type Remote type

T	Input Terminal from built-in temperature sensor		
A B	Input Terminals from vortex detector	Supply + –	4 to 20 mA DC Output Power Supply and Output Signal Terminals
C	Common Terminal	Pulse +	Pulse Output Terminal

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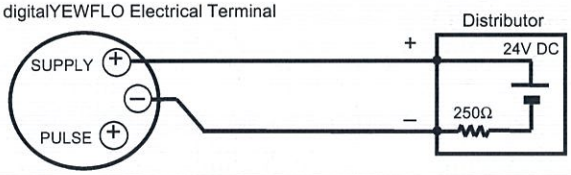
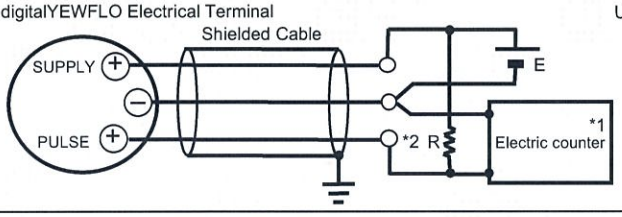
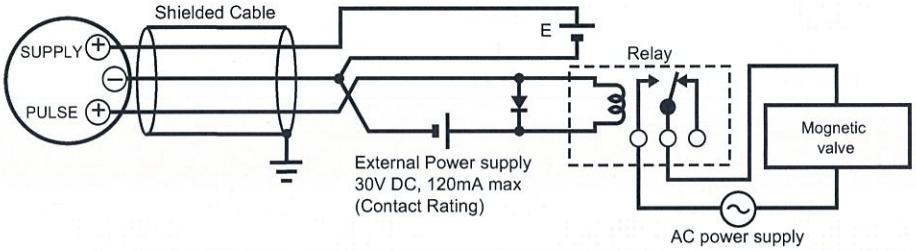
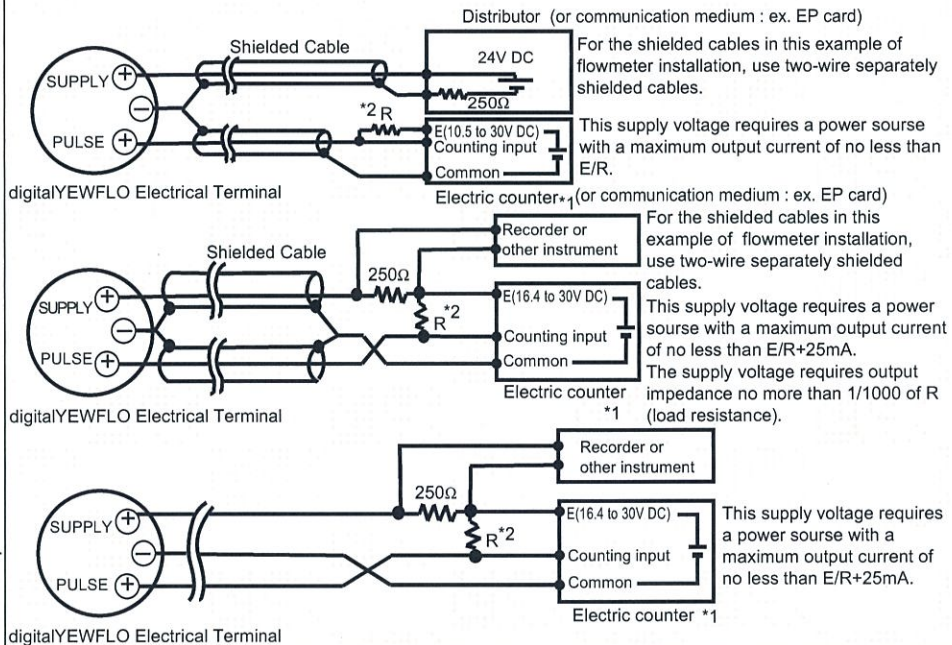
Figure 3.2

Table 3.1 The connection example for simultaneous analog and pulse and alarm, status output.

<table>
<tr><th>Connection</th><th>Description</th></tr>
<tr><td>Analog Output
In this case, Communication is possible (up to a distance of 2km when a CEV cable is used.)</td><td>digitalYEWFLO Electrical Terminal
 
</td></tr>
<tr><td>Pulse Output
In this case, No communication is possible.</td><td>digitalYEWFLO Electrical Terminal
Use the Three-wire shielded cable.
 
</td></tr>
<tr><td>Status Output
Alarm Output
In this case, No communication is possible.</td><td>digitalYEWFLO Electrical Terminal
Use the Three-wire shielded cable.
 
</td></tr>
<tr><td>Simultaneous Analog -Pulse Output
Example 1
In this case, Communica -tion is possible(up to a distance of 2km when a CEV cable is used).

Example 2
In this case, Communica -tion is possible (up to a distance of 200m when a CEV cable is used) and R = 1kΩ).

Example 3
In this case, No communi -cation is possible (when shielded cable is not used).</td><td>When analog and pulse output are used, the length of communication line is subjected to wiring conditions. Refer to example 1 to 3. If the communication carries out from amplifier, no need to consider wiring conditions.
 
</td></tr>
<tr><td>The range of load resistance R for the pulse output.</td><td>The load resistance of pulse output should be used to 1kΩ, 2W.
If no translation of the pulse output possible by the cable length or the frequency of the pluse output, the load resistance should be selected by calculation as shown below.
$\frac{E\,(V)}{120} \leqq R\,(k\Omega) \leqq \frac{0.1}{C\,(\mu F) \times f\,(kHz)}$
Example of CEV cable capacitance ≒ 0.1μF/km
$P\,(mW) = \frac{E^2\,(V)}{R\,(k\Omega)}$
Where
E = Supply voltage (V)
f = Frequency of pulse output (kHz)
R = Value of load resistance (kΩ)
C = Cable capacitance (μF)
P = Power ratio of the load resistance (mW)</td></tr>
</table>

*1 : To avoid the influence of external noise, use an electric counter which fits to the pulse frequency.
*2 : Resistor is not necessary in case of an electric counter which can receive contact pulse signal directly.

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3.4 Wiring Cables and Wires

The following should be taken into consideration when selecting cables for use between the converter and distributor.

(1) Use 600V PVC insulated wire or equivalent standard wire or cable.
(2) Use shielded wire in areas susceptible to electrical noise (both analog and pulse output versions).
(3) In areas with high or low ambient temperatures, use wires or cables suitable for such temperatures.
(4) In atmospheres where oils or solvents, corrosive gases or liquids may be present, use suitable wires or cables.
(5) Use cable which withstand temperature up to 60°C and more, when ambient temperature is more than 60°C.

IMPORTANT

For the remote type, use DYC signal cable to connect the converter and remote type flowmeter(DY-N).

3.5 Connection of the Remote Type Signal Cable

The remote type signal cable is shown in Figure 3.3 and 3.4, and the terminal is shown in Figure 3.5.

The maximum cable length is 30 m (97.5 feet).

Remove terminal box cover and wiring connection dust-cap before wiring.

For remote type the converter has two electrical connections (cable inlets). Use the left connection as viewed from the terminal box for the DYC signal cable and the right connection for the transmission cable.

If a signal cable kit is supplied by YOKOGAWA, both ends of the cable must be finished in accordance with the following instructions as shown in 3.6.1 and 3.6.2.

CAUTION

After completing the signal cable connections, install the shielded cover to signal cable terminal as shown in Figure 3.6.

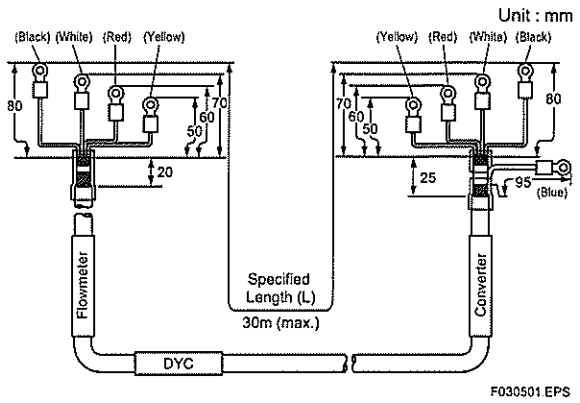


Figure 3.3 DYC Signal Cable

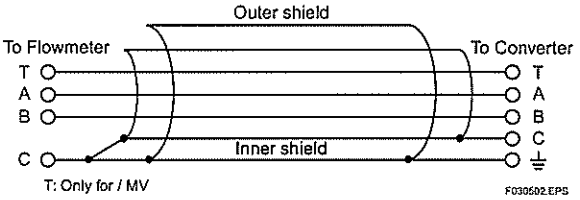
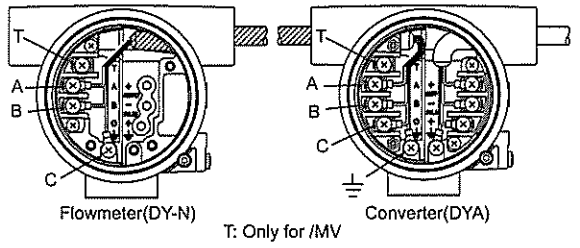


Figure 3.4 Construction of Remote Type Signal Cable



T	Input Terminal from built-in temperature sensor		
A B	Input Terminals from vortex detector	Supply + −	4 to 20 mA DC Output Power Supply and Output Signal Terminals
C	Common Terminal	Pulse +	Pulse Output Terminal

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Figure 3.5 Terminal of Detector and Converter

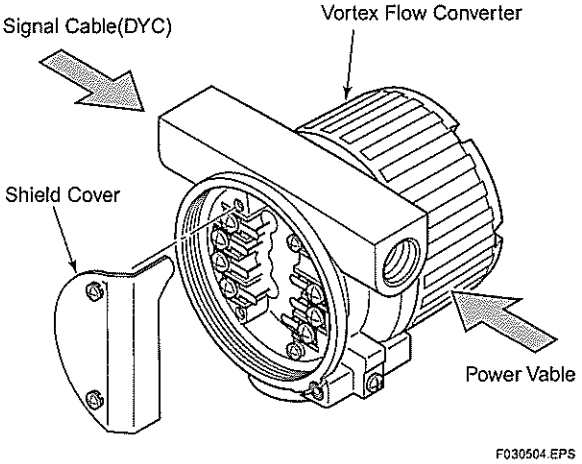
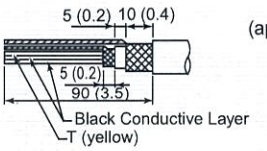
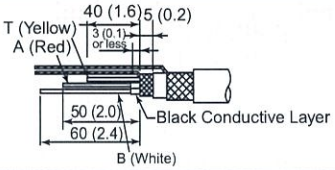
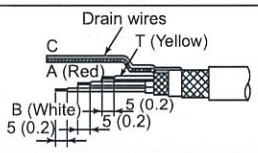
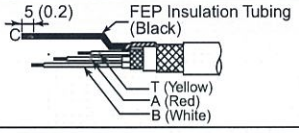
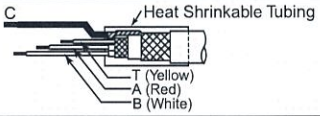
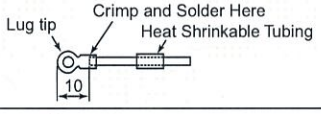


Figure 3.6 Shielded Cover

3.6 Method of Finishing the Signal Cable End(DYC)

3.6.1 For Vortex Flowmeter (DY-N)

	Description	Figure
1	Strip off the outer polyethylene jacket, outer braided shield and inner jacket, and inner braided shield as per the dimensions below.	Unit : mm (approx. inches) 
2	Strip off the black conductive layer convering two wires completely, as per the dimensions below. Twist each of the conductor and drain wires so that there are no free strands.	
3	Do not short-circuit the conductive layer and the terminals (A, B, C and T).	
4	Strip off about 5 mm (0.2 in.) of insulation for each of wires A, B, and T, and twist the strands of each wire. Twist the inner and outer drain wires together.	
5	Slide FEP (fluorinated ethylene propylene) tubing over the twisted inner and outer drain wires C until the tubing cannot be slid any further, and then cut off the tubing leaving 5 mm (0.2 in.) of the stranded drain wires exposed.	
6	Slide heat shrinkable tubing over the cable end so that the tubing covers the braided shield and overlaps both the polyethylene jacket and loose wires A, B, C, and T.	
7	Slide a short piece of heat shrinkable tubing over each of wires A, B, C, and T. Install a crimp-on terminal lug at the tip of each wire. Crimp and solder each lug.	
8	Slide each short piece of heat shrinkable tubing over the crimp sleeve. Heat all pieces of heat shrinkable tubing with a heat blower or dryer.	
9	Attach an identification label to the end of the cable.	

(*1): Only for /MV

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NOTE

Check that the insulation resistance between each wire including the inner shield is 10MΩ or greater at 500V DC. Ensure that both ends of the wires are disconnected (open-circuited) during the check.

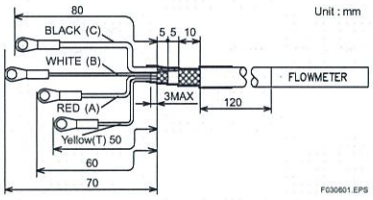


Figure 3.7

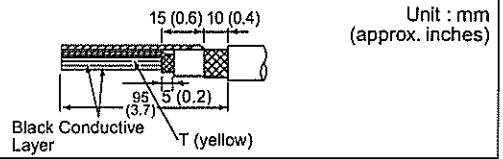
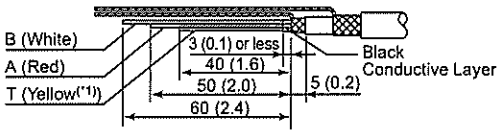
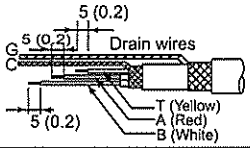
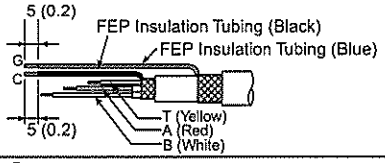
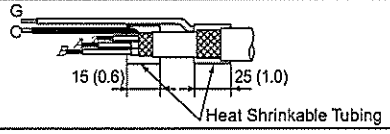
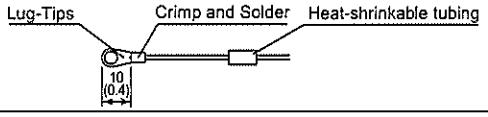
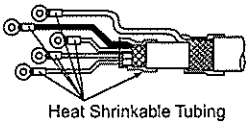
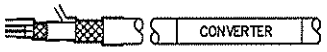
NOTE

In case that the cable end finish parts assembly is necessary after delivery, contact your nearest Yokogawa sales office or the sales representative from which you purchased the product. The parts number of DYC cable end finish parts assembly:
Standard type: F9399AB
Multivariable type (/MV): F9399AD

CAUTION

Do not touch the " conductive layer" (black area covering the signal cables A and B) to the converter case, terminal, and other leadwires. If it is touched, operation of the converter may be incorrect. When the cable is terminated, remove the conductive layer properly.

3.6.2 For Vortex Flow Converter (DYA)

	Description	Figure
1	Strip off the outer polyethylene jacket, outer braided shield and inner jacket, and inner braided shield as per the dimensions as shown.	
2	Cut of the black conductive layers(convering the two wires) completely, as per the dimensions below. Twist each of the conductor and drain wires so that there are no free strands.	
3	Do not short-circuit the conductive layer and the terminals (A, B, C, G and T).	
4	Strip off about 5 mm (0.2 in.) of insulation for each of wires A, B, and T, and twist the strands of each wire.	
5	Slide black FEP (fluorinated ethylene propylene) tubing over the inner shield drain wire C and blue FEP tubing over outer shield drain wire G until the tubing cannot be slid any further, and then cut off the tubing leaving 5 mm (0.2 in.) of the drain wires exposed.	
6	Slide heat shrinkable tubing over the cable end so that the tubing covers the braided shield and overlaps both the polyethylene jacket and loose wires A, B, C, G, and T.	
7	Slide a short piece of heat shrinkable tubing over each of wires A, B, C, G, and T. Install a crimp-on terminal lug at the tip of each wire. Crimp and solder each lug.	
8	Slide each short piece of heat shrinkable tubing over the crimp sleeve. Heat all pieces of heat shrinkable tubing with a heat blower or dryer.	
9	Attach an identification label to the end of the cable.	

(*1): Only for /MV

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NOTE

Check that the insulation resistance between each wire including the inner shield is 10MΩ or greater at 500V DC. Ensure that both ends of the wires are disconnected (open-circuited) during the check.

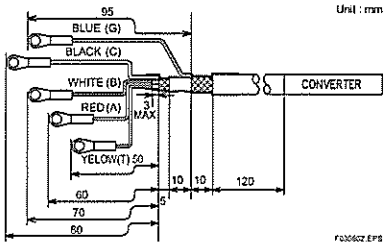

Figure 3.8

NOTE

In case that the cable end finish parts assembly is necessary after delivery, contact your nearest Yokogawa sales office or the sales representative from which you purchased the product.
The parts number of DYC cable end finish parts assembly:
Standard type: F9399AA
Multivariable type (/MV): F9399AC

CAUTION

Do not touch the " conductive layer" (black area covering the signal cables A and B) to the converter case, terminal, and other leadwires. If it is touched, operation of the converter may be incorrect. When the cable is terminated, remove the conductive layer properly.

3.7 Wiring Cautions

(1) Lay wiring as far as possible from electrical noise sources such as large transformers, motors and power supplies.
(2) It is recommended that crimp-on type solderless lugs be used for large wire ends.
(3) For general use, it is recommended that conduits and ducts or racks be used to protect wiring from water or mechanical damage. A rigid steel conduit or flexible metal conduit is recommended. See Figure 3.9.

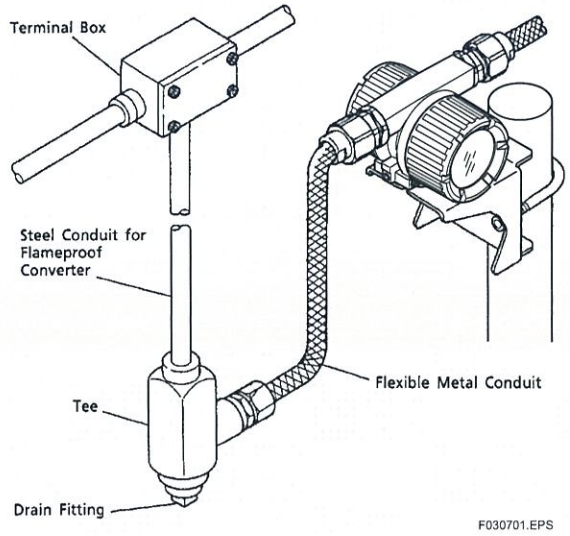

Figure 3.9

3.8 Grounding

IMPORTANT

When a lightning protector (option code: /A) is selected, use a grounding resistance of 10Ω or less.

(1) The grounding terminals ⏚ are located on the inside and outside of the terminal area. Either terminal may be used.
(2) For pulse output version, ground the flowmeter. Also ground the shielded cable between the converter and the pulse receiver.
(3) Grounding should satisfy Class D requirements (ground resistance 100Ω or less).
(4) Use 600V PVC insulated wire for grounding.

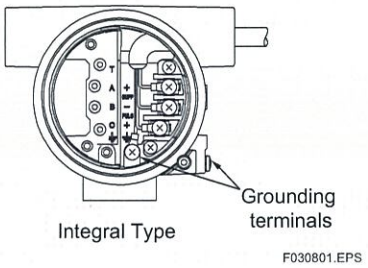

Figure 3.10

4. BASIC OPERATING PROCEDURES

Data setting can be performed with the three keys on the front panel (SET,SHIFT and INC) or using a handheld BRAIN(BT) terminal and HART communicator.

4.1 Construction of the Display

Figure 4.1 shows the configuration of the digitalYEWFLO display panel (if equipped).

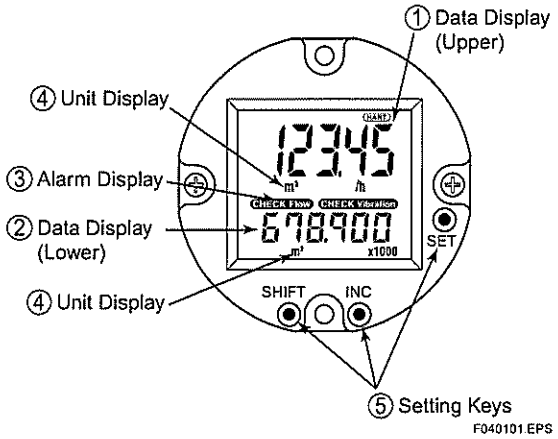

Figure 4.1 · Construction of the Display

① Data Display(Upper) : Displays flowrate data, setting data, total data.
② Data Display(Lower) : Displays total data, alarm data.
③ Alarm Display : Displays alarm of a flow error and a vibration error.
④ Unit Display : Displays Flowrate unit.
⑤ Setting Keys : These keys are used to change flow rate data displays and type of setting data.

■ Description of unit indications and its votes.

Table 4.1 shows the description of unit indications and it's votes.

Table 4.1 Unit Indicator

Unit	Upper Indication	Lower Indication
%	○	×
m^3	○	○
ℓ	○	○
Nm^3	○	○
Nℓ	○	○
Sm^3	○	○
Sℓ	○	○
kg	○	○
t	○	○
/h	○	×
/m	○	×
/s	○	×
/d	○	×
°C	×	○(*1)

(*1) Only for /MV

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4.2 Display Contents in Display Section

The display content items are classified in the following three items.

Table 4.2 Mode Name List

Mode (status) Name	Display Contents
Flowrate display mode	A mode in which instantaneous flow rates or totalized values are displayed. Display content is usually selected either in display content selection mode or by setting parameters via BRAIN communication.
Setting mode	In this mode, parameter contents are confirmed or data is updated using the setting section. The mode is changed to this mode when [SET] key is pressed in normal mode.
Alarm number display mode	This mode is overlapped when an alarm is occurring in display mode. The alarm number presentation to indicate alarm contents (about 2 sec) and the normal data display (about 4 sec) are repeated alternatively.

Mode represents that the system is in a state where the relevant setting or display is possible.

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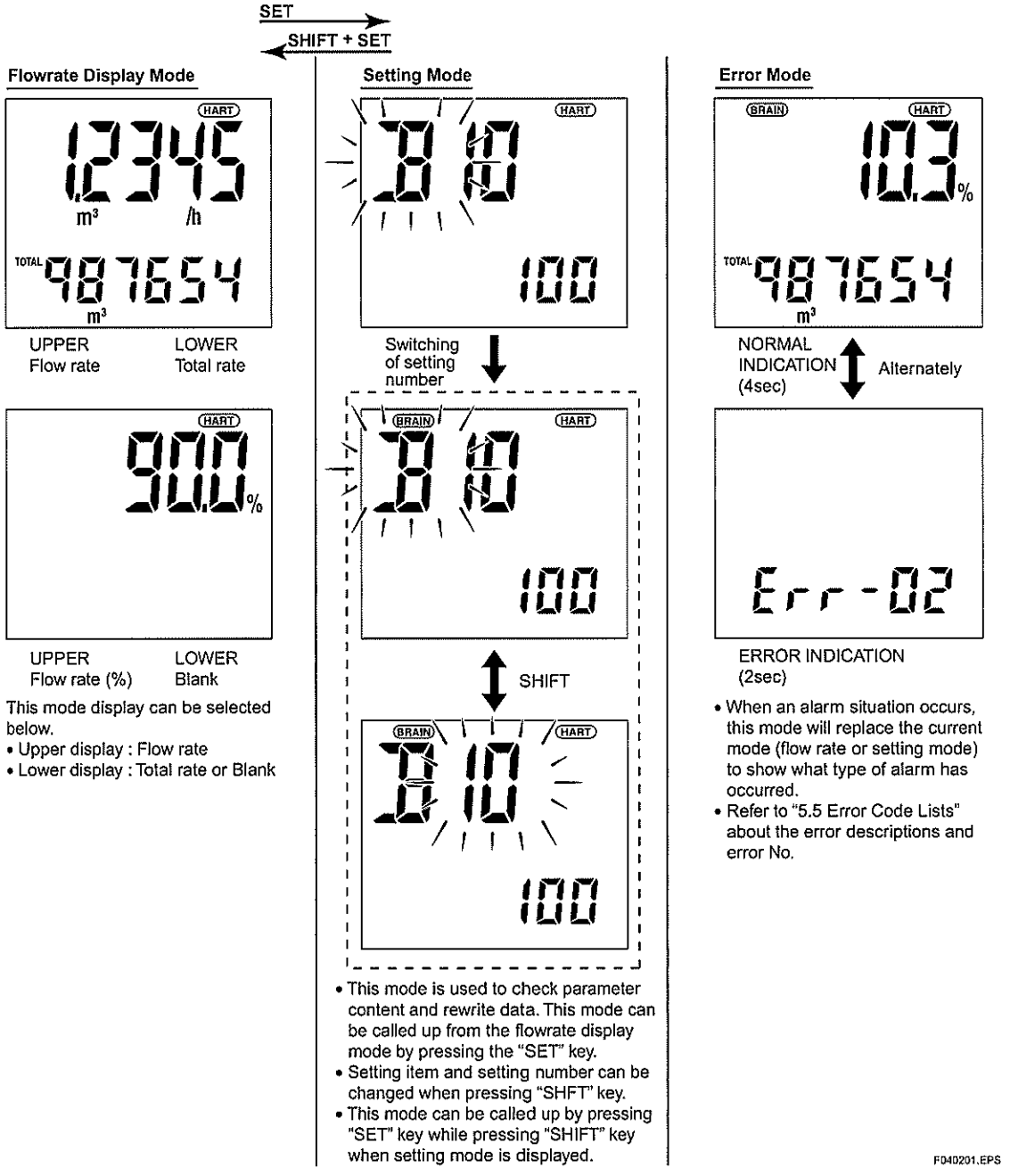
● Display Example



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4.3 Display Contents in Display Section

The display mode is a mode in which instantaneous flow rates or totalized flow are displayed. In display mode, there are three display modes as shown in Table 4.3.

Table 4.3 Display Mode

Name	Contents	Upper Display	Lower Display
% Display (Flow rate)	Instantaneous % flow rate is displayed.	○	×
Engineering Display Unit	Instantaneous flow rate in an engineering unit is displayed.	○	×
Totalized Display	Totalized flow displayed without indicating the decimal point.	×	○
% Display (Temperature) (*1)	Instantaneous temperature is displayed. In this case, "t" is displayed simultaneously (Refer to Figure 4.2).	○	×
Temperature display(*1)	Temperature value is displayed.	×	○
Blank	—	×	○

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(*1) When option code /MV is selected, this function is available.

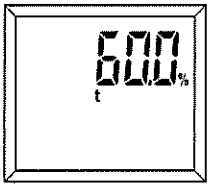

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Figure 4.2 Example

Display mode can be changed using the BT200 terminal or the indicator setting section.

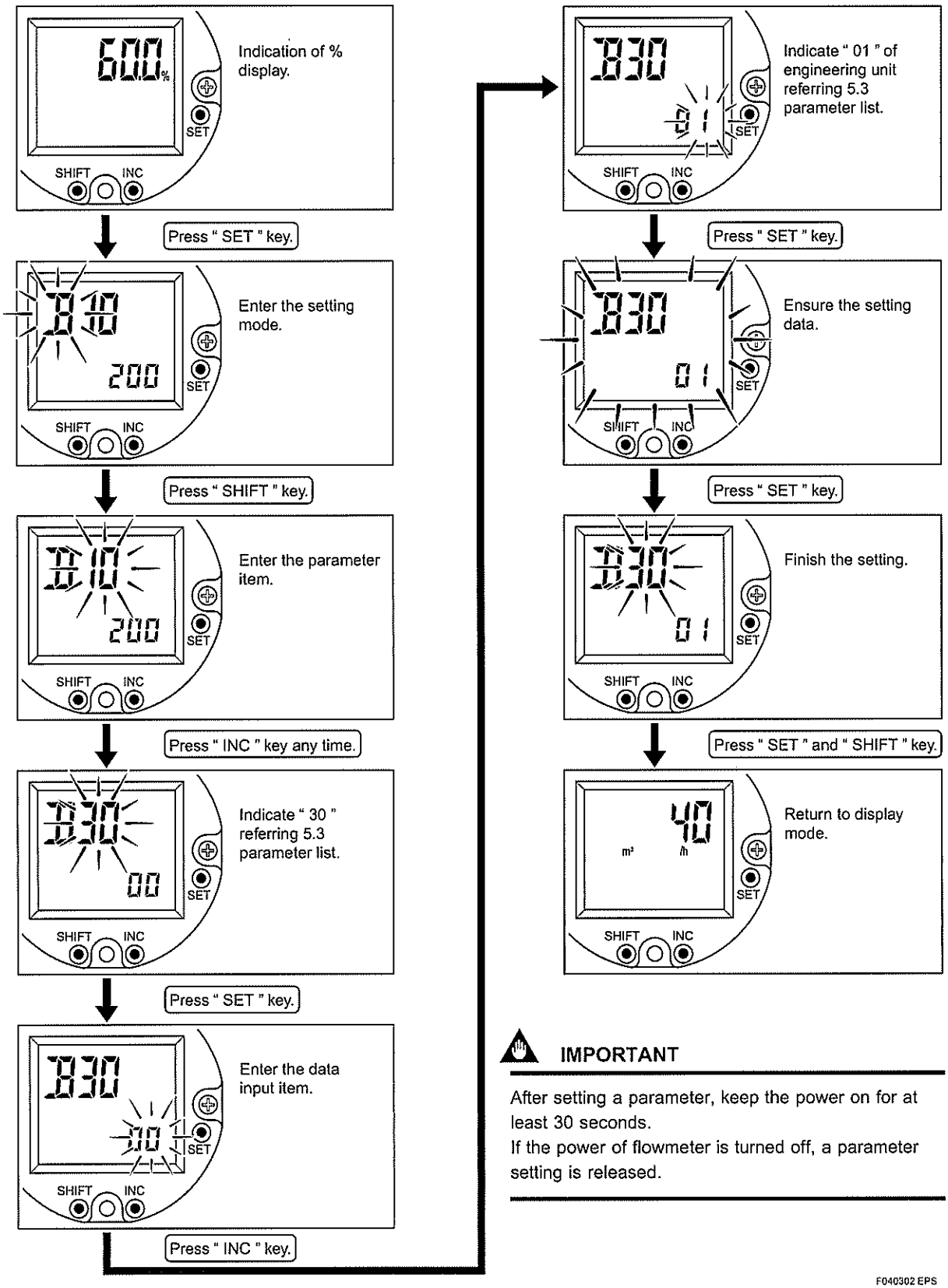
- For operation using BT200, perform changes using the parameter item " B30:UPPER DISP" and "B31:LOWER DISP" referring to section 5. Parameters.
- For operation using indicator, change B30 and B31 parameter item number to display an appropriate display.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.3.1 Change the Display Mode from % Display to Engineering Unit

The display mode can be changed referring 5.3 parameter list.



IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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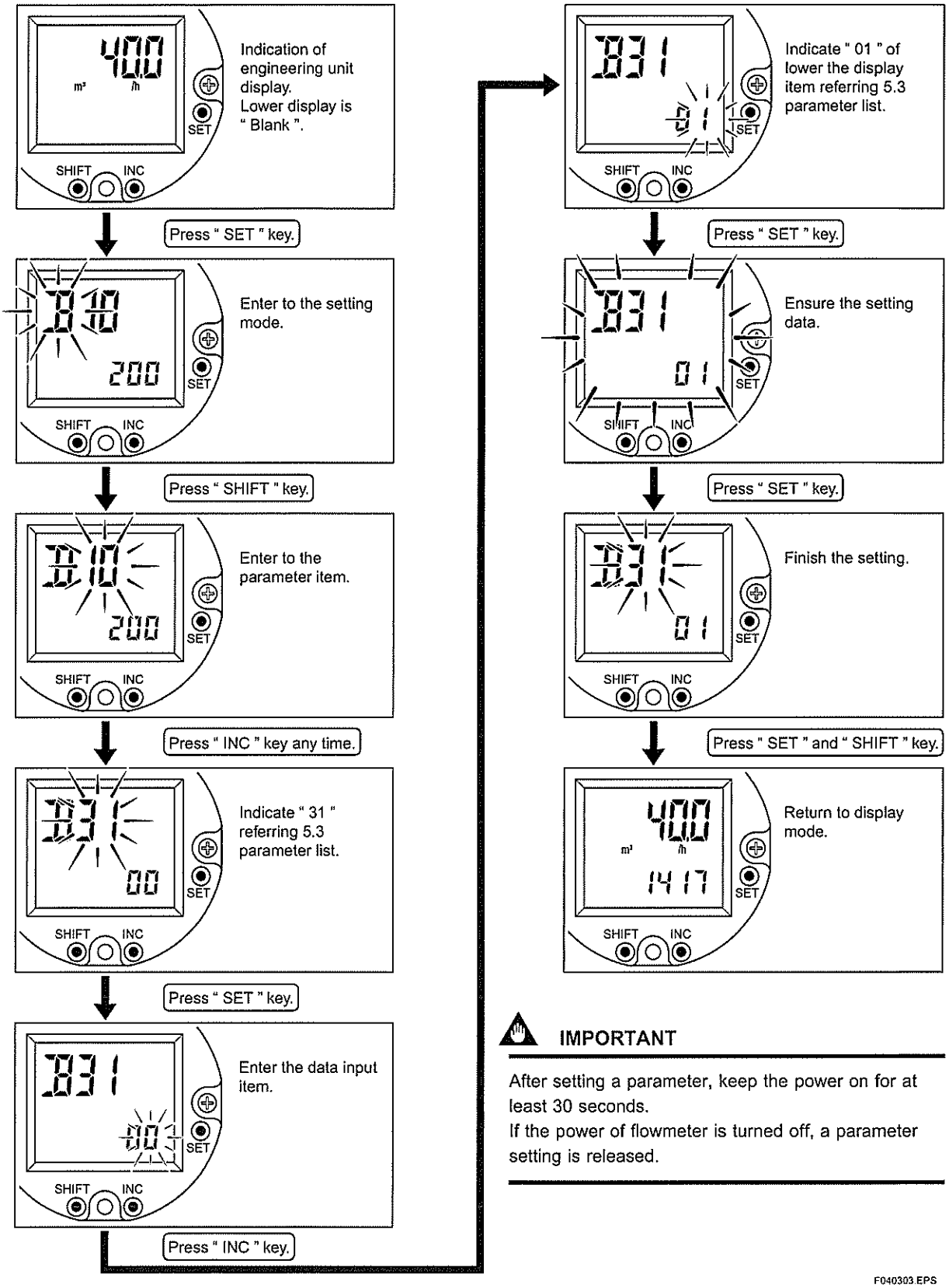
4.3.2 Indicate the Total Rate in the Lower Display

The display mode can be changed referring 5.3 parameter list.



IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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4.4 Setting Mode

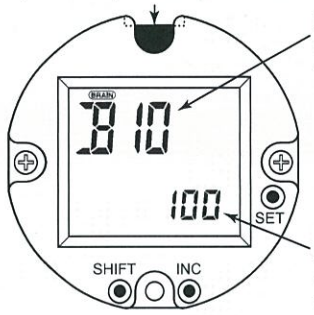
The setting mode is used for checking parameters and rewriting data. The following is an overview of the setting mode.

NOTE

- Refer to 5.3 Parameter List and 5.4 Parameter description for information on how to change setting.

4.4.1 Structure of Setting Mode Display

Simple parameter sheet
IN this sheet, a setting flow chart and the parameter list required to operate digitalYEWFLO is indicated.



Item number
Change item number using "SHIFT" key and "INC"key.

Data number
Change the data number using "SHIFT" key and "INC" key.

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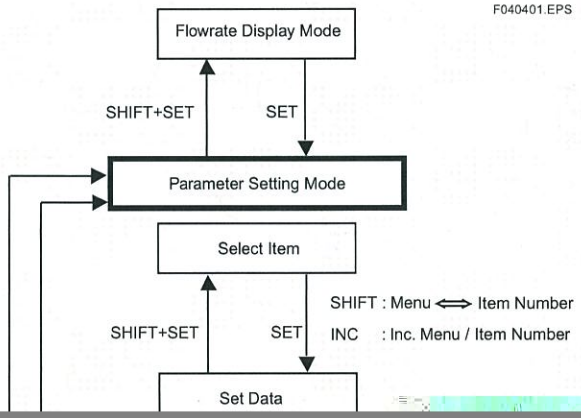


- When completing setting, press "SHIFT" key and "SET" key simultaneously. The mode move to the "display mode".

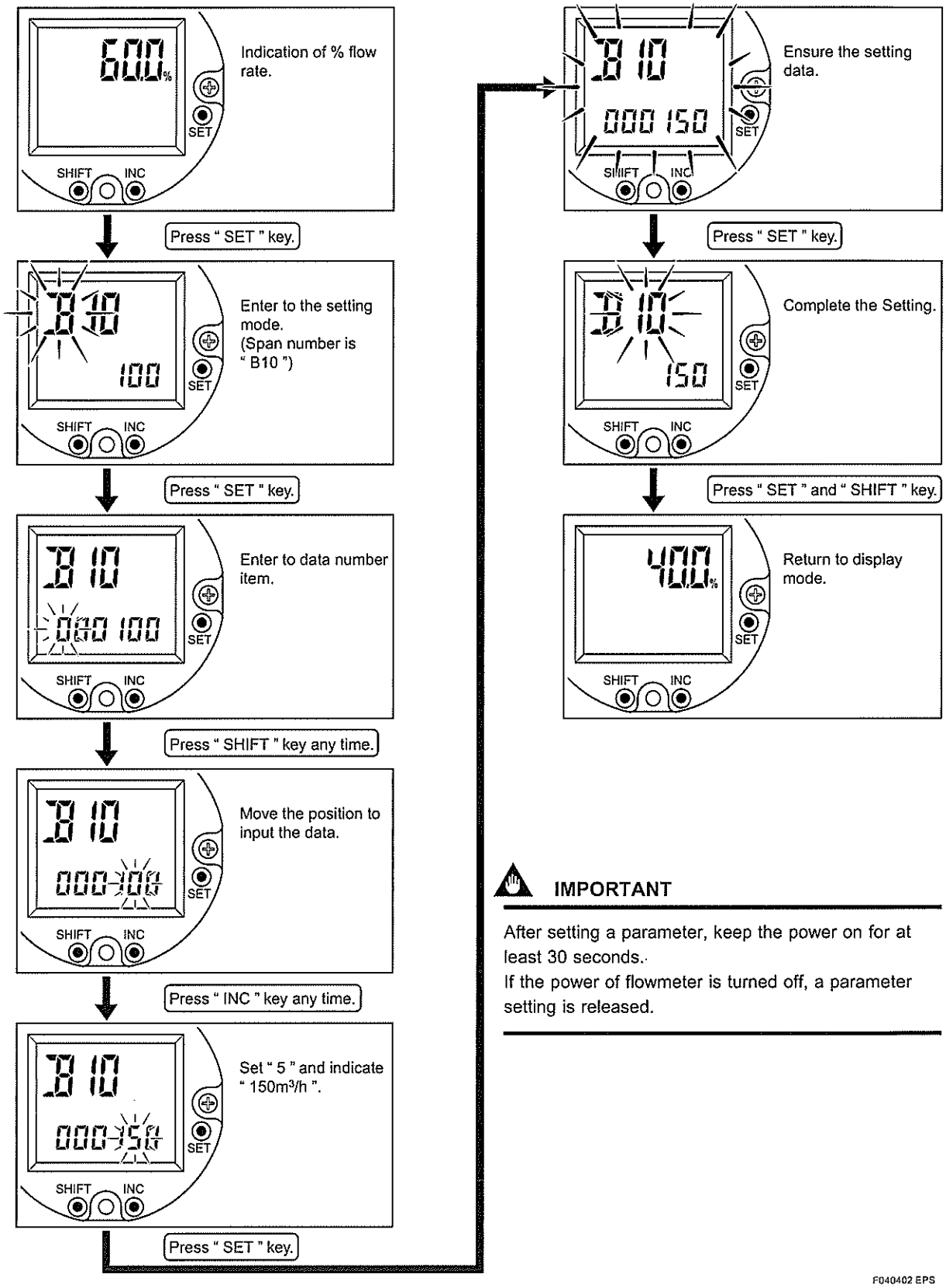
IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.4.2 Method of Parameter Setting

■ Input method of numeric data

Example 1: Change the span from 100m³/h to 150m³/h
The setting mode can be changed referring 5.3 parameter list



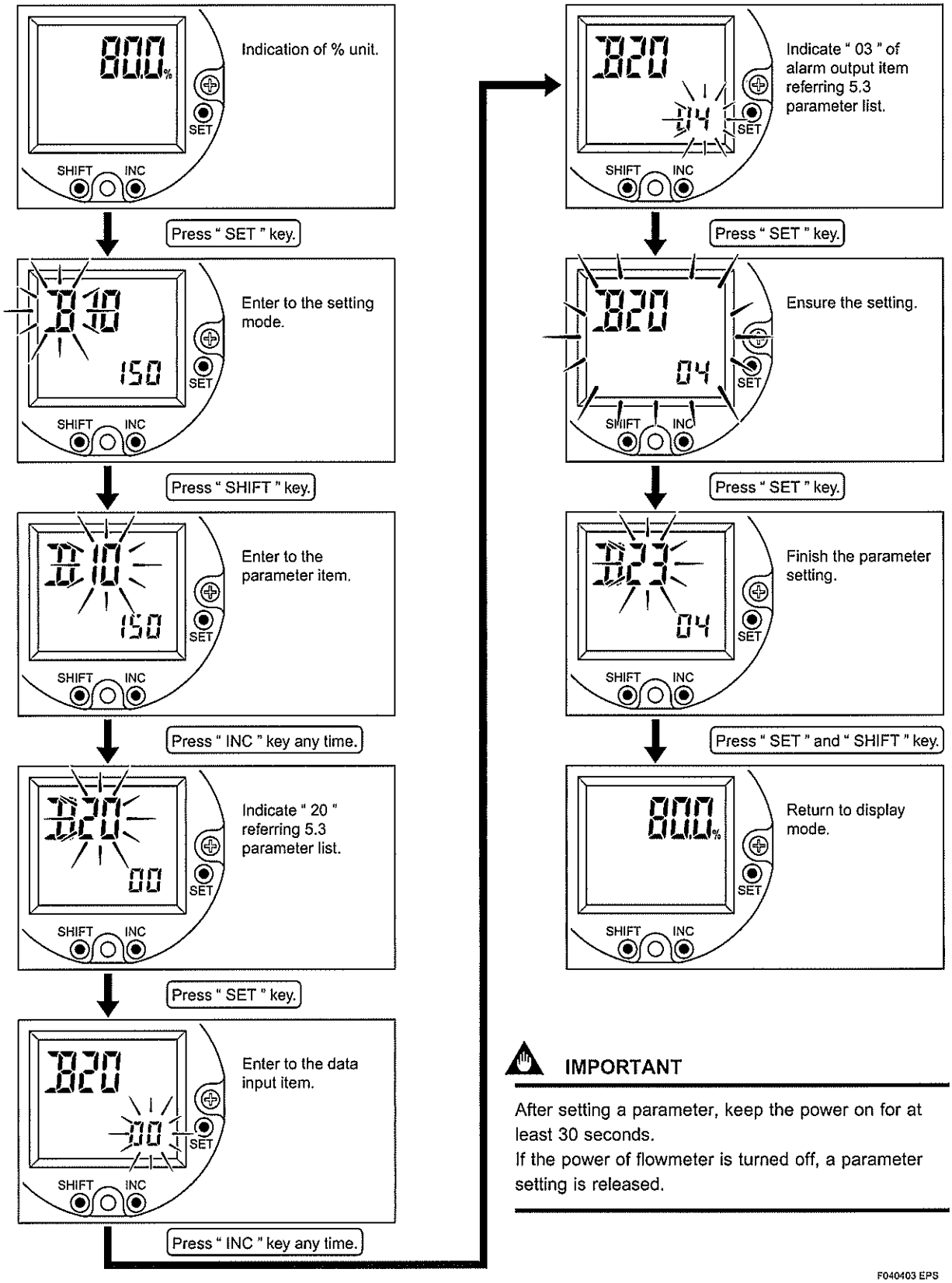
IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

F040402 EPS

■ Input method of selection items

Example 2: Change the pulse output to alarm output.
The setting mode can be changed referring 5.3 parameter list



IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

F040403 EPS

4.5 Operation for the BT200

This section describes the operation procedures using a BRAIN Terminal (BT200). For details on the functions of the digitalYEWFLO, refer to 5.3 Parameter List. And also, see the "BT200 Instruction Manual" (IM 1C0A11-01E) for more detailed Information.

4.5.1 Connection Method for the BT200

(1) Connecting the BT200 to a 4 to 20mA DC Transfer Line

The communication signal of the digitalYEWFLO is superimposed onto the 4 to 20mA DC analog signal to be transferred.

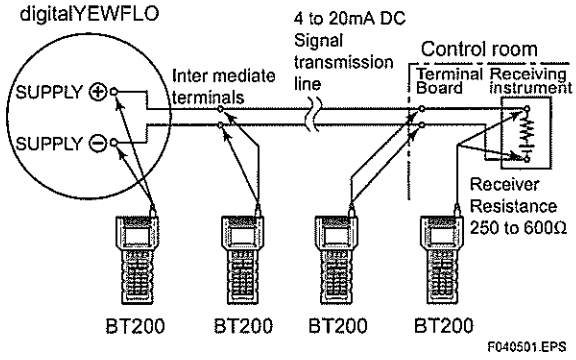


Figure 4.4 Communicating for a 4 to 20mA DC Signal Line

IMPORTANT

The communicable distance of the transmission line is restricted depending on the wiring method. Refer to 3. WIRING.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

(2) Connecting BT200 to Flow Converter

Removing a cover and indicator, the terminals for brain communication are provided on the circuit board. Connect BT200 to the terminal of HHT-COM on the circuit board.

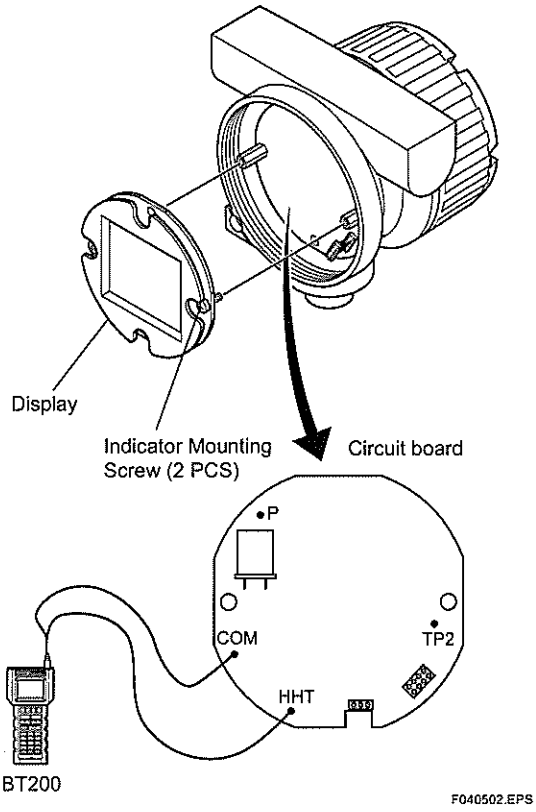
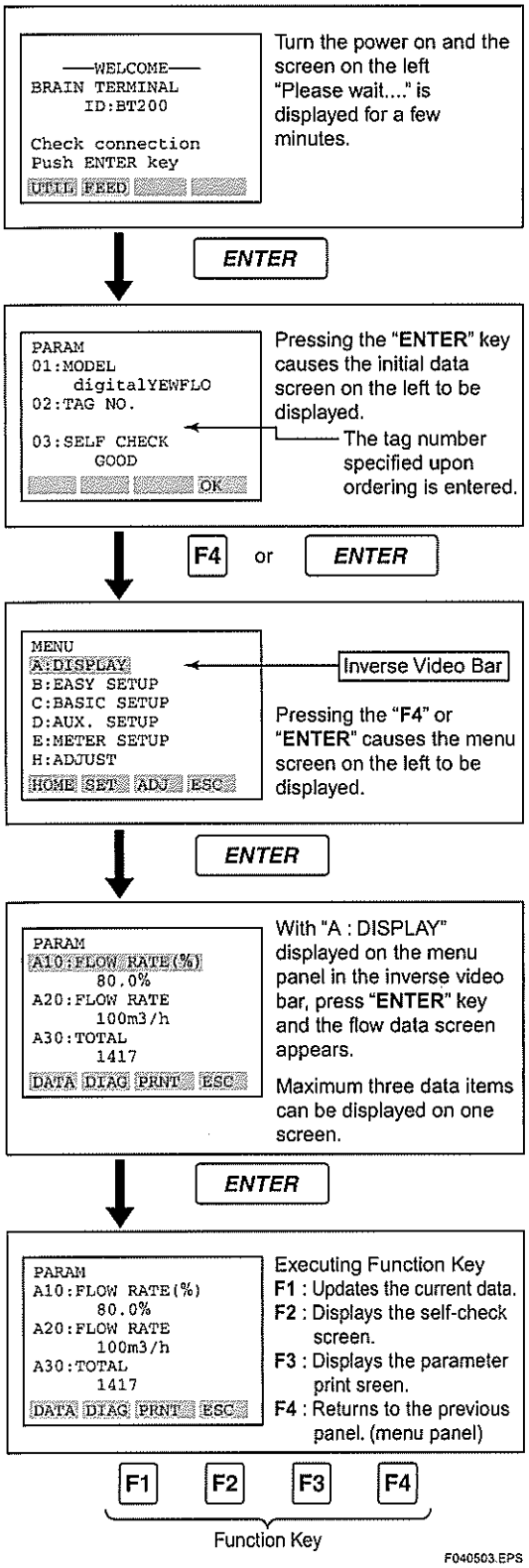


Figure 4.5 Connection of BT200 to Flow Converter

4.5.2 Displaying Flow Rate Data

Flowrate data can be displayed on the BT200 screen according to the following procedure.



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● Function key

The functions of the function keys vary with the commands being displayed on the display panel.

Table 4.4

Command	Description
ADJ	Calls up the adjustment menu.
CAPS/caps	Changes the uppercase / lowercase mode.
CLR	Clears entered data / deletes all data.
COPY*	Prints parameters on the screen.
DATA	Updates parameter data.
DEL	Deletes one character.
DIAG	Calls up the self-check screen.
ESC	Returns to the preceding screen.
FEED*	Paper feed.
HOME	Calls up the home menu (A : DISPLAY).
LIST*	Prints all parameters of the menus.
NO	Setting stop / re-setting. Returns to the previous screen.
OK	Goes to the next screen.
PARM	Parameter number setting mode.
PON/POFF*	Printer output of data whose setting was changed Mode on / off.
PRNT*	Changes to the prints mode.
SET	Calls up the setting menu (B : SETTING).
SLOT	Returns to the slot selection screen.
GO*	Starts print out.
STOP*	Stops printing.
UTIL	Transfers to the utility screen.

*The command is available only for BT-200-P00

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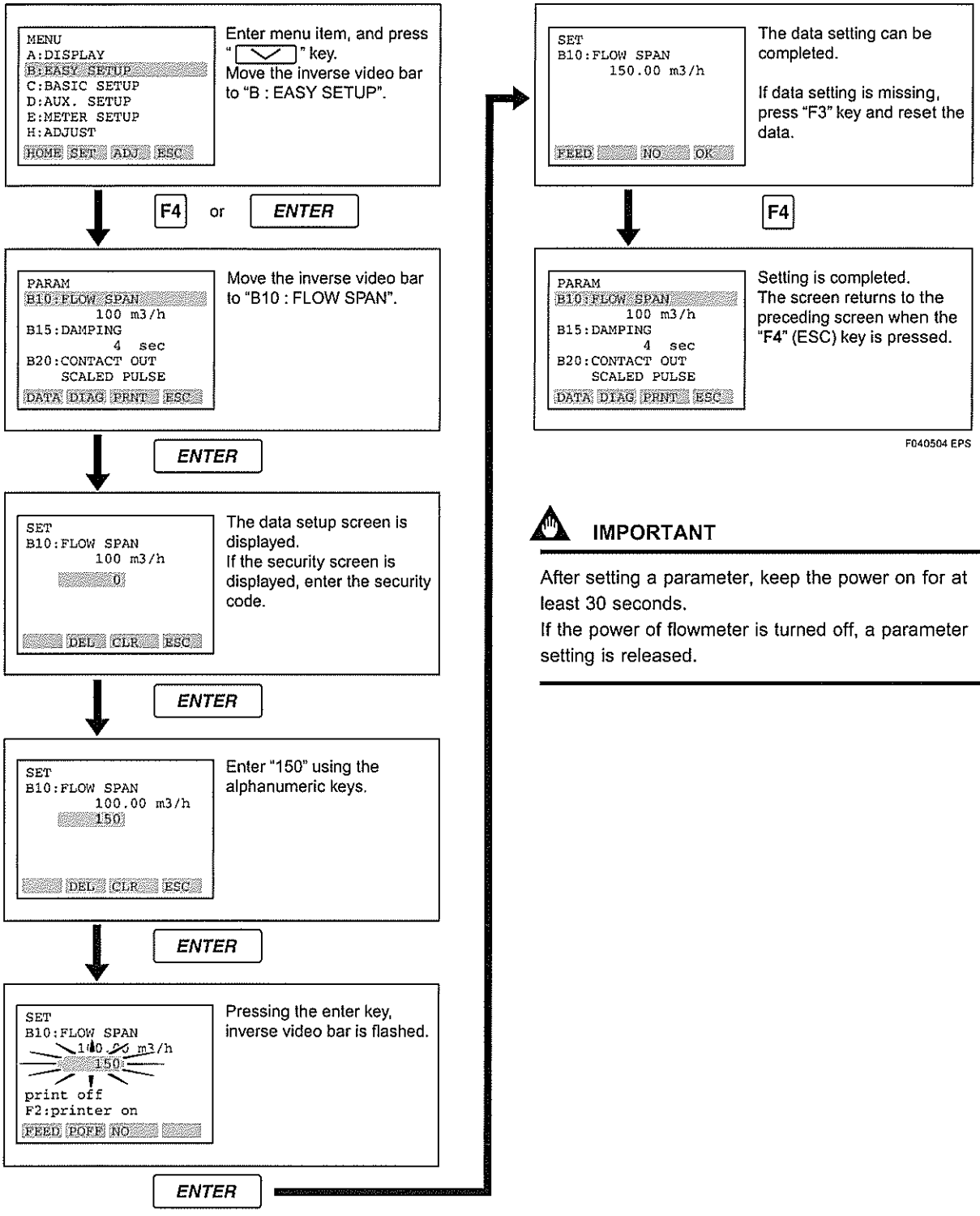
4.5.3 Setting Parameters

This section describes the setting method using a BRAIN Terminal (BT200). For details on the method, refer to 5.3 Parameter List.

(1) Setting Flow Span

Example : Change flow span 100m³/h to 150m³/h

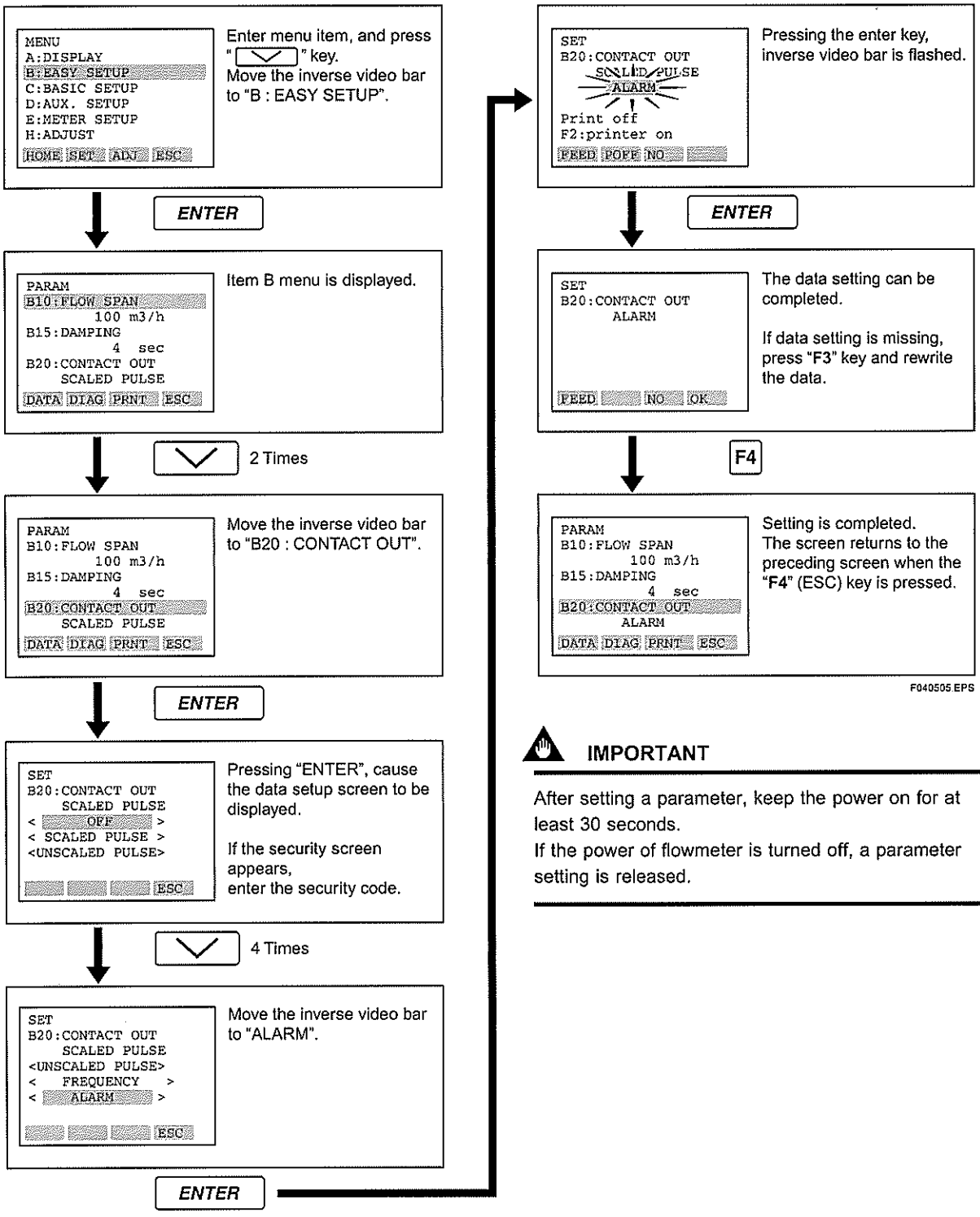


F040504 EPS

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

(2) Change the Pulse Output to Alarm Output.



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IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.6 Operation for HART Communicator

The communication control function with HHT, BRAIN Terminal (BT200) is stated at 4.5 Operation for the BT200. digitalYEWFLO is available not only BRAIN Terminal (BT200) but also HART Communicator as remote control via HHT.

Main functions and parameters are the same with BRAIN Terminal (BT200). Moreover, digitalYEWFLO has unique parameters of HART Communicator.

The amplifier has been pre-configured at the factory, so no setup should be required prior to installation. If your process conditions have changed and reprogramming is required, the menu/parameter configuration list for digitalYEWFLO is in 4.6.12 Menu Tree. Refer to the instructions provided with your HART communicator for operation details. The QUICK START section of this manual will address only those parameters which must be set to establish the operation of the meter for a particular application. The Menu Tree will cross-reference the BRAIN parameters to the corresponding HART parameters.

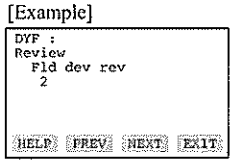
Note: HART is a registered trademark of the HART Communication Foundation.

⚠ CAUTION

Matching of communicator DD and instrument DD
Before using the Model 275 HART Communicator, check that the DD (Device Description) installed in the communicator matches that of the instruments to be set up. To check the DD in the instrument or the HART Communicator, follow the steps below. If the correct DD is not installed in the communicator, you must upgrade the DD at the official HART programming sites. For communication tools other than Model 275 HART Communicator, contact the respective vendors for upgrade information.

1. Checking the DD in the instrument
   1) Connect the communicator to the instrument to be set up.
   2) Open "Device Setup" and press [→].
   3) Select "Review" and press [→].
   4) By pressing [NEXT] or [PREV], locate "Fld dev rev" to show the DD of the instrument.

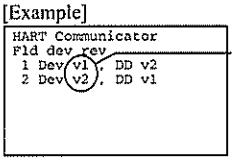
[Example]



"The instrument DD is Version 2"
F040601-1.EPS

2. Checking the DD in Model 275 HART Communicator.
   1) Turn on only the communicator alone.
   2) Select "Utility" from the main menu and press [→].
   3) Select "Simulation" and press [→].
   4) Select "YOKOGAWA" from the manufacturers list by pressing [↓] and then pressing [→] to enter selection.
   5) Select the model name of the instrument (i.e. digitalYEWFLO) by pressing [↓] and then press [→] to show the DD of the communicator.

[Example]



Versions 1 and 2

"The communicator DD supports Versions 1 and 2."
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⚠ NOTE

In case of using HART Communicator, setting from indicator is not available.

⚠ CAUTION

In case of using Burst mode, setting from amplifier unit is not available.

4.6.1 Interconnection between digitalYEWFLO and HART Communicator

The HART Communicator can interface with the digitalYEWFLO from the control room, the digitalYEWFLO site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 230 Ω between the connection and the receiving instrument. To communicate, it must be connected in parallel with the digitalYEWFLO, and the connections must be non-polarized. Figure 4.6 illustrates the wiring connections for a direct interface at the digitalYEWFLO site. The HART Communicator can be used for remote access from any terminal strip as well.

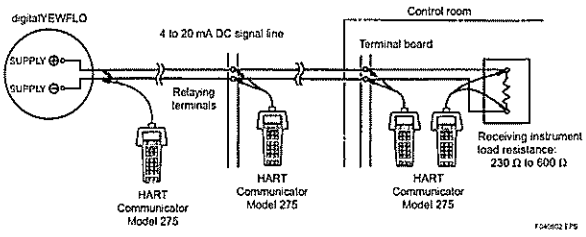

Figure 4.6 Interconnection Diagram

4.6.2 Communication Line Requirements

Specifications for Communication Line:

Load resistance:

230 to 600 Ω (including cable resistance)

Minimum cable size:

24 AWG, (0.51 mm diameter)

Cable type:

Single pair shielded or multiple pair with overall shield

Maximum twisted-pair length:

6,500 ft (2,000 m)

Maximum multiple twisted-pair length:

3,200 ft (1,000 m)

Use the following formula to determine cable length for a specific application:

$$L = \frac{65\times10^6}{(R\times C)} - \frac{(C_f+10{,}000)}{C}$$

where:

L = length in feet or meters

R = resistance in ohms, current sense resistance

C = cable capacitance in pF/ft or pF/m

C_f = 15,000 pF

4.6.3 Keys and Functions of Model 275

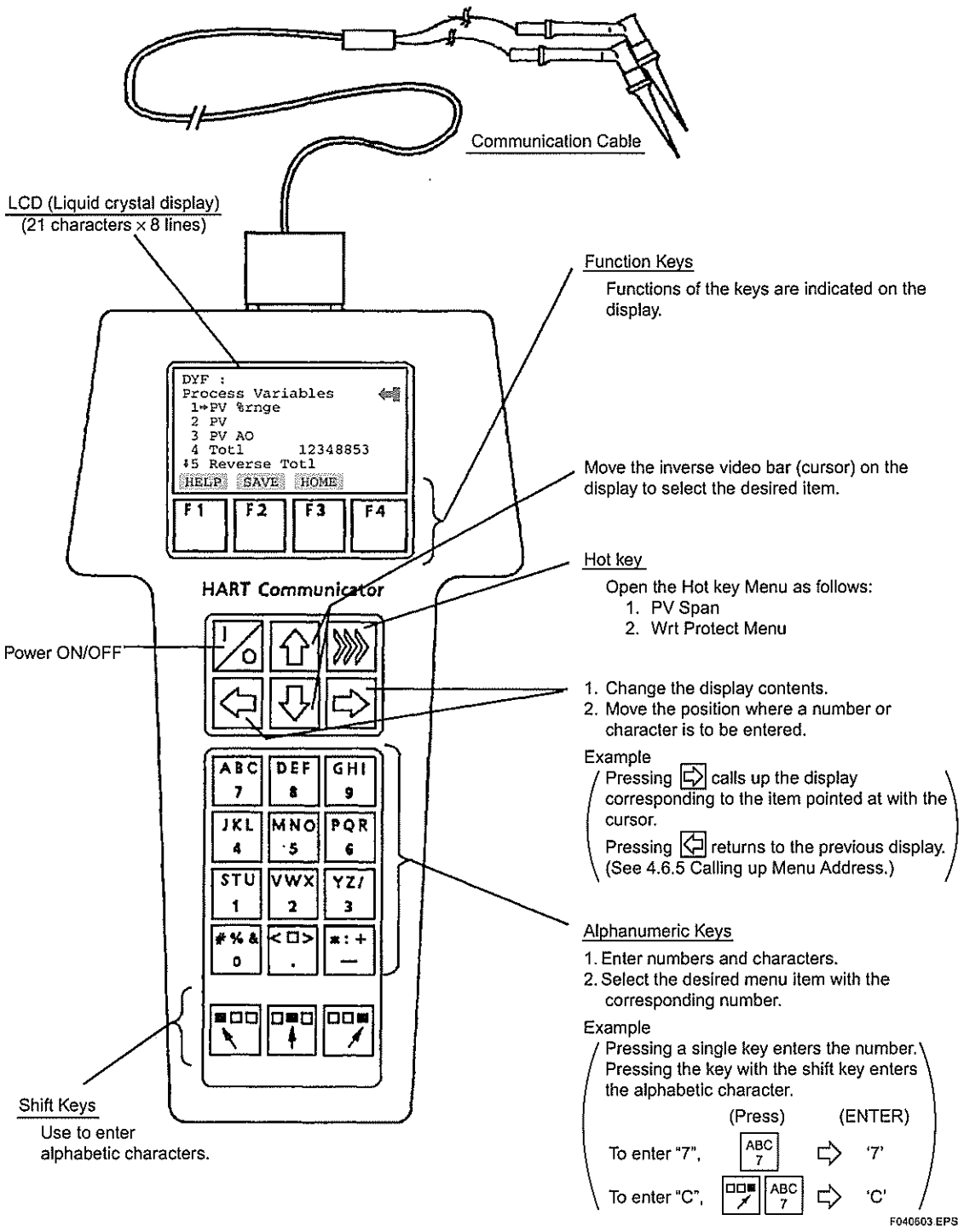

Figure 4.7 HART Communicator

4.6.4 Display

The HART Communicator automatically searches for digitalYEWFLO on the 4 to 20 mA loop when it is turned on. When the HART Communicator is connected to the digitalYEWFLO, it displays "**Online**" menu as shown below. (If digitalYEWFLO is not found, the communicator displays the message "No Device Found. Press OK...." Press the OK 'F4' function key and the main menu appears. Retry after confirming the connection with the digitalYEWFLO.)

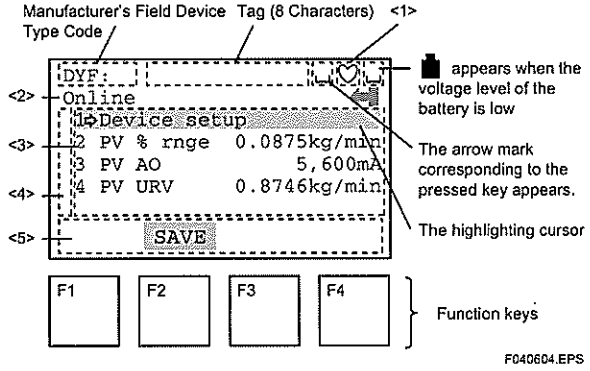

Figure 4.8 Display

<1> ♡ appears and flashes during communication between the HART Communicator and the digitalYEWFLO. At Burst mode*, ♥ appears.

<2> The current display menu title appears.

<3> Each item in menu of <2> appears.

<4> ↓ and/or ↑ appear when the items are scrolled out of the display.

<5> On any given menu, the label appearing above a function key indicates the function of that key for the current menu.

* Refer to 4.6.8 Unique Functions of HART Communicator

4.6.5 Calling Up Menu Addresses

4.6.12 Menu Tree shows the configuration of Online Menu which is needed for the operation with HART Communicator. The desired item can be displayed with ease by understanding the menu configuration.

When the HART Communicator is connected to the digitalYEWFLO, "**Online**" menu will be displayed after the power is turned on (See Figure 4.8). Call up the desired item as follows:

Example: Call up the "**Tag**" to change the tag number.

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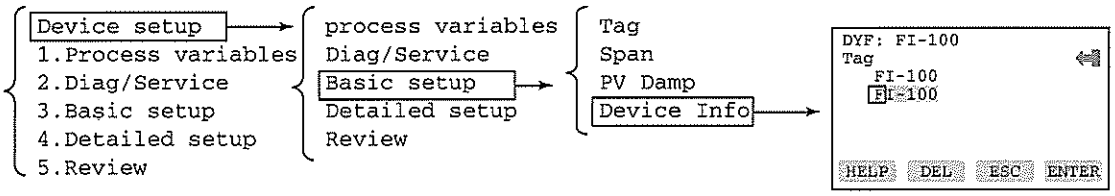
Key operation

There are two choices to select the desired menu item.

1. Use the ⇩ or ⇧ key to select the desired item, and then press the ⇨ key.
2. Press the number key displayed for the desired item.
   - To return to the previous display, press the ⇦ key, **EXIT (F4)** or **ESC (F3)**.

Check where "**Tag**" is located in the menu configuration. Then, call up "**Tag**" on the display according to the menu configuration.



	Display	Operation	
1	DYF : Online 1 Device setup 2 PV 3 PV AO 4 PV URV	⇨ or STU 1	Display 1 appears when the HART Communicator is turned on. Select "**Device setup**".
2	DYF : Device setup 1 Process variables 2 Diag/Service 3 Basic setup 4 Detailed setup 5 Review SAVE HOME	⇩ ×2 ⇨ or YZ/ 3	Select "**Basic setup**".
3	DYF : Basic setup 1 Tag 2 Span 3 PV Damp 4 Device info HELP SAVE HOME	⇩ ×4 ⇨ or MNO 5	Select "**Tag**".
4	DYF : Tag FI-100 FI-100 HELP DEL ESC ENTER		The display for Tag setting appears. (The default value of "Tag" is blank.)

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NOTE

Setting parameters on the display unit of the digitalYEWFLO is not possible during HART Communication.

4.6.6 Entering, Setting and Sending Data

The data which are input with the keys are set in the HART Communicator by pressing **ENTER (F4)**. Then, by pressing **SEND (F2)**, the data are sent to the digitalYEWFLO. Note that the data are not set in the digitalYEWFLO if **SEND (F2)** is not pressed. All the data set with the HART Communicator is held in memory unless power is turned off, so every data can be sent to the digitalYEWFLO at one lot.

Operation

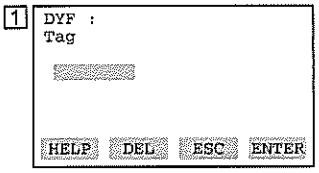
Entering data on the "**Tag**" setting display.
On alphabetic characters, only capital letters can be used for setting Tag No. with HART Communicator.

Example: Set "**FIC-1A**".

5. Tag

Call up "**Tag**" setting display.

1. Device setup → 3. Basic setup → 5. Tag



On the setting display shown above, enter the data as follows:

Character to be entered	Operation	Display
F	DEF 8	F
I	GHI 9	F I
C	ABC 7	F I C
-	*:+ -	F I C -
1	STU 1	F I C - 1
A	ABC 7	F I C - 1 A

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Display	Operation	
1 DYF : Tag FIC-1A HELP DEL ESC ENTER	F4 (ENTER)	Press **ENTER (F4)** to set the data in the HART Communicator after entering the data.
2 DYF : Basic setup 1 Tag 2 Span 3 PV Damp 4 Device info HELP SEND HOME	F2 (SEND)	Press **SEND (F2)** to send the data to the digitalYEWFLO. * ♡ is flashing during communication.
3 DYF : Basic setup 1 Tag 2 Span 3 PV Damp 4 Device info HELP SAVE HOME		SEND label changed to SAVE label, and the transmission is completed. Press **HOME (F3)**, and return "Online Menu".

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4.6.7 Parameters Configuration

IMPORTANT

Do not turn off the digitalYEWFLO just after HART Communicator settings (sending) have been made. If the digitalYEWFLO is turned off less than 30 seconds after parameters have been set, the set data will not be stored and the data returns to previous settings.

Parameters of HART Communicator is constructed hierarchically. The menu tree for Online menu is shown in 4.6.12 Menu Tree.

See 5.4 Parameter Description about the usage of each parameter. Note the differences between parameters on digitalYEWFLO display and those on HART Communicator.

The Online menu summary is shown below.

Table 4.6.1 Online Menu Summary

No.	Display Item	Contents
1	Device setup	Set parameters for digitalYEWFLO.
2	PV	Display process value in engineering unit.
3	PV AO	Display analog output in mA.
4	PV URV	Display set span in engineering unit.

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4.6.8 Unique Functions of HART Communicator

■ Check on communication error

When each error, over run framing error, parity error or buffer overflow error is detected, the data including the informations of errors is returned, and the error message is indicated on HHT.

■ Real time monitoring 4-20mA output

'%' output, actual flow rate and totalized value are mentioned as same as BRAIN communicator. And furthermore 4-20mA output is monitored on real time.

■ Time recording

Online ⇒ 1.Device setup ⇒ 4.Detailed setup
⇒ 4. Device info ⇒ 5.Date

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Day, month and year can be set in a number of 2 figures.

■ Multi drop communication

Field devices in multidrop mode refer to the connection of several field devices on a communication single line. Up to 15 field devices can be connected when set in the multidrop mode. To activate multidrop communication, the field device address must be changed to a number from 1 to 15. This change deactivates the 4 to 20mA output and turns it 4mA output and turns it 4mA.

Online ⇒ 1.Device setup ⇒ 4.Detailed setup
⇒ 4.Device info ⇒ 6.Dev id

F040606_2.EPS

■ Continuously data returning (Burst mode)

NOTE

In case of using Burst mode, setting from amplifier unit is not available.

digitalYEWFLO continuously sends the data stored in it when the burst mode it set "ON". Either one of instantaneous flow rate, output in % and current output can be selected and sent. (Note: This mode is preserved after the converter has been turned off.)

The interval of sending data in this mode is the same as the common specification of HART communicator.

*Calling up "Burst option" display.

Online ⇒ 1.Device setup ⇒ 4.Detailed setup
⇒ 3.Output setup ⇒ 6.HART output ⇒ 3.Burst mode
⇒ 1.Burst option

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■ Multi HHT communication

Corresponding to discriminating communication between two HHTs.

■ Device ID setting

Device ID is set in an unsigned integer number of 3 bytes.

4.6.9 Data Renewing

There are two methods to load the data of digitalYEWFLO to HART Communicator, periodic data renewing and discretionary data renewing.

(1) Periodic Data Renewing
The following data are renewed in 0.5 to 2 seconds cycle.
PV, PV % rnge, PV AO, Totl

(2) Discretionary Data Renewing
The following data can be loaded from/to digitalYEWFLO. Up load can be done with **SAVE (F2)** on any online menu, and down load can be done on Saved Configuration menu in Offline menu. (Refer to HART Communicator Manual.)

4.6.10 Checking for Problems

The self-diagnostic function digitalYEWFLO is stated at Chapter 6. By using HART Communicator, it is also available to carry out in "Test/Status" parameter. Exam for each error.

*Calling up "Diag/Service" setting display.

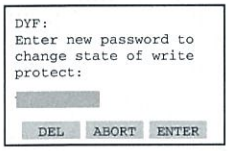
1.Device setup -> 2.Diag/Service

4.6.11 Write Protect

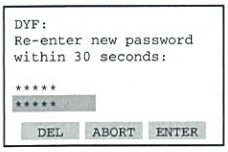
Write protect function is provided to inhibit parameter change. That becomes active by entering a password in "New password". Write protect status is released for 10 minutes by entering the password in "Enable wrt 10min".

Setting the Password

HOT KEY ⇒ 2.Wrt protect menu ⇒ 3.New password



The first indication of Wire protect menu is "1.Write protect ⇒ **No**" after password setting, it shows "**Yes**".
Enter a password into [redacted].
Press **ENTER(F4)**.



Enter a password into [redacted] again.
Press **ENTER(F4)**.
Then, "Change to new password" is indicated.

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HOT KEY ⇒ 2.Wrt protect menu ⇒ 2.Enable wrt 10min

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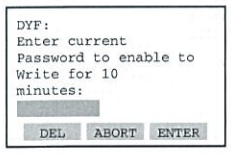
"Enable Write" release write protect status for 10 minutes. While write protect status is released, enter a new password in the "New Password".

It will not be possible to set a new password when 10 minutes have elapsed.

If a parameter, which is able to rewrite, it changed during it is in "Enable wrt 10min", releasing time is extended for more 10 minutes as of the time.



Enter a password into [redacted].
Press **ENTER(F4)**.
Then, "Release the write protection for 10 minutes." is indicated.

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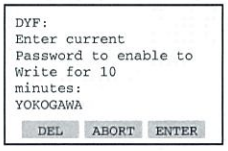
NOTE

- When the write protect function is active (its menu bar shows "Yes"), data setting changes in all parameters of digitalYEWFLO are inhibited and cannot be changed using the HART communicator.
- If 8 characters are input as "space", the Write protect function is in release status irrespective of time.
- If both digitalYEWFLO and HART Communicator power off and on again within 10 minutes after releasing of write protect status, "Enable Write" becomes unavailable.

Joker Password

The Joker Password is reserved for forgetting the password. Though a password had been already set, the Write protect mode is able to release to inhibit status temporary be entering the Joker Password, "YOKOGAWA".

HOT KEY ⇒ 2.Wrt protect menu ⇒ 2.Enable wrt 10min



Enter a password into "YOKOGAWA".
Press **ENTER(F4)**.

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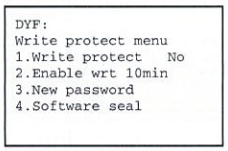
Software seal

The "Software seal" menu is reserved as a evidence so that user is able to confirm whether the Joker password is used or not. This evidence is saved.



The first indication Software seal manu is "4.Software seal ⇒ keep" after the joker password setting, it shows "Break".

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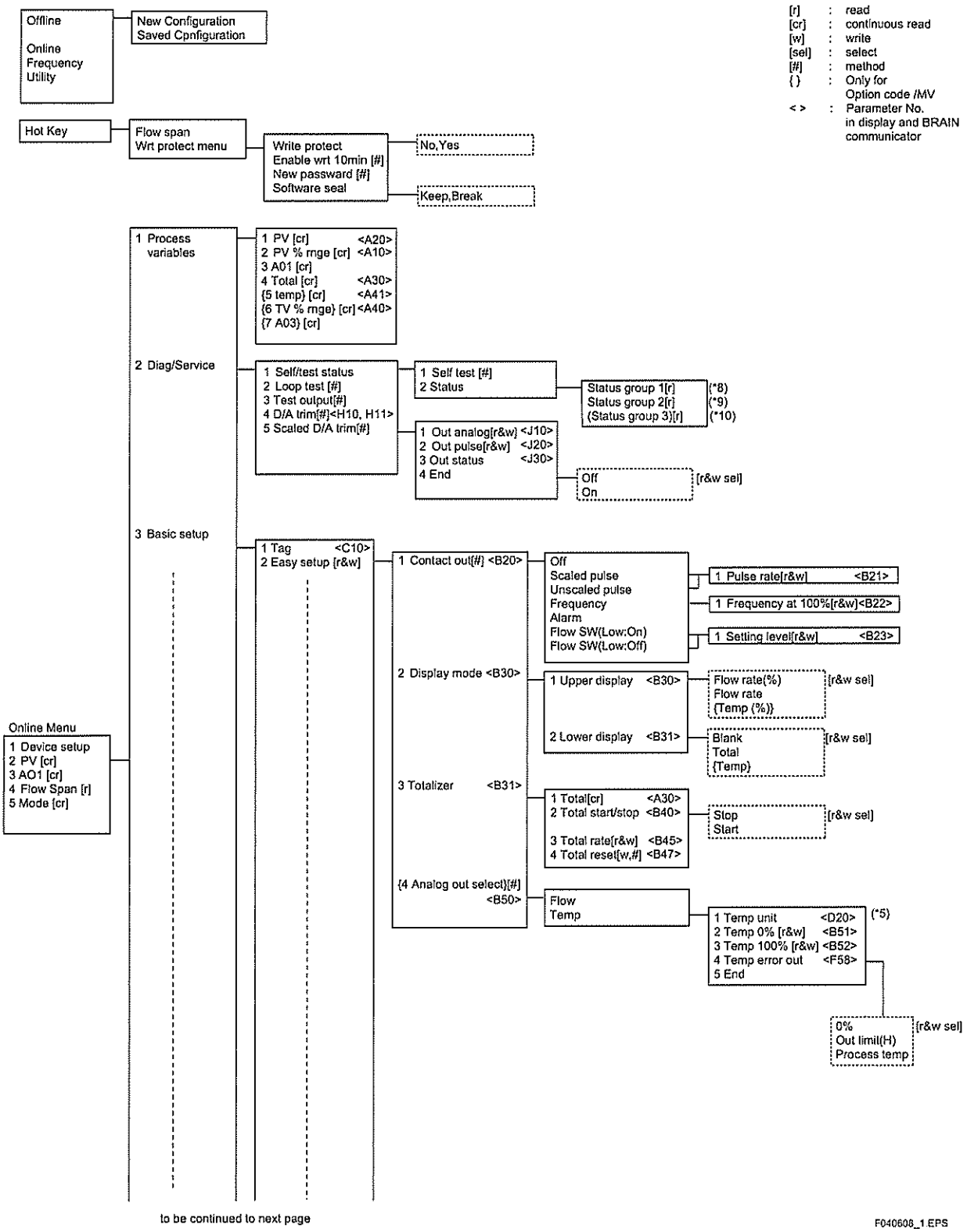
4.6.12 Menu Tree



to be continued to next page

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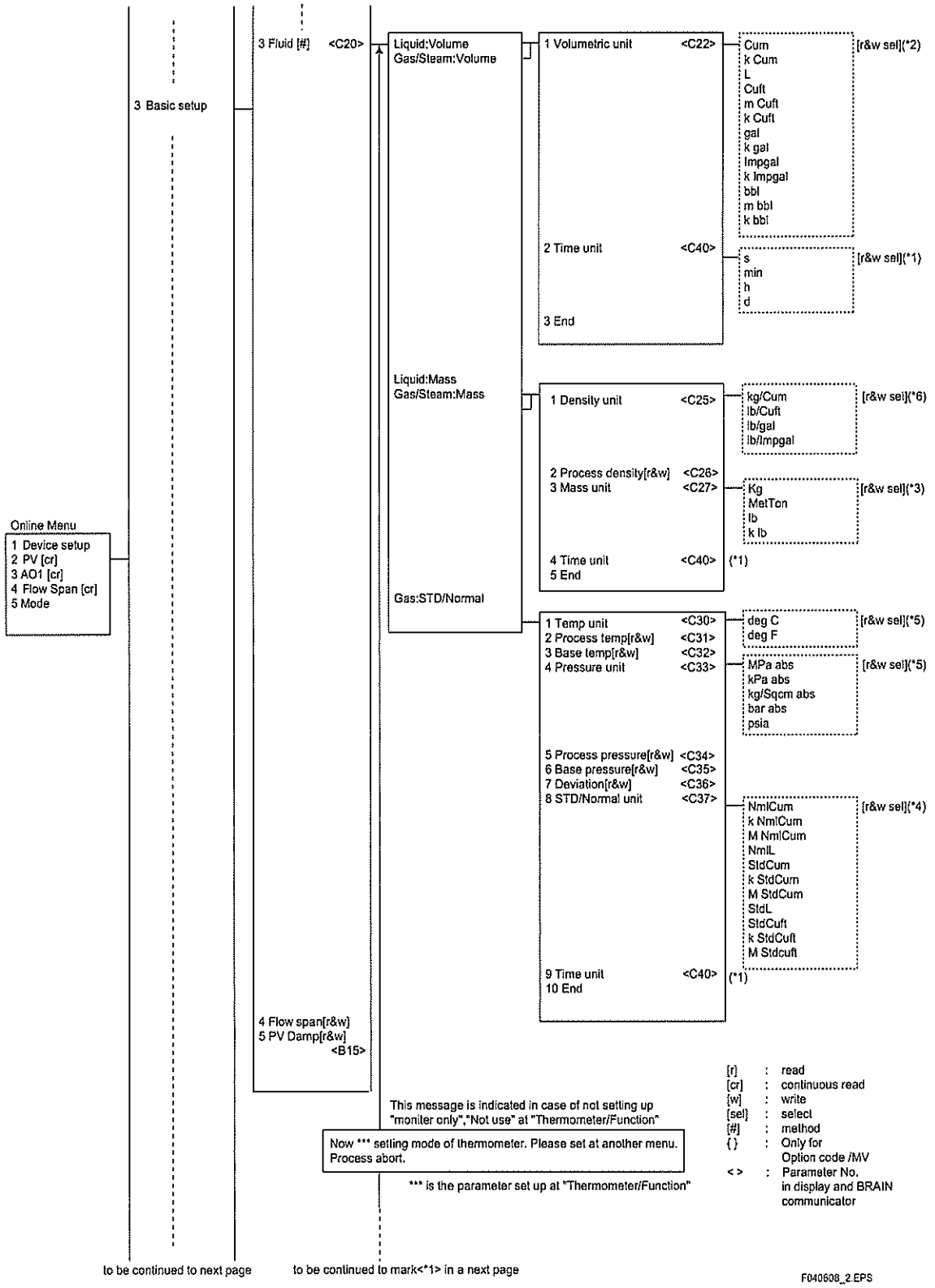
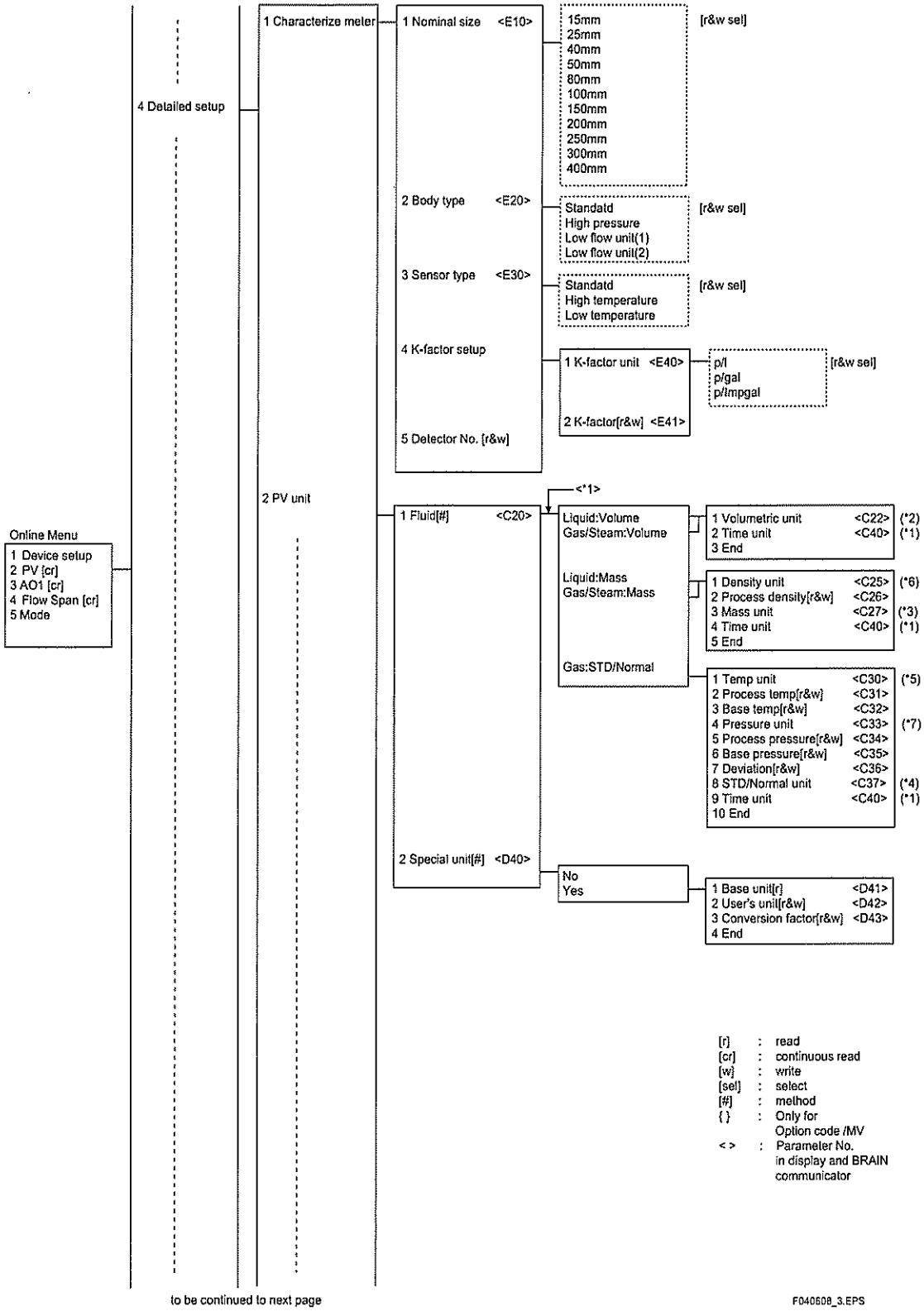
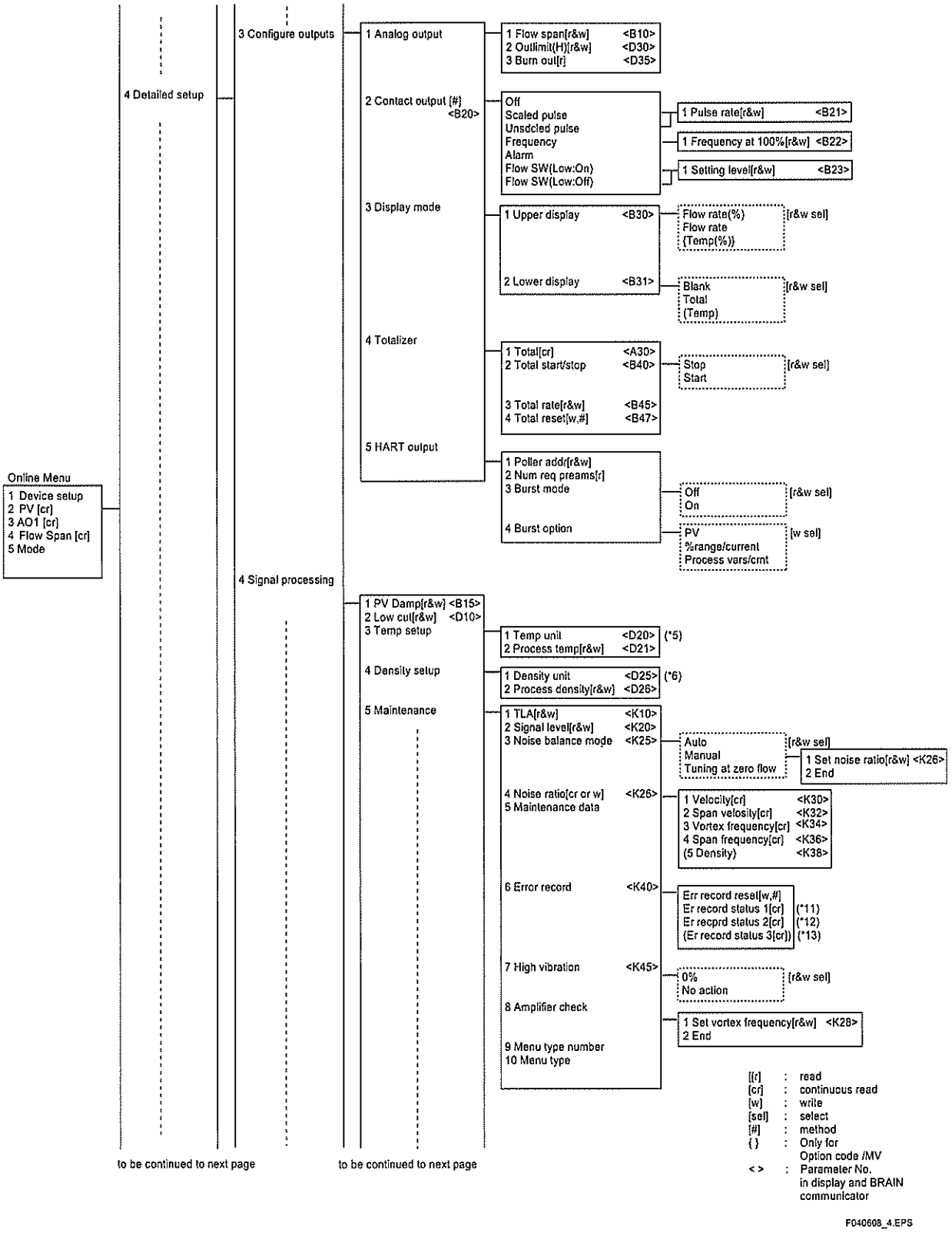
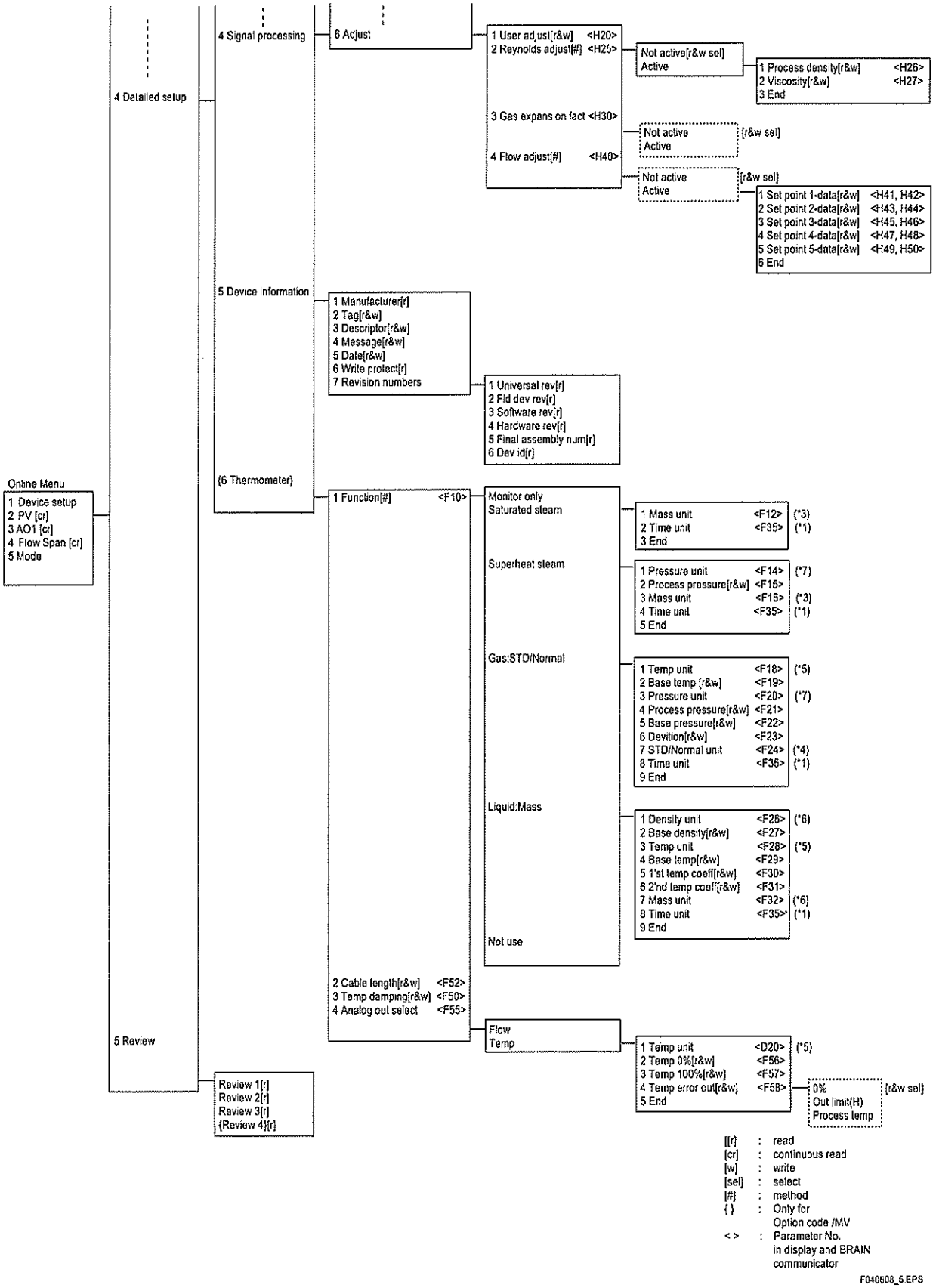

Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
3 Basic setup
3 Fluid [#] <C20>
Liquid:Volume
Gas/Steam:Volume
Liquid:Mass
Gas/Steam:Mass
Gas:STD/Normal
1 Volumetric unit <C22>
Cum
k Cum
L
Cuft
m Cuft
k Cuft
gal
k gal
Impgal
k Impgal
bbl
m bbl
k bbl
[r&w sel](*2)
2 Time unit <C40>
s
min
h
d
[r&w sel](*1)
3 End
1 Density unit <C25>
kg/Cum
lb/Cuft
lb/gal
lb/Impgal
[r&w sel](*6)
2 Process density[r&w] <C26>
3 Mass unit <C27>
Kg
MetTon
lb
k lb
[r&w sel](*3)
4 Time unit <C40>
5 End
(*1)
1 Temp unit <C30>
2 Process temp[r&w] <C31>
3 Base temp[r&w] <C32>
4 Pressure unit <C33>
deg C
deg F
[r&w sel](*5)
MPa abs
kPa abs
kg/Sqcm abs
bar abs
psia
[r&w sel](*5)
5 Process pressure[r&w] <C34>
6 Base pressure[r&w] <C35>
7 Deviation[r&w] <C36>
8 STD/Normal unit <C37>
NmlCum
k NmlCum
M NmlCum
NmlL
StdCum
k StdCum
M StdCum
StdL
StdCuft
k StdCuft
M Stdcuft
[r&w sel](*4)
9 Time unit <C40>
10 End
(*1)
4 Flow span[r&w]
5 PV Damp[r&w]
<B15>
This message is indicated in case of not setting up "moniter only","Not use" at "Thermometer/Function"
Now *** setting mode of thermometer. Please set at another menu. Process abort.
*** is the parameter set up at "Thermometer/Function"
[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
{ } : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
to be continued to next page
to be continued to mark<*1> in a next page
F040608_2.EPS


Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
4 Detailed setup
1 Characterize meter
1 Nominal size <E10>
15mm
25mm
40mm
50mm
80mm
100mm
150mm
200mm
250mm
300mm
400mm
[r&w sel]
2 Body type <E20>
Standatd
High pressure
Low flow unit(1)
Low flow unit(2)
[r&w sel]
3 Sensor type <E30>
Standatd
High temperature
Low temperature
[r&w sel]
4 K-factor setup
1 K-factor unit <E40>
p/l
p/gal
p/Impgal
[r&w sel]
2 K-factor[r&w] <E41>
5 Detector No. [r&w]
2 PV unit
<*1>
1 Fluid[#] <C20>
Liquid:Volume
Gas/Steam:Volume
1 Volumetric unit <C22> (*2)
2 Time unit <C40> (*1)
3 End
Liquid:Mass
Gas/Steam:Mass
1 Density unit <C25> (*6)
2 Process density[r&w] <C26>
3 Mass unit <C27> (*3)
4 Time unit <C40> (*1)
5 End
Gas:STD/Normal
1 Temp unit <C30> (*5)
2 Process temp[r&w] <C31>
3 Base temp[r&w] <C32>
4 Pressure unit <C33> (*7)
5 Process pressure[r&w] <C34>
6 Base pressure[r&w] <C35>
7 Deviation[r&w] <C36>
8 STD/Normal unit <C37> (*4)
9 Time unit <C40> (*1)
10 End
2 Special unit[#] <D40>
No
Yes
1 Base unit[r] <D41>
2 User's unit[r&w] <D42>
3 Conversion factor[r&w] <D43>
4 End
[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
{ } : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
to be continued to next page
F040608_3.EPS


Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
4 Detailed setup
3 Configure outputs
1 Analog output
1 Flow span[r&w] <B10>
2 Outlimit(H)[r&w] <D30>
3 Burn out[r] <D35>
2 Contact output [#] <B20>
Off
Scaled pulse
Unscdcled pulse
Frequency
Alarm
Flow SW(Low:On)
Flow SW(Low:Off)
1 Pulse rate[r&w] <B21>
1 Frequency at 100%[r&w] <B22>
1 Setting level[r&w] <B23>
3 Display mode
1 Upper display <B30>
Flow rate(%)
Flow rate
{Temp(%)}
[r&w sel]
2 Lower display <B31>
Blank
Total
(Temp)
[r&w sel]
4 Totalizer
1 Total[cr] <A30>
2 Total start/stop <B40>
Stop
Start
[r&w sel]
3 Total rate[r&w] <B45>
4 Total reset[w,#] <B47>
5 HART output
1 Poller addr[r&w]
2 Num req preams[r]
3 Burst mode
Off
On
[r&w sel]
4 Burst option
PV
%range/current
Process vars/crnt
[w sel]
4 Signal processing
1 PV Damp[r&w] <B15>
2 Low cut[r&w] <D10>
3 Temp setup
1 Temp unit <D20> (*5)
2 Process temp[r&w] <D21>
4 Density setup
1 Density unit <D25> (*6)
2 Process density[r&w] <D26>
5 Maintenance
1 TLA[r&w] <K10>
2 Signal level[r&w] <K20>
3 Noise balance mode <K25>
Auto
Manual
Tuning at zero flow
[r&w sel]
1 Set noise ratio[r&w] <K26>
2 End
4 Noise ratio[cr or w] <K26>
5 Maintenance data
1 Velocity[cr] <K30>
2 Span velosity[cr] <K32>
3 Vortex frequency[cr] <K34>
4 Span frequency[cr] <K36>
(5 Density) <K38>
6 Error record <K40>
Err record reset[w,#]
Er record status 1[cr] (*11)
Er recprd status 2[cr] (*12)
(Er record status 3[cr]) (*13)
7 High vibration <K45>
0%
No action
[r&w sel]
8 Amplifier check
1 Set vortex frequency[r&w] <K28>
2 End
9 Menu type number
10 Menu type
to be continued to next page
to be continued to next page
[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
( ) : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
F040608_4.EPS


Online Menu
1 Device setup
2 PV [cr]
3 AO1 [cr]
4 Flow Span [cr]
5 Mode
4 Detailed setup
4 Signal processing
6 Adjust
1 User adjust[r&w] <H20>
2 Reynolds adjust[#] <H25>
Not active[r&w sel]
Active
1 Process density[r&w] <H26>
2 Viscosity[r&w] <H27>
3 End
3 Gas expansion fact <H30>
Not active
Active
[r&w sel]
4 Flow adjust[#] <H40>
Not active
Active
[r&w sel]
1 Set point 1-data[r&w] <H41, H42>
2 Set point 2-data[r&w] <H43, H44>
3 Set point 3-data[r&w] <H45, H46>
4 Set point 4-data[r&w] <H47, H48>
5 Set point 5-data[r&w] <H49, H50>
6 End
5 Device information
1 Manufacturer[r]
2 Tag[r&w]
3 Descriptor[r&w]
4 Message[r&w]
5 Date[r&w]
6 Write protect[r]
7 Revision numbers
1 Universal rev[r]
2 Fld dev rev[r]
3 Software rev[r]
4 Hardware rev[r]
5 Final assembly num[r]
6 Dev id[r]
{6 Thermometer}
1 Function[#] <F10>
Monitor only
Saturated steam
1 Mass unit <F12> (*3)
2 Time unit <F35> (*1)
3 End
Superheat steam
1 Pressure unit <F14> (*7)
2 Process pressure[r&w] <F15>
3 Mass unit <F16> (*3)
4 Time unit <F35> (*1)
5 End
Gas:STD/Normal
1 Temp unit <F18> (*5)
2 Base temp [r&w] <F19>
3 Pressure unit <F20> (*7)
4 Process pressure[r&w] <F21>
5 Base pressure[r&w] <F22>
6 Devition[r&w] <F23>
7 STD/Normal unit <F24> (*4)
8 Time unit <F35> (*1)
9 End
Liquid:Mass
1 Density unit <F26> (*6)
2 Base density[r&w] <F27>
3 Temp unit <F28> (*5)
4 Base temp[r&w] <F29>
5 1'st temp coeff[r&w] <F30>
6 2'nd temp coeff[r&w] <F31>
7 Mass unit <F32> (*6)
8 Time unit <F35> (*1)
9 End
Not use
2 Cable length[r&w] <F52>
3 Temp damping[r&w] <F50>
4 Analog out select <F55>
Flow
Temp
1 Temp unit <D20> (*5)
2 Temp 0%[r&w] <F56>
3 Temp 100%[r&w] <F57>
4 Temp error out[r&w] <F58>
5 End
0%
Out limit(H)
Process temp
[r&w sel]
5 Review
Review 1[r]
Review 2[r]
Review 3[r]
{Review 4}[r]
[r] : read
[cr] : continuous read
[w] : write
[sel] : select
[#] : method
{ } : Only for Option code /MV
< > : Parameter No. in display and BRAIN communicator
F040608_5.EPS

Review 1	Review 2	Review 3	Review 4
Model	Flow rate unit	Special unit	Function
Manufacturer	Flow span	User's unit	Base density
Distributor	PV Damp	Conversion faetor	1st temp coeff
Tag	Contact output	Nominal size	2nd temp coeff
Descriptor	Pulse rate	Body type	Cable length
Message	Frequency at 100%	Sensor type	Temp damping
Date	Setting level	K - factor	Analog out select
Dev id	Upper display	Detector No.	Temp 0%
Write protect	Lower display	User adjust	Temp 100%
AO alrm typ	Total rate	Reynolds adjust	Temp error out
Universal rev	Total start/stop	Viscosity	(Only for /MV)
Fld dev rev	Fluid	Gas expansion fact	
Software rev	Process density	Flow adjust	
Hardware rev	Process temp	TLA	
Poll addr	Base temp	Signal level	
Burst mode	Process pressure	Noise balance mode	
Burst option	Base pressure	Noise ratio	
Numb req preams	Deviation	Span velocity	
	Low cut	Span frequency	
	Out limit (H)		
	Burn out		

(*8) Status 1	(*9) Status 2	(*10) Status 3
Flow over output	Transient noise	Temp over output
Span set error	High vibration	Over temp
Pulse set error	Clogging	Temp sensor fault
Device ID nat entered	Fluctuating	Temp conv fault
Sensor fault		(Only for /MV)
Pre-amp fault		
EEPROM fault		

F040608_6.EPS

5. PARAMETERS

5.1 Parameter Setup

The parameters are set before factory shipment. Set the required parameter of changing fluid, contact out and indication of display.

5.2 Multi-Variable Type Parameter (Only for /MV)

Parameter item F is indicated when /MV is selected.

The parameters are set before factory shipment, but it is necessary to set the analog output of temperature, span of temperature output, cable length of DYC.

5.3 Parameters List

This section describes the parameter of digitalYEWFLO.

• Contents of parameter lists.

Item	Description
Parameter number	Parameter item number.
Name	Parameter name.
R / W (Read and write)	Indicates parameter attributes. R : Display only (writing is not permitted). W : Writing is permitted.
Data range	Shows data setting ranges for numerical value entry. Shows data to be selected for data selection. ( ) in parentheses, data code is shown for the display.
Unit	Engineering unit.
Remarks	Remarks such as a description of the contents are given.
Disp.	D : Display can set parameter.
U / D	L : Parameter can be set by UP LOAD and DOWN LOAD. (Check all parameters after setting by DOWN LOAD.)
Initial value	Indicates the initial set values.

T050301.EPS

(1) Item A : Indication

These items are for the indication of flowrate and total.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
A00	DISPLAY				Menu A (Display)			
A10	FLOW RATE(%)	R	0.0 to 110.0	%	Flow rate			
A20	FLOW RATE	R	0.0 to 65535	FU+C40	Flow rate (in engineering unit)			
A30	TOTAL	R	0 to 999999	FU	Totalized value			
	(Indicate only within Temperature sensor)							
A40	TEMP(%)(*1)	R	0.0 to 110.0	%	Temperature Values (%)			
	(Indicate only for Temperature sensor)							
A41	TEMPERATURE(*1)	R	–999.9 to 999.9	D20	Temperature Values			
A60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit
(*1): Only for Option Code /MV

T050302.EPS

(2) Item B : Easy Setting

These items are for the principal items to operate digitalYEWFLO.
A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
B00	EASY SETUP				Menu B			
B10	FLOW SPAN	W	0.00001 to 32000	FU+C40	Flow Span	10	D	L
B15	DAMPING	W	0 to 99	sec	Damping Time	4	D	L
B20	CONTACT OUT	W	OFF (0) SCALED PULSE (1) UNSCALED PULSE (2) FREQUENCY (3) ALARM (4) FLOW SW(LOW:ON) (5) FLOW SW(LOW:OFF)(6)		Contact Output Type	(0)	D	L
	(Indicate and Set only for B20 : SCALED PULSE, UNSCALED PULSE)							
B21	PULSE RATE	W	0.00001 to 32000	FU/P	Pulse Output Rate	1.0	D	L
	(Indicate and Set only for B20 :FREQUENCY)							
B22	FREQ AT 100%	W	0 to 10000	PPS	Pulse Output Rate at sec / 100%	1000	D	L
	(Indicate and Set only for B20 :FLOW SW (ON), FLOW SW (OFF))							
B23	SET LEVEL	W	0.00001 to 32000	FU +C40	Flow Switch (Actual Flow rate)	0	D	L
B30	UPPER DISP	W	FLOW RATE (%) (0) FLOW RATE (1) TEMP(%)(*1)		Selection of Upper Display	(0)	D	L
B31	LOWER DISP	W	BLANK (0) TOTAL (1) TEMP(*1)		Selection of Lower Display	(0)	D	L
B40	TOTAL START	W	STOP (0) START (1)	FU / P	Start / Stop of Totalizer	(0)	D	L
B45	TOTAL RATE	W	0.00001 to 32000 (0)		Total Rate	1.0	D	L
B47	TOTAL RESET	W	NOT EXECUTE (0) EXECUTE (1)		Totalizer Reset	(0)	D	L
	(Indicate and Set only for Option code /MV)							
B50	A / OUT SELECT	W	FLOW (0) TEMP (1)		Selection of Analog Output	0	D	L
	(Indicate and Set only for B50: TEMP)							
B51	TEMP 0%	W	-999.9 to 999.9	D20	Set Temperature Value at 0%	-40	D	L
B52	TEMP 100%	W	-999.9 to 999.9	D20	Set Temperature Value at 100%	260	D	L
B60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit
(*1) : Only for Option Code /MV

T050303.EPS

(3) Item C : BASIC SETUP

These items are for the basic parameters with setting before shipment.
The parameters, C20 to C50, are not indicated when option code "/MV" is selected and parameter item is selected in F10 except "Monitor only" or "Not use".

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
C00	BASIC SETUP				Menu C (Meter characterize)			
C10	TAG NO.	W	16 characters		Tag Number			
C20	FLUID	W	LIQUID:Volume (0) GAS/STEAM:Volume (1) LIQUID:Mass (2) GAS/STEAM:Mass (3) GAS:STD/Normal (4)		Selection of FLUID type	(0)	D	L
(Indicate and Set only for C20 : LIQUID : Volume, GAS / STEAM : Volume)								
C22	VOLUME UNIT	W	m^3 (0) k m^3 (1) l (2) cf (3) m cf (4) k cf (5) USgal (6) k USgal (7) UKgal (8) k UKgal (9) bbl (10) m bbl (11) k bbl (12)		Selection of Flow Units for Flow Rate	(0)	D	L
(Indicate and Set only for C20 : LIQUID : MASS, GAS / STEAM : MASS)								
C25	DENSITY UNIT	W	kg/m^3 (0) lb/c f (1) lb/USgal (2) lb/UKgal (3)	C25	Selection of Density Unit	(0)	D	L
C26	DENSITY f	W	0.00001 to 32000		Operating Density (Manual Setting Value)	1024	D	L
C27	MASS UNIT	W	kg (0) t (1) lb (2) k lb (3)		Selection of Mass Flow Unit	(0)	D	L
(Indicate and Set only for C20 : GAS : STD / Normal)								
C30	TEMP UNIT	W	deg C (0) deg F (1)	C30	Selection of Temperature Unit	(0)	D	L
C31	TEMP f	W	-999.9 to 999.9	C30	Operating Temperature (Manual Setting Value)	15.0	D	L
C32	TEMP b	W	-999.9 to 999.9		Standard / Normal Temperature	15.0	D	L
C33	PRESS UNIT	W	MPa abs (0) kPa abs (1) bar abs (2) kg/cm^2 a (3) psia (4)	C33	Selection of Pressure Unit	(0)	D	L
C34	PRESS f	W	0.00001 to 32000	C33	Absolute Pressure at Operating Condition (Manual Setting Value)	0.1013	D	L
C35	PRESS b	W	0.00001 to 32000		Absolute Pressure at Standard Condition	0.1013	D	L
C36	DEVIATION	W	0.001 to 10.0		Deviation Factor	1.0	D	L
C37	STD/NOR UNIT	W	Nm^3 (0) k Nm^3 (1) M Nm^3 (2) Nl (3) Sm^3 (4) k Sm^3 (5) M Sm^3 (6) Sl (7) scf (8) k scf (9) M scf (10)		Selection of Volumetric Unit at Normal Condition	(0)	D	L
C40	TIME UNIT	W	/s (0) /m (1) /h (2) /d (3)	FU+C40	Selection of Time Unit	(2)	D	L
C45	FLOW SPAN	W	0.00001 to 32000	sec	Flow Span	10	D	L
C50	DAMPING	W	0 to 99		Damping Time	4	D	L
C60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit
(*1) : Only for Option Code /MV

T050304.EPS

(4) Item D : Additional Setup

These items are for Auxiliary Setup.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
D00	AUX. SETUP				Menu D (Additinal Setup)			
D10	LOW CUT	W	* to 32000	FU+C40	Low Cut Flow rate *Minimum Flow rate / 2		D	
D20	TEMP UNIT	W	deg C (0)		Selection of Temperature Unit	(0)	D	L
			deg F (1)					
D21	TEMP f	W	-999.9 to 999.9	D20	Operating Temperature (Manual Setting Value)	15.0	D	L
D25	DENSITY UNIT	W	kg/m³ (0)		Selection of Density Unit	(0)	D	L
			lb/cf (1)					
			lb/USgal (2)					
			lb/UKgal (3)					
D26	DENSITY f	W	0.00001 to 32000	D25	Operating Density (Manual Setting Value)	1024	D	L
D30	OUT LIMIT (H)	W	100.0 to 110.0	%	Upper Limit Value	110.0	D	L
D35	BURN OUT	R	High (0)		Output Direction at Burn Out	(0)	D	L
			Low (1)					
D40	SPECIAL UNIT		No (0)		Selection of change for Special Flow Unit	(0)	D	L
			Yes (1)					
(Indication and set only for D40 : Yes)								
D41	BASE UNIT	R	m³ (0)		Basic unit for conversion to special unit		D	
			k m³ (1)					
			l (2)					
			cf (3)					
			m cf (4)					
			k cf (5)					
			USgal (6)					
			kUSgal (7)					
			UKgal (8)					
			kUKgal (9)					
			bbl (10)					
			m bbl (11)					
			k bbl (12)					
			kg (13)					
			t (14)					
			lb (15)					
			k lb (16)					
			Nm³ (17)					
			k Nm³ (18)					
			M Nm³ (19)					
			Nl (20)					
			Sm³ (21)					
			k Sm³ (22)					
			M Sm³ (23)					
			Sl (24)					
			scf (25)					
			k scf (26)					
			M scf (27)					
D42	USER'S UNIT	W	8 characters		User's unit			L
D43	CONV FACTOR	W	0.00001 to 32000		Coefficient for conversion to special unit	1.0	D	
D60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			L

FU : Flow unit

T050305.EPS

(5) Item E : Detector Setup

These items are for detector that has been already set before.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
E00	METER SETUP				Menu E (Detector setup)			
E10	NOMINAL SIZE	W	15mm (0) 25mm (1) 40mm (2) 50mm (3) 80mm (4) 100mm (5) 150mm (6) 200mm (7) 250mm (8) 300mm (9) — (10)		Selection of Nominal Size	(1)	D	L
E20	BODY TYPE	W	Standard (0) — (1)		Selection of Body Type	(0)	D	L
E30	SENSOR TYPE	W	Standard (0) High Temperature (1) Low Temperature (2)		Selection of Sensor Type	(0)	D	L
E40	K-FACT UNIT	W	P/l (0) P/Usgal (1) P/Ukgal (2)		Selection of K-factor Unit	(0)	D	L
E41	K-FACTOR	W	0.00001 to 32000	E40	K-factor value of 15 deg C	68.6	D	
E50	DETECTOR No.	W	16 characters		Detector number			
E60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

FU : Flow unit

T050306.EPS

(6) Item F: Thermometer (Only for Option Code /MV)

These items is for thermometer setting when.

A Value in "( )" is the data corresponding to the indicator.

F00	THERMOMETER				Menu F(Thermometer) Only within Thermometer	Initial Value	Disp	U/D*1
F10	Function	W	Monitor only	(0)	Select thermometer function.	(0)	D	L
			Saturated Steam	(1)	(Move to F40 when "Monitor only" is selected)			
			Superheat Steam	(2)	(Move to F60 when "Not Use" is selected)			
			GAS: STD/Normal	(3)				
			LIQUID: Mass	(4)				
			Not use	(5)				
	(Indicate and set only for F10: Saturated Stem)							
F12	MASS UNIT	W	kg	(0)	Selection of mass flow rate unit	(0)	D	L
			t	(1)				
			lb	(2)				
			k lb	(3)				
	(Indicate and set only for F10: Superheat Steam)							
F14	PRSS UNIT	W	MPa abs	(0)	Selection of pressure unit	(0)	D	L
			kPa abs	(1)				
			bar abs	(2)				
			kg/cm2 a	(3)				
			psia	(4)				
F15	PRESS f	W	0.00001 to 32000		Absolute pressure at operating condition(Manual setting value)	0.1013		
F16	MASS UNIT	W	kg	(0)	Selection of mass flow rate unit	(0)	D	L
			t	(1)				
			lb	(2)				
			k lb	(3)				
	(Indicate and set only for F10: GAS STD/Normal)							
F18	TEMP UNIT	W	deg C	(0)	Selection of temperature unit	(0)	D	L
			deg F	(1)				
F19	TEMP b	W	-999.9 to 999.9		Standard/Normal temperature	15.0	D	L
F20	PRESS UNIT	W	MPa abs	(0)	Selection of temperture unit	(0)	D	L
		W	kPa abs	(1)				
		W	bar abs	(2)				
		W	kg/cm2 a	(3)				
		W	psia	(4)				
F21	PRESS f	W	0.00001 to 32000		Absolute pressure at operating condition(Manual setting value)	0.1013	D	L
F22	PRESS b	W	0.00001 to 32000		Absolute pressure at Standard condition	0.1013	D	L
F23	DEVIATION	W	0.001 to 10.000		Deviation factor	1.0	D	L
F24	STD/NOR UNIT	W	Nm3	(0)	Selection of volumetric unit at normal condition	(0)	D	L
			k Nm3	(1)				
			M Nm3	(2)				
			Nl	(3)				
			Sm3	(4)				
			k Sm3	(5)				
			M Sm3	(6)				
			Sl	(7)				
			scf	(8)				
			k scf	(9)				
			M scf	(10)				
	(Indicate and set only for F10: Liquid: Mass)							
F26	DENSITY UNIT	W	kg/m3	(0)	Selection of density unit	0	D	L
			lb/cf	(1)				
			lb/USgal	(2)				
			lb/UKgal	(3)				
F27	DENSITY b	W	0.00001 to 32000		Density of standard condition	1024	D	L
F28	TEMP UNIT	W	deg C	(0)	Selection of temperature unit	0	D	L
			deg F	(1)				
F29	TEMP b	W	-999.9 to 999.9		Temperature of standard condition	15.0	D	L
F30	1st coef	W	-32000 to 32000		1st temperature coefficient	0	D	L
F31	2nd coef	W	-32000 to 32000		2nd temperature coefficient	0	D	L
F32	MASS UNIT	W	kg	(0)	Selection of mass flow rate unit	(0)	D	L
			t	(1)				
			lb	(2)				
			k lb	(3)				
F35	TIME UNIT	W	/s	(0)	Selection of time unit	1	D	L
			/m	(1)				
			/h	(2)				
			/d	(3)				
F40	FLOW SPAN	W	0.00001 to 32000		Flow span	0.5	D	L
F45	DAMPING	W	0 to 99		Damping	4	D	L
F50	TEMP DAMPING	W	0 to 99		Damping for temperture output	4	D	L
F52	CABLE LENGTH	W	0 to 30		Cable length for signal cable (0m in case of integral version)	0	D	L
F55	A/OUT SELECT	W	FLOW	(0)	Selection of analog output	0	D	L
			TEMP	(1)				
	(Indicate and set only for F55: TEMP)							
F56	TEMP 0%	W	-999.9 to 999.9		Temperture value at 0%	-40	D	L
F57	TEMP 100%	W	-999.9 to 999.9		Temperture value at 100%	260	D	L
F58	TEMP ERR OUT	W	0%	(0)	Selection of themometer error output when "F55: TEMP"	1	D	L
			OUT LIMIT(H)	(1)	is selected (A value of OUT LIMIT(H) depend on D30)			
			TEMP f	(2)				
F60	SELF CHECK	R	GOOD		Self-diagnostic message			
			ERROR					

(*1) When "K50 : SOFTWARE REV" is "3.10", it can be available.

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(7) Item H : Adjust.

These items are for setting of adjustment.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
H00	ADJUST				Menu H (Adjust)			
H10	TRIM 4mA	W	-1.00 to 1.00	%	Trimming 4mA	0.0	D	
H11	TRIM 20mA	W	-1.00 to 1.00	%	Trimming 20mA	0.0	D	
H20	USER ADJUST	W	0.00001 to 32000		User Adjust	1.0	D	
H25	REYNOLDS ADJ	W	NOT ACTIVE (0) ACTIVE (1)		Reynolds Coefficient	(0)	D	
(Indicator and Set only H25 : Active)								
H26	DENSITY f	W	0.00001 to 32000	D25	Density at operating condition	1024	D	
H27	VISCOSITY	W	0.00001 to 32000	mPa·s	Viscosity factor	1.0	D	
H30	EXPANSION FA	W	NOT ACTIVE (0) ACTIVE (1)		Expansion correction for compressible Gas	(0)	D	
H40	FLOW ADJUST	W	NOT ACTIVE (0) ACTIVE (1)		Instrumental Error Adjust	(0)	D	
(Indicator and Set only H40 : Active)								
H41	FREQUENCY 1	W	0 to 32000	Hz	First break-point frequency (f1)	0.0	D	
H42	DATA 1	W	-50.00 to 50.00	%	First correcting value (d1)	0.0	D	
H43	FREQUENCY 2	W	0 to 32000	Hz	Second break-point frequency (f2)	0.0	D	
H44	DATA 2	W	-50.00 to 50.00	%	Second correcting value (d2)	0.0	D	
H45	FREQUENCY 3	W	0 to 32000	Hz	Third break-point frequency (f3)	0.0	D	
H46	DATA 3	W	-50.00 to 50.00	%	Third correcting value (d3)	0.0	D	
H47	FREQUENCY 4	W	0 to 32000	Hz	Fourth break-point frequency (f4)	0.0	D	
H48	DATA 4	W	-50.00 to 50.00	%	Fourth correcting value (d4)	0.0	D	
H49	FREQUENCY 5	W	0 to 32000	Hz	Fifth break-point frequency (f5)	0.0	D	
H50	DATA 5	W	-50.00 to 50.00	%	Fifth correcting value (d5)	0.0	D	
H60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

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(8) Item J : Test

These items are for test of output.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
J00	TEST				Menu J (Test)			
J10	OUT ANALOG	W	0.0 to 110.0	%	Current Output	0.0	D	
J20	OUT PULSE	W	0 to 10000	PPS	Pulse Output	0	D	
J30	OUT STATUS	W	OFF (0) ON (1)		Status Output	(0)	D	
J60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

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(9) Item K : Maintenance

These items are for maintenance.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
K00	MAINTENANCE				Menu K (Maintenance)			
K10	TLA	W	0.1 to 20.0		Trigger Level Adjust	1.0	D	
K20	SIGNAL LEVEL	W	0.1 to 20.0		Signal Level	1.0	D	
K25	N.B. MODE	W	AUTO (0) MANUAL (1) TUNING AT ZERO (2)		Selection of Noise balance Mode	(0)	D	
K26	NOISE RATIO	R/W	0.00 to 2.00				D	
K28	SET VORTEX F	W	0 to 10000	Hz	Output test by setting simulated frequency.(*2)		D	
K30	VELOCITY	R		m/s	Velocity		D	
K32	SPAN V	R		m/s	Span velocity		D	
K34	VORTEX FREQ.	R		Hz	Vortex frequency		D	
K36	SPAN F	R		Hz	Span frequency		D	
	(Indicate only for F10: "Saturated Steam" or "Super heat steam" or "Liquid mass)(*1)							
K38	DENSITY	R	0.00001 to 32000	D25	Density value (Calculated by Thermometer)		D	
K40	ERROR RECORD	R			Error Records			
K45	H VIBRATION	W	0% No ACTION		Selection of Output Function when "High Vibration" error is indicated.			
K50	SOFTWARE REV	R	0.01 to 99.99		Software Revision Number			
K60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

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(*1) Only for Option Code /MV

(*2) Available for 5.10 or greater version that can be checked in K50 SOFTWARE REV.

(10) Item M : Memo

These items are for Memorandum.

Item	Name	R/W	Data Range	Unit	Remark	Initial value	Disp.	U/D
M00	MEMO				Menu M (Memo)			
M10	MEMO 1	W	16 characters		Memorandum 1 (16 characters)			
M20	MEMO 2	W	16 characters		Memorandum 2 (16 characters)			
M30	MEMO 3	W	16 characters		Memorandum 3 (16 characters)			
M60	SELF CHECK	R	GOOD ERROR		Self-diagnostic message			

T050311.EPS

5.4 Parameter Description

(1) Item A : Display

These items are for the indication of flowrate and total.

[A10:FLOW RATE(%)] Flow rate

Flowrate is displayed by "%" to span value.

[A20:FLOW RATE] Flow rate (Engineering unit)

Flowrate is displayed by engineering unit.

[A30:TOTAL] Total value

Total value of flowrate is displayed

The following item should be done in case of which Option code /MV is selected and analog output is "Temperature".

[A40:TEMP(%)] Temperature value

The measured temperature value is displayed by "%" to span value of temperature.

The following item should be done in case of which Option code /MV is selected.

[A41:TEMPERATURE] Temperature value

The measured temperature value is displayed by engineering unit.

(2) Item B : Easy Setting

These items are for the Principal items to operate digitalYEWFLO.

A value in "( )" is the data corresponding to indicator.

[B10:FLOW SPAN] Flowrate span

Set the required span with a numerical.

[B15:DAMPING] Damping time constant

Set damping time constant values from 0s to 99sec.

[B20:CONTACT OUT] Contact output

Select contact output.

Item		Description
OFF	(0)	————
SCALED PULSE	(1)	Scaled pulse output: Refer to "B21"
UNSCALED PULSE	(2)	Unscaled pulse output: Refer to "B21"
FREQUENCY	(3)	Frequency output: Refer to "B22"
ALARM	(4)	Alarm output: The status goes from close to open (OFF) during alarming. Refer to 5.5 Error Code Lists.
FLOW SW (LOW:ON)	(5)	Status output: Refer to "B23"
FLOW SW (LOW:OFF)	(6)	Status output: Refer to "B23"

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[B21:PULSE RATE] Pulse output rate

Set output rate in a selection of SCALED PULSE or UNSCALED PULSE.

SCALED PULSE OUTPUT:

When SCALED PULSE is selected in B20, set flowrate per one pulse output. Rate unit is linking to the flow unit.

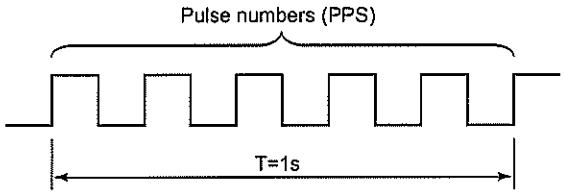
UNSCALED PULSE OUTPUT:

When UNSCALED PULSE is selected in B20, it output number of vortex (vortex frequency) as a pulse-number, which is detected from vortex shedder bar. (1.0 must be set for this.)

The formula for output pulse number is as follows.
Output pulse number per one second = vortex number per one second / PULSE RATE set number. Refer to 6.1.5 Unit of Pulse Output (Scaling).

[B22:100% FREQ] Pulse numbers of 100% at one second

Set pulse number at 100% for one second when "FREQUENCY" in B20 is selected.



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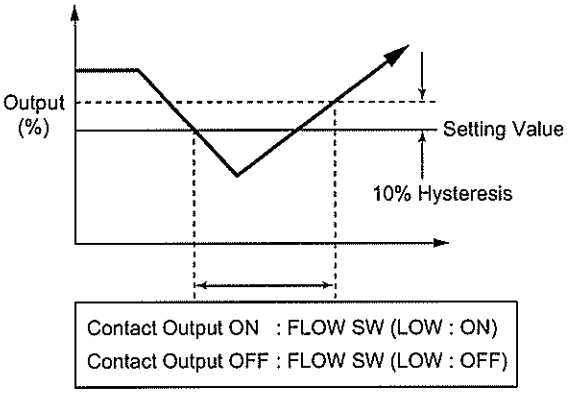
[B23:SET LEVEL] Level of flow switch

Set level of flow switch when "FLOW SW" in B20 is selected. The contact output is sent out when the flowrate is less than the set comparison level.



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[B30:UPPER DISP] Upper indicator display

Select upper display, Flow rate (%) (0), Flowrate (1), TEMP(%)(2). "TEMP(%)" can be selected when Option Code
/MV.

[B31:LOWER DISP] Lower indicator display

Select lower indicator display, "BLANK (0), TOTAL (1), TEMP(2). When "BLANK" in B31 is selected, indicator is blank. "TEMP" can be selected when Option Code
/MV.

[B40:TOTAL START]

Select the START/STOP of totalizer from "STOP (0), START (1)."

[B45:TOTAL RATE] Total rate of the totalizer

Set the total rate of the totalizer.

[B47:TOTAL RESET] Reset the totalizer

When totalizer reset function is executed, the total display and communication parameter are reset.

The following items should be done in case of which Option code "/MV" is selected.

[B50 A/OUT SELECT] Analog Output select

Select the analog output select from flow rate or temperature.

When changing the analog output, UPPER DISPLAY can be changed shown as below automatically.

B50 : A/OUT SELECT	UPPER DISPLAY
"TEMP" TO "FLOW"	FLOW(%)
"FLOW" TO "TEMP"	TEMP(%)

("B30 : UPPER DISPLAY" is "FLOW RATE", it can not be changed.)

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The following item should be done in case of which B50 is "TEMP"

[B51 TEMP 0%]

Set temperature value of 0% output.

[B52 TEMP 100%]

Set temperature valve of 100% output.

(3) Item C : BASIC SETUP

These items are for the basic parameters with setting before shipment.

The parameters which are set in B are not necessary to set in C.

A value in "( )" is the data corresponding to indicator.

The parameters, C20 to C50, are not indicated when option code "/MV" is selected and parameter item is selected in F10 except "Monitor only" or "Not Use".

[C10: TAG NO] Tag. No

Set Tag. No. (16 characters)

Available characters are as follows.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a
b c d e f g h i j k l m n o p q r s t u v w x y z 0 1 2 3 4 5 6 7
8 9 . SPACE / - , + *) (' & % $ # " !

[C20:FLUID] Flowrate unit

Set the flowrate unit below.

Item	Description
LIQUID : Volume (0)	Volumetric flow of liquid measuring
GAS/STEAM : Volume (1)	Volumetric flow of gas or steam measuring
LIQUID : Mass (2)	Mass flow of liquid measuring
GAS/STEAM : Mass (3)	Mass flow of gas or steam measuring
GAS : STD/Normal (4)	Volumetric flow at Standard condition

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The following items should be done in case of which "C20" is "LIQUID : Volume" or "GAS/STEAM : Volume".

[C22:VOLUME UNIT] Volumetric unit

Select the unit of volumetric flow from m^3(0), km^3(1), l(2), cf(3), mcf(4), def(5), USgal(6), kUKgal(9), bbl(10), mbbl(11), kbbl(12).

The following items should be done in case of which "C20" is "LIQUID: Mass" or "GAS/STEAM : Mass"

[C25:DENSITY UNIT] Density Unit of Flow measurement

Select the unit of density from kg/m^3(0), lb(1), lb/USgal(2), lb/UKgal(3).

[C26:DENSITY f] Density at normal operation conditions

Set the density value of the fluid at operating condition for mass flow unit.

[C27:MASS UNIT] Mass flowrate unit

Select the mass flowrate unit from kg(0), t(1), lb(2), k lb(3).

The following item should be done in case of which "C20" is "GAS/STEAM : Volume".

[C30:TEMP UNIT] Fluid temperature unit at operating conditions

Select temperature unit at operating condition from "degC (0), degF (1)".

[C31:TEMP f] Fluid temperature at operating conditions

Set fluid temperature at operating condition.

Range is -196 to 450°C

The following items should be done in case of which "C20" is "GAS/STD : Normal".

[C32:TEMP b] Fluid temperature at standard/normal conditions

Set the values of Fluid temperature at standard condition.

[C33:PRESS UNIT] Pressure unit

Select the unit of pressure from "MPa abs(0), kPa abs(1), kg/cm^2 abs(2), bar abs(3)".

[C34:PRESS f] Absolute pressure at operating conditions

Set the absolute pressure at operating condition.

[C35:PRESS b] Absolute pressure at standard/normal condition

Set the absolute pressure at normal condition.

[C36:DEVIATION] Deviation factor

Set deviation factor.

[C37:STD/NOR UNIT] Volumetric unit at normal conditions

Select volumetric unit at normal condition from Nm^3(0), kNm^3(1), MNm^3(2), Nl(3), Sm^3(4), Km^3(5), Mm^3(6), Sl(7), scf(8), kscf(9), Mscf(10).

[C40:TIME UNIT] TIME UNIT

Select time unit from "/s(0), /m(1), /h(2), d(3)"

[C45:FLOW SPAN] Flowrate span

Set the required span with a numerical value.

[C50:DAMPING] Damping time constant

Set damping time constant values from 0 to 99sec.

(4) Item D (AUX SETUP)

These items are for Auxiliary setup.

A value in "( )" is the data corresponding to indicator.

[D10:LOW CUT] Low-cut flowrate

NOTE

For D10 setting, be sure to set "NOMINAL SIZE" in E10 firstly.

Set to noise elimination or zero flow in the low flowrate (or low frequency) range. The settable range for low cut flowrate is more than half-minimum flowrate.

NOTE

The low cut can be set after the compensate items (H25, H30, H40) are set to "NOT ACTIVE". It is possible that indication value changes by the compensated items are set to "ACTIVE", however, it does not affect an actual calculation.

[D20:TEMP UNIT] Fluid temperature unit at operating conditions

Select temperature unit at operating condition from "degC (0), degF (1)".

[D21:TEMP f] Fluid temperature at operating conditions

Set fluid temperature at operating condition.

Range is -196 to 450°C

[D25:DENSITY UNIT] Density Unit of Flow measurement

Select the unit of density from kg/m³(0), lb(1), lb/USgal(2), lb/UKgal(3).

[D26:DENSITY f] Density at normal operation conditions

Set the density value of the fluid at operating condition for mass flow unit

[D30:OUT LIMIT] Limit value of output and indication

Set limit value of output from 100.0% to 110.0%

[D35:BURN OUT] Indication of the output direction at burn out

This is indication of the output direction at burn out. Refer to "6.1.6 Burn out" when the output direction can be changed.

[D40:SPECIAL UNIT] Change to special flowrate unit

Select the availability of changing to special flowrate Unit from "No(0)" or "Yes(1)"

[D41:BASE UNIT] Indication of the special flowrate unit

Indication of the basic flowrate unit when item D40 is "Yes(1)"

[D42:USER'S UNIT] Free unit for users

Set in up to 8 alphanumeric characters when item D40 is "Yes(1)"

Refer to C10 for available characters.

[D43:CONV FACTOR] Convert factor

Set the conversion factor for special units when item D40 is "Yes(1)"

(5) Item E (METER SETUP)

These items are for detector set up that has already been set before shipment.

A value in "( )" is the data corresponding to indicator.

[E10:NOMINAL SIZE] Nominal size of the detector

Select the nominal size of the flowmeter, from "15mm(0), 25mm(1), 40mm(2), 50mm(3), 80mm(4), 100mm(5), 150mm(6), 200mm(7), 250mm(8), 300mm(9)"

[E20:BODY TYPE] Body type for the detector

Select body type for detector from standard or high pressure.

[E30:SENSOR TYPE] Sensor type for the detector

Select sensor type for the detector from standard or HT/LT

[E40:K-FACTOR UNIT],

Select this unit from p/l, p/Usgal, p/Ukgal.

[E41:K-FACTOR]

The flowmeter data plate includes a K-factor (KM) at 15°C for the combined detector.

[E50:DETECTOR NO.] Detector number of flowmeter

Set the serial number using 16 alphanumeric characters of the detector combined converter.

(6) Item F (Thermometer)

These items are for setting of thermometer and available when build in thermometer type (Option code: /MV).

[F10: Function] Thermometer function

Select the thermometer function.

Monitor only(0): Only temperature measurement.

Saturated Steam: Mass Flow rate is calculated from density values by temperature measurement using saturated steam table.

Superheat Steam: Mass Flow rate is calculated from density values by temperature measured by using steam table. In order to measure superheat steam. It is necessary to make constant pressure value.

GAS: STD/Normal: Volumetric flow rate at standard condition is calculated by using Pressure-Temperature correction. It is necessary to male constant pressure value.

Liquid: Mass: Mass flow rate is calculated by using the density change values depend on temperature values by which the secondary order function is used.

The following item should be done in case of which F10 is Saturated steam

[F12 MASS UNIT] Mass flow unit

Select mass rate unit from kg(0), t(1), lb(2), k lb(3).

The following items should be done in case of which F10 is Superheat steam

[F14 PRESS UNIT] Pressure unit

Select pressure unit from MPa abs(0), kPa abs(1), bar abs(2), kg/cm^2 a(3), psia(4).

[F15 PRESS f] Pressure value

Set absolute pressure values at operating condition.

[F16 MASS UNIT] Mass flow unit

Select mass flow unit from kg(0), t(1), lb(2), k lb(3).

The following items should be done in case of which F10 is GAS: STD/Normal

[F18 TEMP UNIT] Temperature unit

Select temperature unit from deg C(0), deg F (1).

[F19 TEMP b] Temperature b

Set temperature value at normal/standard condition.

[F20 PRESS UNIT] Pressure unit

Select pressure unit from MPa abs(0), kPa abs(1), bar abs(2), kg/cm^2 a(3), psia(4).

[F21 PRESS f] Pressure value f

Set absolute pressure values at operating condition.

[F22 PRESS b] Pressure value b

Set absolute pressure values at normal/standard Condition.

[F23 DAVIATION] Daviation factor

Set the daviation factor.

[F24 STD/NOR UNIT] Standard/Normal unit

Select Volumetric unit at standard/normal condition From Nm3(0), k Nm3(1), M Nm3(2), Nl(3), Sm3(4)

k Sm3(5), M Sm3(6), Sl(7), scf(8), k scf(9), M scf(10)

The following item should be done in case of which F10 is LIQUID:MASS

[F26 DENSITY UNIT] Density unit

Select density unit from kg/m3(0), lb/cf(1), lb/Usgal(2), lb/Ukgal(3).

[F27 DENSITY b] Density b

Set density value at standard condition.

[F28 TEMP UNIT] Temperature unit

Select temperature unit from deg C(0), deg F(1).

[F29 TEMP b] Temperature b

Set temperature value at standard condition

[F30 1st coef] lst coefficient

Set lst temperature coefficient using the density correction.

[F31 2nd coef] 2nd coefficient

Set lst temperature coefficient using the density correction.

[F32 MASS UNIT] Mass unit

Select mass flow rate unit from kg(0), t(1), lb(2), k lb(3).

[F35 TIME UNIT] Time unit

Select time unit from /s(0), /m(1), /h(2), /d(3).

[F40 FLOW SPAN] Flow span

Set span flow rate, 0 to 32000.

[F45 DAMPING] Flow damping

Set flow damping, 0 to 99sec.

[F50 TEMP DAMPING] Temperature damping

Set temperature damping, 0 to 99sec.

[F52 CABLE LENGTH] Cable length of signal cable(DYC)

Set cable length(m) of signal cable for DYA.

When type of model is integral, cable length is set in 0m.

[F55 A/OUT SELECT] Analog out select

Select the analog output from FLOW(0), TEMP(1).

The following item should be done in case of which F55 is TEMP

[F56 TEMP 0%] Temperature at 0%

Set temperature value at 0%.

[F57 TEMP 100%] Temperature at 100%

Set temperature value at 100%.

[F58 TEMP ERR OUT] Output selection of thermometer error

Select output function when thermometer error from 0%(0), OUTLIMIT(H)(1), TEMP f.

In case of OUT LIMIT(H), it is based on parameter "D30"

(7) Item H (ADJUST)

This item for setting of adjustment.

[H10, H11:TRIM 4mA, TRIM 20mA] Triming of 4mA and 20mA

Fine tuning adjustment of 4mA and 20mA output.

Fine tuning range is form -1.00% to 1.00%.

[H20:USER ADJUST] Conversion factor for user setting.

Set conversion factor by user.

This conversion factor is converted into measurement flowrate.

[H25:REYNOLDS ADJ] Reynolds adjustment

Select the Reynolds adjustment.

This adjustment should be done in case of their error compensation, because error of vortex flowmeter should be increased when it come to low reynolds numbers.

The following item should be done in case of which "H25" is "ACTIVE".

[H26:DENSITY f]

Set the density at operating condition.

[H27:VISCOSITY]

Set the value of density and viscosity at standard conditions. These values should be used for Reynolds adjustment. Reynolds number(Re) is calculated as shown in the formula below.

$$Re = 354 \times \frac{Q \cdot \rho f}{D \cdot v}$$

Q : Volumetric flow (m^3/h)
D : Internal diameter (m)
ρf : Density at operating condition
μ : Viscosity (m Pa · s (cp))

Flowrate error of vortex flowmeter increases as Reynolds number decrease less than 20000.

By setting H25, H26, H27, it corrects the error.

[H30:EXPANSION FA] Gas expansion correction.

When measuring a compressibility gas by mass flow (Steam M, Gas M) and standard condition (Gas Qn), this expansion factor is useful to correct the deviation from the ideal gas law.

[H40:FLOW ADJUST] Select a break point correction

Select a break point correction for the instrumental error from "NOT ACTIVE(0) OR ACTIVE(1)".

[H41, H45:FLOW ADJUST] Instrumental Error Correction

■ Correct the instrumental error in flowmeter characteristics using 1 line-segment approximation (with five correction factors).

(1) Flow frequency input at line segments needs to be $f_1 \leq f_2 \leq f_3 \leq f_4 \leq f_5$.
When four correction factors are available, line segments need to be $f_4=f_5$ and $d_4=d_5$.
When three correction factors are available, line segments need to be $f_3=f_4=f_5$ and $d_3=d_4=d_5$.

(2) When a flow input of f_1 or less is present, correct the instrumental error as the corrected value=d_1.

(3) When a flow input of f_5 or more is present, correct the instrumental error as the corrected value=d_5.

(4) Abscissa (f_1 to f_5) : Set the break-point frequencies as parameters.

(5) Ordinate (d_1 to d_5) : Set the corrected value (%) at each break-point as parameters.

$$\text{Set value} = -\frac{Qs-I}{I} \times 100$$

Where
Qs : Correct flowrate determined by a reference apparatus
I : Indication of vortex flowmeter

• Definition of error varies with the type of flowmeter. Be careful of the difference in signs in the error and corrected value.

$$Qf = \frac{f(Hz)}{\text{K-factor}} \times 100$$

holds and the error is included in the K-factor.
Therefore, for the region where the K-factor shift on the positive side, the corrected value is negative.
The corrected value when the calibration fluid of the flowmeter and the fluid to be measured are different must be set as a corrected value obtained by making both abscissas agree with respect to the Reynolds number.

NOTE

If Low cut flowrate D10 is used together with those parameters (H30, H35, H40), D10 must be set in advance while those parameters are "NOT ACTIVE".

(8) Item J (TEST)

These items are for test of output.

A value in "( )" is the data corresponding to indicator.

[J10:OUT ANALOG] 4 to 20mA Current output.

It tests 4 to 20mA Current output. Electric current of the set value (%) which designates 4 to 20mA as 0 to 100%.

When this test is executed, transistor contact output (Pulse, Alarm, Status) is fixed at ON or OFF (not determined).

Exiting this parameter item or stopping access after ten minutes, this function will be reset automatically.

[J20:OUT PULSE] Pulse output

It tests Pulse output.
The number of pulses which is set (unit: PPS) is output.

Exiting this parameter item or stopping access after ten minutes, this function will be reset automatically.

When this test is executed, current output is fixed at 0% (4mA).

[J30:OUT STATUS] Status output test

Status output test can be executed (OFF(0) or ON(1)).

When this test is executed, current output is fixed at 0% (4mA).

Exiting this parameter item or stopping access after ten minutes, this function will be reset automatically.

(9) Item K (Maintenance)

These items are for maintenance.

A value in "( )" is the data corresponding to indicator.

[K10:TLA] TLA Adjustment

Trigger level (TLA) is adjusted upon shipment. Therefore, TLA adjustment is nonnecessity. But set TLA adjustment below as

- The measurement of Low flow rate area is required.
- Mechanical vibration and impact are applied to digitalYEWFLO and Zero point and low flow rate area is output.

  Note: Refer to "6.2 Adjustment for Manual Mode".

[K20:SIGNAL LEVEL]

Set the signal level.

[K25:N. B. MODE]

Set the Noise Balance Mode from "AUTO(0)" or "MANUAL(1)" or "TUNING AT ZERO(2)"

[K26:N. B.RATIO] The ratio of Noise Balance.

When "NOISE BALANCE MODE (N. B. MODE)" is "AUTO", noise balance value is the indication only.

When N.B. mode is "MANUAL", the noise balance can be adjusted entering the setting values.

Note: Refer to "6.2 Adjustment for Manual Mode".

[K28:SET VORTEX F] Output test by setting simulated frequency.

Amplifier check is executed by simulated frequency input.

Output to be able to check are, analog output, pulse output/ contact output.

Test status also can be seen on display board.

NOTE

- In case of multi-variable type (/MV), output value is calculated by setting density and temperature.
- Available for 5.10 or greater version that can be checked in K50 SOFTWARE REV.

[K30:VELOCITY] Flow velocity

Indication of flow velocity at the operating conditions.

[K32:SPAN V] Flow span velocity

Indication of flow span velocity.

When /MV is selected and "F10 : FUNCTION" is "Saturated Steam" or "Superheat Steam" and "GAS : STD/Normal" or "LIQUID : Mass", the display of span velocity may differ from an actual value.

[K34:VORTEX FREQ.] Vortex frequency.

Indication of vortex frequency at operating conditions.

[K36:SPAN F] Span vortex frequency.

Indication of span vortex frequency.

When /MV is selected and "F10 : FUNCTION" is "Saturated Steam" or "Superheat Steam" and "GAS : STD/Normal" or "LIQUID : Mass", the display of span frequency may differ from an actual value.

[K40:ERROR RECORD] Error record

The error record can be indicated.

- The error is recorded as history.
- The error history is not time-series data.
- The error history can be holded for 30 days.

In order to clear an error record, set the video inverse bar by "< >" and press "ENTER"key twice.

[K50:SOFTWARE REV] Software revision

The software revision can be indicated.

5.5 Error Code Lists

When an ERROR is displayed by SELF CHECK in item A60, B60, C60, D60, E60, or H60, J60, K60, M60, press function key F2 [DIAG] and the error contents are displayed.

The error contents are listed below:

Table 5.1 ERROR Code List

Indication	Diagnostic Message	Error Name	Problem Cause	Current Output		% Output		Pulse Output	Engineering Unit Output	Totalizing Output	Engineering Temp Output	Pulse / Status Output			How to recover
				Select flow rate	Select temperature	Select flow rate	Select temperature					Pulse(*2)	Status(*2)	Alarm(*2)	
Err-01	OVER OUTPUT	Over range output signal	Output signal is 110% or more	Fixed at 110%.(*1)	Normal Operation	Fixed at 110%.(*1)	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change parameters or over ranged flow input
Err-02	SPAN SET ERROR	Span Setting Error	Span setting parameter is more than 1.5 times of max flow velocity	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change parameters span factor is outside the acceptable limits
Err-06	PULSE OUT ERROR	Pulse output error	Pulse output frequency is more than 10kHz	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Fixed at 10KHz	Normal Operation	Normal Operation	Normal Operation	Fixed at 10kHz			Change parameters (ItemC,ItemE)
Err-07	PULSE SET ERROR	Pulse setting error	Pulse output frequency setting is more than 10kHz	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation			Change parameters (ItemC,ItemE)
CHECK Vibration	Transient noise	Error of Vibration	Transitional disturbance	Hold	Normal Operation	Hold	Normal Operation	Normal Operation	Hold	Normal Operation	Normal Operation	Hold	Hold	OFF(H)	CHECK the vibration
CHECK Vibration	High vibration	Error of Vibration	High vibration	Based on K45	Normal Operation	Based on K45	Normal Operation	Stop Output	Based on K45	Stop the total	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the vibration
CHECK Flow	Fluctuating	Error of Flow	Fluctuating	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the clogging
CHECK Flow	Clogging	Error of Flow	Clogging	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the clogging
Err-10	TEMP OVER OUTPUT	Over range Temp output signal	Temp output signal is 110% or more, and 0% below.	Normal Operation	Fixed at 110% in case of over 110%, and fixed at 0% when in case of less than 0%.(*1)	Normal Operation	Fixed at 110% in case of over 110%, and fixed at 0% when in case of less than 0%.(*1)	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the temperature or temperature span
Err-11	OVER TEMP	Error of temperature	Temp value is -50°C below or 300°C over.	Remain in operational Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operational Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	OFF(H)	CHECK the temperature
Err-12	TEMP SENSOR FAULT	Error of thermometer	Disconnection or short of thermometer sensor	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	OFF(H)	Change thermometer sensor.
Err-13	TEMP CONV. FAULT	Error of temperature converter	Temperature converter is failed	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	OFF(H)	Change converter case build in temperature sensor.
Err-20	PRE-AMP ERROR	PRE-AMP is failed		Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Normal Operation	Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Normal Operation	OFF(H)	Replace the AMP. unit
Err-30	EE PROM ERROR	EEPROM is not functioning correctly		Over 110% or -2.5% below	Over 110% or -2.5% below	Fixed at 0%	Fixed at 0%	Halt	Fixed at 0%	Halt	Fixed at 0%	Stop the Output	OFF(H)	OFF(H)	Replace the AMP. unit
Err-40	FLOW SEBSOR FAULT	Error of Flow sensor	Flow sensor is fault.	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change Flow sensor
	CPU FAULT	CPU is failed	All operations are Dead. Display and self dignostic function is also dead.g	Over 110% or -2.5% below	Over 110% or -2.5% below	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Replace the AMP. unit

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Note. Normal Operation : Operation continues without relation to error occurrence.
Remain in Operation : Calculation continues with relation to error occurrence.

(*1) "110%" is based on "D30 : OUT LIMIT(H)".
(*2) Pulse output : These conditions should be done in case of which B20 is "SCALED PULSE", "UNSCALED PULSE", "FREQUENCY".
Status output : These conditions should be done in case of which B20 is "FLOW SW (LOW :ON)", "FLOW SW (LOW : OFF)".
Alarm output : These conditions should be done in case of which B20 is "Alarm".

6. OPERATION

After you have installed the flowmeter into the process piping, wired the input/output terminals, set up the required parameters, the vortex flowmeter should output an accurate flow signal from its terminals as soon as the measured liquid begins to flow.

This section describes procedure of test method and adjustment method for the pre-operation.

6.1 Adjustment

6.1.1 Zero Adjustment

No zero adjustment is necessary since the zero point does not shift.

Because of the effect of electrical noise and vibration noise, digitalYEWFLO may provide an output even when the flowrate is zero. In that case, properly eliminate the source of the noise.

Refer to "6.2 : Adjustment for manual mode".

6.1.2 Span Adjustment

In normal application, you need not confirm the span.

If you need to ensure the output of 4 to 20mA DC, refer to "6.1.3 Loop Test".

6.1.3 Loop test

To ensure output of 4 to 20mA DC or pulse, their loop tests can be done using parameter "J10 (Analog out)" or "J20 (Pulse test)".

If you are verifying the analog output, follow the procedure on the verification procedure.

<Check Procedure>

1. Connect the instruments referring to Figure 6.1, and warm up for three minutes more.
2. Set span frequency in Parameter J10:OUT ANALOG.
3. In case the load resistance is 250 ohm, digital multimeter indicates 5V. Otherwise if it is known load resistance value, it indicates R x 0.02A.
4. Check output value after set 50% in Parameter J10.
5. Check output value after set 0% in Parameter J10.

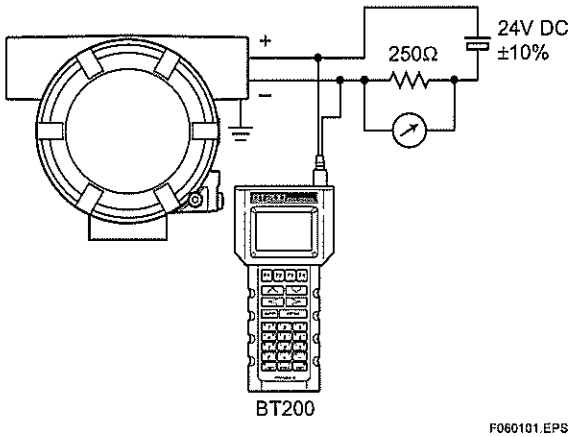


Figure 6.1 Connection of Maintenance Instruments

IMPORTANT

- When using any test-purpose measuring instruments, do not ground them.
- All of your parameter settings will be cancelled if you turn digitalYEWFLO off less than 30 seconds after the parameter setup. Keep digitalYEWFLO turned on at least 30 seconds after setting up the parameters.

6.1.4 Totalizer Function Start and Totalized Value Reset

When using the Totalizer Function, the start setup should be done.

(1) Start operation using BT200
Enter to B40(TOTAL START), and move the video bar to "EXECUTE". Push "ENTER" key at 2 times.
(2) Start operation using indicator
Enter to "Setting mode", move to B40 of parameter number, and enter to "01" of data number.
Refer to "4.4: Setting mode".

Totalized value can be reset using the indicator or BT200.

(1) Reset operation using BT200
Enter to B42 (TOTAL RESET), and move the video bar to "EXECUTE". Push "ENTER" key at 2 times.
(2) Reset operation using indicator
Enter to "Setting mode", move to B42 of parameter number, and enter to "01" of data Number.
Refer to "4.4 : Setting mode".

6.1.5 Unit of Pulse Output (Scaling)

Pulse output are constructed by two units, that are "Scaled pulse and Unscaled Pulse".

(1) Scaled Pulse

When SCALED PULSE is selected in B20, set flowrate per one pulse output. Rate unit is linking to the flow unit.

(2) Unscaled Pulse

When UNSCALED PULSE is selected in B20, it output number of vortex (vortex frequency) as a pulse-number, which is detected from vortex shedder bar. (1.0 must be set for this.)

Refer to 7.6 (1) Flow calculation.

● Pulse Rate setting

Pulse rate setting are settable by "B21:PULSE RATE".

6.1.6 Power Failure

When a power failure occurs, the totalized value will be protected by EEPROM (Electrically Erasable Programmable ROM). But during a power failure, the vortex flowmeter stops and also the totalizing will stop.

After a power is recovered, the vortex flowmeter and the totalizing start to work automatically.

EEPROM doesn't need a battery for backup.

6.2 Adjustment for Manual Mode

digitalYEWFLO does not need the initial adjustment because digitalYEWFLO is always adjusted by itself automatically.

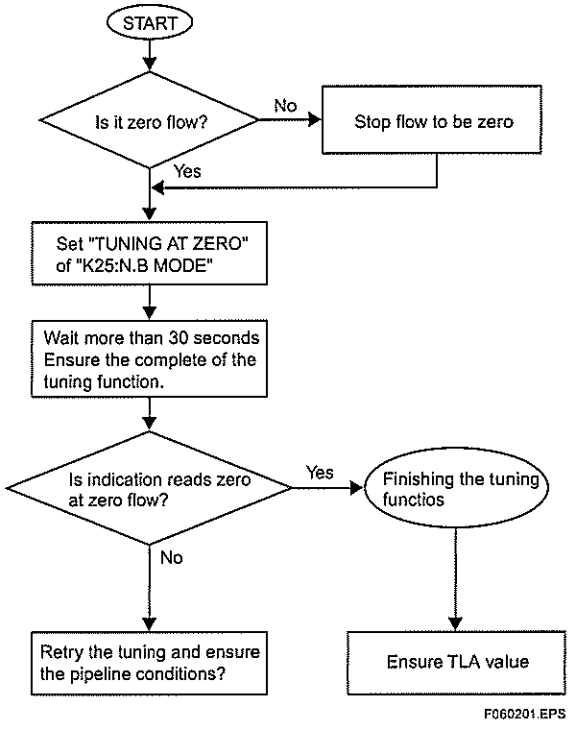
These adjustments should be done in case that indicator reads over zero at zero flow.

6.2.1 Low Cut Adjustment

Adjust to noise elimination or zero flow in the low flowrate (or low frequency) range.
The settable range for low cut flowrate is below half of minimum flowrate.

6.2.2 Tuning

This adjustment should be done according to a flow figure shown below.



If this adjustment is executed, the following value is changed.

K25:N.B MODE = MANUAL

K26:NOISE RATIO=Constant value

Minimum flowrate is increased when TLA value is changed form initial value.

1. Tuning method

(1) Ensure the condition of flowrate
The necessary condition for tuning function is zero flow.

(2) Executing the tuning function.
Set " TUNING AT ZERO" of "K25:N.B MODE".
Wait more 30 second.

(3) Finishing the tuning functions
Using the BT200
(a) Press "DATA" key of BT200 function key.
(b) Ensure the indication of "MANUAL" which is "K25:N.B MODE"
("NOW TUNING" is indicated during tuning operation.)
Using the indicator
(a) Press "SHIFT" and "SET" key simultaneously.
(b) Press "SET" key and ensure "01" of Lower indication.
("02" is indicated during tuning operation. Execute (a), (b) once again.)

2. TLA value

TLA values is possible to change after executing "TUNING". In this case, minimum flowrate is increased.

Minimum flowrate for TLA value is given by below equation.

$$\text{Minimum Flowrate after changing TLA Value} = \text{Specified Minimum Flowrate} \times \sqrt{\frac{\text{TLA Value after Tuning}}{\text{TLA initial value or defalt value}}}$$

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Ensure minimum flowrate for changing TLA value.

3. Output

After tuning, ensure that the indication reads is zero where no fluid is flowing.

If the indication reads over zero is done continuously, retry the tuning and ensure the below condition.

Does high vibrations occur in pipeline?

In this case, refer to "2:INSTALLATION", and keep the pipeline properly.

6.3 Other Maintenance

6.3.1 Cleaning Precautions

Care should be taken to prevent the build up of dirt, dust or other material on the display glass and data plate. In case of its maintenance, soft and dry cloth is used.

7. MAINTENANCE

CAUTION

- Maintenance work must be carried out by expert engineer or skilled personnel and not by operators.
- Before opening the cover, it is important to ensure that at least 10 minutes have passed since the power was turned off. Furthermore, opening of the cover must also be carried out by expert engineer or skilled personnel.

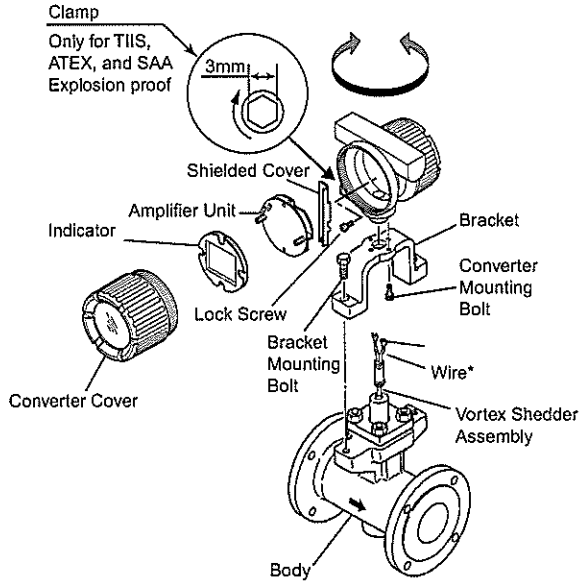
CAUTION

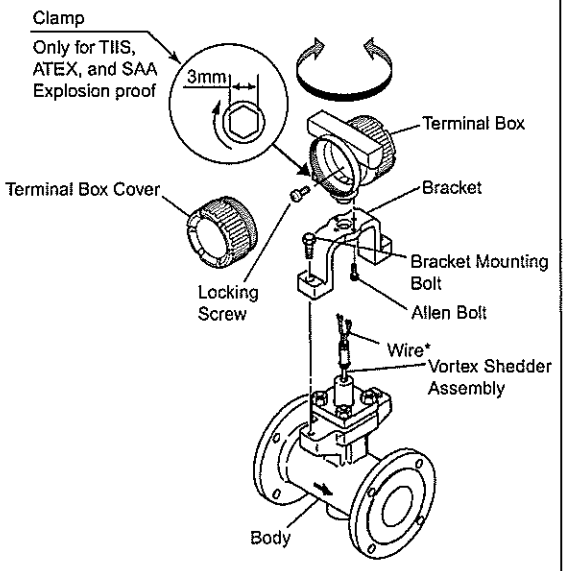
- It is prohibited by law for the user to modify flameproof instruments. It is not permitted to add or remove indicators. If modification is required, contact YOKOGAWA.
- Explosion protected type must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state.
- For TIIS, ATEX and SAA explosion proof, the display cover is locked by the clamp. In case of opening the display cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the clamp using the hexagonal wrench attached after installing the cover.

7.1 Changing the Terminal Box Orientation

The terminal box can be changed in four directions with respect to the flow direction.

Integral Type Vortex Flowmeter	Remote Converter Type Vortex Flowmeter
<1> Remove the converter cover. <2> For amplifier unit removal, refer to paragraph 3.7.2. <3> Disconnect the vortex shedder assembly lead-wires from the converter. <4> Remove the bracket mounting bolts and remove the converter and bracket from the flowmeter body. The bracket applies to the 1 (25mm) to 4 (100mm) inch flowmeters. <5> Remove the four allen bolts securing the converter to the bracket. <6> Turn the converter to the desired orientation. When reassembling the converter, reverse the above procedure.	<1> Remove the terminal box cover. <2> Loosen two screws to disconnect leadwires from shedder bar. <3> Remove the bracket mounting bolts and remove the terminal box and bracket from the flowmeter body. The bracket applies to the 1 (25mm) to 4 (100mm) inch flowmeters. <4> Remove the four allen bolts securing the terminal box to the bracket. <5> Turn the terminal box to the desired orientation. When reassembling the terminal box, reverse the above procedure.





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7.2 Indicator Removal and Rotation

(1) Turn the power OFF.
(2) Remove the cover.
    * In case of the Explosion protected type, remove the cover after unlock the clamp.
(3) For the indicator, disconnect the cable connector from the amplifier unit.
(4) Loosen the two indicator mounting screws using a Phillips screwdriver.
(5) Pull out the indicator.
(6) Reinstall the indicator in the reverse order to its removal (above) and secure the mounting screws.

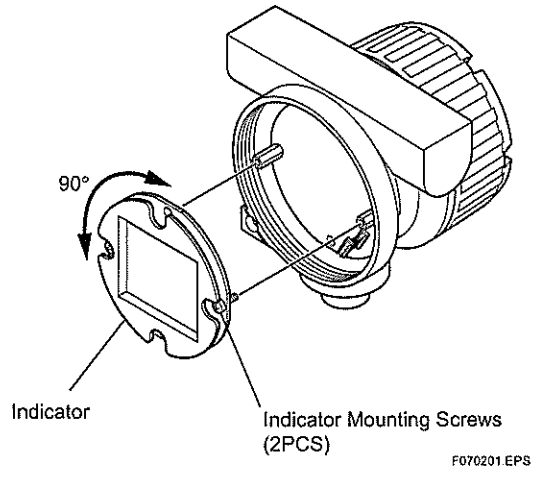

Figure 7.1 Removing and Reinstalling the Indicator

7.3 Amplifier Unit Removal

IMPORTANT

Do not turn the amplifier unit for removal or assembling. The connector pins may be damaged.

(1) Turn the power OFF.
(2) Remove the converter cover.
    * In case of the Explosion protected type, remove the cover after unlock the clamp.
(3) Remove the indicator according to the procedures described in paragraph 7.2.
(4) Loosen the terminal screws and remove the amplifier unit.

7.4 Amplifier Unit Assembling

IMPORTANT

The amplifier unit must be assembled keeping the procedure as follows. Amplifier may not operate normally when the procedure does not keep.

(1) Put two-mounting pins① into mounting hole②.
(2) Push the head of two mounting screws④ lightly.
(3) Push head of two IC⑤ and mount the amplifier unit③.
(4) Tighten two mounting screws④.

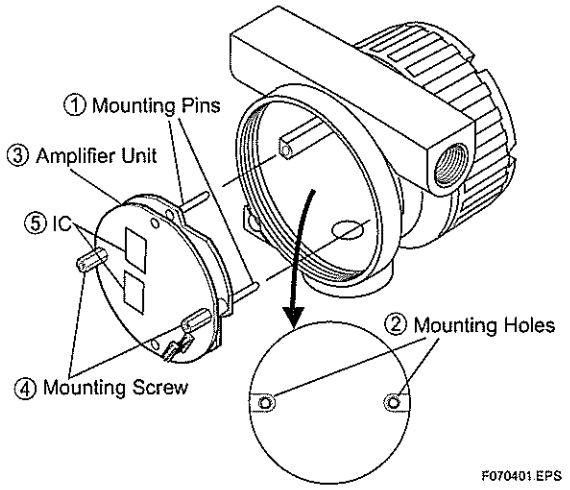

Figure 7.2 Removing and Reinstalling the Amplifier Unit

7.5 Vortex Shedder Removal

CAUTION

- Disassemble work should be done only for error occurrence.
- Only expert engineer or skilled personnel are permitted to open the cover.
- When the vortex shedder is disassembled, and empty the flow tube before the gasket must be replaced with a new one.
- For Explosion proof type, move vortex flowmeter to non-hazardous area firstly, then do the assemble work.

(1) Remove the converter cover.
(2) For Integral Type, loosen the terminal screws and disconnect leadwires on the amplifier and loosen 4 screws to disassemble the Amplifier. And for Remote Type, remove the terminal box cover in the same way.
(3) Loosen the bracket mounting bolts and remove the terminal box together with the bracket. Be careful not to damage the leadwires connected to the vortex shedder assembly when removing the terminal box.
(4) Loosen the vortex shedder assembly mounting bolts or nuts and remove the vortex shedder assembly.
(5) When reassembling the vortex shedder assembly, reverse above procedure. Confirm the following.
   a. The gasket should be changed to new one.
   b. The guide pin on the vortex shedder mounting block meets the guide pin hole. See Figure 7.3. The guide pin applies to the 1 to 4 inch flowmeters.
   c. The vortex shedder assembly is installed as illustrated in Figure 7.3.
   d. Tighten the sensor mounting bolts or nuts with a torque wrench, applying the torque specified below.

Table 7.1 Torque Value

UNIT: kg·m (ℓb·in)

Nominal Size mm (inch)	Standard	High Temperature (HPT)	
		A	B
15 (1/2)	1.6 (140)		
25 (1)	1.2 (105)	1.75 (153)	1.2 (105)
40 (1-1/2)	1.2 (105)	1.75 (153)	1.2 (105)
50 (2)	2 (174)	5 (435)	2 (174)
80 (3)	3 (260)	10 (870)	4 (348)
100 (4)	4 (348)	10 (870)	5 (435)
150 (6)	5 (435)	7 (608)	5 (435)
200 (8)	7 (610)	10 (870)	7 (608)
250 (10)	16 (1390)		
300 (12)	16 (1390)		

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In case of High Temperature Version (Option code: HPT), First time tighten Nuts with a torque wrench, applying the torque specified "A".

Next time loosen Nuts completely, then again tighten Nuts with a torque wrench, applying the torque specified "B".

   e. Insert the leadwires (vortex shedder) through the terminal box bottom hole and lower the terminal box slowly until the bracket touches the flowmeter shoulder. Be sure to keep the leadwires vertical while lowering the terminal box.
   f. After assembling, confirm that there is no leakage from the vortex flowmeter.

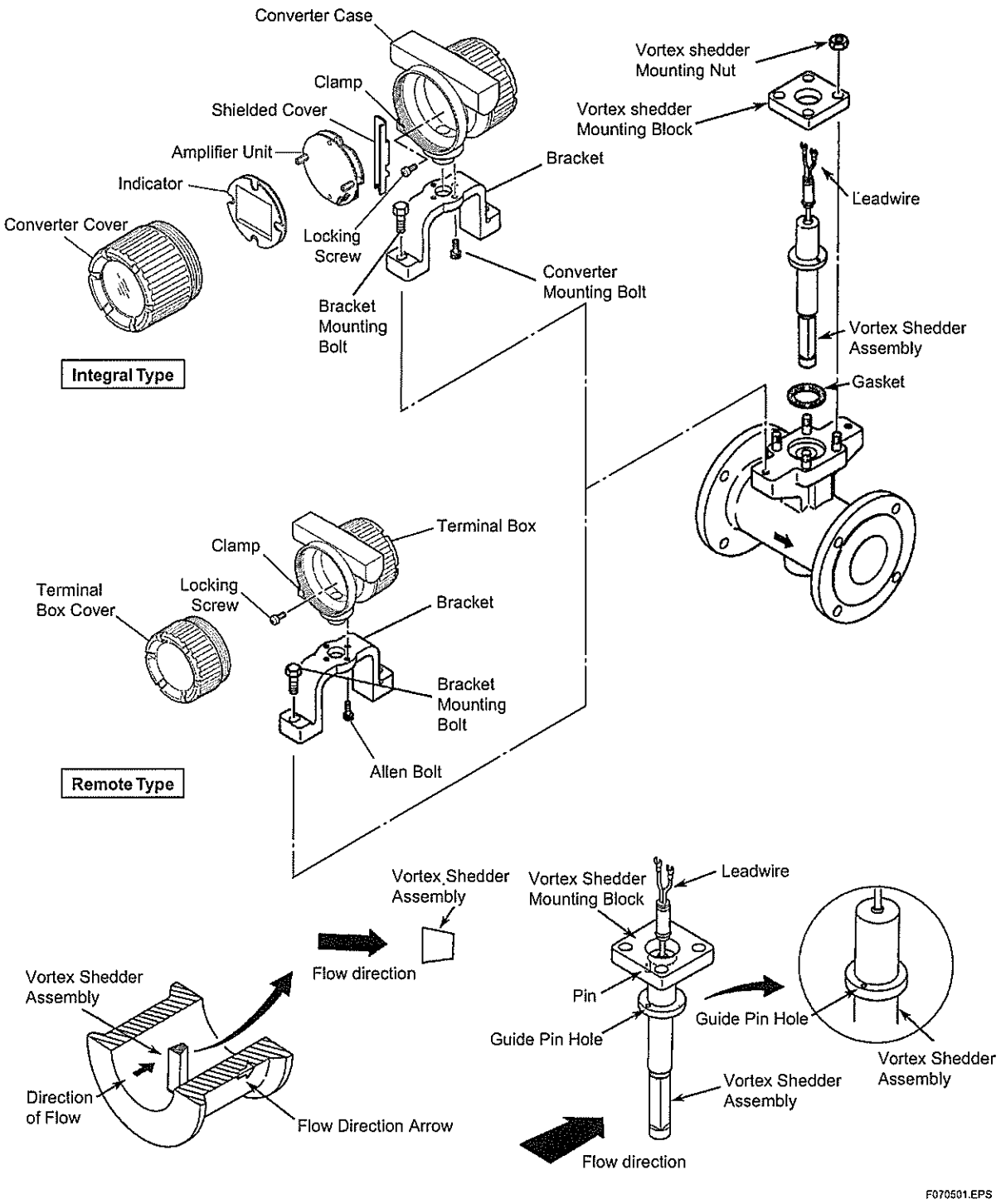

Figure 7.3 Disassembling and Reassembling the Vortex Shedder Assembly

7.6 Setting Switches

7.6.1 Setting of Burnout Switch

digitalYEWFLO is equipped with a CPU error burnout function used to set the output direction upon CPU error, and a sensor burnout function that sets the direction of the output in the event of burnout of the temperature sensor. When factory-shipment under normal conditions, the output of both CPU error burnout and sensor burnout are set to HIGH, but if suffix code/C1 is specified, the CPU error burnout is set to LOW(-2.5% below) output, and sensor burnout is set to LOW(-2.5% below) output, respectively. The setting of the direction of output from burnout can be changed.

To change the direction of output arising from burnout, switch the setting pin on the CPU assembly (see Table 7.2).

Table 7.2 Output Setting Pin for Burnout

Pin position	CPU error burnout direction	CPU error burnout output	Remark
	HIGH	110% or more (21.6mA DC)	Set to HIGH before shipment.
	LOW	-2.5% or less (3.6mA DC)	Set to LOW for option specification code / C1.

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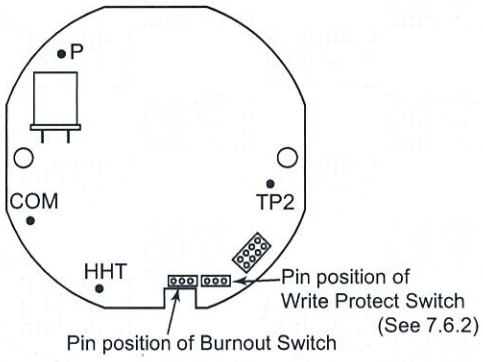

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Figure 7.4 Pin position of Burnout and Write Protect Switch

7.6.2 Setting of Write Protect Switch

By setting the write protect function to "Protect", it is possible to prevent the overwriting of parameters. Write protection can be carried out using either the hardware switch on the CPU board (i.e., Switch 2) or software parameter settings. If either of these items is set to "Protect", the overwriting of parameters will be prohibited.

NOTE

If the hardware switch is set to "Protect", it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to "Enable".

For more details regarding usage of the write protect function and the software's parameter switches, refer to 4.6.11 Write Protect.

Table 7.3 Setting pin for Write Protect

Pin position	CPU error burnout direction
	Enable
	Protect

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7.7 Software Configuration

(1) Flow Calculation

The flowrate is calculated with the following equations based on the N number of generated vortices:

(a) Flowrate (in engineering units)

$$RATE=N\cdot\frac{1}{\Delta t}\cdot\varepsilon_f\cdot\varepsilon_c\cdot\varepsilon_r\cdot\frac{1}{KT}\cdot U_k\cdot U_{TM}$$

.... (7.1.1)

$$KT=KM\cdot U_{KT}\cdot\{1-4.81\times(Tf-15)\times10^{-5}\}$$ .... (Metric Units) .... (7.1.2)

$$KT=KM\cdot\{1-2.627\times(Tf-59)\times10^{-5}\}$$ .... (English Units) .... (7.1.3)

(b) Flowrate (%)

$$RATE(\%)=RATE\cdot\frac{1}{F_S}$$ .... (7.2)

(c) Totalized value

$$TOTAL=TOTAL+\Delta TOTAL$$

$$\Delta TOTAL=RATE\cdot\Delta t\cdot\frac{1}{T_R}\cdot\frac{1}{U_{TM}}$$ .... (7.3)

(d) Pulse output frequency

$$PULSE\ FREQ=RATE\cdot\frac{1}{P_R}\cdot\frac{1}{U_{TM}}$$ .... (7.4.1)

$$PULSE\ FREQ=N\cdot\frac{1}{\Delta t}\cdot\frac{1}{P_R}$$ .... (Unscaled pulses) .... (7.4.2)

(e) Velocity

$$V=N\cdot\frac{1}{\Delta t}\cdot\frac{1}{KT}\cdot U_{KT}\cdot\frac{4}{\pi D^2}$$ .... (7.5)

(f) Reynolds number

$$Red=V\cdot D\cdot\rho_f\cdot\frac{1}{\mu}\times1000$$ .... (Metric Units) .... (7.6.1)

$$Red=V\cdot D\cdot\rho_f\cdot\frac{1}{\mu}\times124$$ .... (English Units) .... (7.6.2)

where N: Number of input pulses (pulse)
Δt: Time corresponding to N (seconds)
ε_f: Instrumental error correction factor
ε_c: Expansion correction factor for compressive fluid
ε_r: Reynolds number correction factor
KT: K-factor at operating conditions (pulses/litre) (pulse/gal)
KM: K-factor at temperature 15°C (59°F)
U_{KT}: Unit conversion factor for K-factor
U_k: Flow unit conversion factor (Refer to item (2))
U_k(user): Flow unit conversion factor for user's unit
U_{TM}: Factor corresponding to flow unit time (ex./m (minute) is 60.)
S_E: Span factor (ex. E+ 3 is 10^3.)
P_E: Pulse rate (ex. E+ 3 is 10^3.)
T_f: Temperature at operating conditions (°C) (°F)
F_S: Flowrate span
T_E: Total factor
D: Internal diameter (m) (inch)
μ: Viscosity (cP)
ρ_f: Density at operating conditions (kg/m³) (ℓb/ft³)

(2) Flow Conversion Factor (Uk)

Flow conversion factor Uk is obtained by carrying out the following computation depending on the selection of the fluid to be measured and the flow unit.

(a) Steam
M (Mass flowrate): $U_k=\rho_f\cdot U\rho_f\cdot U_k$ (kg) .... (7.7.1)
$U_k=\rho_f\cdot U_k$ (ℓb) .... (7.7.2)
Qf (Flowrate at operation): $U_k=U_k$ (m³) .... (7.7.3)
$U_k=U_k$ (acf) .... (7.7.4)

(b) Gas
Qn: (Flowrate at STP):

$$U_k=\frac{P_f}{P_n}\cdot\frac{P_f+273.15}{P_n+273.15}\cdot\frac{1}{K}\cdot U_{k\,(Nm^3)}$$ .... (7.8)

$$U_k=\frac{P_f}{P_n}\cdot\frac{\frac{5}{9}(T_n-32)+273.15}{\frac{5}{9}(T_n-32)+273.15}\cdot\frac{1}{K}\cdot U_{k\,(scf)}$$

M: (Mass flowrate): $U_k=\rho_f\cdot U\rho_f\cdot U_k$ (kg) .... (7.9.1)
$U_k=\rho_f\cdot U\rho_f\cdot U_k$ (ℓb) .... (7.9.2)
Qf: (Flowrate): $U_k=U_k$ (m³) .... (7.10.1)
$U_k=U_k$ (acf) .... (7.10.2)

(c) Liquid
Qf: (Flowrate): $U_k=U_k$ (m³) .... (7.11.1)
$U_k=U_k$ (acf) .... (7.11.2)
M (Mass flowrate): $U_k=\rho_f\cdot U$ (kg) .... (7.12.1)
$U_k=7.481\times\rho_f\cdot U$ (ℓb) .... (7.12.2)
7.481 is a conversion factor of U.S gal into acf

(d) User's unit
$U_k=U_k$ (user) .... (7.13)

where
M: Mass flow
Q_n: Volumetric flow in a Normal condition
M: Mass flow
Q_f: Volumetric flow in an operating condition
ρ_f: Specific weight (kg/m³), (ℓb/acf)
h_f: Specific enthalpy (kcal/kg), (Btu/ℓb)
T_f: Temperature in an operating condition (°C), (°F)
T_n: Temperature in a Normal condition (°C), (°F)
P_f: Pressure in an operating condition (kg/cm² abs), (psia)
P_n: Pressure in a Normal condition (kg/cm² abs), (psia)
K: Deviation factor
ρ_n: Density in a Normal condition (kg/Nm³), (ℓb/scf)
ρ_f: Density in an operating condition (kg/m³), (ℓb/acf)

$U\rho_f$: Unit conversion factors of density.
$U_{k(kg)}$, $U_{k(Nm3)}$, $U_{k(m3)}$
$U_{k(lb)}$, $U_{k(Btu)}$, $U_{k(scf)}$, $U_{k(acf)}$: Unit conversion factors

(3) Mass Flow calculation

a) Steam

In case of saturated steam, mass flow rate is calculated from density values to temperature measured by using saturated steam table.

In case of superheat steam, mass flow rate is calculated from density values to temperature measured by using steam table. In order to measure superheat steam, it is necessary to make constant pressure value. A pressure values which is entered in parameter is used.

$$M = \rho_{ft} \cdot Q_f \quad \text{.....(7.14.1)}$$

b) Gas

In case of gas, Volumetric flow rate at standard condition is calculated, so Pressure-Temperature correction is carried out. It is necessary to make constant pressure value. A Pressure values at operational condition, temperature and pressure value at standard condition which is entered in parameter is used.

$$Q_n = Q_f \cdot \frac{P_f}{P_n} \cdot \frac{T_n + 273.15}{T_{ft} + 273.15} \cdot \frac{1}{K} \quad \text{.....(7.14.2)}$$

c) Liquid

In case of liquid, mass flow late is calculated from which used to calculate the secondary function for the density value to the temperature. A density value which indicated by the order sheet is used.

$$M = \rho_n \cdot Q_f \cdot \{1 + a_1(T_{ft} - T_n) \cdot 10^{-2} + a_2(T_{ft} - T_n)^2 \cdot 10^{-6}\}$$
$$\text{.....(7.14.3)}$$

Where

- M : Mass flow
- Q_n : Volumetric flow rate in a Standard condition
- Q_f : Volumetric flow rate in a operating condition
- ρ_{ft} : Density calculated by temperature value
- ρ_n : Density in a Standard condition (kg/m³), (lb/cf)
- P_f : Pressure in an operating condition (kPa abs), (psi)
- P_n : Pressure in a standard condition (kpa abs), (psi)
- T_n : Temperature in an operating condition (°C), (°F)
- T_f : Temperature in a standard condition (°C), (°F)
- T_{ft} : Measured temperature value (°C), (°F)
- a_1 : 1st temperature coefficient
- a_2 : 2nd temperature coefficient

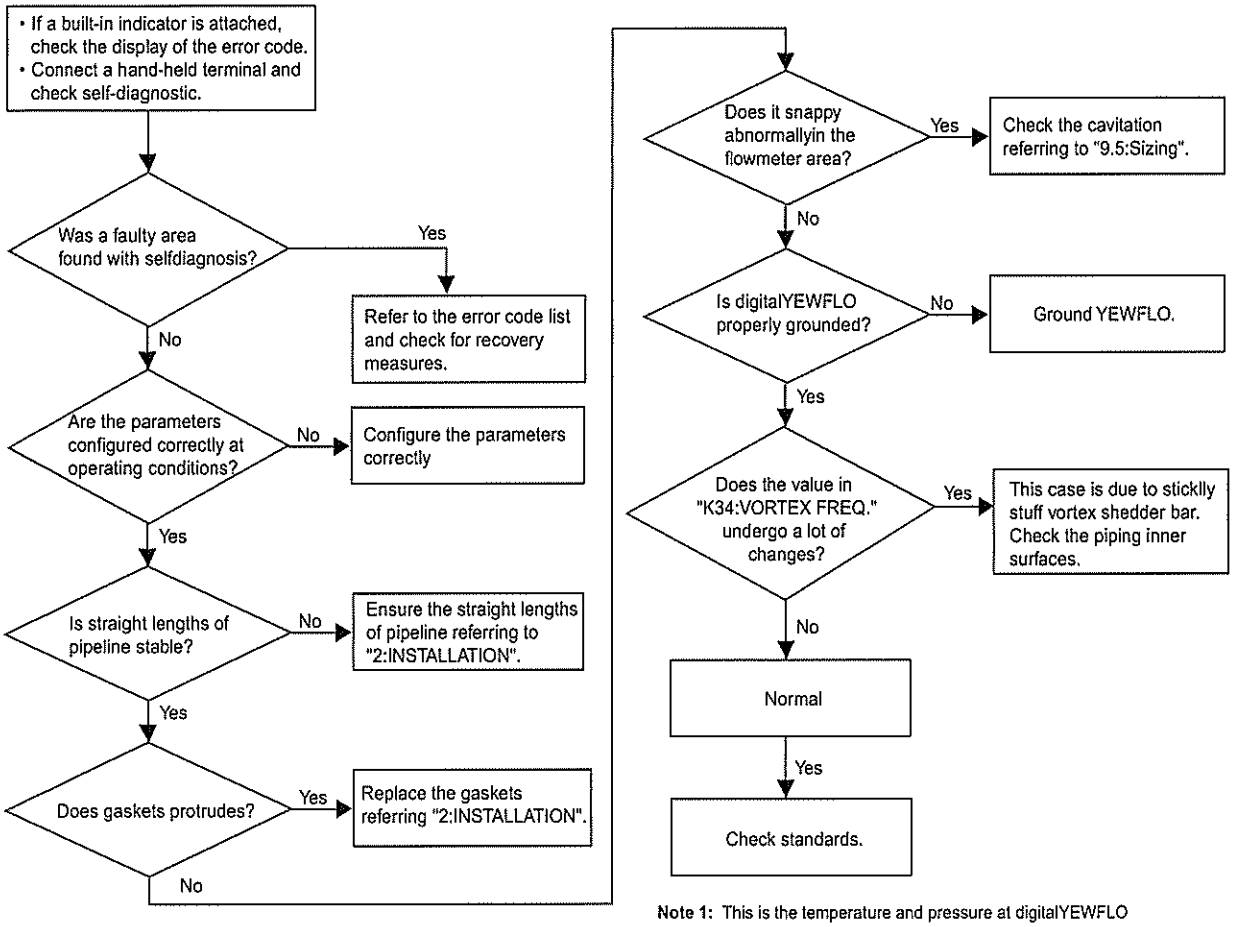
8. TROUBLESHOOTING

CAUTION

Please avoid replacing the amplifier unit from the case, and the vortex shedder bar. When these procedures are needed, please contact the nearest Yokogawa office.

8.1 Flow

● Large flowmeter errors and flowrate reading fluctuates.



Note 1: This is the temperature and pressure at digitalYEWFLO mounted place.
Note 2: Contact with our service in case this is not carried out into the right statement.

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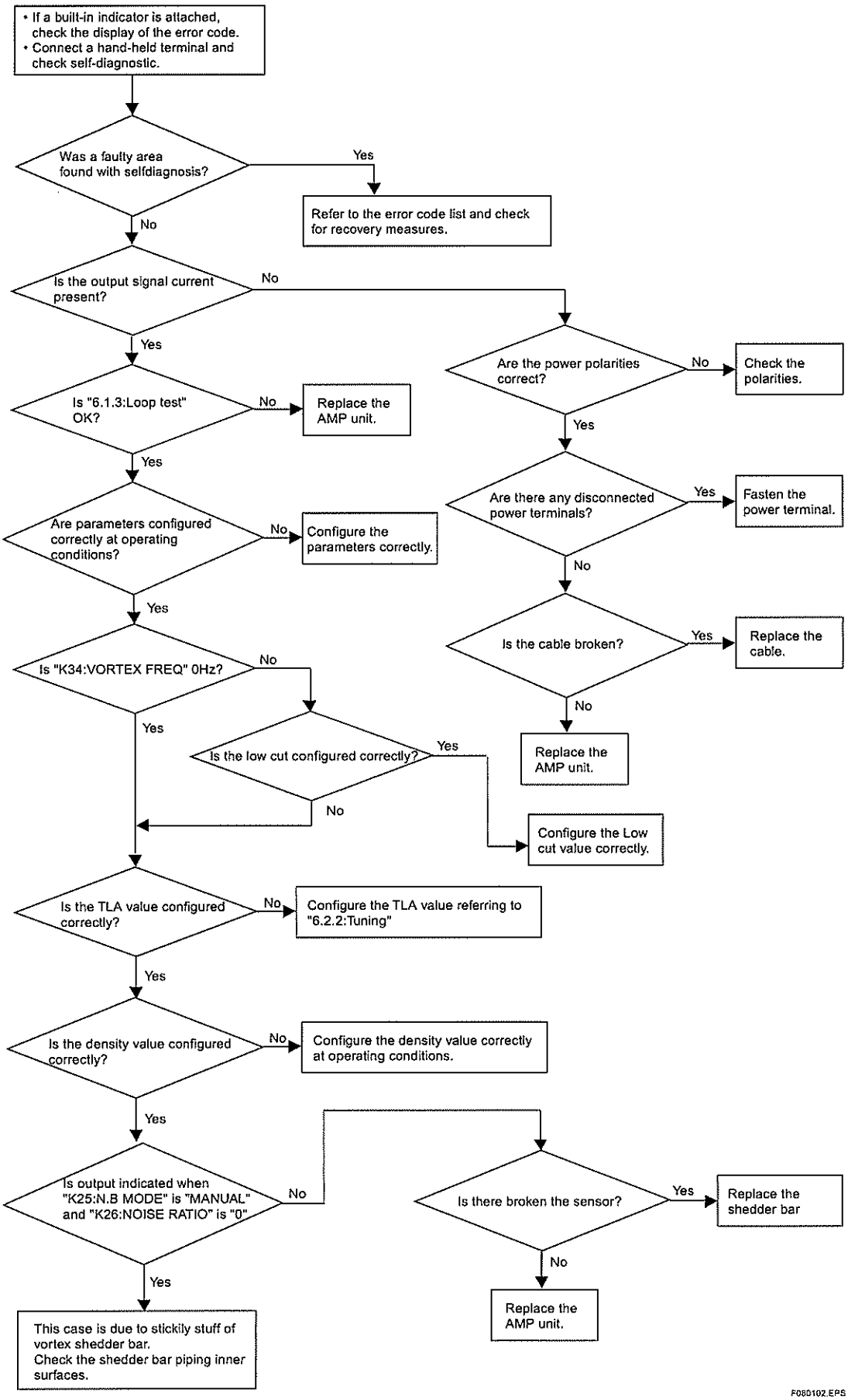
● After the output showed correctly, the indication goes down to zero at certain time.

When this problem occurred, the cause is suspected of deterioration of sensor sensitivity and turbulent of fluid flow due to sticky stuff on the shedder bar and flowmeter inner tube.

How to cope with this problem

1) Referring item 7.5 "Vortex Shedder Removal", take out the Vortex Shedder bar and clean it.
2) If there is the sticky stuff on inner tube of the flowmeter, remove the flowmeter body from adjacent pipes and clean it.

● No output is indicated when the fluid is flowing.



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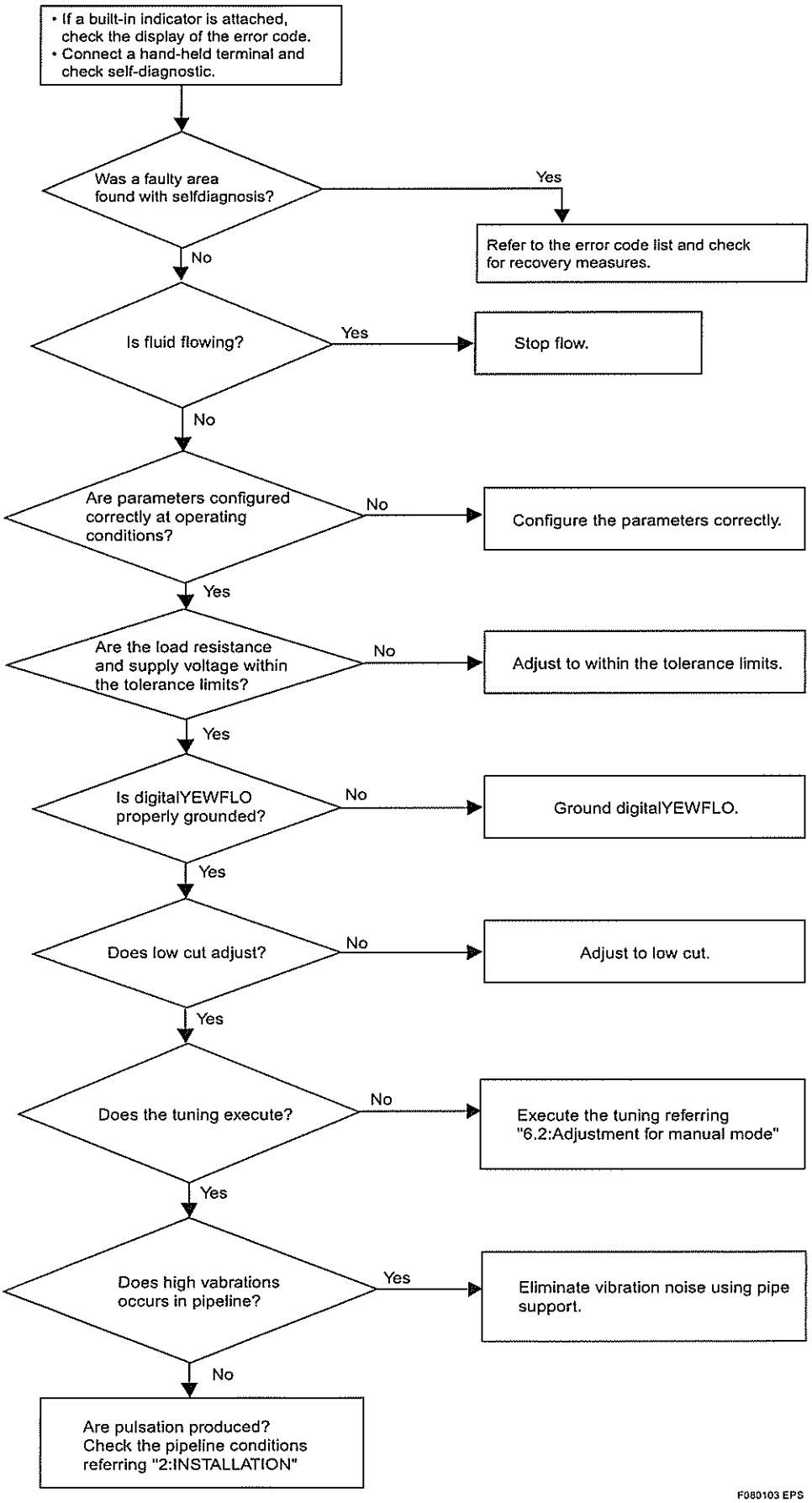
● Output is indicated at zero flow.



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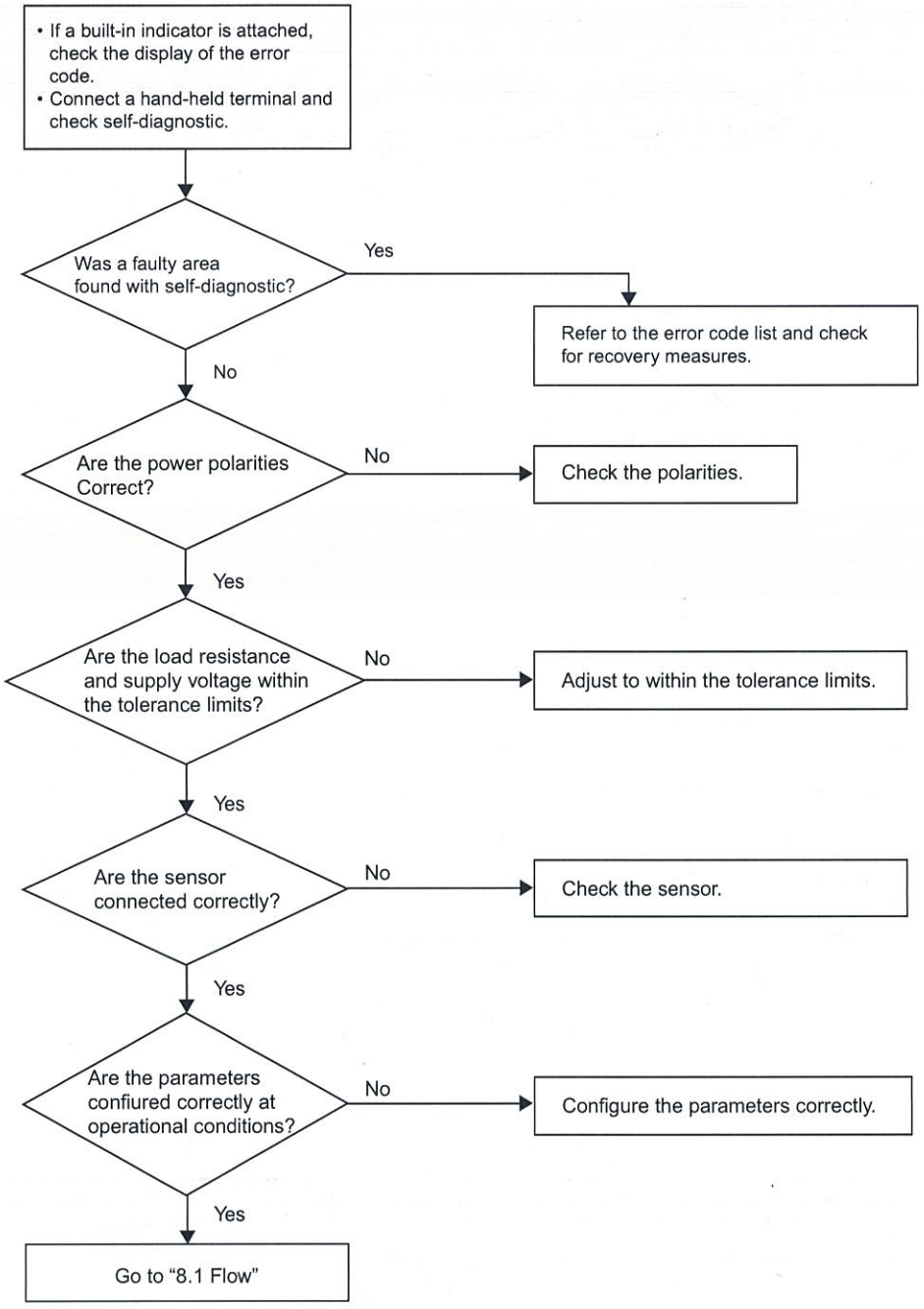
8.2 Flow (Only for /MV)

● **Start with this flow in case of /MV.**



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9. GENERAL DESCRIPTION

9.1 Outline

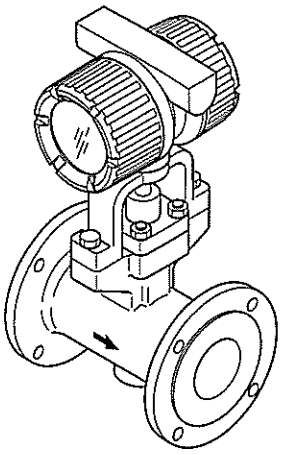
This vortex flowmeter measures liquid, gas and steam flow rates and converts them to a 4 to 20mA DC output or pulse, alarm, status output signal.

Since the converter is mounted independently from the flowmeter, it permits remote flow measurements of high temperature liquid, steam, etc.

■ Integral Type

The Integral Type Vortex Flowmeter (DY-A) has the converter with the flowmeter, and measures liquid, gas and steam flow rates and converts them to a 4 to 20mA DC output or pulse, alarm, status output signal.

Flange Type
(built-in indicator)



Wafer Type

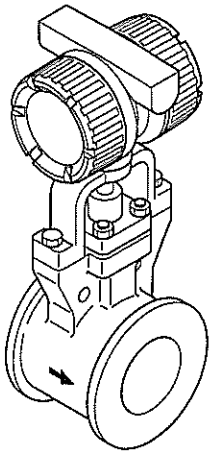


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Figure 9.1.1 External Views (Integral Type)

■ Remote Type

The Remote Converter Type Vortex Flowmeter (DY-N) is used with the Model DYA Vortex Flow Converter. A special cable (DYC) is used between these instruments.

Model DYA Vortex flow converter
(built-in indicator)

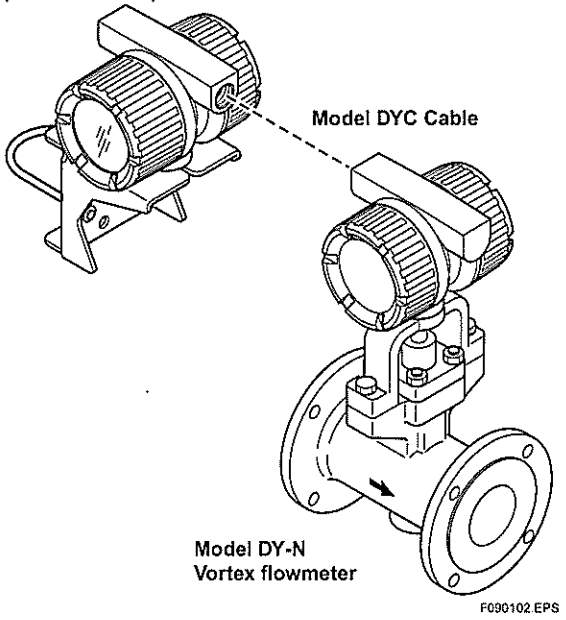

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Figure 9.1.2 External Views (Remote Type)

- **Name of a portion of the flowmeter (Example of the Wafer Type)**

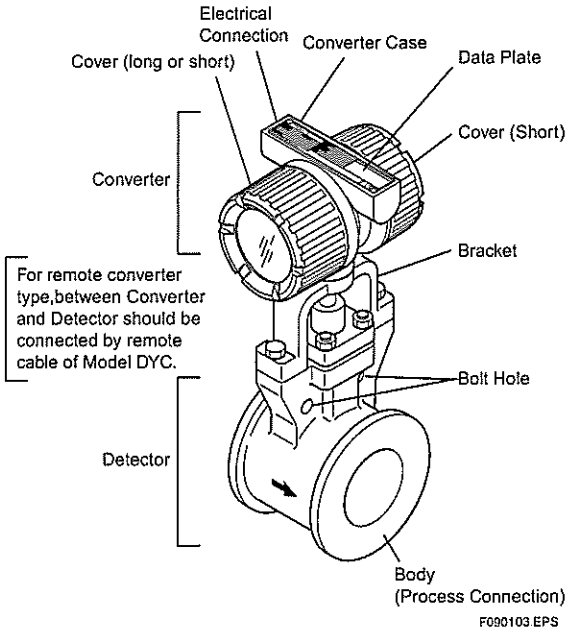

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Figure 9.1.3 Example of Name of portion

9.2 Standard Specifications

Performance Specifications

Fluid to be Measured :
Liquid, Gas, Steam (Avoid Multiphase Flow and Sticky Fluids)

Measuring Flow Rates :
Refer to Table 9.5.2

Accuracy : ±0.75% of Reading (Liquid)
±1% of Reading (Gas, Steam)
Refer to Table 9.5.4
For the Multi-Variable Type, refer to 9.4.2 term.

Repeatability : ± 0.2% of Reading

Calibration :
This flowmeter is factory-calibrated using a water flow.
Temperature and flow calibration by water flow when /MV is selected.

Normal Operating Condition

Process Temperature Range :
–29 to 260 °C (general)
–196 to 100 °C (Cryogenic Version:option)
–29 to 450 °C (High Process Temperature Version:option)
For the Multi-Variable Type, refer to 9.4.2 term.
Refer to Figure 1 for integral converter type.

Process Pressure Limit :
–0.1MPa (–1 kg/cm²) to flange rating.

Ambient Temperature Range :
–29 to 85 °C (Remote type detector)
–40 to 85 °C (Remote type converter)
–29 to 85 °C (Integral type, refer to Figure 9.2.1)
–29 to 80 °C (Integral type with Indicator, refer to Figure 9.2.1)
–30 to 80 °C (Remote type converter with Indicator)

Ambient Humidity : 5 to 100% RH (at 40 °C) (No Condensation)

Power Supply Voltage : 10.5 to 42 V DC
(Refer to Figure 9.2.2 ; Relationship Between Power Supply Voltage and Load Resistance)

Mechanical Specifications

Material (General Type):
Refer to Table 9.3.1
Body; SCS14A casting stainless steel (equivalent to CF8M,SUS316)
For Nominal Size 250mm and 300mm, flange parts materials are 304SS.
Shedder bar;
Duplex stainless steel(DCS1,only for 15mm is DSD1-H,Both equivalent to JIS SUS329J1,ASTM CD4MCu)
DCS1 and DSD1-H are registered trademarks of Daido Tokusyu Steel Co.
Gasket; JIS SUS316 stainless steel with polytetrafluoroethylene (Teflon) coating.
Converter housing and case,cover ;
Aluminum alloy

Coating Color:
Converter case, cover : Deep sea moss green (Munsell 0.6GY 3.1/2.0) (Polyurethane corrosion-resistant coating)

Protection:
IP67 immersion proof and dust proof. (NEMA 4X).

Hazardous Area Classifications:
Refer to 9.4 Option Specifications.

Electrical Connection:
JIS G1/2 female, ANSI 1/2 NPT female, ISO M20 × 1.5 female

Signal Cable:
Model DYC cable, used for remote detector and converter.
Max. length : 30 m.
Outer Sheath Material: Heat resisting polyethylene
Durable Temperature : –40 to 150 °C

Weight:
Refer to 9.6 External Dimension.

Mounting:
Integral type and Remote type detector :
Flange mounting or wafer mounting by flange adjacent to the pipeline.
Remote type converter : 2 inch pipe mounting.

Electrical Specifications

Note*: Pulse output, alarm output and status output use the common terminal, therefore these functions are not used simultaneously.

Output Signal : Dual Output (Both Analog and Transistor contact output can be obtained simultaneously). In this case refer to "3: WIRING".

Analog : 4 to 20 mA DC, 2-wire system.

Transistor Contact Output* :
Open collector, 3-wire system.
Pulse, alarm, status output are selected by parameter setting.
Contact rating: 30 V DC, 120 mA DC
Low level: 0 to 2 V DC. (refer to Figure 9.2.3)

Communication Requirement :

Communication Signal :
BRAIN or HART communication signal (superimposed on a 4 to 20 mA DC signal)

Conditions of Communication Line :

Load Resistance :
250 to 600 Ω(including cable resistance).
Refer to Figure 9.2.2

Supply Voltage :
16.4 to 42 V DC for digital communications BRAIN and HART protocols .(16.4 to 30 V DC for intrinsically safe type).
Refer to Figure 9.2.2

Space from other Power Line: 15cm or more (Parallel wiring should be avoided.)

BRAIN:

Communication Distance :
Up to 2 km, when polyethylene insulated PVC-sheathed cables (CEV cables) are used. Communication distance varies depending on type of cable used.

Load Capacitance: 0.22 μF or less

Load Inductance: 3.3 mH or less

Input Impedance of Receiver Connected to the Receiving Resistance:
10 kΩ or more at 2.4 kHz.

HART:

Communication Distance:

Up to 1.5km(0.9 mile), when using multiple twisted pair cables. Communication distance varies depending on type of cable used.

Cable Length for Specific Applications:

Use the following formula to determine cable length for specific applications.

$$L = \frac{65\times10^6}{(R\times C)} - \frac{(Cf+10,000)}{C}$$

where:

L=length in meters.

R=resistance in Ω (including barrier resistance)

C=cable capacitance in pF/m or pF/ft.

Cf= maximum shunt capacitance of receiving devices in pF/m or pF/ft.

NOTE: HART is a registered trademark of the HART Communication Foundation.

Functions:

Damping Time Constant :

0 to 99 Sec (63% response time)

Note: Delay time is 0.5 Sec.
Analog output circuit time constant is 0.3 Sec.

Pulse Output Function*:

Pulse output is selected from scaled pulse, unscaled pulse, frequency (number of pulses output per second at 100% of output).

Pulse frequency : Max 10 kHz

Duty cycles : Approx.50% (1:2 to 2:1)

Self -diagnostics and Alarm Output *:

In case alarm (over range output signal, EEPROM error, vibration noise, abnormal flow such as clogging, bubble) occurs, an alarm signal is output and indicated.

The alarm signal output goes from close(ON) to open(OFF) during alarming.

Status Output Function *:

Flow Switch:

In case flow rate decreases under the flow set value, a status signal is output.

Status signal output mode can reverse (ON/OFF) .

Analog Output Function:

Analog output is selected from flowrate temperature value when option code /MV is selected.

Data Security During Power Failure:

Data (parameter, totalizer value, etc) storage by EEPROM. No back-up battery required.

Correction:

Instrument Error Correction:

Vortex flowmeter instrument errors can be corrected by segment approximations.

Reynolds Number Correction:

Output error at Reynolds number 20000 or less is corrected by using five-break-point line-segment approximation.

Gas Expansion Correction:

When measuring a compressibility gas and steam, this expansion factor is useful to correct the error at high velocity of flow (35m/s or more).

Down-scale or Up-scale burn out.

In case a CPU or EEPROM failure occurs, flow meter output the signal of Up-scale (21.6 mA or more).

Up-scale or Down-scale (3.6 mA or less) is user-selectable through the fail mode alarm jumper.

Indicator:

Flow rate (% or engineering units) or temperature value and totalizer can be indicated simultaneously.

Short message for self diagnostics indicates.

Local parameter setting can be operated by key switches.

In mounting direction, the right and left 90° is rotatable.

EMC Conformity Standards:

EN61326

AS/NZS CIS PR11

Note: For remote converter type, the signal cable should be used with the metal conduit.

Pressure Equipment Directive:

Notified Body Identification Number 0038

Module H

MODEL	DN(mm)*	PS(Mpa)*	PS-DN (Mpa-mm)	CATEGORY**
DY015	15	42	630	Article 3***, Paragraph 3
DY025	25	42	1050	Article 3***, Paragraph 3
DY040	40	42	1680	II
DY050	50	42	2100	II
DY080	80	42	3360	II
DY100	100	42	4200	II
DY150	150	42	6300	III
DY200	200	42	8400	III
DY250	250	42	10500	III
DY300	300	42	12600	III

* PS : Maximum allowable pressure for Flow tube, DN : Nominal size

** Refered to Table 6 coverd by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC

*** DY015 and DY025 are not attached CE mark of PED because they do not under CE mark of PED

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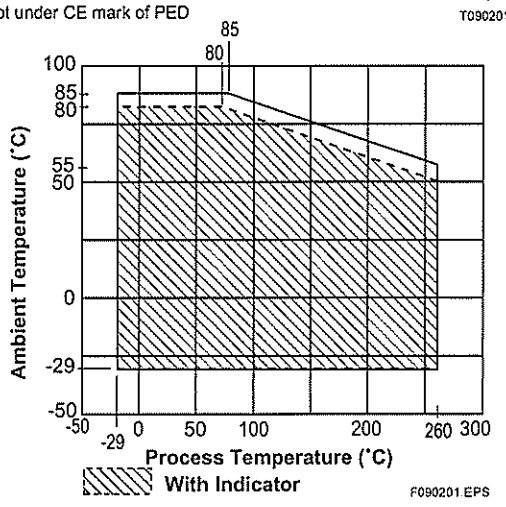

Figure 9.2.1 Ambient Temperature limit (Integral Type)

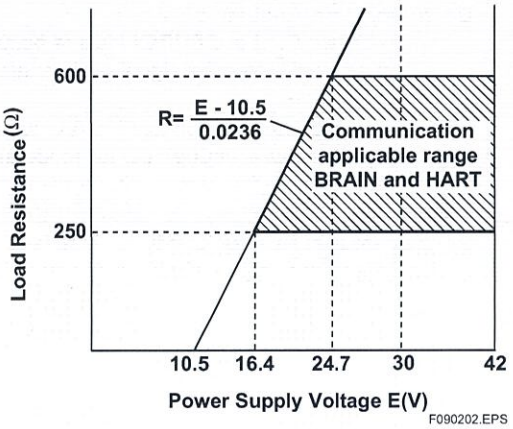

Figure 9.2.2 Relationship Between Power Supply and Load Resistance

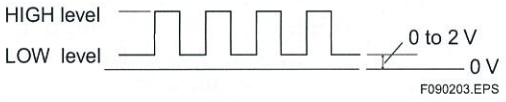

Figure 9.2.3 High and low level (Pulse output)

9.3 Model and Suffix Codes

DY Vortex Flowmeter (Integral Type, Remote type detector)

Model	Suffix Codes		Description
DY015	.....		Size 15 mm (1/2 inch)
DY025	.....		Size 25 mm (1 inch)
DY040	.....		Size 40 mm (1-1/2 inch)
DY050	.....		Size 50 mm (2 inch)
DY080	.....		Size 80 mm (3 inch)
DY100	.....		Size 100 mm (4 inch)
DY150	.....		Size 150 mm (6 inch)
DY200	.....		Size 200 mm (8 inch)
DY250	.....		Size 250 mm (10 inch)
DY300	.....		Size 300 mm (12 inch)
Output Signal /Commu-nication *1, *12	-D	.....	4 to 20 mA DC, Pulse, BRAIN Communication
	-E	.....	4 to 20 mA DC, Pulse, HART Communication
	-F	.....	Digital communication (FOUNDATION Fieldbus protocol)
	-N	.....	Remote type detector
Body Material *2, *14	A	.....	SCS14 A *10
	B	.....	CF8M *3
	C	.....	DIN 1. 4552
	W	.....	WCB
	X	.....	Others
Shedder bar Material *4, *14	L	.....	DCS1 (15mm is DSD1- H)
	M	.....	CD4MCu
	X	.....	Others
Process Connection *5 RF : Raised Face SF : Smooth Finish RJ : Ring Joint	AJ1	.....	JIS 10 K Wafer
	AJ2	.....	JIS 20 K Wafer
	AJ4	.....	JIS 40 K Wafer
	AA1	.....	ANSI Class 150 Wafer
	AA2	.....	ANSI Class 300 Wafer
	AA4	.....	ANSI Class 600 Wafer
	AD1	.....	DIN PN10 Wafer
	AD2	.....	DIN PN16 Wafer
	AD3	.....	DIN PN25 Wafer
	AD4	.....	DIN PN40 Wafer
	BJ1	.....	JIS 10K Flange(RF)
	BJ2	.....	JIS 20K Flange(RF)
	BJ4	.....	JIS 40K Flange(RF)
	BA1	.....	ANSI Class 150 Flange(RF)
	BA2	.....	ANSI Class 300 Flange(RF)
	BA4	.....	ANSI Class 600 Flange(RF)
	BA5	.....	ANSI Class 900 Flange(RF)
	BS1	.....	ANSI Class 150 Flange(RF, SF)
	BS2	.....	ANSI Class 300 Flange(RF, SF)
	BS4	.....	ANSI Class 600 Flange(RF, SF)
	BS5	.....	ANSI Class 900 Flange(RF, SF)
	BD1	.....	DIN PN10 Flange(RF)
	BD2	.....	DIN PN16 Flange(RF)
	BD3	.....	DIN PN25 Flange(RF)
	BD4	.....	DIN PN40 Flange(RF)
	CA4	.....	ANSI Class 600 Flange(RJ)
	CA5	.....	ANSI Class 900 Flange(RJ)
Electrical Connection *11	-0	.....	JIS G 1/2 Female
	-2	.....	ANSI 1/2 NPT Female *6
	-4	.....	ISO M20×1.5 Female
Indicator *7	D	.....	With Indicator
	N	.....	None Indicator, Remote type detector
Options	/□		Refer to Option Specifications

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DYA Vortex Flowmeter Converter(Remote Type)

Model	Suffix Code		Description
DYA	.....		Vortex Flowmeter Converter (Remote Type)
Output Signal /Commu-nication *1, *12	-D	.....	4 to 20 mA DC, Pulse BRAIN Communication
	-E	.....	4 to 20 mA DC, Pulse HART Communication
	-F	.....	Digital communication (FOUNDATION Fieldbus protocol)
Electrical Connection	0	.....	JIS G 1/2 Female
	2	.....	ANSI 1/2 NPT Female *6
	4	.....	ISO M20 ×1.5 Female
Indicator	D	.....	With Indicator
	N	.....	None Indicator
Options	/□		Refer to Option Specifications
	/MV	.....	Multi-Variable Type *13

DYC Signal Cable

Model	Suffix Code		Description
DYC	.....		Signal Cable
Cable End	-0	.....	Without End finish *8
	-1	.....	With End finish
Cable Length *9	-05	.....	5 m
	-10	.....	10 m
	-15	.....	15 m
	-20	.....	20 m
	-25	.....	25 m
	-30	.....	30 m
	-35	.....	35 m
	-40	.....	40 m
	-45	.....	45 m
	-50	.....	50 m
	-55	.....	55 m
	-60	.....	60 m
	-65	.....	65 m
	-70	.....	70 m
	-75	.....	75 m
	-80	.....	80 m
	-85	.....	85 m
	-90	.....	90 m
	-95	.....	95 m
Options	/C1	.....	Cable End Finish Parts 1 set
	/C2	.....	2 set
	/C3	.....	3 set
	/C4	.....	4 set
	/C5	.....	5 set
	/C6	.....	6 set
	/C7	.....	7 set
	/C8	.....	8 set
	/C9	.....	9 set
	/MV	.....	Multi-variable Type

* 1 : Nominal size, Fluid(Liquid, Gas, Steam), Density, Viscosity, Pressure, Temperature, Flow range, Parameters are set at the factory before shipment.
* 2 : Refer to Table 9.3.1.
In case of /NC or /HX or /HY or /HT or /LT, select X (others).
The body material (SCS14A or CF8M or DIN 1.4452 or WCB) varies according to each sales area. Please contact to YOKOGAWA sales person.
* 3 : In case of B (CF8M), the process connection is available for ANSI (AA1 to 4, BA1 to 5, CA4 to 5) and DIN (BD1 to 4).
* 4 : Refer to Table 9.3.1.
In case of /NC or /HX or /HY or /HT or /LT, select X (others).
The shedder bar material (DCS1 (15mm is DSD1-H), CD4MCu) varies according to each sales area. Please contact to YOKOGAWA sales person.
* 5 : Refer to Table 9.3.2.
* 6 : In case of /FF1 or /CF1, the screw length is deeper than ANSI standard for 0.5 to 3.5 threads.
* 7 : Indicator is not available for remote type detector.
* 8 : One set of end finish part is attached.
* 9 : DYC cable can be used up to 30m. When you divide the cable below 30m, select the Cable End code [-0].
*10: In case of A (SCS14A), the process connection is available for JIS (AJ1, AJ2, AJ4, BJ1, BJ2, BJ4)
*11: In case of an explosion proof type, it depends for an electrical connecion on the kind of an explosion protect type. Refer to 9.4.3 Option Specification (Hazardous Area Classifications).
*12: For FOUNDATION Fieldbus protcol, refer to GS 01F06F01-01E.
For Fieldbus communication type, there are not setting keys on the display board.
*13: Essentially, DYA-□□□ / MV and DY□□□-N*** / MV should be combined.
*14: Users must consider the characteristics of selected wetted parts material and the influence of process fluids. The use of inappropriate materials can result in the leakage of corrosive process fluids and cause injury to personnel and/or damage to plant facilities. It is also possible that the instrument itself can be damaged and that fragments from the instrument can contaminate the user's process fluids.
Be very careful with highly corrosive process fluids such as hydrochloric acid, sulfuric acid, hydrogen sulfide, sodium hypochlorite, and high-temperature steam (150°C [302°F] or above). Contact Yokogawa for detailed information of the wetted parts material.

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Table 9.3.1 Body, Shedder bar, Gasket Material

Option Item (Note 1)	Option Code (Note 1)	Material			Process Connection	
		Body (Note 2)	Shedder bar (Note 3)	Gasket	Wafer Nominal Size	Flange Nominal Size
General (REFERENCE)	—	SCS14A CF8M DIN1.4552 WCB 304SS (250/300 mm flange part)	DCS1 (DSDH-1) CD4MCu	(Note 4)	15 mm up to 100 mm	15 mm up to 300 mm
Compliance with NACE	NC	CF8M	(Note 5)	(Note 4)	15 mm up to 100 mm	15 mm up to 200 mm
Anti-corrosion Version II	HY	SCS14A CF8M DIN1.4552 WCB	(Note 5)	(Note 4)	15 mm up to 100 mm	15 mm up to 100 mm
High Process Temperature Version	HT	SCS14A CF8M DIN1.4552 WCB	(Note 5)	JIS SUS316 stainless steel plated with silver	25 mm up to 100 mm	25 mm up to 200 mm
Cryogenic Version	LT	DIN1.4308 (equiv.: SCS13)	(Note 5)	(Note 4)	15 mm up to 100 mm	15 mm up to 100 mm

(Note 1) Refer to 9.4 Option Specifications.
(Note 2) In case of /NC or /HY or /HT or /LT, select body material code [-X]. The body material (SCS14A or CF8M or DIN1.4452 or WCB) varies according to each sales area. Please contact to YOKOGAWA sales person.
(Note 3) In case of /NC or /HY or /HT or /LT, select shedder bar material code [-X]. The shedder bar material (DCS1 (15mm is DSD1-H), CD4MCu) varies according to each sales area. Please contact to YOKOGAWA sales person.
(Note 4) JIS SUS316 stainless steel with polytetrafluoroethylene(Teflon) coating
(Note 5) Hastelloy C with polytetrafluoroethylene (Teflon) coating.
(Note 6) 25mm to 300mm: ASME SA-494 CW-12MW or ASTM A479 CW-12MW (equiv. Hastelloy C)
15mm: ASME SB-574 N10276 or ASTM B574 N10276 (equiv. Hastelloy C)

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Table 9.3.2 Flowmeter Selection Guide

Process Connection	Wafer		Flange(Raised Face)		Flange(Ring Joint)		Flange(Raised Face, Smooth Finish)	
	Suffix Code	Nominal Size	Suffix Code	Nominal Size	Suffix Code	Nominal Size	Suffix Code	Nominal Size
JIS 10 K	AJ1	15 mm up to 100 mm	BJ1	15 mm up to 300 mm	—	—	—	—
JIS 20 K	AJ2	15 mm up to 100 mm	BJ2	15 mm up to 300 mm	—	—	—	—
JIS 40 K	AJ4	15 mm up to 100 mm	BJ4	15 mm up to 150 mm	—	—	—	—
ANSI Class 150	AA1	15 mm up to 100 mm	BA1	15 mm up to 300 mm	—	—	BS1	15 mm up to 300 mm
ANSI Class 300	AA2	15 mm up to 100 mm	BA2	15 mm up to 300 mm	—	—	BS2	15 mm up to 300 mm
ANSI Class 600	AA4	15 mm up to 100 mm	BA4	15 mm up to 200 mm	CA4	15 mm up to 200 mm	BS4	15 mm up to 200 mm
ANSI Class 900	—	—	BA5	15 mm up to 200 mm	CA5	15 mm up to 200 mm	BS5	15 mm up to 200 mm
DIN PIN 10	AD1	15 mm up to 100 mm	BD1	15 mm up to 200 mm	—	—	—	—
DIN PIN 16	AD2	15 mm up to 100 mm	BD2	15 mm up to 200 mm	—	—	—	—
DIN PIN 25	AD3	15 mm up to 100 mm	BD3	15 mm up to 200 mm	—	—	—	—
DIN PIN 40	AD4	15 mm up to 100 mm	BD4	15 mm up to 200 mm	—	—	—	—

(Note)
• ANSI standardized types are worked by serration finishing except the Smooth Finish type.

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9.4 Option Specifications

9.4.1 Option Specifications

Item	Specification	Applicable Model	Code
Multi-Variable Type(Note 5)	Build in Temperature sensor (Pt 1000) in vortex shedder bar.	DY / DYA	MV
Stainless Steel Tag Plate (Note 1)	SUS304 tag plate, hung on converter case.	DY / DYA	SCT
Stainless Steel Bolt & Nut Assembly	SUS304 bolt/nut assembly. Used when a wafer type is installed.	DY Wafer Type	BL
Paint Color Change	Only for converter covers: See refer to Table 9.4.2.	DY / DYA	See Table 2.4.2
Static Pressure and Leakage Test Certificate	Using hydraulic or nitrogen pressure according to the Table 9.4.3. Test time is 10 minutes. Available for the general type.	DY	T01
Hydrostatic Pressure Test Certificate	Using hydrostatic pressure according to Table 9.4.3. Test time is 10 minutes. Available for the general type.	DY	T02
Degrease Treatment (Note 2)	Degrease cleansing treatment.	DY	K1
Epoxy Coating	Epoxy coating for meter cover and case.	DY / DYA	X1
High Process Temperature Version (Note 7)	For Liquid and Steam (NOT for Gas) This specification temperature is from -29 to +450 °C Refer to Table 1 , Figure 9.4.1. Refer to Table 5 for minimum velocity. In case of another size, please contact to YOKOGAWA sales person.	DY***-N	HT
Cryogenic Version	This specification temperature is from -196 to +100 °C Refer to Table 1 , Figure 9.4.3. In case of another size, please contact to YOKOGAWA sales person.	DY***-N	LT
Stainless Steel Bracket for Remote Conveter (DYA)	The bracket material for remote converter type (DYA) is SUS304.	DYA	SB
Lightning Protector	There is an arrester inside converter for power supply line. Maximum power supply voltage : 30VDC	DY***-D,E / DYA	A
Compliance with NACE	Compliance with NACE. Refer to Table 9.3.1.	DY	NC
Compliance with NAMUR (Note 6)	Compliance with NAMUR43. Current signal for measurement is 4mA up to 20.5mA. Set output 3.6mA or less when burn-out occurred.	DY / DYA	NM
Anti-corrosion Version II	Anti-corrosion Version II. Refer to Table 9.3.1.	DY	HY
Converter Installing Direction 180 Change (Note4)	Converter installing direction 180° change inversely when shipped.	DY	CRC
Down-scale burn-out in CPU or EEPROM failure (Note 3)	Set output 3.6mA or less when burn-out occurred.	DY***-D,E / DYA	C1
Flameproof Packing Adapter	Power source connection port and signal cable (remote type) connection port. JIS G1/2 female thread. Other cable shape: ø 8 to ø 12. G11 : One piece, G12 : Two pieces.	DY / DYA, /JF3	G11 G12
Calibration Certificate	Level 2 Declaration and Calibration Equipment List	DY / DYA	L2
	Level 3 Declaration and Primary Standard List	DY / DYA	L3
	Level 4 Declaration and YOKOGAWA Measuring	DY / DYA	L4

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Item	Specification		Applicable Model	Code
Material certificates: Mill sheets	Each certificate to be attached produced by the vendors.		DY	
	Item to be specified	1. Meterbody		M01
		1. Meterbody, 2. Shedder bar		M02
		1. Meterbody, 2. Shedder bar, 3. Bottom plug		M03
		1. Meterbody, 2. Shedder bar, 3. Bottom plug, 4. Welding rod		M04
Material certificates: 3.1B	3.1B certificate to be attached according to EN10204. Each certificate to beattached produced by the vendors.		DY	
	Item to be specified	1. Meterbody		E01
		1. Meterbody, 2. Shedder bar		E02
		1. Meterbody, 2. Shedder bar, 3. Bottom plug		E03
		1. Meterbody, 2. Shedder bar, 3. Bottom plug, 4. Welding rod		E04
PAMI test certificate	Positive Material Identification certificate to be attached for the main 3 chemical components of specified materials. Each certificate to be attached.		DY	
				PM1
	Item to be specified	1. Meterbody		PM2
		1. Meterbody, 2. Shedder bar		
ASME welding documents submission	1. Welder/Welding Operator Performance Qualification (or Welder Qualification Record) 2. Welding Procedure Specification (WPS) 3. Procedure Qualification Record (PQR) Each certificate to be submitted. The customer's name and job name to be specified when ordered.		DY	WP
	Item to be specified	1. Welded portion for the bottom plug 2. Welded portion for the flange in case of the welding construction		
Dye Penetrant test certificate	Dye Penetrant test certificate for the welded portion to be attached. Each certificate to be attached.		DY	PT
	Item to be specified	1. Welded portion for the bottom plug 2. Welded portion for the flange in case of the welding construction	DY 2. is for DY250 and DY300.	
Pilling up coating to keep off corrosion	Epoxy and Polyurethane coating for the purpose of corrosion - proof improvement; salt damage, alkali, climate and acidity		DY, DYA	X2

(Note 1) When /SCT is not chosen, the specified Tag Number is engraved on the data plate.
When /SCT is chosen, the specified Tag Number is engraved on the data plate and stainless tag plate. The limitation of characters for Tag Number is, for BRAIN communication or name plate, stainless steel tag plate: 16 characters, and for HART communication: 8 characters.
(Note 2) There is a case that calibration water should stay in the meter tube. So this is not degrease treatment in the strict sense.
(Note 3) The output is set 3.6mA or less (General type is set 21.6mA or more at shipping).
(Note 4) When /CRC is chosen, the electrical connection turn to a downstream side.
(Note 5) Refer to "OPTION MULTI-VARIABLE (BUILD IN TEMPERATURE SENSOR) TYPE (/MV)" (see 9.4.2)
In case of Remote type detector (DY***-N), select "/MV" both DY and DYA.
(Note 6) /NM can not combine with Remote type (DY***-N).
(Note 7) SAA Flame proof Appreval (/SF1) can not combine with High Process Temperature Version (/HT).

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9.4.2 Option Multi-Variable (Build in Temperature Sensor) Type (/MV)(*1)

This option is the same as standard specification except the following items.

		Multi-variable Type					Standard Type
Size		Wafer Type	25mm to 100mm				15mm to 100mm
		Flange Type	25mm to 200mm				15mm to 300mm
Function		Only for indication and output	Mass Flow calculation. (Volumetric flowrate at Standard condition for GAS)				
Fluid		Liquid, Gas Saturated Steam Superheat Steam	Saturated Steam	Superheat Steam	Gas	Liquid	Liquid, Gas Saturated Steam Superheat Steam
		–29 to 260°C	100 to 260°C	100 to 260°C	–29 to 260°C	–29 to 260°C	–29 to 260 C
Accuracy (*2)	Mass Flow		Refer to Table 3				
	Temperature		±0.5% OF RATE	±1% OF RATE	±1% (Less than 100°C) ±1% OF RATE (100°C or more)	±0.5°C (Less than 100°C) ±0.5% OF RATE (100°C or more)	
Temperature Response (50% response)		60sec (Churning Underwater)					
Mass Flow Calculation Method			Density Calculation (*3)	Density Calculation (Constant pressure is assumed) (*4)	Temp.-Pressure Correction (Constant pressure is assumed) (*5)	Density change Calculation (*6)	
Output	Analog Output	Select from Flow rate or temperature (*7)					Only for Flow Rate
	Pulse Output	Only for Flow rate					Only for Flow Rate
	Alarm Output	Standard Alarm+Error of thermometer etc.					Only for Standard
	StatusOutput	Only for Flow Switch					Flow Switch
Display	Upper	Select from Flow rate (%,Engineering Unit) or Temperature (%) (*8)					Only for Flow Rate
	Lower	Select from Total Rate or temperature (C, F) (*9)					Only for Total Rate
Remote Type		Flow Converter : Select DYA-□□□/MV Signal Cable : Select DYC-□□□/MV (*10)					

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(*1) When /MV is chosen, /HT, /LT is not available.

(*2) Measurement temperature is changed by the heat-insulation method of piping and piping method. Refer to 2.2 Piping, about heat-insulation (P.2-3). In case of the Mass Flow measurement of saturated steam and superheat steam, it is necessary to make a heat-insulation.

(*3) Mass Flow rate is calculated from density values by temperature measurement using saturated steam table.

(*4) Mass Flow rate is calculated from density values to temperature measured by using steam table. In order to measure superheated steam, it is necessary to make constant pressure value. A pressure values which is indicated by order sheet is used.

(*5) In order to measure gas, Pressure-Temperature correction is carried out. It is necessary to make constant pressure value.
A pressure values at operational condition, temperature and pressure value at standard condition which is indicated by order sheet is used.

(*6) In order to measure mass flowrate of liquid application, the density at normal condition is used, and if fluid temperature deviates from normal temperature density values is calculated by 2 dimensional equation. In this case, temperature coefficient should be prepared by user's side.

(*7) Default setting is Flow rate. It is necessary to change the parameter of output in case of setting temperature output.

(*8) In case of indicating the temperature %, the display indicate not only "%" but also "t" . ("t" is the means of temperature)

(*9) Default setting is "temperature" but "Total " is setup when ordering the Total Rate.

(*10) In case of Multi valiable(/MV), it is necessary to setup the parameter of Cable Length.

Table 9.4.1 Detailed Accuracy (for Table 9.5.3 Range of Guaranteed Accuracy)

Fluid	Nominal Size	Accuracy
Liquid	25 mm up to	± 2.0% of Reading (20000≦Re<D×10^3)
	100 mm	± 1.5% of Reading (D×10^3≦Re)
	150 mm, 200 mm	± 2.0% of Reading (40000≦Re)
Gas, Steam	25 mm up to	± 2.0% of Reading (Velocity 35 m/s or less)
	200 mm	± 2.5% of Reading (Velocity 35 m/s up to 80 m/s)

D: Inner diameter of digitalYEWFLO (mm)
Re: Reynolds number (non unit)

Note: In case of analog output, add up ± 0.1% of full scale to the values mentioned above.

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Table 9.4.2 Paint Color and Codes

Codes	Munsell Renotation Code	Color
P1	N1.5	Black
P2	7.5BG4/1.5	Jade green
P7	————	Metallic silver

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Table 9.4.3 Pressure Test Value

Flange Rating	Pressure
JIS 10 K	2.1 MPa
JIS 20 K	5.0 MPa
JIS 40 K	10.0 MPa
ANSI Class 150	2.9 MPa
ANSI Class 300	7.5 MPa
ANSI Class 600	14.9 MPa
ANSI Class 900	22.4 MPa
DIN PN 10	1.5 MPa
DIN PN 16	2.4 MPa
DIN PN 25	3.8 MPa
DIN PN 40	5.9 MPa

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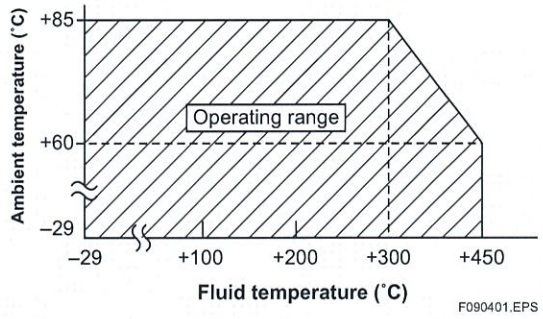

Figure 9.4.1 Fluid temperature range of high process temperature version

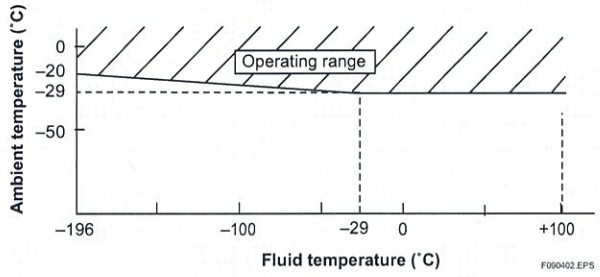

Figure 9.4.2 Fluid temperature range of cryogenic version

9.4.3 Option Specifications (Hazardous Area Classifications)

Item	Specification	Code
TIIS Certification	TIIS Flame proof Approval (Note 1) Flame proof Ex d IIC T6 Certified by TIIS. (TIIS is the abbreviation of Technology Institution of Industrial Safety.) Amb. Temp: –20 to 60°C Electrical connection: JIS G1/2 female	JF3
Factory Mutual (FM)	FM Explosion proof Approval Type of Protection : Explosion proof for Class I, Division 1, Groups A, B, C and D; Dust-ignitionproof Class II/III, Division 1, Groups E, F, and G. "SEAL ALL CONDUITS WITHIN 18 INCHES." "WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED." Enclosure Rating : NEMA TYPE 4X Temperature Code : T6 Ambient Temperature : –29 to 60°C (Integral Type Flowmeter and Remote Type Flowmeter) –40 to 60°C (Remote Type Converter) Ambient Humidity : 0 to 100%RH Maximum Working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Coating of Enclosure : Epoxy resin coating or Polyurethane resin coating. Electrical Connection : ANSI 1/2NPT female	FF1
	FM Intrinsically safe Approval (Note 2) Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G, T4, and Class I, Zone 0, AEx ia IIC T4 Nonincendive for Class I, II, Div.2, Groups A, B, C, D, F and G, Class III, DIV.1, T4, and Class I, Zone 2, Groups IIC, T4 Ambient Temperature : –29 to +60°C (Integral Type Flowmeter) –29 to +80°C (Remote Type Flowmeter) –40 to +60°C (Remote Type Converter) Ambient Humidity : 0 to 100% RH (No condensation) Maximum Working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Indoors and Outdoors : NEMA TYPE 4X Electrical Parameter : Vmax=30Vdc, Imax=165mAdc, Pi=0.9W, Ci=12nF, Li=0.15mH Electrical Connection : ANSI 1/2NPT female	FS1
CENELEC ATEX (KEMA)	CENELEC ATEX(KEMA) Explosion proof Approval Type of protection : EExd IIC T6...T1(Integral Type Flowmeter and Remote Type Flowmeter) EExd IIC T6 (Remote Type Converter) Groups : Group II Category : Category 2G Temperature Class : T6...T1(Integral Type Flowmeter and Remote Type Flowmeter) T6(Remote Type Converter) Process temp.: T6; 85°C, T5;100°C; T4;135°C; T3;200°C;T2;300°C; T1;450°C (Use /HT version above 260°C) Degree of Protection of Enclosure : IP67 Tamb: –29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter) –30 to +60°C (Remote Type Converter) –29 to +60°C (Integral Type Flowmeter with indicator) –30 to +60°C (Remote Type Converter with indicator) Ambient Humidity : 0 to 100% RH Maximum working Pressure : 42MPa Coating of Enclosure : Epoxy resin coating or Polyurethane resin coating. Electrical Connection : ANSI 1/2 NPT female, ISO M20 × 1.5 female.	KF1
	CENELEC ATEX(KEMA) Intrinsically safe Approval (Note 2) Type of protection : EEx ia IIC T4...T1(Integral Type Flowmeter and Remote Type Flowmeter) EEx ia IIC T4(Remote Type Converter) Groups : II Category : 1G Maximum Working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Tamb.(Integral Type Flowmeter) : –29 to +60°C Tamb.(Remote Type Flowmeter) : –29 to +80°C Tamb.(Remote Type Converter) : –40 to +60°C Ambient Humidity : 0 to 100%RH (No condensation) Process temp.: T4;135°C; T3;200°C; T2;300°C; T1; 450°C (Use /HT version above 260°C) For connection to certified Intrinsically Safe circuit with Signal/Supply and Pulse circuit of Integral Type Flowmeter and Remote Type Converter Ui=30Vdc, Ii=165mAdc, Pi=0.9W, Ci=6nF, Li=0.15mH Connect sensor circuit of DYA and DY-N(/HT) Maximum cable capacitance:160nF Electrical connection : ANSI 1/2NPT female, ISO M20 × 1.5 female.	KS1

(Note 1) TIIS Certification (/JF3) is available for JIS G1/2 female for electrical connection. Only for exports, the combination excluding electrical connection "JIS G1/2" can apply. And be sure to specify in the option code with Flame proof packing ground (/G11 or /G12), when the cable wire construction is specified. In case the ambient temperature exceeds 50 deg.C, use heat resistant cables with maximum allowable temperature of 70 deg. C or above.

(Note 2) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).

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Item	Specification	Code
CENELEC ATEX (KEMA)	CENELEC ATEX (KEMA) Type n Approval Type of Protection : EEx nL IIC T4...T1 (Integral Type Flowmeter and Remote Type Flowmeter) EEx nL IIC T4 (Remote Type Converter) Groups : II Category : 3G Maximum Working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Ambient Temperature: -29 to +60°C (Integral Type Flowmeter) : -29 to +80°C (Remote Type Flowmeter) : -40 to +60°C (Remote Type Converter) Ambient Humidity : 0 to 100%RH (No Condensation) Process Temp.: T4; 135°C, T3; 200°C, T2(*); 300°C, T1(*); 450°C (*: Use /HT version above 260°C) Degree of Protection of Enclosure: IP67 Maximum Capacitance of Cable :160nF Electrical Connection : ANSI 1/2 NPT female, ISO M20 X 1.5 female.	KN1
Canadian Standards Association (CSA)	CSA Explosion proof Approval Type of Protection : Explosionproof for Class I, Groups B, C and D; Class II, Groups E, F, and G; Class III. For Class I, Division 2 locations- "FACTRY SEALED, CONDUIT SEAL NOT REQUIRD" Enclosure : Type 4X Temperature Class : T6...T1 (Integral Type Flowmeter and Remote Type Flowmeter) T6 (Remote Type Converter) Amb.Temp. : –29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter) –40 to +60°C (Remote Type Converter) Process temp. : T6;85°C, T5;100°C, T4;135°C, T3;200°C, T2;300°C, T1; 450°C Enclosure : Type 4X Maximum working Pressure : 16MPa (2160 psi) (DY015 to DY200) 5MPa (720 psi) (DY250 and DY300) Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating. Electrical Connection: ANSI 1/2 female	CF1
	CSA Intrinsically safe Approval (Note 2) Type of Protection : Ex ia IIC T4...T1 and Ex nC IIC T4...T1(Integral Type Flowmeter and Remote Type Flowmeter) Ex ia IIC T4 and Ex nC IIC T4(Remote Type Converter) Process Temp.: T4;135°C, T3;200°C, T2;300°C, T1;450°C (Integral Type Flowmeter and Remote Type Flowmeter) Amb. Temp. : –29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter) –40 to +60°C (Remote Type Converter) Amb. Hum. : 0 to 100%RH (No condensation) Degree of Protection of Enclosure:IP67 Electrical Parameters:Ui=30Vdc, Ii=165mAdc, Pi=0.9W, Ci=12nF, Li=0.15mH. Electrical Connection: ANSI 1/2 NPT female Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G Non-incendive for Class I, II, DIV.2, Groups A, B, C, D, E, F and G, ClassIII, DIV.1. Temperature Code : T4...T1(Integral Type Flowmeter and Remote Type Flowmeter) T4(Remote Type converter) Process Temp. : T4;135°C, T3; 200°C, T2; 300°C, T1; 450°C (Integral Type Flowmeter and Remote Type Flowmeter) Amb. Temp. : –29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter) : –40 to +60°C (Remote Type Converter) Amb. Hum. : 0 to 100%RH (No condensation) Enclosure : Type 4X Electrical Parameter:Vmax =30Vdc, Imax =165mAdc, Pmax = 0.9W, Ci =12nF, Li = 0.15mH. Electrical Connection: ANSI 1/2 NPT female Maximum working Pressure : 16MPa (2160 psi) (DY015 to DY200) 5MPa (720 psi) (DY250 and DY300)	CS1
Standards Association of Australia (SAA) (Note 3)	SAA Flame proof Approval Ex d IIC T6...T1, IP67, Class I, Zone 1 Amb.Temp.: –29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter) : –40 to +60°C (Remote Type Converter) Max. process temp. : T6; 85°C, T5; 100°C, T4; 135°C, T3; 200°C, T2; 300°C, T1;450°C Electrical connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female	SF1

(Note 2) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).
(Note 3) SAA Flame proof Approval (/SF1) can not combine with High Process Temperature Version (/HT).

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Item	Specification	Code
Standards Association of Australia (SAA)	SAA intrinsically Safe Approval (Note 2) SAA Type n Approval Type of Protection: Ex ia IIC T4 IP67 (Integral Type Flowmeter, Remote Type Flowmeter and Remote Type Converter) Hazardous Area: Class I, Zone 0 Maximum Input Voltage (Ui)=30Vdc Maximum Input Current (Ii)=165mAdc Maximum Input Power (Pi)=0.9W Internal Capacitance (Ci)=37nF Internal Inductance (Li)=0mH Ambient Temperature: –20 to +60°C Ambient Humidity: 0 to 100% RH (No condensation) Type of Protection: Ex n IIC T4 IP67 (Integral Type Flowmeter, Remote Type Flowmeter and Remote Type Converter) Hazardous Area: Class I, Zone 2 Maximum Input Voltage (Ui)=30Vdc Ambient Temperature: –20 to +80°C Ambient Humidity: 0 to 100% RH (No condensation) Electrical connection: ANSI 1/2 NPT female, ISO M20 × 1.5 female	SS1

(Note 2) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).

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9.5 Sizing

The following items are the basic specifications.
In case of the definite sizing, it is necessary to check by the sizing software.

■ Measurable minimum flow velocity

Table 9.5.1 Relationship between Minimum Velocity and Density (Use the Large of the Two Values)

Nominal size in mm	Liquid		GAS, Steam	
	General Type, Cryogenic Type (unit: m/s)	High Process Temperature Version (unit: m/s)	General Type, Cryogenic Type (unit: m/s)	High Process Temperature version (unit: m/s)
15	$\sqrt{250/\rho}$	—	$\sqrt{80/\rho}$ or 3	—
25	$\sqrt{122.5/\rho}$	$\sqrt{490/\rho}$	$\sqrt{45/\rho}$ or 2	$\sqrt{125/\rho}$ or 2
40	$\sqrt{90/\rho}$	$\sqrt{302.5/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{90.3/\rho}$ or 2
50	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
80	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
100	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
150	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 3	$\sqrt{61.3/\rho}$ or 3
200	$\sqrt{122.5/\rho}$	$\sqrt{202.5/\rho}$	$\sqrt{45/\rho}$ or 3	$\sqrt{80/\rho}$ or 3
250	$\sqrt{160/\rho}$	—	$\sqrt{61.3/\rho}$ or 3	—
300	$\sqrt{160/\rho}$	—	$\sqrt{61.3/\rho}$ or 3	—

ρ : Density at operating conditions (kg/m^3)
Liquid density is 400 up to 2000kg/m^3

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Table 9.5.2 Range of Measurable flow velocity

Fluid	Nominal Size	Minimum flow velocity	Maximum flow velocity
Liquid	15mm up to 300 mm	"flow velocity obtained from Table 9.5.1" or "flow velocity at Reynolds number of 5000", whichever is greater. For liquid Reynolds number of 5000 : Use Figure.6	10 m/s
Gas, Steam	15mm up to 300 mm	"flow velocity obtained from Table 9.5.1" or "flow velocity at Reynolds number of 5000", whichever is greater. For Gas and steam Reynolds number of 5000 : Use of a calculation formula on the following page.	80 m/s

When the flow velocity is lower than minimum, both the analog output and the pulse output is displayed as zero "0".

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■ Guaranteed accuracy at minimum flow velocity

Table 9.5.3 Range of Guaranteed Accuracy Flow Velocity

Fluid	Nominal Size	Minimum flow velocity	Maximum flow velocity
Liquid	15 mm up to 100 mm	"flow velocity obtained from Table.9.5.1" or " flow velocity at Reynolds number of 20000", whichever is greater. For liquid Reynolds number of 20000 : The value is four times velocity value in Figure.9.5.1	10 m/s
	150 mm up to 300 mm	"flow velocity obtained from Table.9.5.1" or " flow velocity at Reynolds number of 40000", whichever is greater. For liquid Reynolds number of 40000 : The value is eight times velocity value in Figure.9.5.1	
Gas, Steam	15 mm up to 100 mm	"flow velocity obtained from Table.9.5.1" or " flow velocity at Reynolds number of 20000", whichever is greater. For gas and steam Reynolds number of 20000 : Use of a calculation formula	80 m/s
	150 mm up to 300 mm	"flow velocity obtained from Table.9.5.1" or " flow velocity at Reynolds number of 40000", whichever is greater. For gas and steam Reynolds number of 40000 : Use of a calculation formula	

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Table 9.5.4 Detailed Accuracy (for Range of Guaranteed Accuracy)

Fluid	Nominal Size	Accuracy
Liquid	15mm	± 1.0% of Reading (20000 ≦ Re)
	25 mm up to 100 mm	± 1.0% of Reading (20000 ≦ Re < D × 10^3)
		± 0.75% of Reading (D × 10^3 ≦ Re)
	150 mm up to 300 mm	± 1.0% of Reading (40000 ≦ Re)
Gas, Steam	15 mm up to 300 mm	± 1.0% of Reading (Velocity 35m/s or less)
		± 1.5% of Reading (Velocity 35m/s up to 80m/s)

D : Inner diameter of digitalYEWFLO (mm)
Re: Reynolds number (non unit)
Note: This table shows the accuracy of pulse output. In case of analog output, add up ± 0.1% of full scale to the values mentioned above.

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■ Flow velocity at Reynolds Number of 5000(Liquid)

Kinematic Viscosity : Use of equation(2). When the nominal size is 50mm and the Kinematic viscosity is 10cSt, the flow velocity at Reynolds number of 5000 is 1m/s using Figure 6.

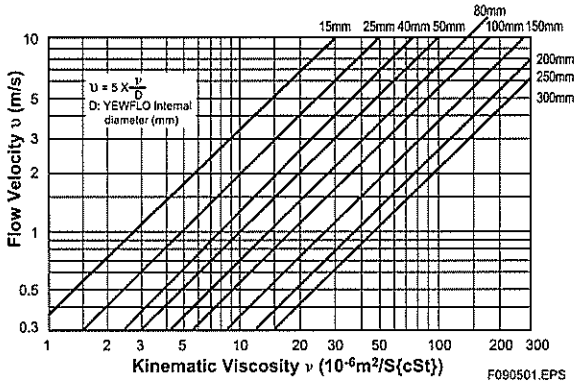

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Figure 9.5.1 Flow velocity at Reynolds number of 5000(Liquid)

■ Calculation formula

■ How to calculate volume flow rate at operating conditions.

• $Qf = \frac{\upsilon \times D^2}{354}$ or $Qf = 3600 \times \upsilon \times S$

■ How to calculate the velocity of a Reynolds number.

• $\upsilon = 5 \times \nu / D$ (Reynolds number of 5000)

• $\upsilon = 20 \times \nu / D$ (Reynolds number of 20000)

• $\upsilon = 40 \times \nu / D$ (Reynolds number of 40000)

however

• $Re = \frac{354 \times 10^3 \times Qf}{\nu \times D}$ ..... (1)

• $\nu = \frac{\mu}{\rho f} \times 10^3$ ..... (2)

Qf : Volume flow rate at operating conditions (m^3/h)
D : Inner diameter of digitalYEWFLO (mm)
S : Sectional area of digitalYEWFLO (m^2)
υ : Flow velocity (m/s)
Re : Reynolds number (none unit)
pf : Density at operating conditions (kg/m^3)
μ : Viscosity at operating conditions (cP)
ν : Kinematic viscosity at operating conditions ($10^{-6}m^2/s${cSt})

Table 9.5.5 Inner Diameter and Nominal value

Nominal Size		Inner Diameter mm	Nominal K-Factor Pulse/L	Nominal Pulse Rate	
mm	inch			Hz/m/s	Hz/m³/h
15	1/2	14.6	376	62.7	104
25	1	25.7	65.6	35.5	19.1
40	1-1/2	39.7	18.7	23.1	5.19
50	2	51.1	8.95	18.3	2.49
80	3	71.0	3.33	13.2	0.925
100	4	93.8	1.43	9.88	0.397
150	6	138.8	0.441	6.67	0.123
200	8	185.6	0.185	5.00	0.0514
250	10	230.8	0.0966	4.04	0.0268
300	12	276.2	0.0563	3.37	0.0156

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■ Typical fluid example

Table 9.5.6 Range of Measurable Water Flow Rate
(At standard condition of 15°C, ρ = 1000 kg/m^3)

Nominal Size		Measurable Flow Rate in m³/h	Range of Guarranted Accuracy Flow Rate in m³/h
mm	inch		
15	1/2	0.30 up to 6	0.94 up to 6
25	1	0.65 up to 18	1.7 up to 18
40	1-1/2	1.3 up to 44	2.6 up to 44
50	2	2.2 up to 73	3.3 up to 73
80	3	4.3 up to 142	4.6 up to 142
100	4	7.5 up to 248	7.5 up to 248
150	6	17 up to 544	18 up to 544
200	8	34 up to 973	34 up to 973
250	10	60 up to 1506	60 up to 1506
300	12	86 up to 2156	86 up to 2156

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Table 9.5.7 Range of Measurable Air Flow Rate at Selected Process Pressures

Nominal Size	Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in Nm³/h									
		0 MPa	0.1 MPa	0.2 MPa	0.4 MPa	0.6 MPa	0.8 MPa	1 MPa	1.5 MPa	2 MPa	2.5 MPa
15 mm	min.	4.8(11.1)	6.7(11.1)	8.2(11.1)	10.5(11.1)	12.5	16.1	19.7	28.6	37.5	46.4
	max.	48.2	95.8	143	239	334	429	524	762	1000	1238
25 mm	min.	11.0(19.5)	15.5(19.5)	19.0(19.5)	24.5	29.0	33.3	40.6	59.0	77.5	95.9
	max.	149	297	444	739	1034	1329	1624	2361	3098	3836
40 mm	min.	21.8(30.0)	30.8	37.8	48.7	61.6	79.2	97	149	184	229
	max.	356	708	1060	1764	2468	3171	3875	5634	7394	9153
50 mm	min.	36.2(38.7)	51	62.4	80.5	102	131	161	233	306	379
	max.	591	1174	1757	2922	4088	5254	6420	9335	12249	15164
80 mm	min.	70.1	98.4	120	155	197	254	310	451	591	732
	max.	1140	2266	3391	5642	7892	10143	12394	18021	23648	29274
100 mm	min.	122	172	211	272	334	442	540	786	1031	1277
	max.	1990	3954	5919	9847	13775	17703	21632	31453	41274	51095
150 mm	min.	268	377	485	808	1131	1453	1776	2583	3389	4196
	max.	4358	8659	12960	21559	30163	38765	47365	68867	90373	111875
200 mm	min.	575	809	990	1445	2202	2599	3175	4617	6059	7501
	max.	7792	15482	23172	38549	53933	69313	84693	123138	161591	200046
250 mm	min.	1037	1461	1788	2306	3127	4019	4911	7140	9370	11600
	max.	12049	23939	35833	59611	83400	107181	130968	190418	249881	309334
300 mm	min.	1485	2093	2561	3303	4479	5756	7033	10226	13419	16612
	max.	17256	34286	51317	85370	119441	153499	187556	272699	357856	443017

(1) At standard conditions STP (0°C. 1atm).
(2) Pressure listed is at process temperature of 0°C.
(3) Maximum flow rate is the lower of 80 m/s.
(4) Minimum values are determined from Table 9.5.1. The values in parenthesis show the minimum linear flow rates (Re = 20,000 or 40,000) when they are higher than the minimum measurable flow rate.

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Table 9.5.8 Range of Measurable Saturated Steam Flow Rate at Selected Process Pressures

Nominal Size	Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in kg/h									
		0.1 MPa	0.2 MPa	0.4 MPa	0.6 MPa	0.8 MPa	1 MPa	1.5 MPa	2 MPa	2.5 MPa	3 MPa
15 mm	min.	5.8(10.7)	7.0(11.1)	8.8(11.6)	10.4(12.1)	11.6(12.3)	12.8	15.3	19.1	23.6	28.1
	max.	55.8	80	129	177	225	272	390	508	628	748
25 mm	min.	13.4(18.9)	16.2(20.0)	20.5	24.1	27.1	30	36	41	49	58
	max.	169.7	247.7	400	548	696	843	1209	1575	1945	2318
40 mm	min.	26.5(29.2)	32	40.6	47.7	53.8	59	72	93	116	138
	max.	405	591	954	1310	1662	2012	2884	3759	4640	5532
50 mm	min.	44.0	53	67.3	79	89	98	119	156	192	229
	max.	671	979	1580	2170	2753	3333	4778	6228	7688	9166
80 mm	min.	84.9	103	130	152	171	189	231	300	371	442
	max.	1295	1891	3050	4188	5314	6435	9224	12024	14842	17694
100 mm	min.	148	179	227	267	300	330	402	524	647	772
	max.	2261	3300	5326	7310	9276	11232	16102	20986	25907	30883
150 mm	min.	324	392	498	600	761	922	1322	1723	2127	2536
	max.	4950	7226	11661	16010	20315	24595	35258	45953	56729	67624
200 mm	min.	697	841	1068	1252	1410	1649	2364	3081	3803	4534
	max.	8851	12918	20850	28627	36325	43976	63043	82165	101433	120913
250 mm	min.	1256	1518	1929	2260	2546	2801	3655	4764	5882	7011
	max.	13687	19977	32243	44268	56172	68005	97489	127058	156854	186978
300 mm	min.	1799	2174	2762	3236	3646	4012	5235	6823	8423	10041
	max.	19602	28609	46175	63397	80445	97390	139614	181960	224633	267772

(1) Maximum flow rate is the lower of 80 m/s.
(3) Minimum values are determined from Table 9.5.1. The values in parenthesis show the minimum linear flow rates (Re = 20,000 or 40,000) when they are higher than the minimum measurable flow rate.

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■ Pressure Loss

At velocity of 10 m/s by water, ΔP = 108 kPa
At velocity of 80 m/s by atmospheric air,
ΔP = 9 kPa
obtained from the following equations.

$\Delta P = 108 \times 10^{-5} \cdot \rho_f \cdot \upsilon^2$ ····· (1)

or

$\Delta P = 135 \times pf \cdot \frac{Q_f^2}{D^4}$ ····· (2)

where,

ΔP : Pressure loss (kPa)
ρ_f : Density at operating condition (kg/m³)
υ : Flow velocity (m/s)
Q_f : Actual flow rate (m³/h)
D : Internal Diameter (mm)

Figure 9.5.2 shows pressure loss versus actual flow rate. When nominal size 15 to 50mm and adjacent pipeline is Sch 40, and nominal size 80 to 300 mm and adjacent pipeline is Sch 80, the pressure loss will be approximately 10% smaller than calculated value.

(Example) Calculation of pressure loss
Calculate the pressure loss when the nominal size is 50 mm and the flow rate of water at operating temperature 80°C is 30m³/h.

1. Since the density of water at 80°C is 972kg/m³, substitute this value in equation (2):

$$\Delta P = 135 \times 972 \times \frac{30^2}{51.1^4}$$

$$= 17.3\text{kPa}$$

2. Obtain the pressure loss using equation (1). The flow velocity when the flow rate is 30m³/h is given by:

$$\upsilon = \frac{354 \times Q_f}{D^2} = \frac{354 \times 30}{51.1^2} = 4.07\text{m/s}$$

Therefore, substitute this value in equation (1):

$$\Delta P = 108 \times 10^{-5} \times 972 \times 4.07^2$$
$$= 17.3\text{kPa}$$

3. Obtain the pressure loss using Figure 9.5.2. Since the liquid pressure loss factor can be read as 18.5, then:

$$\Delta P = 98.1 \times 18.5 \times 972 \times 10^{-5}$$
$$= 17.6\text{kPa}$$

■ Cavitation

(Minimum Back Pressure, Liquid service only):
Cavitation occurs when the flow line pressure is low and flow velocity is high during fluid measurement, preventing correct measurement of flow rate. The optimum line pressure can be obtained from the following equation.

$P = 2.7 \cdot \Delta P + 1.3 \cdot Po$ ····· (3)

Where,

P : Line pressure, 2 to 7 times as large as internal diameter on downstream of flowmeter body surface. (kPa absolute).
ΔP : Pressure loss (kPa).
Refer to the item above.
Po : Saturation liquid vapor pressure at operating temperature (kPa absolute).

(Example) Confirmation of presence of cavitation
Suppose that the line pressure is 120 kPa abs and the flow rate scale is 0 to 30 m³/h. It is only necessary to confirm the pressure at the maximum flow rate ; therefore, the saturated steam pressure of water at 80°C is as follows from the table of saturated steam pressures:

Po = 47.4 kPa abs

Therefore, substitute this value in equation (3):

$P = 2.7 \times 17.3 + 1.3 \times 47.4$
$= 108.3$ kPa abs

Since the operating pressure of 120 kPa abs is higher than 108.3 kPa abs, no cavitation occurs.

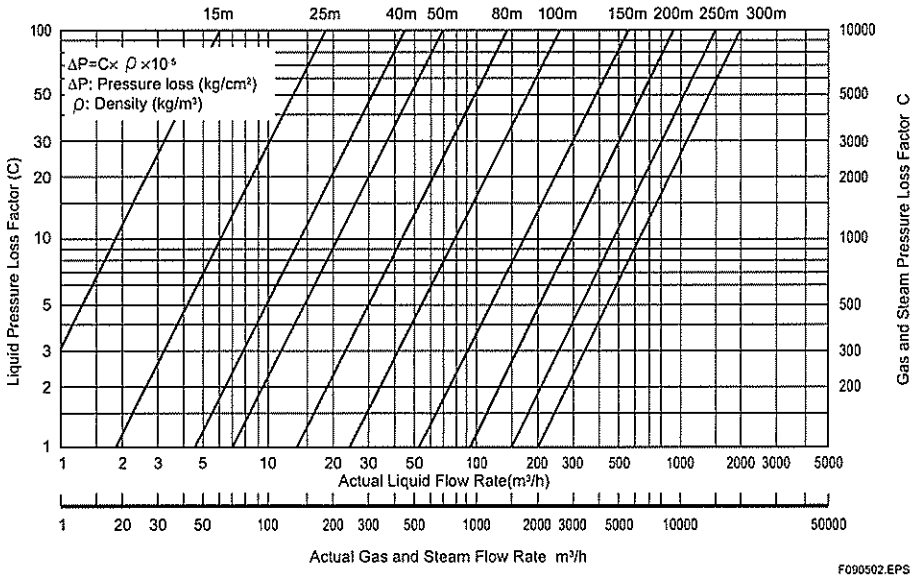
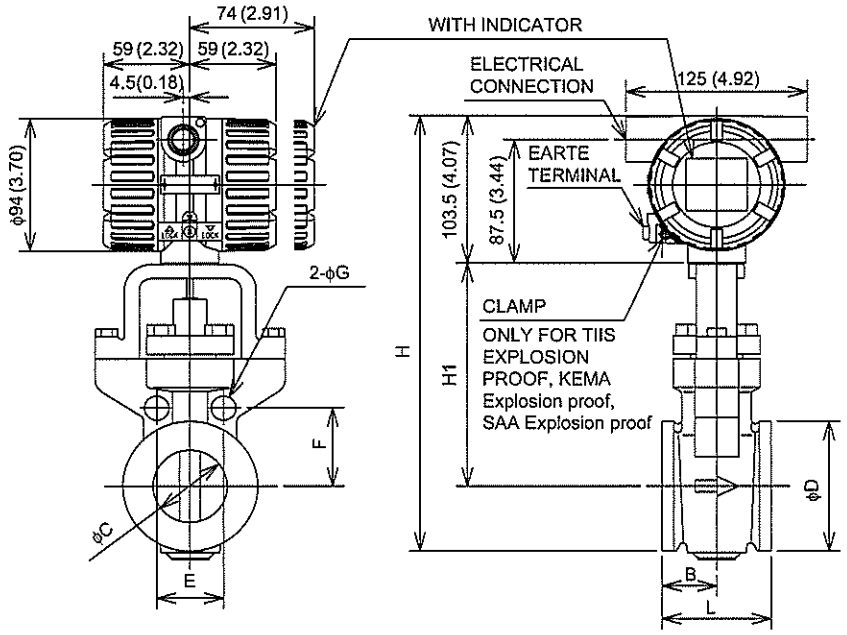


Figure 9.5.2 Pressure Loss

9.6 External Dimensions

■ **Wafer type (15mm up to 100mm)**

Unit: mm
(approx. inch)



TYPE	INTEGRAL/REMOTE													
CODE	DY015 (15mm,½in)							DY025 (25mm,1in)						
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4
L	70 (2.76)							70 (2.76)						
B	35 (1.38)							35 (1.38)						
C	14.6 (0.57)							25.7 (1.01)						
D	35.1 (1.38)							50.8 (2.00)						
H	248 (9.76)							258 (10.16)						
H1	127 (5.00)							129 (5.08)						
E	49.5 (1.95)	49.5 (1.95)	56.6 (2.23)	42.7 (1.68)	47.1 (1.85)	47.1 (1.85)	46 (1.81)	63.6 (2.50)	63.6 (2.50)	67.2 (2.65)	56 (2.21)	62.9 (2.48)	62.9 (2.48)	60.1 (2.37)
F	24.7 (0.97)	24.7 (0.97)	28.3 (1.11)	21.4 (0.84)	23.6 (0.93)	23.6 (0.93)	23 (0.91)	31.8 (1.25)	31.8 (1.25)	33.6 (1.32)	28 (1.10)	31.4 (1.24)	31.4 (1.24)	30.1 (1.19)
G	13 (0.51)	13 (0.51)	17 (0.67)	14 (0.55)	14 (0.55)	14 (0.55)	13 (0.51)	17 (0.67)	17 (0.67)	17 (0.67)	14 (0.55)	17 (0.67)	17 (0.67)	13 (0.51)
WEIGHT kg	2.8 (6.17lb)							3.7 (8.16lb)						

TYPE	INTEGRAL/REMOTE													
CODE	DY040 (40mm,1½in)							DY050 (50mm,2in)						
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AP4 AA4	AD1 - AD4
L	70 (2.76)							75 (2.95)						
B	35 (1.38)							37.5 (1.48)						
C	39.7 (1.56)							51.1 (2.01)						
D	73 (2.87)							92 (3.62)						
H	276 (10.87)							307.5 (12.11)						
H1	136 (5.35)							158 (6.22)						
E	74.2 (2.92)	74.2 (2.92)	84.9 (3.34)	69.7 (2.74)	80.8 (3.18)	80.8 (3.18)	77.8 (3.06)	(Note 3)	45.9 (1.81)	49.8 (1.96)	(Note 3)	48.6 (1.91)	48.6 (1.91)	(Note 3)
F	37.1 (1.46)	37.1 (1.46)	42.4 (1.67)	34.9 (1.37)	40.4 (1.59)	40.4 (1.59)	38.9 (1.53)	(Note 3)	55.4 (2.18)	60.1 (2.36)	(Note 3)	58.7 (2.31)	58.7 (2.31)	(Note 3)
G	17 (0.67)	17 (0.67)	21 (0.83)	14 (0.55)	20 (0.79)	20 (0.79)	17 (0.67)	(Note 3)	17 (0.67)	17 (0.67)	(Note 3)	17 (0.67)	17 (0.67)	(Note 3)
WEIGHT kg	4.3 (9.48lb)							6.0 (13.23lb)						

TYPE	INTEGRAL/REMOTE															
CODE	DY080 (80mm,3in)								DY100 (100mm,4in)							
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4
L	100 (3.94)								120 (4.72)							
B	40 (1.57)								50 (1.97)							
C	71 (2.80)								93.8 (3.69)							
D	127 (5.00)								157.2 (6.19)							
H	342 (13.47)								372 (14.65)							
H1	175 (6.89)								190 (7.48)							
E	57.4 (2.26)	61.2 (2.41)	69.1 (2.56)	(Note 3)	64.4 (2.54)	64.4 (2.54)	61.2 (2.41)	61.2 (2.41)	67 (2.64)	70.8 (2.79)	78.5 (3.09)	72.9 (2.87)	76.6 (3.02)	82.6 (3.25)	68.9 (2.71)	72.7 (2.86)
F	69.3 (2.73)	73.9 (2.91)	78.5 (3.09)	(Note 3)	77.7 (3.06)	77.7 (3.06)	73.9 (2.91)	73.9 (2.91)	80.8 (3.18)	85.5 (3.37)	94.7 (3.73)	88 (3.46)	92.5 (3.64)	99.7 (3.93)	83.1 (3.27)	87.8 (3.46)
G	17 (0.67)	21 (0.83)	21 (0.83)	(Note 3)	20 (0.79)	20 (0.79)	17 (0.67)	17 (0.67)	17 (0.67)	21 (0.83)	23 (0.91)	17 (0.67)	20 (3.06)	23 (0.91)	17 (0.67)	21 (0.83)
WEIGHT kg	9.4 (20.73lb)								12.8 (28.22lb)							

(Note 1) Integral weight is the same as Remote.
(Note 2) In case of with Indicator, add 0.2kg.
(Note 3) The hole is not provided.
(Note 4) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

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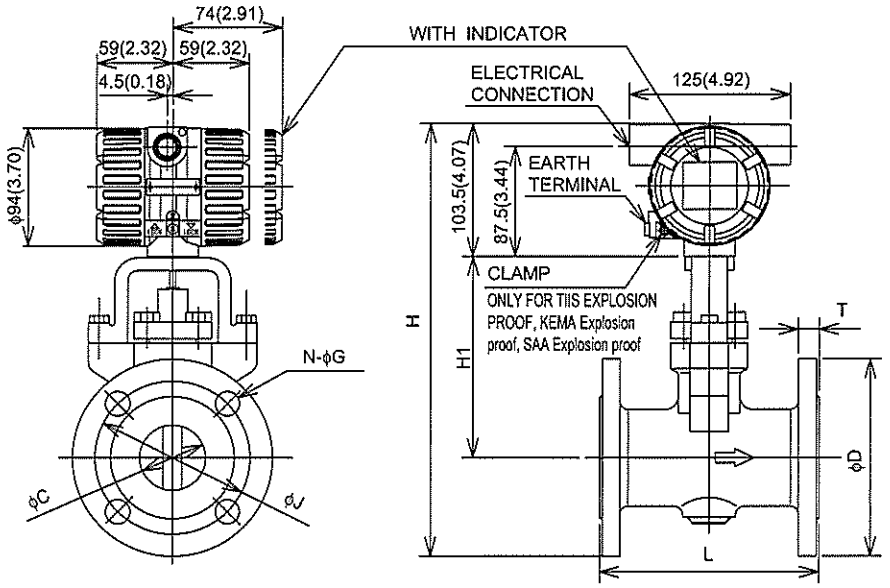
■ Flange type (15mm up to 100mm)

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																			
CODE		DY015 (15mm,½in)										DY025 (25mm,1in)									
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		130 (5.12)						160 (6.30)	130 (5.12)	140 (5.51)	160 (6.30)	150 (5.91)						190 (7.48)	150 (5.91)	170 (6.69)	190 (7.48)
C		14.6 (0.58)										25.7 (1.01)									
D		95 (3.74)	95 (3.74)	115 (4.53)	88.9 (3.50)	95.3 (3.75)	95.3 (3.75)	120.7 (4.75)	95 (3.74)	95.3 (3.75)	120.7 (4.75)	125 (4.92)	125 (4.92)	130 (5.12)	108 (4.25)	124 (4.88)	124 (4.88)	149.4 (5.88)	115 (4.53)	124 (4.88)	149.4 (5.88)
H		278 (10.94)	278 (10.94)	288 (11.34)	275 (10.63)	278 (10.94)	278 (10.94)	291 (11.46)	278 (10.94)	278 (10.94)	291 (11.46)	295 (11.61)	295 (11.61)	297.5 (11.91)	286.5 (11.28)	294.5 (11.59)	294.5 (11.59)	307 (12.09)	290 (11.42)	294.5 (11.59)	307 (12.09)
H1		127 (5.00)										129 (5.08)									
T		12 (0.47)	14 (0.55)	20 (0.79)	11.2 (0.44)	14.2 (0.56)	21 (0.83)	28.8 (1.13)	16 (0.63)	19.9 (0.78)	28.8 (1.13)	14 (0.55)	16 (0.63)	22 (0.87)	14.2 (0.56)	17.5 (0.69)	24 (0.94)	34.9 (1.37)	18 (0.71)	24 (0.94)	34.9 (1.37)
J		70 (2.76)	70 (2.76)	80 (7.15)	60.5 (2.38)	66.5 (2.62)	66.5 (2.62)	82.6 (3.25)	65 (2.56)	66.5 (2.62)	82.6 (3.25)	90 (3.54)	90 (3.54)	95 (3.74)	79.2 (3.12)	89 (3.50)	89 (3.50)	101.6 (4.00)	85 (3.35)	89 (3.50)	101.6 (4.00)
N		4 (0.16)										4 (0.16)									
G		15 (0.59)	15 (0.59)	19 (0.75)	15.7 (0.62)	15.7 (0.62)	15.7 (0.62)	22.4 (0.88)	14 (0.55)	15.7 (0.62)	22.4 (0.88)	19 (0.75)	19 (0.75)	19 (0.75)	15.7 (0.62)	19 (0.75)	19 (0.75)	25.4 (1.00)	14 (0.55)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	4.2	4.3	5.9	4.1	4.3	4.6	6.7	4.2	4.5	6.8	6.9	7.1	8.6	6.6	7.2	7.7	11.1	6.9	7.9	11.4
	lb	9.26	9.48	13.01	9.04	9.48	10.14	14.77	9.26	9.92	14.99	15.21	15.66	18.96	14.55	15.88	16.98	24.48	15.21	17.42	25.14

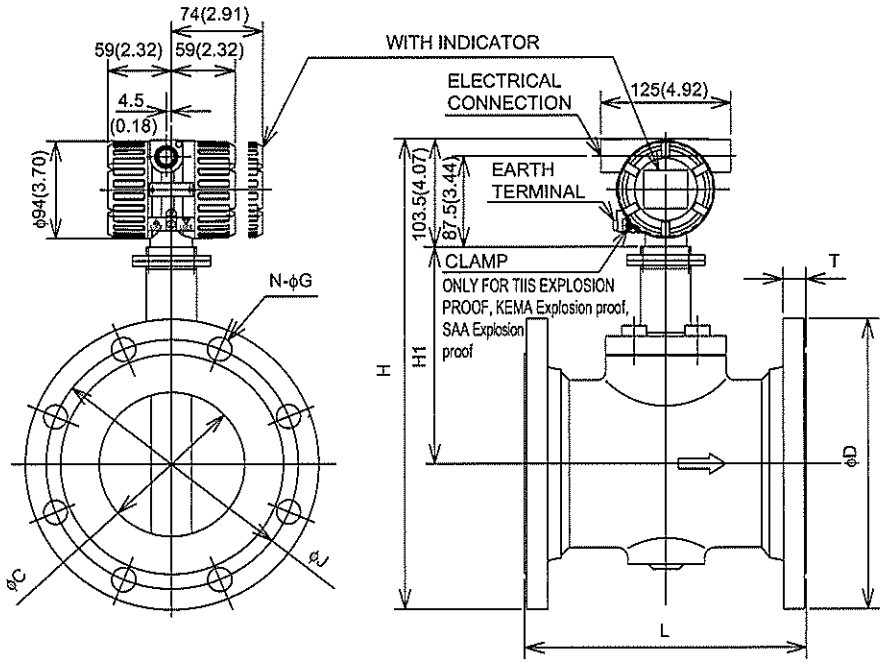
TYPE		INTEGRAL/REMOTE																			
CODE		DY040 (40mm,1½in)										DY050 (50mm, 2in)									
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		150 (5.91)						200 (7.87)	150 (5.91)	185 (7.28)	200 (7.87)	170 (6.69)						230 (9.06)	170 (6.69)	205 (8.07)	230 (9.06)
C		39.7 (1.56)										51.1 (2.01)									
D		140 (5.51)	140 (5.51)	160 (6.30)	127 (5.00)	155.4 (6.12)	155.4 (6.12)	177.8 (7.00)	150 (5.91)	155.4 (6.12)	177.8 (7.00)	155 (6.10)	155 (6.10)	165 (6.50)	152.4 (6.00)	165.1 (6.50)	165.1 (6.50)	215.9 (8.50)	165 (6.50)	165.1 (6.50)	215.9 (8.50)
H		309.5 (12.19)	309.5 (12.19)	319.5 (12.58)	303 (11.93)	317 (12.48)	317 (12.48)	328.5 (12.93)	314.5 (12.38)	317 (12.48)	328.5 (12.93)	339 (13.35)	339 (13.35)	344 (13.54)	337.5 (13.29)	344 (13.54)	344 (13.54)	369.5 (14.55)	344 (13.54)	344 (13.54)	369.5 (14.55)
H1		136 (5.35)										158 (6.22)									
T		16 (0.63)	18 (0.71)	26 (1.02)	17.5 (0.69)	20.6 (0.81)	28.6 (1.13)	38.2 (1.50)	18 (0.71)	28.6 (1.13)	38.2 (1.50)	16 (0.63)	18 (0.71)	26 (1.02)	19.1 (0.75)	22.4 (0.88)	31.6 (1.25)	44.5 (1.75)	20 (0.79)	33.3 (1.31)	46 (1.81)
J		105 (4.13)	105 (4.13)	120 (4.72)	98.6 (3.88)	114.3 (4.50)	114.3 (4.50)	124 (4.88)	110 (4.33)	114.3 (4.50)	124 (4.88)	120 (4.72)	120 (4.72)	130 (5.12)	120.7 (4.75)	127 (5.00)	127 (5.00)	165.1 (6.50)	125 (4.92)	127 (5.00)	165.1 (6.50)
N		4 (0.16)										4 (0.16)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)
G		19 (0.75)	19 (0.75)	23 (0.91)	15.7 (0.62)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	18 (0.71)	22.4 (0.88)	28.4 (1.12)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	25.4 (1.00)	18 (0.71)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	8.2	8.4	11.9	8.1	9.3	11.3	16.2	8.8	11.7	16.3	11.1	11.6	14.3	11.7	13.2	14.8	26.5	11.3	15.8	26.9
	lb	18.08	18.52	26.24	17.86	20.51	24.92	35.72	19.40	25.80	35.94	24.48	25.58	31.53	25.80	29.11	32.63	58.43	24.92	34.84	59.31

TYPE		INTEGRAL/REMOTE																					
CODE		DY080 (80mm, 3in)											DY100 (100mm, 4in)										
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5
L		200 (7.87)						245 (9.65)	200 (7.87)		235 (9.25)	250 (9.84)	220 (8.66)					240 (9.45)	280 (11.02)	220 (8.66)		270 (10.63)	285 (11.22)
C		71 (2.80)											93.8 (3.69)										
D		185 (7.28)	200 (7.87)	210 (8.27)	190.5 (7.50)	209.6 (8.25)	209.6 (8.25)	241.3 (9.50)	200 (7.87)	200 (7.87)	209.6 (8.25)	241.3 (9.50)	210 (8.27)	225 (8.90)	250 (9.84)	228.6 (9.00)	254 (10.00)	273 (10.75)	292.1 (11.50)	220 (8.66)	235 (9.25)	273 (10.75)	292.1 (11.50)
H		371 (14.61)	378.5 (14.90)	383.5 (15.10)	374 (14.72)	383.5 (15.10)	383.5 (15.10)	399 (15.71)	378.5 (14.90)	378.5 (14.90)	383.5 (15.10)	399 (15.71)	398.5 (15.69)	406 (15.98)	418.5 (16.48)	409 (16.10)	420.5 (16.56)	430 (16.93)	439.5 (17.30)	403.5 (15.89)	411 (16.18)	430 (16.93)	439.5 (17.30)
H1		175 (6.89)											190 (7.48)										
T		18 (0.71)	22 (0.87)	32 (1.26)	23.9 (0.94)	28.4 (1.12)	38.2 (1.50)	44.5 (1.75)	20 (0.79)	24 (0.95)	39.7 (1.56)	46 (1.81)	18 (0.71)	24 (0.95)	36 (1.42)	23.9 (0.94)	31.8 (1.25)	44.5 (1.75)	50.9 (2.00)	20 (0.79)	24 (0.95)	46 (1.81)	52.4 (2.06)
J		150 (5.91)	160 (6.30)	170 (6.69)	152.4 (6.00)	168.2 (6.62)	168 (6.61)	190.5 (7.50)	160 (6.30)	160 (6.30)	170 (6.69)	180 (7.09)	175 (6.89)	185 (7.28)	205 (8.07)	190.5 (7.50)	200.2 (7.88)	216 (8.50)	235 (9.25)	180 (7.09)	190 (7.48)	216 (8.50)	235 (9.25)
N		8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)										
G		19 (0.75)	23 (0.91)	23 (0.91)	19 (0.75)	22.4 (0.88)	22.4 (0.88)	25.4 (1.00)	18 (0.71)	18 (0.71)	22.4 (0.88)	25.4 (1.00)	19 (0.75)	23 (0.91)	25 (0.98)	19 (0.75)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	18 (0.71)	22 (0.87)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	17.4	20	25.4	20	23.8	25.4	35.7	19.4	20	27.1	36.3	22.8	26.8	38.1	27.4	35.9	50.8	55.9	23.2	27.4	52.8	55.6
	lb	38.37	44.10	56.01	44.10	52.48	56.01	78.72	42.78	44.10	59.76	80.04	50.27	59.09	84.01	60.42	79.16	112.01	123.26	51.16	60.42	116.42	124.80

(Note 1) Integral weight is the same as Remote
(Note 2) In the case of with Indicator, add 0.2 kg
(Note 3) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

■ **Flange type (150mm up to 300mm)**

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																					
CODE		DY150 (150mm, 6in)											DY200 (200mm, 8in)										
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1	BD2	BD3	BD4	CA4	CA5
L		270 (10.63)					310 (12.21)	336 (13.23)	270 (10.63)		325 (12.80)	340 (13.39)	310 (12.20)				370 (14.57)	386 (15.20)	310 (12.20)				375 (14.76)	390 (15.35)
C		138.8 (5.46)											185.6 (7.31)											
D		280 (11.02)	305 (12.01)	355 (13.98)	279.4 (11.00)	317.5 (12.50)	356 (14.02)	381 (15.00)	285 (11.22)	300 (11.81)	356 (14.02)	381 (15.00)	330 (12.99)	350 (13.78)	342.9 (13.50)	381 (15.00)	419.1 (16.50)	469.9 (18.50)	340 (13.39)	340 (13.39)	360 (14.17)	375 (14.76)	419.1 (16.50)	469.9 (18.50)
H		453 (17.83)	465 (18.31)	490 (19.29)	452 (17.80)	471 (18.54)	491 (19.33)	503 (19.80)	455 (17.91)	463 (18.23)	491 (19.33)	503 (19.80)	510 (20.08)	520 (20.47)	516 (20.31)	535 (21.06)	554 (21.81)	579 (22.80)	515 (20.28)	515 (20.28)	525 (20.67)	532 (20.94)	554 (21.81)	579 (22.80)
H1		209 (8.23)											241 (9.49)											
T		22 (0.87)	28 (1.10)	44 (1.73)	25.4 (1.00)	35.6 (1.44)	54.4 (2.14)	62 (2.44)	22 (0.87)	28 (1.10)	55.7 (2.19)	63.6 (2.50)	22 (0.87)	30 (1.18)	28.4 (1.12)	41.1 (1.62)	62 (2.44)	69.9 (2.75)	24 (0.95)	24 (0.95)	30 (1.18)	34 (1.34)	63.6 (2.50)	71.4 (2.81)
J		240 (9.45)	260 (10.24)	295 (11.61)	241.3 (9.50)	269.7 (10.62)	292 (11.50)	317.5 (12.50)	240 (9.45)	250 (9.84)	292 (11.50)	317.5 (12.50)	290 (11.42)	305 (12.01)	298.5 (11.75)	330.2 (13.00)	349.3 (13.75)	393.7 (15.50)	295 (11.61)	295 (11.61)	310 (12.20)	320 (12.60)	349.3 (13.75)	393.7 (15.50)
N		8 (0.31)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)
G		23 (0.91)	25 (0.98)	33 (1.30)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	31.8 (1.25)	22 (0.87)	26 (1.02)	28.4 (1.12)	31.8 (1.25)	23 (0.91)	25 (0.98)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	38.1 (1.50)	22 (0.87)	22 (0.87)	26 (1.02)	30 (1.18)	31.8 (1.25)	38.1 (1.50)
WEIGHT	kg	33.4	43.4	76.4	36.4	54.4	84.4	106	33.4	42.9	90	107	45.4	52.4	55.4	80.4	136	182	46.3	46.3	53.6	55.9	139	183
	lb	73.65	95.70	168.46	80.26	119.95	186.10	233.73	73.65	94.59	199.45	235.94	100.11	115.54	122.16	177.28	299.88	401.31	102.09	102.09	118.19	123.26	306.52	403.52

TYPE		INTEGRAL/REMOTE							
CODE		DY250 (250mm, 10in)				DY300 (300mm, 12in)			
PROCESS CONNECTION		BJ1	BJ2	BA1 BS1	BA2 BS2	BJ1	BJ2	BA1 BS1	BA2 BS2
L		370 (14.57)				400 (15.75)			
C		230.8 (9.09)				276.2 (10.87)			
D		400 (15.75)	430 (16.93)	406.4 (16.00)	444.5 (17.50)	445 (17.52)	480 (18.90)	482.6 (19.00)	520.7 (20.50)
H		581 (22.87)	595 (23.46)	584 (22.99)	603 (23.74)	633 (24.92)	651 (25.63)	652 (25.67)	671 (26.42)
H1		277 (10.91)				307 (12.09)			
T		25 (0.98)	35 (1.38)	31.2 (1.23)	48.8 (1.92)	25 (0.98)	37 (1.46)	32.8 (1.29)	51.8 (2.04)
J		355 (13.98)	380 (14.96)	362 (14.25)	387.4 (15.25)	400 (15.75)	430 (16.93)	431.8 (17.00)	450.9 (17.75)
N		12 (0.47)	12 (0.47)	12 (0.47)	16 (0.63)	16 (0.63)	16 (0.63)	12 (0.47)	16 (0.63)
G		25 (0.98)	27 (1.06)	25.4 (1.00)	28.5 (1.12)	25 (0.98)	27 (1.06)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	78	100	90	125	100	128	140	178
	lb	171.99	220.50	198.45	275.63	220.50	282.24	308.70	392.49

(Note 1) Integral weight is the same as Remote
(Note 2) In case of with indicator, add 0.2kg
(Note 3) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

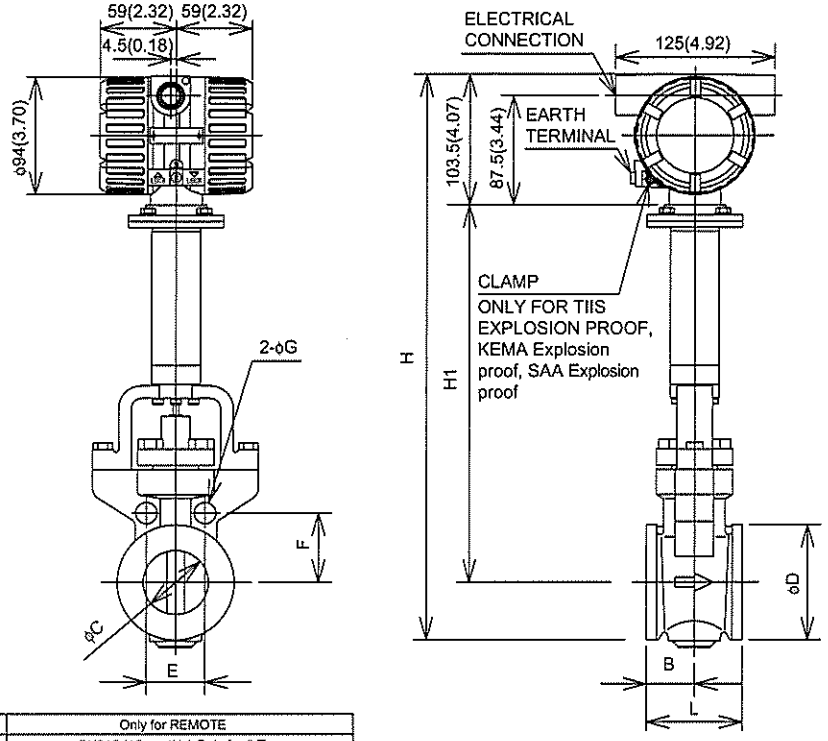
F090603.EPS

■ **High Process Temperature Version (/HT): 25mm up to 100mm**

■ **Cryogenic Version (/LT): 15mm up to 100mm**

■ **Wafer type**

Unit: mm
(approx. inch)



TYPE	Only for REMOTE						
CODE	DY015 (15mm,½in) Only for /LT						
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4
L	70 (2.76)						
B	35 (1.38)						
C	14.6 (0.57)						
D	35.1 (1.38)						
H	391 (15.39)						
H1	270 (10.63)						
E	49.5 (1.95)	49.5 (1.95)	56.6 (2.23)	42.7 (1.68)	47.1 (1.85)	47.1 (1.85)	46 (1.81)
F	24.7 (0.97)	24.7 (0.97)	28.3 (1.11)	21.4 (0.84)	23.5 (0.93)	23.5 (0.93)	23 (0.91)
G	13 (0.51)	13 (0.51)	17 (0.67)	14 (0.55)	14 (0.55)	14 (0.55)	13 (0.51)
WEIGHT kg	3.2 (7.06lb)						

TYPE	Only for REMOTE																							
CODE	DY025 (25mm,1in) /LT, /HT							DY040 (40mm,1½in) /LT, /HT							DY050 (50mm,2in) /LT, /HT							
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	
L	70 (2.76)							70 (2.76)							75 (2.95)							
B	35 (1.38)							35 (1.38)							37.5 (1.48)							
C	25.7 (1.01)							39.7 (1.56)							51.1 (2.01)							
D	50.8 (2.00)							73 (2.87)							92 (3.62)							
H	401 (15.79)							419 (16.50)							450.5 (17.74)							
H1	272 (10.71)							279 (10.98)							301 (11.85)							
E	63.6 (2.50)	63.6 (2.50)	67.2 (2.65)	56 (2.20)	62.9 (2.48)	62.9 (2.48)	60.1 (2.37)	74.2 (2.92)	74.2 (2.92)	84.9 (3.34)	69.7 (2.74)	80.8 (3.18)	80.8 (3.18)	77.8 (3.06)	(Note 1)	45.9 (1.81)	49.8 (1.96)	(Note 1)	46.6 (1.91)	46.6 (1.91)	(Note 1)	
F	31.8 (1.25)	31.8 (1.25)	33.6 (1.32)	28 (1.10)	31.4 (1.24)	31.4 (1.24)	30.1 (1.19)	37.1 (1.46)	37.1 (1.46)	42.4 (1.67)	34.8 (1.37)	40.4 (1.59)	40.4 (1.59)	38.9 (1.53)	(Note 1)	55.4 (2.18)	60.1 (2.37)	(Note 1)	58.7 (2.31)	58.7 (2.31)	(Note 1)	
G	17 (0.67)	17 (0.67)	17 (0.67)	14 (0.55)	17 (0.67)	17 (0.67)	13 (0.51)	17 (0.67)	17 (0.67)	21 (0.83)	14 (0.55)	20 (0.79)	20 (0.79)	17 (0.67)	(Note 1)	17 (0.67)	17 (0.67)	(Note 1)	17 (0.67)	17 (0.67)	(Note 1)	
WEIGHT kg	4.1 (9.04lb)							4.7 (10.36lb)							6.4 (14.11lb)							

TYPE	Only for REMOTE															
CODE	DY080 (80mm,3in) /LT, /HT								DY100 (100mm,4in) /LT, /HT							
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4
L	100 (3.94)								120 (4.72)							
B	40 (1.57)								50 (1.97)							
C	71 (2.80)								93.8 (3.69)							
D	127 (5.00)								157.2 (6.19)							
H	485 (19.09)								515 (20.28)							
H1	318 (12.52)								333 (13.11)							
E	57.4 (2.26)	61.2 (2.41)	65.1 (2.56)	(Note 1)	64.4 (2.54)	64.4 (2.54)	61.2 (2.41)	61.2 (2.41)	67 (2.64)	70.8 (2.79)	78.5 (3.09)	72.9 (2.87)	76.6 (3.02)	82.6 (3.25)	68.9 (2.71)	72.7 (2.86)
F	69.3 (2.73)	73.9 (2.91)	78.5 (3.09)	(Note 1)	77.7 (3.06)	77.7 (3.06)	73.9 (2.91)	73.9 (2.91)	80.8 (3.18)	85.5 (3.37)	94.7 (3.73)	88 (3.46)	92.5 (3.64)	99.7 (3.93)	83.1 (3.27)	87.8 (3.46)
G	17 (0.67)	21 (0.83)	21 (0.83)	(Note 1)	20 (0.79)	20 (0.79)	17 (0.67)	17 (0.67)	17 (0.67)	21 (0.83)	23 (0.91)	17 (0.67)	20 (0.79)	23 (0.91)	17 (0.67)	21 (0.83)
WEIGHT kg	9.8 (21.61lb)								13.2 (29.11lb)							

(Note 1) The hole is not provided.
(Note 2) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

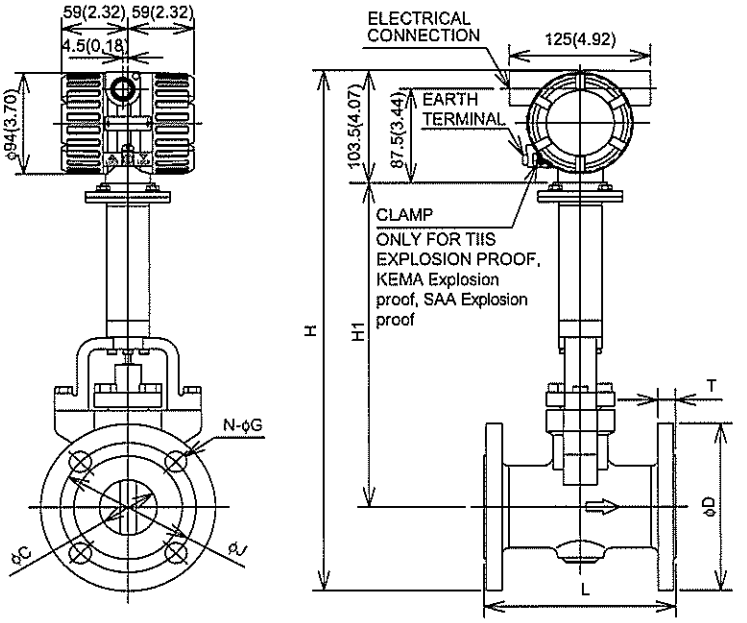
F000604.EPS

■ **High Process Temperature Version (/HT): 25mm up to 100mm**

■ **Cryogenic Version (/LT): 15mm up to 100mm**

■ **Flange type**

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																			
CODE		DY015 (15mm,½in) Only for /LT										DY025 (25mm,2in) /LT, /HT									
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		130 (5.12)						160 (6.30)	130 (5.12)	140 (5.51)	160 (6.30)	150 (5.91)						190 (7.48)	150 (5.91)	170 (6.69)	190 (7.48)
C		14.6 (0.57)										25.7 (1.01)									
D		95 (3.74)	95 (3.74)	115 (4.53)	88.9 (3.50)	95.3 (3.75)	95.3 (3.75)	120.7 (4.75)	95 (3.74)	95.3 (3.75)	120.7 (4.75)	125 (4.92)	125 (4.92)	130 (5.12)	108 (4.25)	124 (4.88)	124 (4.88)	149.4 (5.88)	115 (4.53)	124 (4.88)	149.4 (5.88)
H		421 (16.57)	421 (16.57)	431 (16.97)	418 (16.46)	421 (16.57)	421 (16.57)	434 (17.09)	421 (16.57)	421 (16.57)	434 (17.09)	438 (17.24)	438 (17.24)	441 (17.36)	430 (16.93)	438 (17.24)	438 (17.24)	450 (17.72)	433 (17.05)	438 (17.24)	450 (17.18)
H1		270 (10.63)										272 (10.71)									
T		12 (0.47)	14 (0.55)	20 (0.79)	11.2 (0.44)	14.2 (0.56)	21 (0.83)	28.8 (1.13)	16 (0.63)	19.9 (0.78)	28.8 (1.13)	14 (0.55)	16 (0.63)	22 (0.87)	14.2 (0.56)	17.5 (0.69)	24 (0.94)	34.9 (1.37)	18 (0.71)	24 (0.94)	34.9 (1.37)
J		70 (2.76)	70 (2.76)	80 (3.15)	60.5 (2.38)	66.5 (2.62)	66.5 (2.62)	82.6 (2.25)	65 (2.56)	66.5 (2.62)	82.6 (2.25)	90 (3.54)	90 (3.54)	95 (3.74)	79.2 (3.12)	89 (3.50)	89 (3.50)	101.6 (4.00)	85 (3.35)	89 (3.50)	101.6 (4.00)
N		4 (0.16)										4 (0.16)									
G		15 (0.59)	15 (0.59)	19 (0.75)	15.7 (0.62)	15.7 (0.62)	15.7 (0.62)	22.4 (0.88)	14 (0.55)	15.7 (0.62)	22.4 (0.88)	19 (0.75)	19 (0.75)	19 (0.75)	15.7 (0.62)	19 (0.75)	19 (0.75)	25.4 (1.00)	14 (0.55)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	4.6	4.7	6.3	4.5	4.7	5.0	7.1	4.6	4.9	7.2	7.3	7.5	9.0	7.0	7.6	8.1	11.5	7.3	8.3	11.6
	lb	10.14	10.36	13.89	9.92	10.36	11.03	15.66	10.14	10.80	15.88	16.10	16.54	19.85	15.44	16.76	17.86	25.36	16.10	18.30	26.02

TYPE		INTEGRAL/REMOTE																			
CODE		DY040 (40mm,1½in) /LT, /HT										DY050 (50mm,2in) /LT, /HT									
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		150 (5.91)						200 (7.87)	150 (5.91)	185 (7.28)	200 (7.87)	170 (6.69)						230 (9.06)	170 (6.69)	205 (8.07)	230 (9.06)
C		39.7 (1.56)										51.1 (2.01)									
D		140 (5.51)	140 (5.51)	160 (6.30)	127 (5.00)	155.4 (6.12)	155.4 (6.12)	177.8 (7.00)	150 (5.91)	155.4 (6.12)	177.8 (7.00)	155 (6.10)	155 (6.10)	165 (6.50)	152.4 (6.00)	165.1 (6.50)	165.1 (6.50)	215.9 (8.50)	165 (6.50)	165.1 (6.50)	215.9 (8.50)
H		453 (17.83)	453 (17.83)	463 (18.23)	446 (17.56)	460 (18.11)	460 (18.11)	472 (18.58)	459 (18.03)	460 (19.11)	472 (18.58)	482 (18.98)	482 (18.98)	487 (19.17)	481 (18.94)	487 (19.17)	487 (19.17)	513 (20.20)	487 (19.17)	487 (19.17)	513 (20.20)
H1		279 (10.98)										301 (11.85)									
T		16 (0.63)	18 (0.71)	26 (1.02)	17.5 (0.69)	20.6 (0.81)	28.8 (1.13)	38.2 (1.50)	18 (0.71)	28.8 (1.13)	38.2 (1.50)	16 (0.63)	18 (0.71)	26 (1.02)	19.1 (0.75)	22.4 (0.88)	31.8 (1.25)	44.5 (1.75)	20 (0.79)	33.3 (1.31)	46 (1.81)
J		105 (4.13)	105 (4.13)	120 (4.72)	98.6 (3.88)	114.3 (4.50)	114.3 (4.50)	124 (4.88)	110 (4.33)	114.3 (4.50)	124 (4.88)	120 (4.72)	120 (4.72)	130 (5.12)	120.7 (4.75)	127 (5.00)	127 (5.00)	165.1 (6.50)	125 (4.92)	127 (5.00)	165.1 (6.50)
N		4 (0.16)										4 (0.16)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)
G		19 (0.75)	19 (0.75)	23 (0.91)	15.7 (0.62)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	16 (0.71)	22.4 (0.88)	28.4 (1.12)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	25.4 (1.00)	18 (0.71)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	8.6	8.8	12.3	8.5	9.7	11.7	16.6	9.2	12.1	16.7	11.5	12.0	14.7	12.1	13.6	15.2	26.9	11.7	16.2	27.3
	lb	18.96	19.40	27.12	18.74	21.39	25.80	36.60	20.29	26.68	36.82	25.36	26.46	32.42	26.68	29.99	33.52	59.32	25.80	35.72	60.20

TYPE		INTEGRAL/REMOTE																					
CODE		DY080 (80mm,3in) /LT, /HT											DY100 (100mm,4in) /LT, /HT										
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5
L		200 (7.87)						245 (9.65)	200 (7.87)		235 (9.25)	250 (9.84)	220 (8.66)					240 (9.45)	280 (11.02)	220 (8.66)		270 (10.63)	285 (11.22)
C		71 (2.80)											93.8 (3.69)										
D		185 (7.28)	200 (7.87)	210 (8.27)	190.5 (7.50)	209.6 (8.25)	209.6 (8.25)	241.3 (9.50)	200 (7.87)	200 (7.87)	209.6 (8.25)	241.3 (9.50)	210 (8.27)	225 (8.86)	250 (9.84)	228.6 (9.00)	254 (10.00)	273 (10.75)	292.1 (11.50)	220 (8.66)	235 (9.25)	273 (10.75)	292.1 (11.50)
H		514 (20.24)	522 (20.55)	527 (20.75)	517 (20.35)	527 (20.75)	527 (20.75)	542 (21.34)	522 (20.55)	522 (20.55)	527 (20.75)	542 (21.34)	542 (21.34)	549 (21.61)	562 (22.13)	552 (21.73)	564 (22.20)	573 (22.56)	583 (22.95)	547 (21.54)	554 (21.81)	573 (22.56)	583 (22.95)
H1		318 (12.52)											333 (13.11)										
T		16 (0.71)	22 (0.87)	32 (1.26)	23.9 (0.94)	28.4 (1.12)	38.2 (1.50)	44.5 (1.75)	20 (0.79)	24 (0.94)	39.7 (1.56)	46 (1.81)	18 (0.71)	24 (0.94)	36 (1.42)	23.9 (0.94)	31.8 (1.25)	44.5 (1.75)	50.9 (2.00)	20 (0.79)	24 (0.94)	46 (1.81)	52.4 (2.06)
J		150 (5.91)	160 (6.30)	170 (6.69)	152.4 (6.00)	168.2 (6.62)	168.2 (6.61)	190.5 (7.50)	160 (6.30)	160 (6.30)	170 (6.69)	180 (7.09)	175 (6.89)	185 (7.28)	205 (8.07)	190.5 (7.50)	200.2 (7.88)	216 (8.50)	235 (9.25)	180 (7.09)	190 (7.48)	216 (8.50)	235 (9.25)
N		8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	6 (0.31)	8 (0.31)										
G		19 (0.75)	23 (0.91)	23 (0.91)	19 (0.75)	22.4 (0.88)	22.4 (0.88)	25.4 (1.00)	18 (0.71)	18 (0.71)	22.4 (0.88)	25.4 (1.00)	19 (0.75)	23 (0.91)	25 (0.98)	19 (0.75)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	18 (0.71)	22 (0.87)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	17.8	20.4	25.8	20.4	24.2	25.8	36.1	19.8	20.4	27.5	36.7	23.2	27.2	38.5	27.7	36.3	51.2	58.3	23.6	27.8	53.2	57.0
	lb	39.25	44.98	56.89	44.98	53.36	56.89	79.60	43.66	44.98	60.64	80.92	51.16	59.96	84.89	61.30	80.04	112.90	124.14	52.04	61.30	117.31	125.66

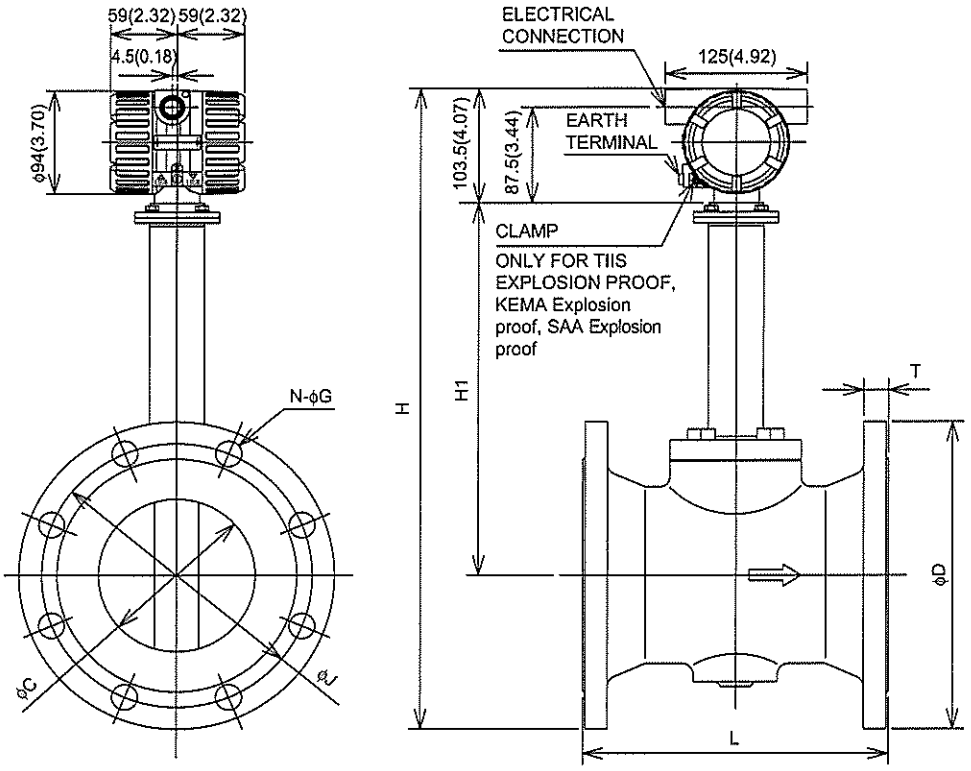
(Note 1) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

F060005.EPS

■ **High Process Temperature Version (/HT): 150mm up to 200mm**

■ **Flange type**

Unit: mm
(approx. inch)



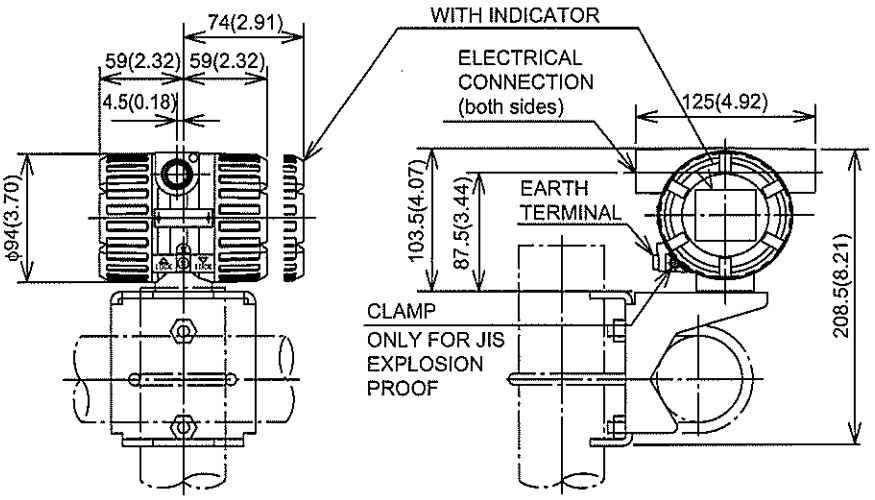
TYPE		INTEGRAL/REMOTE																					
CODE		DY150 (150mm,6in) / HT											DY200 (200mm,8in) / HT										
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1	BD2	BD3	BD4	CA4	CA5
L		270 (10.63)					310 (12.20)	336 (13.23)	270 (10.63)		325 (12.80)	340 (13.39)	310 (12.20)				370 (14.57)	386 (15.20)	310 (12.20)				375 (14.77)	390 (15.35)
C		138.8 (5.46)											185.6 (7.31)											
D		280 (11.02)	305 (12.01)	355 (13.98)	279.4 (11.00)	317.5 (12.50)	356 (14.02)	381 (15.00)	285 (11.22)	300 (11.81)	356 (14.02)	381 (15.00)	330 (12.99)	350 (13.78)	342.9 (13.50)	381 (15.00)	419.1 (16.50)	469.9 (18.50)	340 (13.39)	340 (13.39)	360 (14.17)	375 (14.76)	419.1 (16.50)	469.9 (18.50)
H		583 (22.95)	595 (23.43)	620 (24.41)	582 (22.91)	601 (23.66)	621 (24.45)	633 (24.92)	585 (23.03)	593 (23.35)	621 (24.45)	633 (24.92)	640 (25.20)	650 (25.59)	646 (25.43)	665 (26.18)	684 (26.93)	709 (27.91)	645 (25.39)	645 (25.39)	655 (25.79)	662 (26.06)	684 (26.93)	709 (27.91)
H1		339 (13.35)											371 (14.61)											
T		22 (0.87)	28 (1.10)	44 (1.73)	25.4 (1.00)	36.6 (1.44)	54.4 (2.14)	62 (2.44)	22 (0.87)	28 (1.10)	55.7 (2.19)	63.6 (2.50)	22 (0.87)	30 (1.18)	28.4 (1.12)	41.1 (1.62)	62 (2.44)	69.9 (2.75)	24 (0.95)	24 (0.95)	30 (1.18)	34 (1.34)	63.6 (2.50)	71.4 (2.81)
J		240 (9.45)	260 (10.24)	295 (11.61)	241.3 (9.50)	269.7 (10.62)	292 (11.50)	317.5 (12.50)	240 (9.45)	250 (9.84)	292 (11.50)	317.5 (12.50)	290 (11.42)	305 (12.01)	298.5 (11.75)	330.2 (13.00)	349.3 (13.75)	393.7 (15.50)	295 (11.61)	295 (11.61)	310 (12.20)	320 (12.60)	349.3 (13.75)	393.7 (15.50)
N		8 (0.31)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)
G		23 (0.91)	25 (0.98)	33 (1.30)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	31.8 (1.25)	22 (0.87)	26 (1.02)	28.4 (1.12)	31.8 (1.25)	23 (0.91)	25 (0.98)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	38.1 (1.50)	22 (0.87)	22 (0.87)	26 (1.02)	30 (1.18)	31.8 (1.25)	38.1 (1.50)
WEIGHT	kg	33.4	43.4	76.4	36.4	54.4	84.4	106	33.4	42.9	90	107	45.4	52.4	55.4	80.4	136	182	46.3	46.3	53.6	55.9	139	183
	lb	73.65	95.70	168.46	80.26	119.95	186.10	233.73	73.65	94.59	198.45	235.94	100.11	115.54	122.16	177.28	299.88	401.31	102.09	102.09	118.19	123.26	306.50	403.52

(Note 1) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

F020608.EPS

■ **Remote Type Converter (DYA)**

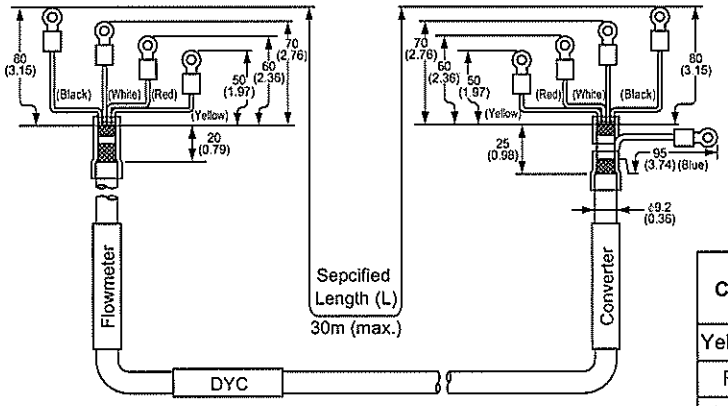
Unit: mm
(approx. inch)



Weight: 1.9 kgf (4.19lb)
Note: For flowmeters with indicator, add 0.2 kg.(0.44lb)

F090607.EPS

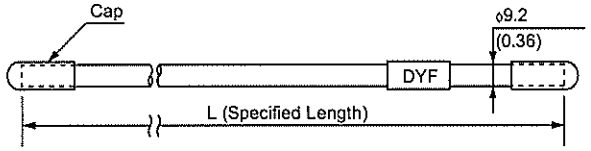
■ **Signal Cable for Remote Type (DYC)**



Cable Color and Terminal

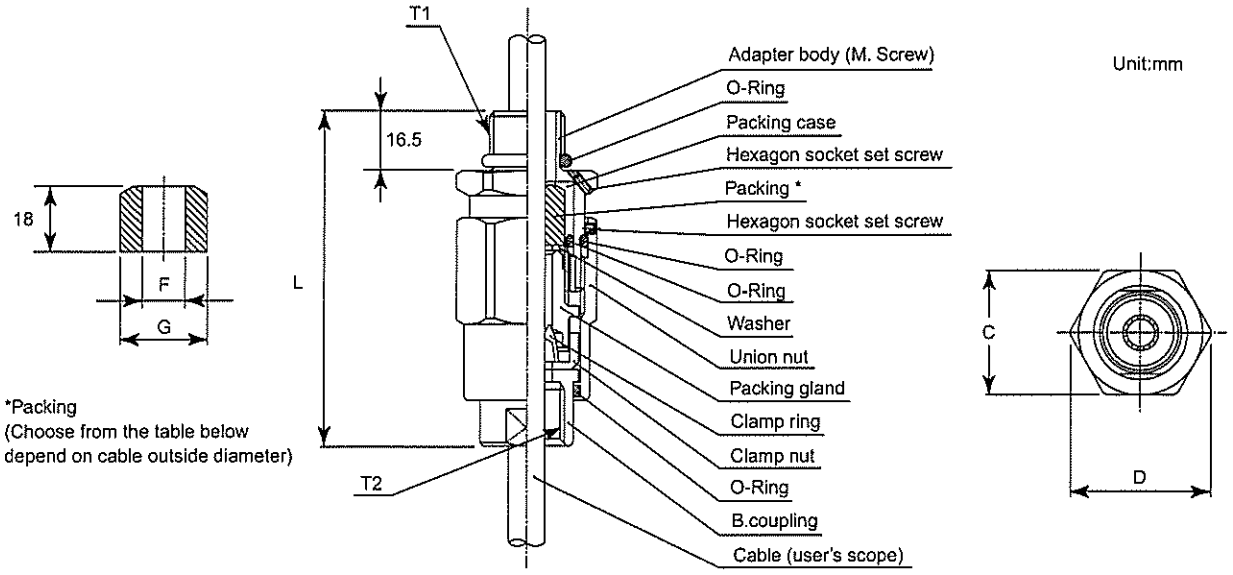
Color	Terminal	
	Flowmeter	Converter
Yellow(*1)	T	T
Red	A	A
White	B	B
Black	⏚	C
Blue		⏚

(*1) Only for /MV



F090608.EPS

■ **Flameproof Packing Adapter (Option code /G11,/G12)**



Unit:mm

Size					Cable outer diameter	Packing dimensions		Identification mark	Weight (kg)
T1	T2	C	D	L		F	G		
G 1/2	G 1/2	35	39	94.5	ϕ8 to ϕ10	ϕ10.0	ϕ20.0	16 8-10	0.26
					ϕ10 to ϕ12	ϕ12.0		16 10-12	

F090609.EPS

10. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described except JIS Flame proof. For explosion proof type instrument, the description in this chapter is prior to other description in this Instruction Manual.

WARNING

- Only trained persons use this instrument in industrial locations.

10.1 CENELEC ATEX (KEMA)

WARNING

Only trained persons use this instrument in industrial locations.

10.1.1 Technical Data

• Explosion proof

Applicable Standard : EN50014: 1997, EN50018: 2000
EN60529: 1991
Certificate : KEMA 01ATEX2072
Type of protection: EEx d IIC T6...T1 (Integral Type Flowmeter and Remote Type Flowmeter)
EEx d IIC T6 (Remote Type Converter)
Groups: Group II
Category: Category 2G
Temperature Code: (Integral Type Flowmeter and Remote Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T6	+60°C	85°C
T5	+60°C	100°C
T4	+60°C	135°C
T3	+60°C	200°C
T2 *1	+60°C	300°C
T1 *1	+60°C	450°C

T100101-1.eps

*1 Note: Use /HT version above 260°C

Temperature Class: T6 (Remote Type Converter)
Degree of Protection of Enclosure: IP67
Tamb: -29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter)
-30 to +60°C (Remote Type Converter)
-29 to +60°C (Integral Type Flowmeter with indicator)
-30 to +60°C (Remote Type Converter with indicator)
Ambient Humidity: 0 to 100%RH
Power Supply: 42Vdc max.
Output Signal: Current Output; 4 to 20mAdc
Pulse output; On=2Vdc, 200mA
Off=42Vdc, 4mA
Maximum Working Pressure: 16MPa(DY015 to DY200)
5MPa(DY200 and DY300)
Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating
Electrical Connection: ANSI 1/2 NPT female,
ISO M20 X 1.5 female

• Intrinsically Safe

Applicable Standard : EN50014: 1997, EN50020: 1994
EN60529: 1991
Certificate : KEMA 01ATEX1082X
Type of protection: EEx ia IIC T4...T1 (Integral Type Flowmeter and Remote Type Flowmeter)
EEx d IIC T4 (Remote Type Converter)
Groups: Group II
Category: Category 1G
Maximum Working Pressure: 16MPa (DY015 to DY200)
5MPa (DY250 and DY300)
Tamb. (Integral Type Flowmeter): -29 to +60°C
Tamb. (Remote Type Flowmeter): -29 to +80°C
Tamb. (Remote Type Converter): -40 to +60°C
Ambient Humidity: 0 to 100%RH (No condensation)
(Integral Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	60°C	≦135°C
T3	60°C	≦200°C
T2*	60°C	≦300°C
T1*	60°C	≦450°C

T100101-2.eps

*: Use /HT version above 260°C

(Remote Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	80°C	≦135°C
T3	80°C	≦200°C
T2*	80°C	≦300°C
T1*	80°C	≦450°C

T100101-3.eps

*: Use /HT version above 260°C

For connection to certified Intrinsically Safe circuit with Signal/Supply and Pulse circuit of DY(/HT) and DYA :
Ui =30V dc, Ii=165mAdc, Pi= 0.9W, Ci= 6nF, Li= 0.15mH

Connect sensor circuit of DYA to DY-N(/HT) :
Maximum cable capacitance: 160nF
Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

• Type of Protection "n"

Applicable Standard: EN50014: 1997, EN50021, EN60529
Type of protection: EEx nL IIC T4...T1 (Integral Type Flowmeter and Remote Type Flowmeter)
EEx nL IIC T4 (Remote Type Converter)
Groups: Group II
Category: Category 3G
Maximum Working Pressure: 42MPa
Tamb. (Integral Type Flowmeter): -29 to +60°C
Tamb. (Remote Type Flowmeter): -29 to +80°C
Tamb. (Remote Type Converter): -40 to +60°C
Ambient Humidity: 0 to 100%RH (No condensation)
(Integral Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	60°C	≦135°C
T3	60°C	≦200°C
T2*	60°C	≦300°C
T1*	60°C	≦450°C

T100101-4.eps

*: Use /HT version above 260°C

(Remote Type Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	80°C	≦135°C
T3	80°C	≦200°C
T2*	80°C	≦300°C
T1*	80°C	≦450°C

T100101-5.eps

*: Use /HT version above 260°C

Degree of protection of enclosure: IP67
Electrical data
Signal/Supply and Pulse circuit
Ui= 30Vdc, Ci= 6nF, Li= 0.15mH
Sensor circuit only for connection to DY-N(/HT) series
Maximum capacitance of cable: 160nF
Connect to DYA series only
Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

10.1.2 Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- Suitable heat-resisting cables shall be used for the digitalYEWFLO Model DY Series Vortex Flowmeter when the ambient temperature exceeds +70°C and/or the process temperature exceeds 135°C.
- The cable entry devices shall be certified in type of protection flame proof enclosure "d" and suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with certified blanking elements in type of protection flame proof enclose "d".

10.1.3 Operation

WARNING

- Wait 10 min. after power is turned off, before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

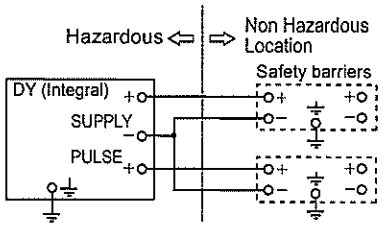
10.1.4 Maintenance and Repair

WARNING

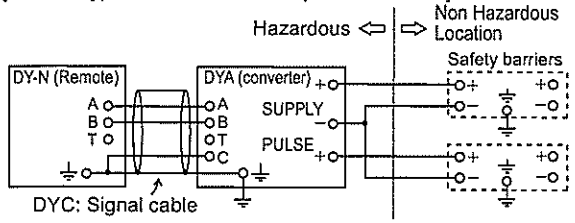
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

10.1.5 Installation Diagram of Intrinsically safe (and Note)

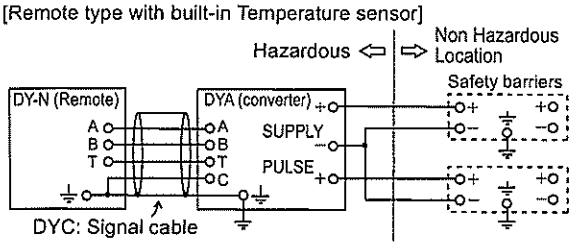
[Integral type]



[Remote type without built-in Temperature sensor]



[Remote type with built-in Temperature sensor]



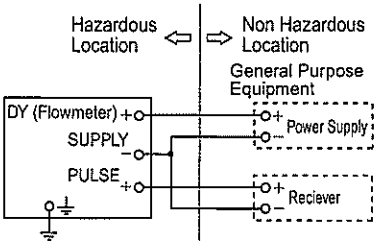
Note: In any safety barrier used output current must be limited by a resistor 'R' such that Io=Uo/R

Electric data:
Supply and Output Circuit (SUPPLY + and −, PULSE+ and −)
Maximum Input Voltage Ui: 30V
Maximum Input Current Ii: 165mA
Maximum Input Power Pi: 0.9W
Internal Capacitance Ci: 6nF
Internal Inductance Li: 0.15mH

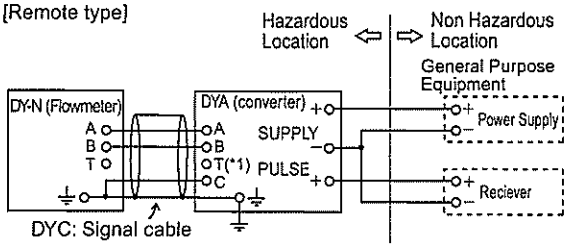
F100101.EPS

10.1.6 Installation Diagram of Type of Protection "n"

[Integral type]



[Remote type]



(*1): Wire for T termanal
With temperature sensor type: Installed
Without temperature sensor type: Not Installed

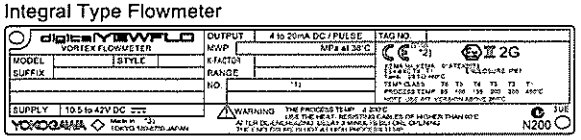
Electric data:
Maximum Input Voltage Ui: 30V
Internal Capacitance Ci: 6nF
Internal Inductance Li: 0.15mH

F100101-1.EPS

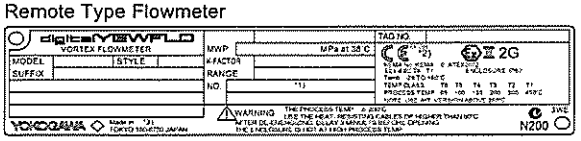
10.1.7 Data Plate

Explosion Proof

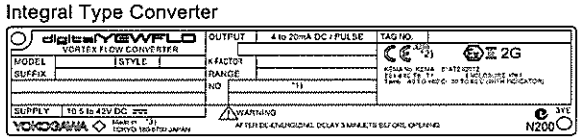
Integral Type Flowmeter



Remote Type Flowmeter

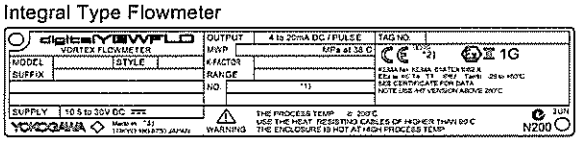


Integral Type Converter

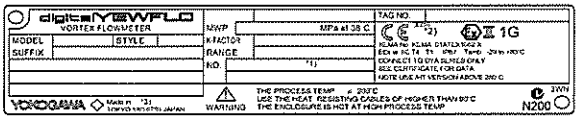


Intrinsically safe

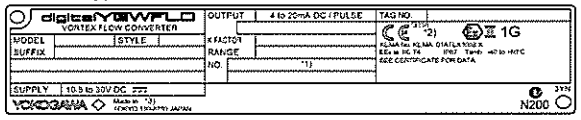
Integral Type Flowmeter



Remote Type Flowmeter



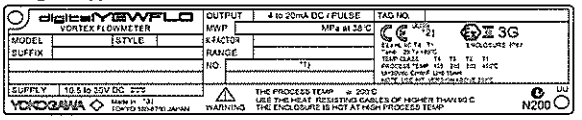
Remote Type Converter



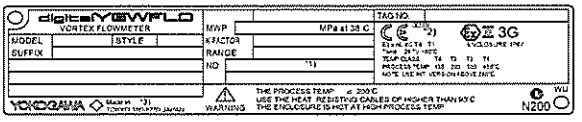
F100102.EPS

Type of Protection "n"

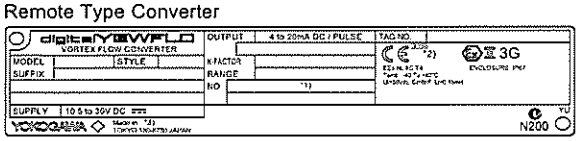
Integral Type Flowmeter



Remote Type Flowmeter



Remote Type Converter



F100102-1.EPS

MODEL SUFFIX : Specified model code
STYLE : Specified style code.
MWP : Maximum working pressure of apparatus.
K-FACTOR : Sensor constant number of apparatus.
RANGE : Meter range.
No. : Serial number.
TAG. No. : Tag number of apparatus.
YOKOGAWA ◇ Made in *3) TOKYO 180-8750 JAPAN : Name and address of manufacturer.
CE : CE-Marking.
II 2G : GroupII, Category 2 Gas atmosphere.
KEMA No. : Certificate number.
KEMA 01ATEX2072 for EEx d
KEMA 01ATEX1082X for EEx ia
EEx d IIC T6...T1 : Type of protection and temperature class.
Tamb : Ambient temperature.
PROCESS TEMP. : Process temperature.
ENCLOSURE : Enclosure protection No.
NOTE : Note about model, suffix code "/HT"

*1) The third figure from the last shows the last one figure of the year production.
For example, the year of production of the product engraved as follow is year 2001.
No. 2 1 W C Z Z 0 5 2 1 2 0
↑
Produced in 2001
*2) The identification number of the notified body. : 0344
*3) The product - producing country.

F100102-2.EPS

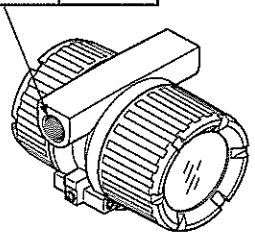
IMPORTANT

- In hazardous location, BT200 BRAIN Terminal can not be connected to the digitalYEWFLO which is approved by CENELEC (KEMA) Intrinsically Safe. (See the IM 1C0A11-01E).

10.1.8 Screw Marking

The type of electrical connection is stamped near the electrical connection port according to the following codes.

SCREW SIZE	MARKING
M20 X 1.5	⚠ M
1/2-14NPT	⚠ A



F100103.EPS

10.2 FM

10.2.1 Technical Data

• **Explosion Proof**

Applicable Standard: FM3600, FM3611, FM3615, FM3810, Including Suppliment 1 ANSI/NEMA 250

Type of Protection: Explosionproof for Class I, Division 1, Groups A,B, C and D; Dust-ignition proof for Class II/III, Division 1, Groups E, F,and G.

"SEAL ALL CONDUITS 18 INCHES." " WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED"

Enclosure Rating: NEMA TYPE 4X

Temperature Code: T6

Ambient Temperature: -29 to 60°C (Integral Type Flowmeter and Remote Type Flowmeter)
-40 to 60°C (Remote Type Converter)

Ambient Humidity: 0 to 100%RH

Power Supply: 42Vdc max. (Integral Type Flowmeter and Remote Type Converter)

Output Signal (Integral Type Flowmeter):
Current Output; 4 to 20mAdc
Pulse Output; On=2Vdc, 200mA
Off=42Vdc, 4mA

Output Signal (Remote Type Flowmeter):
Output Signal to Converter; 30Vp-p, 100μAp-p

Input/Output Signal (Remote Type Converter):
Current Output; 4 to 20mAdc
Pulse Output; On=2Vdc, 200mA
Off=42Vdc, 4mA
Input Signal from Flowmeter; 30Vp-p, 100μAp-p

Maximum Working Pressure: 15MPa (2160psi) (DY015 to DY200)
5MPa (720psi) (DY250 and DY300)

Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating.

• **Intrinsically Safe**

Applicable Standard: FM3600, FM3610, FM3611, FM3810, Including Suppliment 1 ANSI/NEMA 250

Type of Protection: Intrinsically safe for Class I, II, III, Div.1, Groups A, B, C, D, E, F and G,T4 and Class I, Zone 0, AEx ia IIC T4
Nonincendive for Class I, II, Div. 2, Groups A, B, C, D, F and G, Class III, Div.1, T4, and Class I, Zone 2, Group IIC, T4

Ambient Temperature: –29 to +60°C (Integral Type Flowmeter)
–29 to +80°C (Remote Type Flowmeter)
–40 to +80°C (Remote Type Converter)

Ambient Humidity: 0 to +100% RH (No condensation)

Indoors and Outdoors: NEMA Type 4X

Electrical Parameters:Vmax=30Vdc, Imax=165mAdc, Pi=0.9W, Ci=12nF, Li=0.15mH

Electrical connection : ANSI 1/2 NPT female

10.2.2 Wiring

• **Explosion proof**

⚠ WARNING

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- "SEAL ALL CONDUITS 18 INCHES" " WHEN INSTALLED DIV.2, SEALS NOT REQUIRED".

• **Intrinsically Safe**

⚠ WARNING

- The FM Approved Hand Held Communicator may be connected at any point in the loop between the digitalYEWFLO and the Control Equipment.

10.2.3 Operation

• **Explosion proof**

⚠ WARNING

- Note a warning label worded as follows.
  Warning: OPEN CIRCUIT BEFORE REMOVING COVER.
  INSTALL IN ACCORDANCE WITH THE INSTRUCTION MANUAL (IM) IF6A1-01E.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

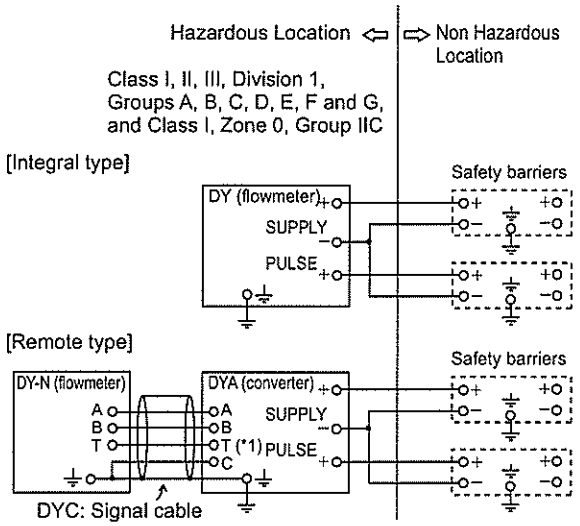
10.2.4 Maintenance and Repair

⚠ WARNING

- The instrument modification or part replacements by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of FM Approvals.

10.2.5 Installation Diagram

Intrinsically Safe (and WARNING)



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

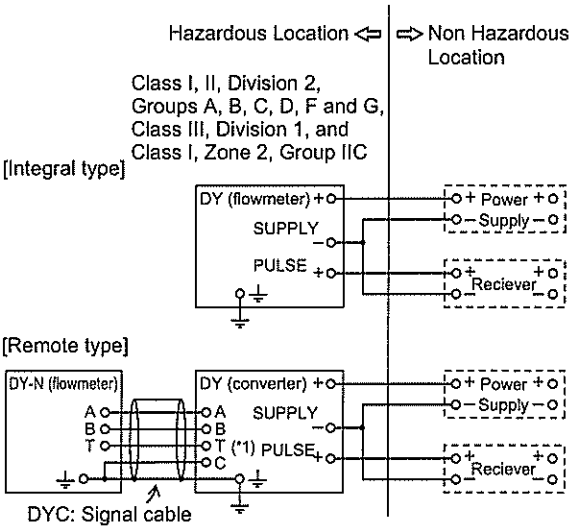
Electrical parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Vmax=30V Imax=165mA Pi=0.9W
Ci=12nF Li=0.15mH

Installation requirement between flowmeter, converter and Safety Barrier
Vt or Voc ≦ Vmax It or Isc ≦ Imax Po≦ Pi
Ca ≧ Ci+Ccable
La ≧ Li+Lcable
Vt, Voc, It, Isc, Voc, Ca and La are parameters of barrier.
F100201_1.EPS

WARNING

1. In any safety barrier used output current must be limited by a resistor 'R' such that Isc=Voc/R.
2. Any Single FM Approved Barrier of multiple barriers FM Approved for this configuration who's parameters meet the above installation requirements.
3. Input voltage of the safety barrier must be less than 250Vrms/Vdc.
4. Installation should be in accordance with National Electrical Code, ANSI /NFPA70.
5. Dust-tight conduit seal must be used when installed in class II and III environments.
6. Do not alter drawing without authorization from FM.

Nonincendive (and WARNING)



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Non-incendive field wire parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Vmax=30V Imax=165mA Pi=0.9W
Ci=12nF Li=0.15mH

Installation requirement between flowmeter, converter and general purpose equirement.
Vt or Voc ≦ Vmax It or Isc ≦ Imax Po ≦ Pi
Ca ≧ Ci+Ccable La ≦ Li+Lcable
Vt, Voc, It, Isc, Po, Ca and La are nonincendive field wire parameters of general purpose equipment.
F100201_2.EPS

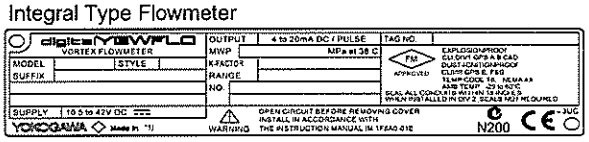
WARNING

1. The general purpose equipment must be FM approved with Nonincendive field wiring parameter which meet the above installation requirements.
2. Installation should be in accordance with National Electric Code, ANSI/NFPA70.
3. Dust-tight conduit seal must be used when installed in class II and III environments.
4. Do not alter drawing without authorization from FM.

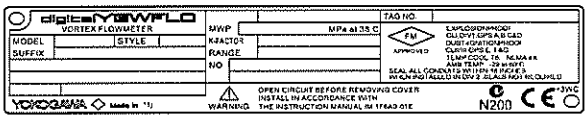
10.2.6 Data Plate

Explosion Proof

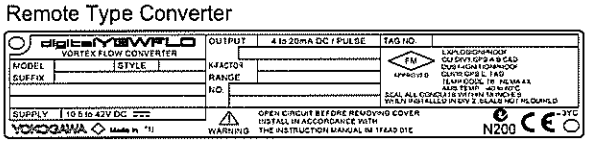
Integral Type Flowmeter



Remote Type Flowmeter

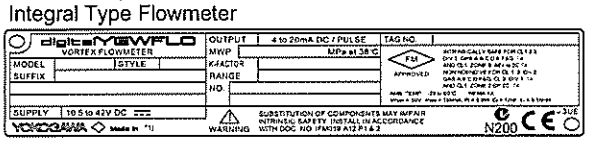


Remote Type Converter

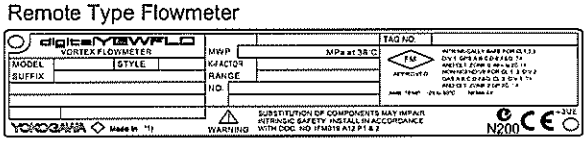


Intrinsically safe

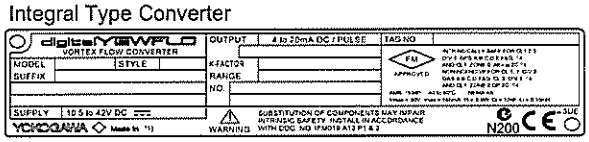
Integral Type Flowmeter



Remote Type Flowmeter



Integral Type Converter



F100202.EPS

YOKOGAWA ◇ Made in *1) TOKYO 180-8750 JAPAN : Name and address of manufacturer.

*1) The product - producing country.

10.3 SAA

WARNING

Only trained persons use this instrument in industrial locations.

10.3.1 Technical Data

• Flameproof

Applicable Standard: AS 2380.1-1989, AS2380.2-1991, AS1939-1990

Certificate : AUS Ex 3808X

Exd IIC T6....T1, IP67, Class I, Zone 1.

Ambient Temperature : -40 to +60°C

Max. Process Temp. : T6; 85°C, T5; 100°C, T4: 135°C, T3; 200°C, T2; 300°C, T1; 450°C

Electrical Connection : ANSI 1/2 NPT female, ISO M20 X 1.5 female

• Intrinsically Safe

Type n

Applicable Standard: AS 2380.1-1989, AS2380.7-1987, AS2380.9-1991

Certificate : AUS Ex 2611X

Type of Protection: Ex ia IIC T4 IP67 (Integral Type Flowmeter, Remote Type Flowmeter and Remote Type Converter)

Hazardous Area: Class I, Zone 0

Maximum Input Voltage (Ui)=30Vdc

Maximum Input Current (Ii)=165mAdc

Maximum Input Power (Pi)=0.9W

Internal Capacitance (Ci)=37nF

Internal Inductance (Li)=0mH

Ambient Temperature: -20 to +60°C

Type of Protection: Ex n IIC T4 IP67 (Integral Type Flowmeter, Remote Type Flowmeter and Remote Type Converter)

Hazardous Area: Class I, Zone 2

Maximum Input Voltage (Ui)=30Vdc

Ambient Temperature: -20°C to +80°C

Ambient Humidity: 0 to 100% RH (No condensation)

Electrical Connection : ANSI 1/2 NPT female, ISO M20X1.5 female.

10.3.2 Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- In hazardous locations, the cable entry devices shall be certified flame proof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements.

10.3.3 Operation

WARNING

- Open circuit before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

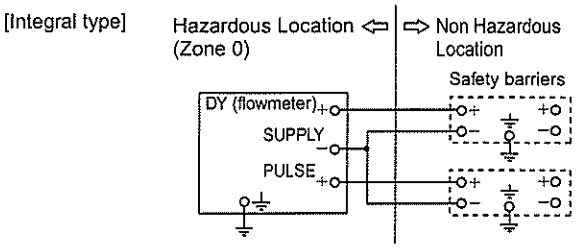
10.3.4 Maintenance and Repair

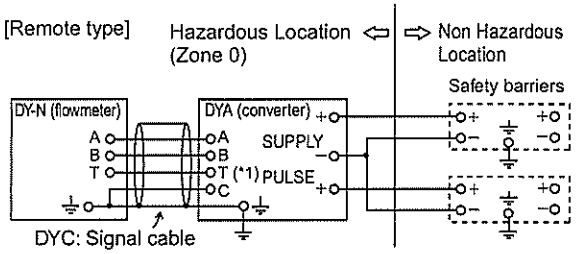
WARNING

- The instrument modification or parts replacements by other than authorized representative of Yokogawa Electric Corporation are prohibited and will void the certification.

10.3.5 Installation Diagram

Intrinsically Safe





(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Electrical parameters:
Ui=30V Ii=165mA Pi=0.9W
Ci=37nF Li=0mH

Installation Requirements between Flowmeter, Converter and Safety Barrieres:
Uo ≦ Ui Io ≦ Ii Po ≦ Pi Co ≧ Ci+Ccable
Lo ≧ Li+Lcable
Uo, Io, Co, and Lo are parameters of safety barrier.
Ccable and Lcable are the maximum allowable cable parameters.

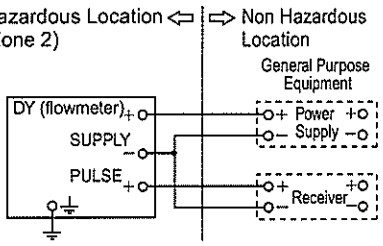
F100301_1.EPS

WARNING

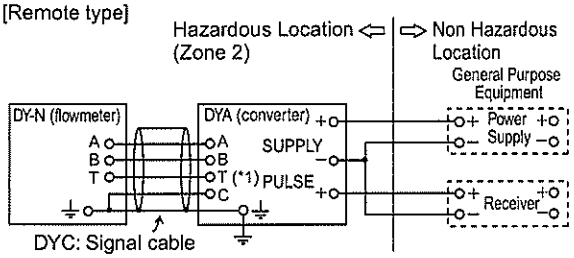
1. The safety barrier must be SAA certified.
2. Input voltage of the safety barrier must be less than 250Vrms/Vdc.
3. In any safety barriers used the output current must be limited by a resistor 'R' such that Io=Uo/R.

Type "n"

[Integral type]



[Remote type]



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

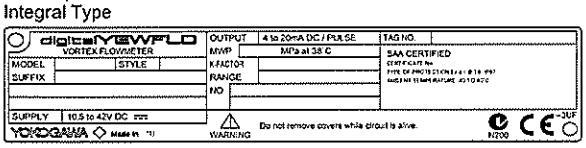
F100301_2.EPS

WARNING

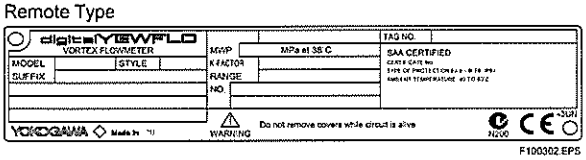
Output voltage of power supply must not exceed 30Vdc and will void the certification.

10.3.6 Data Plate

Flameproof
Integral Type



Remote Type



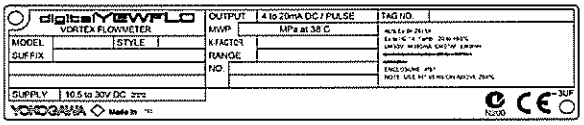
F100302.EPS

Intrinsically safe and Type "n"

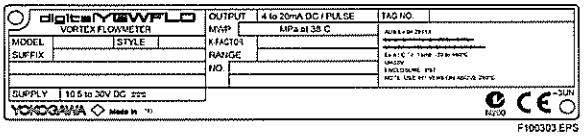
IMPORTANT

- The specifications of Intrinsically safe type and Type n are described (engraved) on these data plates. For use of SAA, select a specification either Intrinsically safe type (Ex ia) or Type n (Ex n), then **erase unnecessary specification at the customer side.**
  Once a specification has been selected, never it can be changed again. (ex. Never use the flowmeter as Type n if it has selected Intrinsically safe type firstly.)

Integral Type
*For Ex ia

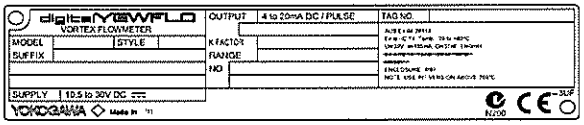


*For Ex "n"

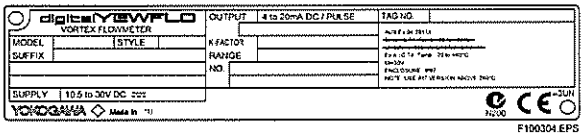


F100303.EPS

Remote Type Converter
*For Ex ia

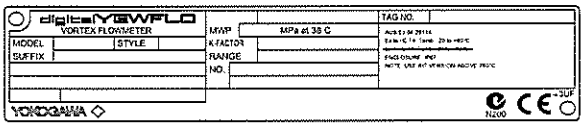


*For Ex "n"

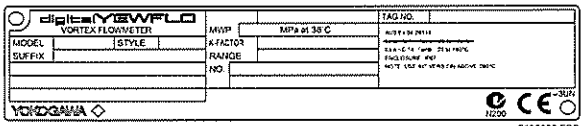


F100304.EPS

Remote Type Flowmeter
*For Ex ia



*For Ex "n"



F100305.EPS

YOKOGAWA ◇ : Name and address of manufacturer.

*1) The product - producing country

F100306.EPS

10.4 CSA

10.4.1 Technical Data

• Explosion Proof

Applicable Standard: For CSA C22.1
For CSA C22.2 Series:
C22.2 No 0, C22.2 No 0.4, C22.2 No 0.5, C22.2 No 25, C22.2 No 30, C22.2 No 94, C22.2 No 142, C22.2 No 1010.1

Certificate : 1166201

Type of Protection: Explosionproof for Class I, B, C and D; Class II, Groups E, F and G; Class III. For Class I, Division 2 locations - "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED."

Enclosure : Type 4X

(Integral Type Flowmeter and Remote Type Flowmeter)

Temperature Code	Ambient Temperature	Process Temperature
T6	60°C	85°C
T5	60°C	100°C
T4	60°C	135°C
T3	60°C	200°C
T2	60°C	300°C
T1	60°C	450°C

T100401_1.EPS

Temperature Code: T6 (Remote Type Converter)

Ambient Temperature: -29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter)
-40 to +60°C (Remote Type Converter)

Ambient Humidity: 0 to 100%RH

Power Supply: 42Vdc max. (Integral Type Flowmeter and Remote Type Converter)

Output Supply (Integral Type Flowmeter):
Current Output; 4 to 20mAdc
Pulse Output; on=2Vdc, 200mA
Off=42Vdc, 4mA

Output Signal (Remote Type Flowmeter):
Output Signal; 30Vp-p, 100μAp-p

Input/Output signal (Remote Type Converter):
CUrrent Output; 4 to 20mAdc
Pulse; On=2Vdc, 20mA
Off=42Vdc, 4mA
Input Signal; 30Vp-p, 100μAp-p

Maximum Working Pressure: 15MPa(2160psi)
(DY015 to DY200)
5MPa(720psi)
(DY200 and DY300)

Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating.

Electrical Connection: ANSI 1/2 female(Special)

• Intrinsically Safe

Applicable Standard: For CSA C22.1
For CSA C22.2 Series:
C22.2 No 0, C22.2 No 0.4, C22.2 No 0.5, C22.2 No 25, C22.2 No 30, C22.2 No 94, C22.2 No 142, C22.2 No 1010.1
CAN/CSA-E79 Series
E79-0-95, E79-11-95, E79-15-95

Certificate : 1198227

Type of Protection: Ex ia IIC T4...T1 and Ex nC IIC T4...T1 (Integral Type Flowmeter and Remote Type Flowmeter)
Ex ia IIC T4 and Ex nC IIC T4 (Remote Type Converter)

(Integral Type Flowmeter and Remote Type Flowmeter)

Temperature Code	Ambient Temperature	Process Temperature
T4	60°C	≦135°C
T3	60°C	≦200°C
T2	60°C	≦300°C
T1	60°C	≦450°C

T100401_2.EPS

Ambient Temperature: -29 to +60°C (Integral Type Flowmeter and Remote Type Flowmeter)
-40 to +60°C (Remote Type Converter)

Ambient Humidity: 0 to 100%RH(No Condensation)

Degree of Protection of Enclosure: IP67

Electrical Parameters: Ui=30Vdc, Ii=165mAdc, Pi=0.9W
Ci=12nF, Li=0.15mH

Electrical Connection: ANSI 1/2 NPT female

Type of Protection: Intrinsically Safe for Class I,II,III, Div.1, Groups A,B,C,D,E,F and G,
Non- incendive for Class I,II, DIV.2, Groups A,B,C,D,E,F and G, Class III, Div.1

(Integral Type Flowmeter and Remote Type Flowmeter)

Temperature Code	Ambient Temperature	Process Temperature
T4	60°C	≦135°C
T3	60°C	≦200°C
T2	60°C	≦300°C
T1	60°C	≦450°C

T100402.EPS

Temperature Code: T4 (Remote Type Converter)

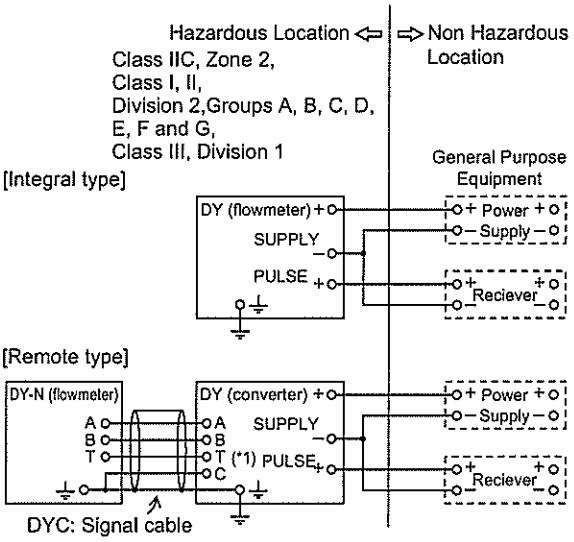
Ambient Temperature: -40 to 60°C

Ambient Humidity: 0 to 100%RH (No Condensation)

Enclosure: Type 4X

Electrical Parameters: Vmax=30Vdc, Imax=165mAdc, Pmax=0.9W, Ci=12nF, Li=0.15mH

Type "n" and Non-incendive



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Non-incendive field wire parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Ui (Vmax)=30 Ii (Imax)=165mA Pi (Pmax)=0.9W
Ci=12nF Li=0.15mH

Installation requirement between flowmeter, converter and general purpose equirement.
Uo ≦ Ui Io ≦ Ii Po ≦ Pi Co ≧ Ci+Ccable
Lo ≧ Li+Lcable
Voc ≦ Vmax Isc ≦ Imax Ca ≧ Ci+Ccable
La ≧ Li+Lcable

Uo, Io, Po, Co Voc, Isc, Ca and La are nonincendive field wire parameters of general purpose equipment.

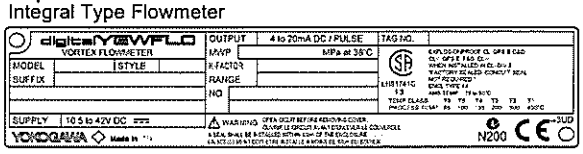
F100401_2.EPS

⚠ WARNING

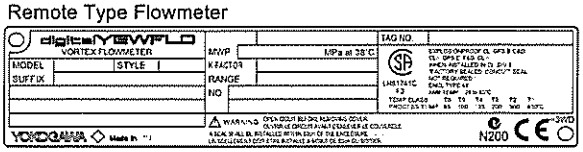
1. The general purpose equipment must be CSA certified as the equipment which have type n or non-incendive field wire parameters.
2. Installation should be in accordance with Canadian Electrical Code Part I.
5. Dust-tight conduit seal must be used when installed in class II and III environments.
6. Do not alter drawing without authorization from CSA.

10.4.6 Data Plate

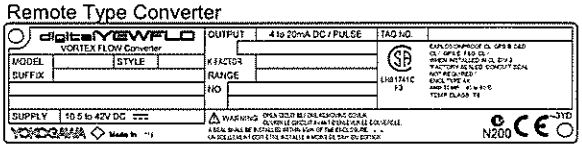
Explosion Proof
Integral Type Flowmeter



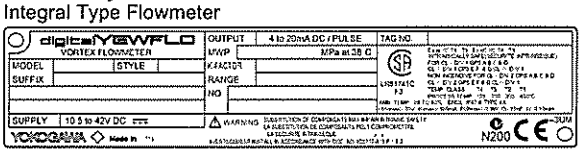
Remote Type Flowmeter



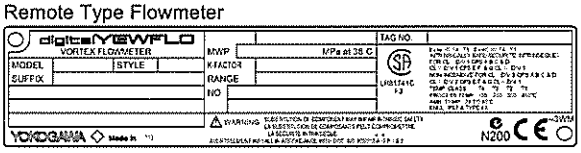
Remote Type Converter



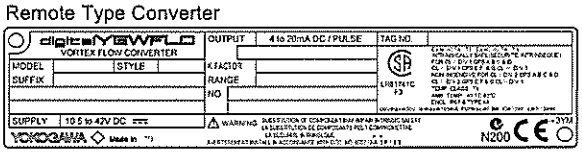
Intrinsically safe
Integral Type Flowmeter



Remote Type Flowmeter



Remote Type Converter



F100402.EPS

YOKOGAWA ◇ Name and address of manufacturer.

*1) The product - producing country.

10.5 TIIS

Certificate:

	Integral Type Flowmeter		Remote Flowtube
Size:mm (inch)	N (None Indicator)	D (With Indicator)	-N (Remote Flowtube)
15	C14901	C14912	C14923
25	C14902	C14913	C14924
40	C14903	C14914	C14925
50	C14904	C14915	C14926
80	C14905	C14916	C14927
100	C14906	C14917	C14928
150	C14907	C14918	C14929
200	C14908	C14919	C14930
250	C14909	C14920	C14931
300	C14910	C14921	C14932

T100403.EPS

	Integral Type Flowmeter		Remote Type Flowmeter	
	None Indicator	With Indicator	Detector	Converter
Construction	Ex d IIC T6	←	←	←
	Flame Proof Approval	←	←	←
Amb.Temp	-20°C-60°C	←	←	←
Rating	Maximum power supply vortage: DC42V Current Signal: DC4-20mA Pulse Signal: ON : 2V 200mA OFF : 42V 4mA		Output Voltage: 30Vp-p Output Current: 100μ Ap-p	Maximum power supply vortage: DC42V Current Signal: DC4-20mA Pulse Signal: ON : 2V 200mA OFF : 42V 4mA Input Signal: 30V p-p,100μ A p-p Resistance Temp, Sensor Input: Pt1000Ω at 0°C Specified Current: less than 1mA

T100404.EPS

* In case that ambient temperature exceeds 50 degC, use heat-resistant cables with maximum allowable temperature of 70 degC or above.

11. PRESSURE EQUIPMENT DIRECTIVE

This chapter is described further requirements and notices concerning the PED (Pressure Equipment Directive). The description in this chapter is prior to other description in this User's Manual.

(1) Technical Data

Type of Equipment: Piping
Type of Fluid: Liquid and Gas
Group of Fluid: 1 and 2

Model	DN(mm)*	PS(MPa)*	PS-DN(MPa-mm)	CATEGORY**
DY015	15	42	630	Article 3,*** Paragraph 3
DY025	25	42	1050	Article 3,*** Paragraph 3
DY040	40	42	1680	II
DY050	50	42	2100	II
DY080	80	42	3360	II
DY100	100	42	4200	II
DY150	150	42	6300	II
DY200	200	42	8400	III
DY250	250	42	10500	III
DY300	300	42	12600	III
DY400	400****	25	10000	III

T110001.EPS

* PS: Maximum allowable pressure for Flow Tube
DN: Nominal size

** Referred to Table 6 covered by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC

*** DY015 and DY025 are not attached CE mark of PED because they do not under CE mark of PED.

**** Special-order product

(2) Installation

WARNING

- Please tighten the bolts for piping-joint according to the prescribed torque values.
- Please take measure to protect the flowmeters from forces caused by vibration through piping.

(3) Operation

WARNING

- The temperature and pressure of fluid should be applied under the normal operating condition.
- The ambient temperature should be applied under the normal operating condition.
- Please pay attention to prevent the excessive pressure like water hammer, etc. When water hammer is to be occurred, please take measures to prevent the pressure from exceeding PS(maximum allowable pressure) by setting the safety valve, etc. at the system and the like.
- When external fire is to be occurred, please take safety measures at the device or system not to influence the flowmeters.
- Please pay attention not to be abrade the metal pipe, when the fluid to abrade the lining such as slurry and sand are contained.

INSTALLATION AND OPERATING PRECAUTIONS FOR JIS FLAMEPROOF EQUIPMENT

Apparatus Certified Under Technical Criteria
(IEC-compatible Standards)

1. General

The following describes precautions on electrical apparatus of flameproof construction (hereinafter referred to as flameproof apparatus) in explosion-protected apparatus.

Following the Labour Safety and Health Laws of Japan, flameproof apparatus is subjected to type tests to meet either the technical criteria for explosionproof electrical machinery and equipment (standards notification no. 556 from the Japanese Ministry of Labour) (hereinafter referred to as technical criteria), in conformity with the IEC Standards, or the "Recommended Practice for Explosion-Protected Electrical Installations in General Industries," published in 1979. These certified apparatus can be used in hazardous locations where explosive or inflammable gases or vapours may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements.

For electrical wiring and maintenance servicing, please refer to "Internal Wiring Rules" in the Electrical Installation Technical Standards as well as "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

To meet flameproof requirements, equipment that can be termed "flameproof" must:

(1) Be certified by a Japanese public authority in accordance with the Labour Safety and Health Laws of Japan and have a certification label in an appropriate location on its case, and
(2) Be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

2. Electrical Apparatus of Flameproof Type of Explosion-Protected Construction

Electrical apparatus which is of flameproof construction is subjected to a type test and certified by the Japanese Ministry of Labour aiming at preventing explosion caused by electrical apparatus in a factory or any location where inflammable gases or vapours may be present. The flameproof construction is of completely enclosed type and its enclosure shall endure explosive pressures in cases where explosive gases or vapours entering the enclosure cause explosion. In addition, the enclosure construction shall be such that flame caused by explosion does not ignite gases or vapours outside the enclosure.

In this manual, the word "flameproof" is applied to the flameproof equipment combined with the types of protection "e", "o", "i", and "d" as well as flameproof equipment.

3. Terminology

(1) Enclosure

An outer shell of an electrical apparatus, which encloses live parts and thus is needed to configure explosion-protected construction.

(2) Shroud

A component part which is so designed that the fastening of joint surfaces cannot be loosened unless a special tool is used.

(3) Enclosure internal volume

This is indicated by:— the total internal volume of the flameproof enclosure minus the volume of the internal components essential to equipment functions.

(4) Path length of joint surface

On a joint surface, the length of the shortest path through which flame flows from the inside to outside of the flameproof enclosure. This definition cannot be applied to threaded joints.

(5) Gaps between joint surfaces

The physical distance between two mating surfaces, or differences in diameters if the mating surfaces are cylindrical.

Note: The permissible sizes of gaps between joint surfaces, the path length of a joint surface and the number of joint threads are determined by such factors as the enclosure's internal volume, joint and mating surface construction, and the explosion classification of the specified gases and vapours.

4. Installation of Flameproof Apparatus

(1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

(2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from –20°C to +40°C (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to +60°C as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring or flameproof metal conduits for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. For metal conduits, attach sealing fittings as close to wiring connections as possible and completely seal the apparatus. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

(1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated form Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables, or cable connections with insulated cables inside the conduit pipes are made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

(2) Flameproof Metal Conduit Wiring

- For the flameproof metal conduit wiring or insulated wires shall be used as recommended by the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry, published in 1994.
- For conduit pipes, heavy-gauge steel conduits conforming to JIS C 8305 Standard shall be used.
- Flameproof sealing fittings shall be used in the vicinity of the wiring connections, and those fittings shall be filled with sealing compounds to complete sealing of the apparatus. In addition, to prevent explosive gases, moisture, or flame caused by explosion form being propagated through the conduit, always provide sealing fittings to complete sealing of the conduit in the following locations:
  (a) In the boundaries between the hazardous and non-hazardous locations.
  (b) In the boundaries where there is a different classification of hazardous location.
- For the connections of the apparatus with a conduit pipe or its associated accessories, G-type parallel pipe threads (JIS B 0202) shall be used to provide a minimum of five-thread engagement to complete tightness. In addition, since these parallel threads do not have sealing property, nonhardening sealant such as liquid gaskets shall thus be applied to those threads for ensuring waterproofness.
- If metal conduits need flexibility, use flameproof flexible fittings.

6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 "MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION" in the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

(1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

(a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.

(b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

(2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

(a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.

(b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.

⚠ CAUTION

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

(c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.

(d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

(3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

7. Selection of Cable Entry Devices for Flameproof Type

IMPORTANT

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

References:

(1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan

(2) USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

REVISION RECORD

Title : Model DY Vortex Flowmeter
Model DYA Vortex Flow Converter

Manual No. : IM 1F6A0-01E

Edition	Date	Page	Revised Item	
3rd	Jun. 2002	1-1	1.1	Change Figure1.1(b)
		2-2	2.2	Change the process temperature range and ambient temperature
		2-3	2.2	Add Pressure Equipment Directive, Change Figure 2.2.1
		2-5	2.3	Change Table 2.3.1 "Body" of Cryogenic Version
		2-6, 2-7	2.4	Change the process temperature range and ambient temperature
		2-9	2.4	Change the process temperature range.
		2-10	2.4	Change Figure 2.4.1 , 2.4.2
		4-2	4.2	Add the description of Table 4.1
		6-1	6.3	Change the contents of parameter lists
		6-6	6.3	Change a table of parameter list
		6-10	6.4	Add the description of "B50 A/OUT SELECT"
		7-3	7.2.2	Change a tuning method
		9-1	9.1.1	Change the process temperature and ambient temperature
		9-3	9.1.6	Change Data Plate
		9-4	9.2.1	Change the process temperature and ambient temperature
		9-5	9.2.5	Correct "WARNING" and Installation Diagram of Non incendive
		9-6	9.2.6	Change Data Plate
		9-8	9.4.1	Change the process temperature and ambient temperature
		9-10	9.4.5	Correct the Installation Diagram of Non incendive
		9-11	9.4.6	Change Data Plate
		10-1	10	Change the technical data
4th	Sep. 2003	2-4	2.3	Add BS1 to 5
		2-5		Table 2.3.2 Add BS1 to 5
		2-8, 2-9	2.4	Add Hydrostatic Pressure Test, etc
		2-11	2.5	Table 2.5.1 Change the value for size 40 mm
		3-10	3.7.3	Add the description
		4-1	4.2	Figure 4.2 Add the description
		4-3	4.4	Figure 4.5 Add the description
		5-9	5.5	Figure 5.5 Add the description
5th	Apr. 2004	i	CONTENTS Reconfiguration	
		iv	Add symbol mark, revision	
		vi	Revision	
		1-1	Revision	
		2-1/22	Revision of Specification, Move to Chapter 9	
		3-1/10	Revision, Move to Chapter 2	
		3-9	Revision, Move to Chapter 7	
		3-10	Add IMPORTANT, Revision, Move to Chapter 7	
		4-1/6	Move to Chapter 3	
		4-4/5	Revision, Move to Chapter 3	
		5-1/24	Revision, Move to Chapter 4	
		6-1/17	Revision, Move to Chapter 5	
		7-1/4	Change Chapter name MAINTENANCE to OPERATION	
		9-1/11	Revision, Move to Chapter 10	
		10-1	Move to Chapter 11	
		8-5/6	8.3 moves to Chapter 7	
		8-7/8	8.4 moves to Chapter 7	

Edition	Date	Page	Revised Item
6th	Jan. 2005	5-6	Correction.
		5-8	Added a parameter.
		5-16	Added a parameter explanation and corrections.
		9-5	Revision (MS code).
		9-8	Revision (Option Specification).
		9-13	Revision.
		9-18/25	Revision.
		10-7	Revision.
		10-8	Revision.
		10-9	Revision.
7th	July 2005	2-5	Added a "CAUTION" about heat insulating material installation.
		7-8	Revised the formura 7.14.3.
		9-3	Changed the EMC Conformity Standards No..
		9-6	Deleted DIN64 and DIN100 (Suffix Code: BD5 and BD6).
		10-1/13	Added Applicable Standard No.and Certificate No. to each Approval body.
8th	Nov. 2005	2-7	Revision: Vertical Installation
		3-5	Revision: 7
		4-21-25	Revision.
		4-24	Revision <K36>
		5-15	H27: Revision
		5-16	J10, J20: Revision
		8-2	Revision.
		9-5	Revision of specification
		9-6	Revision of specification
		9-7	Revision of specification
		9-8	Revision of specification
		9-10	Table 9.4.3: Revision
		9-11	Revision of specification
		9-12	Revision of specification
		9-14	Table 9.5.1: Revision
		9-19	Tables: Revision
		9-20	Tables: Revision
		9-22	Tables: Revision
		9-23	Tables: Revision
		9-24	Revision

10 INSPECTION TEST PLANS

10.1 Testing Data

PLUMBING / MECHANICAL SERVICES
Paragon

Paragon Plumbing (WA) Pty Ltd A.B.N. 86 134 571 921
Unit1 92 Forsyth St O'Connor WA 6163
PO Box 469, Hillarys WA 6923
Ph: (08) 9305 8863 Fax: (08) 9406 8369

PRESSURE TEST CERTIFICATE:

Project:	UTS	**Job No.:**	545
Client:	NEP SOLAR	**Pressure Test No.:**	

Pipe / Vessel / Spool Description:	Heatdump-Condensor-DHW circuits
Drawing Number:	
Special Instructions:	
Approval Number:	
Construction Code:	
Hazard Level:	
Serial Number:	

Design Pressure:	
Design Temperature:	

Test Method:	Pressure test
Test Medium:	Water
Test Pressure:	700 Kpa
Start Time:	9:00 am
Finish Time:	8:00 am
Test Date:	22/5/14 - 23/5/14

Tester Name:	Daniel Butler	**Signature:**	D. Butler
Witness Name:	JOHAN DREYER	**Signature:**	
Date:	23/5/14		

Comments:

Name (Originator): _____ Signed: _____ Date: _____
Distribution: Original to Project QA files:

PLUMBING / MECHANICAL SERVICES
Paragon

Paragon Plumbing (WA) Pty Ltd A.B.N. 86 134 571 921
Unit1 92 Forsyth St O'Connor WA 6163
PO Box 469, Hillarys WA 6923
Ph: (08) 9305 8863 Fax: (08) 9406 8369

PRESSURE TEST CERTIFICATE:

Project:	UTS	**Job No.:**	545
Client:	NEP Solar	**Pressure Test No.:**	

Pipe / Vessel / Spool Description:	CHW circuit
Drawing Number:	
Special Instructions:	
Approval Number:	
Construction Code:	
Hazard Level:	
Serial Number:	

Design Pressure:	
Design Temperature:	

Test Method:	Pressure test
Test Medium:	Water
Test Pressure:	700 kpa
Start Time:	9:00 am
Finish Time:	9:00 am
Test Date:	22/5/14

Tester Name:	Daniel Butler	**Signature:**	D. Butler
Witness Name:	JOHAN DREYER	**Signature:**	J Dreyer
Date:	23/5/14		

Comments:

Name (Originator): _____ Signed: _____ Date: _____
Distribution: Original to Project QA files:

PLUMBING / MECHANICAL SERVICES
Paragon

Paragon Plumbing (WA) Pty Ltd A.B.N. 86 134 571 921
Unit1 92 Forsyth St O'Connor WA 6163
PO Box 469, Hillarys WA 6923
Ph: (08) 9305 8863 Fax: (08) 9406 8369

PRESSURE TEST CERTIFICATE:

Project:	UTS	**Job No.:**	545
Client:	NEP SOLAR	**Pressure Test No.:**	

Pipe / Vessel / Spool Description:	Solar Distribution & Solar field
Drawing Number:	
Special Instructions:	
Approval Number:	
Construction Code:	
Hazard Level:	
Serial Number:	

Design Pressure:	
Design Temperature:	

Test Method:	Pressure test
Test Medium:	Water
Test Pressure:	1500 kpa
Start Time:	11:00 am
Finish Time:	
Test Date:	23/5/14

RETESTED 27/5/2014

Tester Name:	Daniel Butler	**Signature:**	D. Butler
Witness Name:	JOHAN DREYER	**Signature:**	
Date:			

Comments: 23/5
LEAKS ON ROOF (AT STAG NEP JOINT) ON SOLAR CIRCUIT 23/5. DRAINED AND REMIXED. NEED NEW TEST.

24/5 - 5 SMALL LEAKS AT FLANGES ON VALVES AND 1 SLIGHTLY LARGER AT FLANGE ON DISTRIBUTION CIRCUIT. PRESSURE AT 1250 kPa. TIGHTEN FLANGES AND LEFT UNDER PRESSURE @ 07:30.

LEAKS ON PUMPS 1 & 2 FITTINGS. MARKED ON 23/5.

26/5 No leaks found - Pressure in distribution is 1175 kPa (down from 1250 kPa)

Name (Originator): _____ Signed: _____ Date: _____
Distribution: Original to Project QA files:

11 COMMISSIONING

11.1 Refer to Commissioning Report

Polytrough 1200 Commissioning Report

Project: UTS FEIT Solar Field

Client: Nilsen

Date: 19/06/14

Inspection and testing conducted by: Johan Dreyer & James Yorston

Solar Field Items

Item Description	Field	C1	C2	C3	C4	Comment
Collector Installation Complete		✓	✓	✓	✓	
Pressure test field circuit	✓					15 Bar for 24hr (Max operating pressure 10 bar)
PRV installed		✓		✓		Between C1 & C2 and C3 & C4. Setting: 15 bar
Temperature Sensors correct	✓					
Movement limit set (Park)		✓	✓	✓	✓	Proximity switch limits rotation
Movement limit set (Rev Park)		✓	✓	✓	✓	Proximity switch limits rotation
Wind Speed & Direction Sensors	✓					
Sun Sensor	✓					
Control System	✓					Incorporated into EIF Plant control

Collector Parameter Settings

Parameter Description	C1	C2	C3	C4	Comment
Park Angle	140	140	140	140	Degrees
Reverse Park Angle	-90	-90	-90	-90	Degrees
Cleaning Angle	30	30	30	30	Degrees
Max Limit Angle	155	155	155	155	Degrees
Min Limit Angle	-95	-95	-95	-95	Degrees
Outlet Temp Trip	170	170	170	170	^{o}C
Outlet Temp Ok	165	165	165	165	^{o}C
Inclinometer Offset	93.35	91.30	92.50	91.25	Degrees
Trough Axis Alignment	90	90	-90	-90	Degrees, with respect to North

enef tech
Generate your Heat & Power

Eneftech Innovation SA
Route Champ-Colin, 2C
CH-1260 Nyon – Switzerland
Phone : +41 22 994 04 20
Fax : +41 22 566 2743
Web : www.eneftech.com
E-mail : info@eneftech.com

ENEFCOGEN GREEN 10kW

Operational Acceptance Test report (OAT)

For the commissioning of an ORC plant at the site of University of Technology Sydney (UTS), Australia (NSW)

Sydney, 14TH June 2014

Operating points tested for operational test

Following points have been tested in order to demonstrate the operation of the ORC PLANT.

Operating points n°	Hot line température [°C]	Hot pump load [m^3/h]	Cold pump load [m^3/h]
1	120	2.2	5.5
2	135	1.3	5.5
3	130	1.1	7

Test protocol

Duration [min]	Step	Actions	Remarks	Client Notes
0	Start machine		Minimum start of machine at 130°C with 2.2 m^3/h at hot pump	
15	Machine is running		Client send the signal 4-20mA for the load of the thermal power	
	Operating point n°1	Check system stability Performance measurement		
	Operating point n°2	Stabilization and performance measurement Check transition time		
10	Normal stop			
20	Cooling of the hot circuit		Cooling tower oversize have high thermal inertia.	
20	Restart			
1	Security stop	According to costumer choice		

10	Restart (hot start)			

Test results

Measured operating points

Following values are average values based on a minimum of 5 minutes measured values logged every 2 s.

Machine serial n° UADB-0020-TV

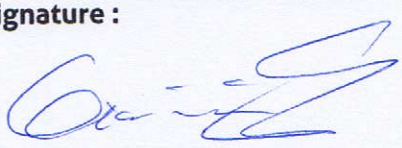
Operating point n°	Hot source			Cold source			Gross electric power [kW] (E1)
	Inlet temperature [°C] (T3A)	Outlet temperature [°C] (T3B)	Calculated power [kW] (Pchaud)	Inlet temperature [°C] (T4B)	Outlet temperature [°C] (T4C)	Calculated power [kW] (Pfroid)	
1	120	82.6	93.2	24.7	39.7	88.1	6.3
2	136.4	81.3	83.9	24.5	39.6	78.4	5.7
3	130.4	76.2	69.2	25.1	32.5	60.9	4.5

Measure uncertainty

Measure	Uncertainty [%]
Electric power	+/- 2
Temperature	+/- 2

Operational acceptance

The following representatives have followed the operational test program and validate operational acceptance of the ORC PLANT.

For Client	For Eneftech
Date and place :	**Date and place :**
Name : Johan Dreyer	**Name : Silvio Giacomini**
Comments: **Machine accepted as operation and performance demonstrated. Safety between system and ORC established. Control protocols established.** **OUTSTANDING :** **Modbus Interface from ORC to System PLC. Need this to collect Power generated and also other display parameters as on the current Web Visu.**	**Comments:** **Sent to client grilles for vantilation opening on the cover of the chassis.** **At the end of each experiment, run ORC at maximum power for minimum 30 min before stopping just to clean oil from heat exchanger of ORC.** **Hot temperature and flow need to be controled well and carefully in order to not exceed limits of ORC (see datasheet and manual).**
Acceptance: ***(please manually write: "Commissioning accepted") :*** Commissioning accepted.	**Acceptance:** ***(please manually write: " Commissioning accepted ") :*** Commissioning accepted
Signature : 	**Signature :** 

Operational Control Tests

1. Local Control feature from roof

Test Description	Field	C1	C2	C3	C4	Comment
Local Control from push button box key switch	✓					Key switch required to ensure operation by authorised personnel only.
Pushbutton Clockwise		✓	✓	✓	✓	Hold down button, 10sec slow move then faster
Pushbutton Counter Clockwise		✓	✓	✓	✓	Hold down button, 10sec slow move then faster

2. Manual Control from HMI PC

PC User access Level: ENGINEER

Test Description	Field	C1	C2	C3	C4	Comment
Collector Movement		✓	✓	✓	✓	
Tracking		✓	✓	✓	✓	
Offset Tracking		✓	✓	✓	✓	
Stop		✓	✓	✓	✓	
Park		✓	✓	✓	✓	
Reverse Park		✓	✓	✓	✓	
Cleaning		✓	✓	✓	✓	
Hold		✓	✓	✓	✓	
Local Control		✓	✓	✓	✓	

3. Automated control from PLC

Test Description	Field	C1	C2	C3	C4	Comment
Over temperature control	✓	✓	✓	✓	✓	
Tracking Sun	✓					
Offset Tracking	✓					
High Wind Park	✓					Simulated high wind input to PLC
Field control on sun threshold	✓					Field starts and stops automatically based on availability of sunshine as sensed by sensor.
Automatic operation on request for temperature setpoint .	✓					System will operate to achieve requested setpoint.

This commissioning report has been prepared by NEP Solar Pty Ltd for Nilsen covering the supply and installation of 4 Standard PolyTrough 1200 B Collectors for UTS FEIT Building Broadway (offer Rev 3 / 26.09.2012)

James Yorston

Project Engineer

Johan Dreyer

Director

12 WARRANTIES AND GUARANTEES

12.1 Deed Poll Warranty

FORM OF PRINCIPAL'S PRESCRIBED WARRANTY

THIS DEED POLL is made on the ..11th ELEVENTH day of ..JULY..... 2014 in favour of the Contractor and the Principal.

RECITALS:

A. the Contractor entered into the Contract with the Principal for the Works;

B. the Contractor and the Warrantor entered into a subcontract for the Subcontract Works;

C. the Warrantor has agreed to provide the warranties set out in this Deed Poll for the benefit of the Principal and the Contractor upon the terms and conditions herein contained.

THIS DEED POLL WITNESSES THAT:

1. **Definitions**

In this Deed Poll, the following words and phrases shall, except where there is something or some matter in the subject or context inconsistent therewith, have the meanings given to them as follows:

1. **the Principal**: the person, partnership or corporation named in item B1 of the Appendix A;
2. **the Contractor**: the person, partnership or corporation named in item B2 of the Appendix A;
3. **the Warrantor**: the person, partnership or corporation named in item B3 of the Appendix A;
4. **the Project Manager**: the person, partnership or corporation named in item B4 of the Appendix A, or any other person, partnership or corporation appointed by the Principal to act as the Project Manager in connection with the Contract (and including persons with authority to act on behalf of the Project Manager).

   For the purposes of this Deed Poll, and notwithstanding any provision in the Contract to the contrary, the Principal shall be entitled to appoint any person, partnership or corporation to act as Project Manager at any time during the currency of and for the purposes of this Deed Poll;
5. **the Contract**: the contract dated 16 March 2012 for the Works between the Principal and the Contractor;
6. **the Subcontract**: the subcontract dated 26th July 2012 between the Contractor and Warrantor for the Subcontract Works;
7. **the Works**: the works described in item B5 of the Appendix A(including all labour, materials, plant, equipment and anything else of whatever nature to be supplied in connection with the same);
8. **the Subcontract Works**: the works described in item B6 of the Appendix A (including all labour, materials, plant, equipment and anything else of whatever nature to be supplied in connection with the same);
9. **the Site**: the location described in item B7 of the Appendix A.

2. Warranty

1. The Warrantor warrants to the Contractor and, as a separate warranty, to the Principal that:

    1. the Subcontract Works shall be:

        1. designed;
        2. executed;
        3. carried out;
        4. manufactured;
        5. supplied;
        6. installed;
        7. commissioned; and
        8. maintained,

        (as the case may be) in all respects in accordance with the Subcontract;

    2. to the extent that the Subcontract does not prescribe a particular standard, whether relating to quality or otherwise, the Subcontract Works shall be executed to a standard consistent with a high quality of workmanship and materials;

    3. the Subcontract Works shall be fit for their intended purpose;

    4. the Subcontract Works shall be and remain free from defects, errors or omissions arising out of or resulting from the Warrantor's design, manufacture, supply, execution, installation commissioning and maintenance (as the case may be).

2. This warranty shall be in addition to, and shall not derogate from, any manufacturer's warranty, or warranty implied by law, attaching to any plant, equipment, materials or any other goods of whatever nature forming part of the Subcontract Works.

3. Indemnity

1. The Warrantor hereby indemnifies, and agrees to keep indemnified, the Principal from and against any damage, loss, cost, or expense incurred by the Principal in the rectification or replacement of the Subcontract Works, or any part thereof, arising out of or resulting from any breach of the warranty referred to in Clause 2 hereof.

2. Without limiting the generality, the indemnity referred to in sub-clause 1. hereof shall extend to and include all damages, losses, expenses, costs, charges and any other expenses arising out of or resulting from any inspection, opening up, removal, making good, supervision, and all other attendances (including the obtaining of expert advice) related to rectification or replacement.

4. Rectification Work

1. The Warrantor covenants with the Contractor and also, as a separate covenant, with the Principal that it shall, at its cost and expense, to the reasonable satisfaction of the Project Manager, make good, repair or replace all loss of or damage to (or lack of

performance of) the Subcontract Works or the Works (as the case may be) caused by, arising out of or in connection with any breach by the Warrantor of the warranty referred to in Clause 2 hereof within such time as may be nominated by the Project Manager.

2. If the Warrantor does not fulfil its obligations under sub-clause 1. above, then:

   1. the Principal may issue a notice to the Warrantor requiring compliance within a reasonable time to be stated in the notice;

   2. if the Warrantor does not comply therewith, the Principal may employ and pay others to execute any work whatsoever which may be necessary to make good, repair or replace all loss of or damage to (or lack of performance of) the Subcontract Works or the Works (as the case may be);

   3. all costs properly incurred, or to be incurred, by the Principal in so doing may be recovered by the Principal as a debt due to the Principal by the Warrantor.

3. The decision of the Project Manager as to:

   1. any breach by the Warrantor of the warranty referred to in Clause 2 hereof;

   2. the work necessary to make good, repair or replace pursuant to Clause 4 hereof,

   shall be notified in writing to the Warrantor (with a copy being provided to the Contractor). Any such decision shall be final and binding upon the parties.

5. Dispute Resolution

1. Any dispute between the Principal, the Contractor and/or the Warrantor directly or indirectly arising from or in consequence of any provision of this Deed Poll either as to its interpretation or its implementation which is not resolved within fourteen (14) days of the Principal, the Contractor or the Warrantor notifying the other(s) of the dispute shall be referred to a person acting in the capacity of an independent expert and not as an arbitrator whose decisions shall be final and binding on the Principal, the Contractor and the Warrantor as to the issue in dispute and to the costs arising therefrom.

2. Any party may propose a person to act as the independent expert for the purposes of Clause 5.1. If there is no agreement within fourteen (14) days of such a proposal, either the Principal, the Contractor or the Warrantor may refer the matter to the Chairman for the time being of the Institute of Arbitrators Australia (NSW Chapter) to nominate an appropriate person.

6. Term of Deed Poll

This Deed Poll shall have full force and effect until the expiry of the period referred to in item B8 of the Appendix A, that period to commence from the Date of Practical Completion of the Works or the Date of Practical Completion (or equivalent) of the Subcontract Works, whichever be the later.

Executed as a Deed Poll.

Signed by NEP Solar Pty Ltd
(ABN 44 130 020 245)
by a director and secretary/director pursuant to section 127 of the *Corporations Act 2001* (Cth):

Signature of Secretary/Director	Signature of Director
JOHAN DREYER	
Name of Secretary/Director (please print)	Name of Director (please print)

APPENDIX A

B1	1(a)	The Principal	University of Technology, Sydney of City Campus, 15 Broadway, Ultimo NSW 2007
B2	1(b)	The Contractor	Lend Lease Project Management and Construction (Australia) Pty Limited ABN 81 162 540 383
		License Number (where applicable)	of 30 The Bond, 30 Hickson Road, Millers Point NSW 2000
B3	1(c)	The Warrantor	NEP Solar Pty Ltd ABN 44 130 020 245 of Unit 20/14 Jubilee Avenue, Warriewood NSW
B4	1(d)	The Project Manager	Denton Corker Marshall Pty Limited ACN 131 308 088 of 49 Exhibition Street, Melbourne, VIC 3000
B5	1(g)	The Works	UTS FEIT Broadway Building
B6	1(h)	The Subcontract Works	Solar Tri-Generation System
B7	1(i)	The Site of the Works	81-121 Broadway, Ultimo NSW 2007
B8	7	Warranty period	1 year for Mechanical System Complete

12.2 Suppliers Warranty

Component	Qty	Model	Warranty
Solar Field	4	NEP Solar PolyTrough 1200	24 months from delivery
ORC	1	Eneftech Enefcogen Green 10kW	12 months from delivery
Chiller	1	Pink PC19	24 months from delivery
Buffer tank	1	Automatic Heating Thermax	12 months from delivery
Expansion and pressurisation system	1	Automatic Heating	12 months from delivery
Solar field pump	1	Grundfos CRIE 5-5	3 years from delivery
Distribution pump	1	Grundfos CRIE 5-4	3 years from delivery
Hot water/heat dump pump	1	Grundfos CRE 15-02	2 years from delivery
Condenser/re-cooling pump	2	Grundfos CRE 15-03	2 years from delivery
Domestic hot water pump	2	Grundfos CRE 15-02	2 years from delivery
Chilled water pump	2	Grundfos CRE 15-02	2 years from delivery
Hot water/heat dump heat exchanger	1	Alfa Laval CB30 - 24H	12 months from delivery
DHW heat exchanger	1	Alfa Laval M6–FG – 27	12 months from delivery
CHW heat exchanger	1	Alfa Laval M6–FG – 43	12 months from delivery
3-way bypass and diverting valves	10	Samson V2001	36 months from delivery and 24 Months from installation (Samson).
Instruments	11	Yokogawa	12 months from delivery
		flow meters	
	1	Yokogawa	
		pressure sensors	
	35	Temperature sensors	
		ECE Fast	
		Pressure gauges	
Control system PLC	1	Yokogawa Stardom PLC	18 months from delivery
			12 months from installation
Control system PC	1	FASTTOOLS SCADA and HMI on PC	12 months from delivery
Electrical system	1	Cabinets by Weidmuller (including components)	12 months from delivery

AUTOMATIC HEATING PTY LTD
WARRANTY

Automatic Heating Pty Ltd (ACN 135 201 955) ("Automatic Heating") provides the following warranty in relation to its goods and services.

The benefits of this warranty are in addition to any rights and remedies imposed by Australian State and Federal legislation that cannot be excluded. Nothing in this warranty is to be interpreted as excluding, restricting or modifying any State or Federal legislation applicable to the supply of goods and services which cannot be excluded, restricted or modified.

Warranty

Automatic Heating warrants that, subject to the exclusions below:

(a) all goods sold have a twelve (12) month warranty against defects in materials and workmanship from the date of purchase (“Goods Warranty”).

(b) all services performed have a one (1) month warranty against any defects in workmanship from the date of the provision of the service ("Service Warranty")

The Goods Warranty and Service Warranty will not apply to goods rendered defective as a result of:

(a) deliberate or accidental damage;

(b) fair wear and tear;

(c) negligent use or use for a purpose other than which the goods were designed, including but not limited to:
  (i) inappropriate site conditions;
  (ii) incorrect voltage; or
  (iii) voltage supply problems;
  (iv) tampering;
  (v) incorrect water treatment
  (vi) improper installation, handling, use, operation, or storage; or
  (vii) due to any other causes outside of Automatic Heating's control.

(d) the Customer's failure to maintain the goods.

(e) exposure to abnormal conditions including environment, temperature, fire, water, humidity, pressure, stress or similar.

Warranty Claims

If a fault covered by warranty occurs, the Customer must:

(a) give Automatic Heating written details (to the contact address specified on the front of this document) of any defect in the goods or provision of the services together with documentary proof of the date of purchase and date of installation of end user of the goods within 30 days of identifying the defect;

(b) return the defective goods to Automatic Heating or allow Automatic Heating or its employees or agents to inspect the goods; and

(c) provide any information requested by Automatic Heating in relation to the goods, installation of the goods or provision of the services.

The Customer must make the goods available to Automatic Heating or its authorised repair agent for inspection and testing. If such inspection and testing finds no defect in the goods, the Customer must pay Automatic Heating's usual cost of service work and testing.

The Customer must bear the cost of transporting any goods to Automatic Heating or its authorised repair agent to make the claim, and all insurance of the goods.

Automatic Heating reserves the right to replace defective parts of the goods with parts and components of similar quality, grade and composition where an identical part or component is not available.

Goods presented for repair may be replaced by refurbished goods of the same type rather than being repaired. Refurbished parts may be used to repair the goods.

Any defects which occur beyond the Goods Warranty or Service Warranty period will be covered in a separate Maintenance Agreement.

Limitations

The repair or replacement of the goods and resupply of the services is the absolute limit of Automatic Heating's liability under this express warranty.

Automatic Heating makes no express warranties or representations other than set out in this warranty.

Contact

Automatic Heating Pty Ltd
51 Assembly Drive, Tullamarine 3043
Ph: (03) 9330 3300 Fax: (03) 9310 5655
Email: sales@automaticheating.com.au

From: Jeremy Plaisted
To: Johan Dreyer
Subject: RE: Warranty Statement
Date: Thursday, 10 July 2014 1:28:44 PM
Attachments: image001.png
image002.png

Johan,

We can confirm that Grundfos offer a warranty of 24 months for CRE pumps, and 36 months for the CRIE pumps.

The Expansion System and Buffer Tank is covered by the Automatic Heating Warranty statement as sent to you previously, which is for 12 months.

Kind Regards,

Jeremy Plaisted | Estimating Manager

AutomaticHeating
efficiency □ performance □ solutions

Automatic Heating Pty Ltd
67 Gateway Boulevard Epping VIC 3076 Australia | **W** www.automaticheating.com.au
P + 613 9330 3300 | **F** + 613 9310 5655 **| E** jeremy@automaticheating.com.au

Click here to view our Product Overview brochure

-

From: Johan Dreyer [mailto:johan.dreyer@nep-solar.com]
Sent: Wednesday, 9 July 2014 3:36 PM
To: Jeremy Plaisted
Subject: RE: Warranty Statement

Jeremy,
Based on previous information we have advised the client that the CRIE pumps carry a 36m warranty, the CRE pumps a 24m warranty, the expansion system and buffer tank a 12m warranty. Your warranty statement needs to state that please.

Thanks,
Johan

CMG Contracting

ABN 23 614 435 591
212 RAILWAY TERRACE (PO BOX 198) GUILDFORD NSW 2161
PH: (02) 9682 7277 - FAX: (02) 9682 7062

Thursday, 10 July 2014

NEP Solar
Unit 20/14 Jubilee Ave
WARRIEWOOD NSW 2102

Att: Johan Dreyer

Dear Johan,

This letter confirms that CMG Contracting shall warrant their workmanship and materials for a period of 12 months effective immediately.

Trusting the above meets with your approval and if you require any additional information please call me on 9682 7277 or 0418 606 224.

Regards,

Erich Anderson
CMG Contracting

Conditions of Sale

ECEFast
Electro Chemical Engineering Pty Ltd
A. B. N. 42 004 182 772

1. DEFINITIONS

1.1 In these Terms:

(a) "ACL" means the Australian Consumer Law Schedule of the Competition and Consumer Act;
(b) "Agreement" means any agreement for the provision of goods or services by the Company to the Buyer;
(c) "Buyer" means the person, jointly and severally if more than one, acquiring goods or services from the Company;
(d) "Company" means Electro Chemical Engineering Pty Ltd trading as ECEFast or Instrument Warehouse or Engineering & Thermal Supplies;
(e) "consumer" is as defined in the ACL and in determining if the Buyer is a consumer, the determination is made if Buyer is a consumer under the Agreement;
(f) "goods" means goods supplied by the Company to the Buyer;
(g) "GST" means the Goods and Services tax as defined in A New Tax System (Goods and Services Tax) Act 1999 as amended;
(h) "services" means services supplied by the Company to the Buyer; and
(i) "Terms" means these Conditions of Sale.

2. GENERAL

2.1 All goods and services are supplied by the Company subject to these Terms, which supersede any earlier sets of terms and conditions appearing in catalogues or elsewhere and which shall override any terms or conditions stipulated, incorporated or referred to by the Buyer, whether in the order or in any negotiations.

2.2 The relaxation or failure to enforce any of the Terms by the Company on any occasion shall not be construed as a waiver of any of the Company's rights.

2.3 The Company may vary or amend these Terms by written notice to the Buyer at any time. Any variation of these Terms must be confirmed in writing by the Company and will not otherwise be valid.

2.4 No order shall be deemed to have been accepted by the Company unless it is accepted by the Company in writing.

2.5 The Company has absolute discretion to refuse to accept any order from the Buyer.

3. PRICES

3.1 All prices are subject to change without notice. All orders are accepted by the Company on the condition that they will be invoiced at prices at the time of order subject to any agreed escalation. All prices will be inclusive of GST and any other taxes or duties imposed on or in relation to the goods and services except where otherwise stated.

3.2 Unless otherwise stated, prices are ex works. Where the Buyer requires freight to be prepaid, then all such expenses will be charged to the Buyer's account at cost.

3.3 All prices shown in published catalogues or price lists are recommended selling prices only and there is no obligation on the part of any reseller to maintain the same prices.

3.4 Any quotation includes only such goods and services as are specified therein.

3.5 Goods offered ex stock are subject to prior sale.

3.6 Any quotation, if not previously withdrawn, will be valid for any order made pursuant to it within 30 days of its date and will be an invitation to treat only. (Validity of Proposal)

3.7 No discounts shall apply unless these are confirmed in writing.

3.8 If the Buyer requests any variation to the Terms, the Company may increase the price to account for the variation.

3.9 Where there is any change in the costs incurred by the Company in relation to goods or services, the Buyer may vary its price to take account of any such change, by notifying the Buyer.

4. GST

4.1 All prices quoted will include GST unless stated. A tax invoice will be supplied in the approved format.

5. PAYMENT

5.1 Terms of payment are strictly nett cash with order unless a credit account has been established with and approved by the Company.

5.2 Where a credit account has been established with the Company, payment must be made within 30 days of date of the Company's tax invoice.

5.3 The Company reserves the right at its complete discretion to refuse to establish a credit account for any Buyer, to refuse credit to any Buyer notwithstanding that a credit account may already have been established and to withdraw established credit account facilities.

5.4 Payment terms may be revoked or amended at the Company's sole discretion immediately upon giving the Buyer written notice.

5.5 The time for payment is of the essence.

5.6 If the Buyer defaults in any payment on the due date (time being of the essence) or is otherwise in breach of any of these Terms, or (being a company) enters into liquidation (whether compulsory or voluntary) or has a receiver or manager appointed of the whole or any part of its business or undertaking, or if distress or execution is levied or threatened upon any of the Buyer's property, then in any such case and without prejudice to any other rights, the Company may have, the Company:

(a) may charge the Buyer interest on any sum due at the prevailing rate pursuant to the Penalty Interest Rates Act 1983 (Vic) plus 4 per cent for the period from the due date until the date of payment in full;
(b) may charge the Buyer for, and the Buyer must indemnify the Company from, all costs and expenses (including without limitation all legal costs and expenses) incurred by it resulting from the default or in taking action to enforce compliance with the Terms or to recover any goods;
(c) shall be entitled to suspend all further deliveries to the Buyer until the default is made good or to refuse to deliver any further goods to the Buyer; or
(d) by written notice to the Buyer, terminate any uncompleted contract with the Buyer.

6. PASSING OF PROPERTY

6.1 Until the Company receives full payment in cleared funds for all goods and services supplied by it to the Buyer, as well as all other amounts owing to the Company by the Buyer:

(a) title and property in all goods remain vested in the Company and do not pass to the Buyer;
(b) the Buyer must hold the goods as fiduciary bailee and agent for the Company;
(c) the Buyer must keep the goods separate from its goods and maintain the Company's labelling and packaging;
(d) the Buyer must hold the proceeds of sale of the goods on trust for the Company in a separate account however failure to do so will not affect the Buyer's obligation to deal with the proceeds as trustee;
(e) the Company may without notice, enter any premises where it suspects the goods are and remove them, notwithstanding that they may have been attached to other goods not the property of the Company, and for this purpose the Buyer irrevocably licences the Company to enter such premises and also indemnifies the Company from and against all costs, claims, demands or actions by any party arising from such action.

7. PERSONAL PROPERTY SECURITIES ACT

7.1 Notwithstanding anything to the contrary contained in these Terms, the PPSA applies to these Terms.

7.2 For the purposes of the PPSA:

(a) terms used in this clause 7 that are defined in the PPSA have the same meaning as in the PPSA;
(b) these Terms are a security agreement and the Company has a Purchase Money Security Interest in all present and future goods supplied by the Company to the Buyer and the proceeds of the goods;
(c) the security interest is a continuing interest irrespective of whether there are monies or obligations owing by the Buyer at any particular time; and
(d) the Buyer must do whatever is necessary in order to give a valid security interest over the goods and their proceeds which is able to be registered by the Company on the Personal Property Securities Register.

7.3 The security interest arising under this clause 7 attaches to the goods when the goods are collected or dispatched from the Company's premises and not at any later time.

7.4 Where permitted by the PPSA, the Buyer waives any rights to receive the notifications, verifications, disclosures or other documentation specified under sections 95, 118, 121(4), 130, 132(3)(d), 132(4), 135 and 157 of the PPSA.

7.5 The Company and the Buyer agree to contract out of and nothing in the provisions of sections 96, 125, 129, 142 and 143 of the PPSA will apply to these Terms.

7.6 To the extent permitted by the PPSA, the Buyer agrees that:

(a) the provisions of Chapter 4 of the PPSA which are for the benefit of the Buyer or which place obligations on the Company will apply only to the extent that they are mandatory or the Company agrees to their application in writing; and
(b) where the Company has rights in addition to those in Chapter 4 of the PPSA, those rights will continue to apply.

7.7 The Buyer must immediately upon the Company's request:

(a) do all things and execute all documents necessary to give effect to the security interest created under this Agreement; and
(b) procure from any person considered by the Company to be relevant to its security position such agreements and waivers (including as equivalent to those above) as the Company may at any time require.

7.8 The Company may allocate amounts received from the Buyer in any manner the Company determines, including in any manner required to preserve any Purchase Money Security Interest it has in goods supplied by the Company.

8. RISK AND INSURANCE

8.1 The risk in the goods and all insurance responsibility for theft, damage or otherwise will pass to the Buyer immediately on the goods being delivered to the Buyer or taken from the Company's premises.

8.2 The goods are sold to the Buyer on the basis that the Buyer has obtained all necessary licenses or permits under all relevant laws and regulations in relation to the goods.

8.3 The Buyer assumes all risk and liability for loss, damage or injury to persons or to property of the Buyer, or third parties arising out of the use, installation or possession of any of the goods sold by the Company, unless recoverable from the Company on the failure of any statutory guarantee under the ACL.

9. DELIVERY

9.1 Any time or date quoted by the Company for delivery is an estimate only. Whilst every endeavour will be made to meet an estimated time for delivery the Company shall not be liable to make good any damage or loss whether arising directly or indirectly out of delay in delivery.

9.2 If the Company cannot complete the services by any estimated date, it will complete the services within a reasonable time.

9.3 The Buyer is responsible for all costs associated with delivery, including freight, insurance and other charges arising from the point of dispatch of the goods to the Buyer to the point of delivery.

Conditions of Sale

ECEFast
Electro Chemical Engineering Pty Ltd
A. B. N. 42 004 182 772

9.4 The Company may make part delivery of goods or provision of services and the Company may invoice the Buyer for the goods or services provided.

9.5 The Buyer indemnifies the Company against any loss or damage suffered by the Buyer, its sub-contractors or employees as a result of delivery, except where the Buyer is a consumer and the Company has not used due care and skill.

9.6 If delivery is attempted and is unable to be completed, the Buyer is deemed to have taken delivery of the goods. The Buyer is liable for storage charges payable monthly on demand.

9.7 If agreed that the Buyer will collect the goods:
(a) the Buyer must collect the goods with 7 days of being advised they are ready;
(b) if the Buyer does not collect the goods within 7 days, the Buyer is deemed to have taken delivery of the goods and is liable for storage charges payable monthly on demand.

9.8 Non-delivery within 7 days of the date of dispatch must be reported immediately in writing to the Company.

10. INSPECTION

10.1 When the Buyer examines the goods before delivery is effected, the Buyer shall have no further right to inspect on arrival, other than to notify the Company of any loss or damage in transit.

10.2 When the goods are delivered to the Buyer without any previous examination, the Buyer shall inspect the goods immediately on arrival and shall within 7 days of such inspection give written notice to the Company, of any matter or thing, by reason of which he may allege that the goods are not in accordance with the Terms and the order. If the Buyer shall fail to give such notice, the goods shall be deemed to be in all respects in accordance with the Terms and the order and the Buyer shall be bound to accept and pay for them accordingly. Goods shall not be returned without authority from the Company.

11. WARRANTY

11.1 Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

11.2 Subject to the exclusions and limitations set out below, all goods which are the Company's own or the Company's principals manufacture are guaranteed against faulty workmanship, materials or design for a period of twelve (12) months from the date of dispatch.

11.3 If a defect covered by this warranty appears in the goods before the end of the warranty period and the Company finds the goods to be defective in materials or workmanship, the company will either replace or repair the goods or the defective part of the goods free of charge.

11.4 The Company reserves the right to replace defective parts of the goods with parts and components of similar quality, grade and composition where an identical part or component is not available.

11.5 Goods presented for repair may be replaced by refurbished goods of the same time rather than being repaired. Refurbished parts may be used to repair the goods.

11.6 If a fault covered by warranty occurs, the Buyer must first contact the Company at the address listed in these Terms.

11.7 Any warranty claim must be accompanied by proof of purchase, and full details of the alleged defect.

11.8 Prior to accepting any warranty claim, the Company is permitted to inspect the defect.

11.9 The Buyer must bear the cost of the defective parts being returned into the Company's store.

11.10 Any repairs will be covered by a 60 day warranty covering only the parts replaced. Failure of other parts which affect functionality will not be covered.

11.11 Any unauthorised repairs or alterations to the equipment shall invalidate that warranty. In the case of goods not of the manufacture of the Company or its principals, the Company undertakes that it will, if requested in writing by the Buyer, make all reasonable endeavour in assisting the Buyer in obtaining from the manufacturer the benefit of any guarantee or warranty which the manufacturer may have expressly given as to the quality or fitness for any purpose of the goods, except as may otherwise be provided for by law.

11.12 The benefits of this warranty are in addition to any rights and remedies imposed by Australian State and Federal legislation that cannot be excluded. Nothing in this warranty is to be interpreted as excluding, restricting or modifying any State or Federal legislation applicable to the supply of goods and services which cannot be excluded, restricted or modified.

12. LIABILITY

12.1 Except as the Terms specifically state, or as contained in any express warranty provided in relation to the goods or services, the Agreement does not include by implication any other term, condition or warranty in respect of the quality, merchantability, acceptability, fitness for purpose, condition, description, assembly, manufacture, design or performance of the goods or services or any contractual remedy for their failure.

12.2 If the Buyer is a consumer, nothing in these Terms restricts, limits or modifies the Buyer's rights or remedies against the Company for failure of a statutory guarantee under the ACL.

12.3 If the Buyer on-supplies the goods to a consumer:
(a) if the goods or services are not of a kind ordinarily acquired for personal, domestic or household use or consumption, then the amount specified in section 276A(1) of the ACL is the absolute limit of the Company's liability to the Buyer;
(b) otherwise, payment of any amount required under section 274 of the ACL is the absolute limit of the Company's liability to the Buyer;
howsoever arising under or in connection with the sale, installation, use of, storage or any other dealings with the goods or services by the Buyer or any third party.

12.4 If clauses 11.2 or 11.3 do not apply, then other than as stated in the Terms or any written warranty statement, the Company is not liable to the Buyer in any way arising under or in connection with the sale, installation, use of, storage or any other dealings with the goods or services by the Buyer or any third party.

12.5 The Company is not liable for any indirect or consequential losses or expenses suffered by the Buyer or any third party, howsoever caused, including but not limited to loss of turnover, profits, business or goodwill or any liability to any other party, except to the extent of any liability imposed by the ACL.

12.6 The Buyer acknowledges that:
(a) it has not relied on any service involving skill and judgement, or on any advice, recommendation, information or assistance provided by the Company in relation to the goods or services or their use or application.
(b) it has not made known, either expressly or by implication, to the Buyer any purpose for which it requires the goods or services and it has the sole responsibility of satisfying itself that the goods or services are suitable for the use of the Buyer.

12.7 Nothing in the Terms is to be interpreted as excluding, restricting or modifying or having the effect of excluding, restricting or modifying the application of any State or Federal legislation applicable to the sale of goods or supply of services which cannot be excluded, restricted or modified.

13. SPECIAL CONDITIONS

13.1 *Electrochemical sensors e.g. pH electrodes will be '100% tested before dispatch and will only subsequently, be replaced if they, contain visible physical defects, or statistic life data is supplied with full details of the application. Pressure transducers will be replaced only if it is clearly shown to f ail due to a defect of manufacture. No warranty will be applicable to units subject to overpressure demonstrated by open circuit bridge, plastic deformation of the sensor or excessive zero shift.

13.2 Temperature sensors warranty is 90 days limited, due to the unpredictable conditions of usage.

14. CREDITS

14.1 No goods will be accepted for return unless permission is given by the Company in writing.

14.2 No goods purchased as a “special” (specially ordered [eg “indent”] or modified away from standard) can be returned unless permission is given by the Company in writing.

14.3 A return will be accepted only if:
(a) The goods are in an unsoiled, undamaged and re-saleable condition in their original package.
(b) Request is made in writing within 7 days of delivery accompanied by a copy of the original delivery docket stating the Company's original invoice number and stating the reason for return.
(c) All charges for freight and handling are to the Buyer's account.

14.4 If the Buyer is a consumer, nothing in this clause 13 limits any remedy available for a failure of the guarantees in sections 56 and 57 of the ACL.

15. CANCELLATION

15.1 If the Company is unable to deliver or provide the goods or services, then it may cancel the Buyer's order (even if it has been accepted) by written notice to the Buyer.

15.2 No purported cancellation or suspension of an order or any part of it by the Buyer is binding on the Company once the order has been accepted.

16. FORCE MAJEURE

16.1 The Company is not liable in any way howsoever arising under the Terms to the extent that it is prevented from acting by events beyond its reasonable control including, without limitation, industrial disputes, strikes, lockouts, accident, breakdown, import or export restrictions, acts of God, acts or threats of terrorism or war. If an event of force majeure occurs, the Company may suspend or terminate the Terms by written notice to the Buyer.

17. MISCELLANEOUS

17.1 The law of Victoria from time to time governs the Terms. The parties agree to the non-exclusive jurisdiction of the courts of Victoria, the Federal Court of Australia, and of courts entitled to hear appeals from those Courts.

17.2 The Company’s failure to enforce any of these Terms shall not be construed as a waiver of any of the Buyer’s rights.

17.3 If a clause is unenforceable it must be read down to be enforceable or, if it cannot be read down, the term must be severed from the Terms, without affecting the enforceability of the remaining terms.

17.4 A notice must be in writing and handed personally or sent by email, facsimile or prepaid mail to the last known address of the addressee. Notices sent by pre-paid post are deemed to be received upon posting. Notices sent by facsimile or email are deemed received on confirmation of successful transmission.

HEAD OFFICE
Melbourne
26 Business Park Drive
Notting Hill VIC 3168
Ph: 03-9538-8101
Fax: 03-9538-8198

Gladstone
4A, 281 J Hickey Avenue
Gladstone QLD 4680
Ph: 07-4978-3380
Fax: 07-4978-7393

Sydney
51/5 Inglewood Pl
Baulkham Hills NSW 2153
Ph: 02-8805-7500
Fax: 02-8805-7599

Brisbane
3/505 Lytton Road
Morningside QLD 4170
Ph: 07-3395-8888
Fax: 07-3395-8988

10th July 2014

King and Martin Electrical agree to warrant all workmanship on all installation's we complete for a period of 2 yrs from completion!

We also will replace any faulty equipment supplied as per the manufacturer's warranty.

We will endeavor to respond to any warrantee issue within 4hrs during business hours.

The above is based on King and Martin Electrical being informed within 24hrs of any warrantee claim.

We also require first option to repair/replace any warrantee issues.

Please call either to report problems

Russell King 0414445066

Grant Mart 0438425607

Regards

Russell King
Director

P.O Box 874 Narellan 2567
Fax 0246481148| license no 141260C | ABN 68101789584
Email: admin@kingandmartinelectrical.com.au |Web: kingandmartinelectrical.com.au

ABN 89 163 993 208

Teralba Industries Pty Ltd
15-19 Kialba Road Campbelltown NSW 2560
PO Box 1639 Campbelltown NSW 2560 Australia

National Call: 1300 20 70 20
P +61 (02) 4629 3000 F +61 (02) 4625 4591
E admin@teralba.com www.teralba.com

11 July 2014

Attention: Mr. Johan Dreyer
NEP SOLAR

Ref: Warranty

Dear Johan,

Further to your email, Alfa Laval's heat exchangers are covered under warranty for either 12 months operation or 18 months from delivery whichever comes first. This covers performance, workmanship and defects in materials. Fouling, corrosion and/or freezing are not warranted.

Should you require further information, please don't hesitate to contact us.

Yours faithfully,

Karl Ovenden | Sales Consultant
Teralba Industries Pty Ltd

National Call 1300 20 70 20

P: +61 (0)2 4629 3000 DDI: +61 (0)2 4629 3016
F: +61 (0)2 4625 4591 E: karl@teralba.com www.teralba.com

Samson Controls Pty Ltd – Terms & Conditions of Trade

1. Definitions

1.1 "Seller" means Samson Controls Pty Ltd, its successors and assigns or any person acting on behalf of and with the authority of Samson Controls Pty Ltd.

1.2 "Customer" means the person/s buying the Goods as specified in any invoice, document or order, and if there is more than one Customer is a reference to each Customer jointly and severally.

1.3 "Goods" means all Goods or Services supplied by the Seller to the Customer at the Customer's request from time to time (where the context so permits the terms 'Goods' or 'Services' shall be interchangeable for the other).

1.4 "Price" means the Price payable for the Goods as agreed between the Seller and the Customer in accordance with clause 4 below.

2. Acceptance

2.1 The Customer is taken to have exclusively accepted and is immediately bound, jointly and severally, by these terms and conditions if the Customer places an order for or accepts delivery of the Goods.

2.2 These terms and conditions may only be amended with the Seller's consent in writing and shall prevail to the extent of any inconsistency with any other document or agreement between the Customer and the Seller.

3. Change in Control

3.1 The Customer shall give the Seller not less than fourteen (14) days prior written notice of any proposed change of ownership of the Customer and/or any other change in the Customer's details (including but not limited to, changes in the Customer's name, address, contact phone or fax number/s, or business practice). The Customer shall be liable for any loss incurred by the Seller as a result of the Customer's failure to comply with this clause.

4. Price and Payment

4.1 At the Seller's sole discretion the Price shall be either:

(a) as indicated on any invoice provided by the Seller to the Customer; or

(b) the Seller's quoted price (subject to clause 4.2) which will be valid for the period stated in the quotation or otherwise for a period of thirty (30) days.

4.2 The Seller reserves the right to change the Price if a variation to the Seller's quotation is requested. Any variation from the plan of scheduled Services or specifications of the Goods (including, but not limited to, any variation as a result of fluctuations in currency exchange rates or increases to the Seller in the cost of taxes, levies, changes in design, materials and labour or where additional Services are required due to the discovery of hidden or unidentifiable difficulties including, but not limited to, limitations to accessing the site, obscured building defects, safety considerations, prerequisite work by any third party not being completed) will be charged for on the basis of the Seller's quotation and will be shown as variations on the invoice.

4.3 At the Seller's sole discretion a deposit may be required.

4.4 Time for payment for the Goods being of the essence, the Price will be payable by the Customer on the date/s determined by the Seller, which may be:

(a) thirty (30) days following the end of the month in which a statement is sent (post/email) to the Customer's address or address for notices;

(b) the date specified on any invoice or other form as being the date for payment; or

(c) failing any notice to the contrary, the date which is seven (7) days following the date of any invoice given to the Customer by the Seller.

4.5 Payment may be made by cash, cheque, bank cheque, electronic/on-line banking, credit card (plus a surcharge of up to three percent (3%) of the Price), or by any other method as agreed to between the Customer and the Seller.

4.6 Unless otherwise stated the Price does not include GST. In addition to the Price the Customer must pay to the Seller an amount equal to any GST the Seller must pay for any supply by the Seller under this or any other agreement for the sale of the Goods. The Customer must pay GST, without deduction or set off of any other amounts, at the same time and on the same basis as the Customer pays the Price. In addition the Customer must pay any other taxes and duties that may be applicable in addition to the Price except where they are expressly included in the Price.

5. Delivery of Goods

5.1 Delivery ("**Delivery**") of the Goods is taken to occur at the time that the Seller (or the Seller's nominated carrier) delivers the Goods to the Customer's nominated address even if the Customer is not present at the address.

5.2 At the Seller's sole discretion the cost of delivery is either included in the Price or is in addition to the Price.

5.3 The Customer must take delivery by receipt or collection of the Goods whenever they are tendered for delivery. In the event that the Customer is unable to take delivery of the Goods as arranged then the Seller shall be entitled to charge a reasonable fee for redelivery and/or storage.

5.4 Any time or date given by the Seller to the Customer is an estimate only. The Customer must still accept delivery of the Goods even if late and the Seller will not be liable for any loss or damage incurred by the Customer as a result of the delivery being late.

6. Risk

6.1 Risk of damage to or loss of the Goods passes to the Customer on Delivery and the Customer must insure the Goods on or before Delivery.

6.2 If any of the Goods are damaged or destroyed following delivery but prior to ownership passing to the Customer, the Seller is entitled to receive all insurance proceeds payable for the Goods. The production of these terms and

conditions by the Seller is sufficient evidence of the Seller's rights to receive the insurance proceeds without the need for any person dealing with the Seller to make further enquiries.

6.3 Where the Seller is required to install the Goods the Customer warrants that the structure of the premises or equipment in or upon which these Goods are to be installed or erected is sound and will sustain the installation and work incidental thereto and the Seller shall not be liable for any claims, demands, losses, damages, costs and expenses howsoever caused or arising in connection with the installation and work incidental thereto.

6.4 The Customer acknowledges that the Seller is only responsible for parts that are replaced by the Seller and that in the event that other parts/Goods, subsequently fail, the Customer agrees to indemnify the Seller against any loss or damage to the Goods, or caused by the Goods, or any part thereof howsoever arising.

6.5 Any advice, recommendation, information, assistance or service provided by the Seller in relation to Goods or Services supplied is given in good faith, is based on the Seller's own knowledge and experience and shall be accepted without liability on the part of the Seller and it shall be the responsibility of the Customer to confirm the accuracy and reliability of the same in light of the use to which the Customer makes or intends to make of the Goods or Services.

7. Accuracy of Customers Plans and Measurements

7.1 The Seller shall be entitled to rely on the accuracy of any plans, specifications and other information provided by the Customer. The Customer acknowledges and agrees that in the event that any of this information provided by the Customer is inaccurate, the Seller accepts no responsibility for any loss, damages, or costs however resulting from these inaccurate plans, specifications or other information.

7.2 In the event the Customer gives information relating to measurements and quantities of the Goods required to complete the Services, it is the Customer's responsibility to verify the accuracy of the measurements and quantities, before the Customer or Seller places an order based on these measurements and quantities. The Seller accepts no responsibility for any loss, damages, or costs however resulting from the Customer's failure to comply with this clause.

8. Customer's Disclaimer

8.1 The Customer hereby disclaims any right to rescind, or cancel the contract or to sue for damages or to claim restitution arising out of any misrepresentation made to him by any servant or agent of the Seller and the Customer acknowledges that he buys the Goods relying solely upon his own skill and judgement.

9. Title

9.1 The Seller and the Customer agree that ownership of the Goods shall not pass until:
(a) the Customer has paid the Seller all amounts owing to the Seller; and
(b) the Customer has met all of its other obligations to the Seller.

9.2 Receipt by the Seller of any form of payment other than cash shall not be deemed to be payment until that form of payment has been honoured, cleared or recognised.

9.3 It is further agreed that:
(a) until ownership of the Goods passes to the Customer in accordance with clause 9.1 that the Customer is only a bailee of the Goods and must return the Goods to the Seller on request.
(b) the Customer holds the benefit of the Customer's insurance of the Goods on trust for the Seller and must pay to the Seller the proceeds of any insurance in the event of the Goods being lost, damaged or destroyed.
(c) the Customer must not sell, dispose, or otherwise part with possession of the Goods other than in the ordinary course of business and for market value. If the Customer sells, disposes or parts with possession of the Goods then the Customer must hold the proceeds of any such act on trust for the Seller and must pay or deliver the proceeds to the Seller on demand.
(d) the Customer should not convert or process the Goods or intermix them with other goods but if the Customer does so then the Customer holds the resulting product on trust for the benefit of the Seller and must sell, dispose of or return the resulting product to the Seller as it so directs.
(e) the Customer irrevocably authorises the Seller to enter any premises where the Seller believes the Goods are kept and recover possession of the Goods.
(f) the Seller may recover possession of any Goods in transit whether or not delivery has occurred.
(g) the Customer shall not charge or grant an encumbrance over the Goods nor grant nor otherwise give away any interest in the Goods while they remain the property of the Seller.
(h) the Seller may commence proceedings to recover the Price of the Goods sold notwithstanding that ownership of the Goods has not passed to the Customer.

10. Personal Property Securities Act 2009 ("PPSA")

10.1 In this clause financing statement, financing change statement, security agreement, and security interest has the meaning given to it by the PPSA.

10.2 Upon assenting to these terms and conditions in writing the Customer acknowledges and agrees that these terms and conditions constitute a security agreement for the purposes of the PPSA and creates a security interest in all Goods that have previously been supplied and that will be supplied in the future by the Seller to the Customer.

10.3 The Customer undertakes to:
(a) promptly sign any further documents and/or provide any further information (such information to be complete, accurate and up-to-date in all respects) which the Seller may reasonably require to;

(i) register a financing statement or financing change statement in relation to a security interest on the Personal Property Securities Register;
(ii) register any other document required to be registered by the PPSA; or
(iii) correct a defect in a statement referred to in clause 10.3(a)(i) or 10.3(a)(ii);

(b) indemnify, and upon demand reimburse, the Seller for all expenses incurred in registering a financing statement or financing change statement on the Personal Property Securities Register established by the PPSA or releasing any Goods charged thereby;

(c) not register a financing change statement in respect of a security interest without the prior written consent of the Seller;

(d) not register, or permit to be registered, a financing statement or a financing change statement in relation to the Goods in favour of a third party without the prior written consent of the Seller;

(e) immediately advise the Seller of any material change in its business practices of selling the Goods which would result in a change in the nature of proceeds derived from such sales.

10.4 The Seller and the Customer agree that sections 96, 115 and 125 of the PPSA do not apply to the security agreement created by these terms and conditions.

10.5 The Customer waives their rights to receive notices under sections 95, 118, 121(4), 130, 132(3)(d) and 132(4) of the PPSA.

10.6 The Customer waives their rights as a grantor and/or a debtor under sections 142 and 143 of the PPSA.

10.7 Unless otherwise agreed to in writing by the Seller, the Customer waives their right to receive a verification statement in accordance with section 157 of the PPSA.

10.8 The Customer must unconditionally ratify any actions taken by the Seller under clauses 10.3 to 10.5.

10.9 Subject to any express provisions to the contrary nothing in these terms and conditions is intended to have the effect of contracting out of any of the provisions of the PPSA.

11. Security and Charge

11.1 In consideration of the Seller agreeing to supply the Goods, the Customer charges all of its rights, title and interest (whether joint or several) in any land, realty or other assets capable of being charged, owned by the Customer either now or in the future, to secure the performance by the Customer of its obligations under these terms and conditions (including, but not limited to, the payment of any money).

11.2 The Customer indemnifies the Seller from and against all the Seller's costs and disbursements including legal costs on a solicitor and own client basis incurred in exercising the Seller's rights under this clause.

11.3 The Customer irrevocably appoints the Seller and each director of the Seller as the Customer's true and lawful attorney/s to perform all necessary acts to give effect to the provisions of this clause 11 including, but not limited to, signing any document on the Customer's behalf.

12. Defects, Warranties and Returns, Competition and Consumer Act 2010 (CCA)

12.1 The Customer must inspect the Goods on delivery and must within seven (7) days of delivery notify the Seller in writing of any evident defect/damage, shortage in quantity, or failure to comply with the description or quote. The Customer must notify any other alleged defect in the Goods as soon as reasonably possible (time being of the essence) after any such defect becomes evident within two (2) years of the date of delivery of the Goods. Upon such notification the Customer must allow the Seller to inspect the Goods.

12.2 Under applicable State, Territory and Commonwealth Law (including, without limitation the CCA), certain statutory implied guarantees and warranties (including, without limitation the statutory guarantees under the CCA) may be implied into these terms and conditions (**Non-Excluded Guarantees**).

12.3 The Seller acknowledges that nothing in these terms and conditions purports to modify or exclude the Non-Excluded Guarantees.

12.4 Except as expressly set out in these terms and conditions or in respect of the Non-Excluded Guarantees, the Seller makes no warranties or other representations under these terms and conditions including but not limited to the quality or suitability of the Goods. The Seller's liability in respect of these warranties is limited to the fullest extent permitted by law.

12.5 If the Customer is a consumer within the meaning of the CCA, the Seller's liability is limited to the extent permitted by section 64A of Schedule 2.

12.6 If the Seller is required to replace the Goods under this clause or the CCA, but is unable to do so, the Seller may refund any money the Customer has paid for the Goods.

12.7 If the Customer is not a consumer within the meaning of the CCA, the Seller's liability for any defect or damage in the Goods is:

(a) limited to the value of any express warranty or warranty card provided to the Customer by the Seller at the Seller's sole discretion;
(b) limited to any warranty to which the Seller is entitled, if the Seller did not manufacture the Goods;
(c) otherwise negated absolutely.

12.8 Subject to this clause 12, returns will only be accepted provided that:

(a) the Customer has complied with the provisions of clause 12.1; and
(b) the Seller has agreed that the Goods are defective; and
(c) the Goods are returned within a reasonable time at the Customer's cost (if that cost is not significant); and
(d) the Goods are returned in as close a condition to that in which they were delivered as is possible.

12.9 Notwithstanding clauses 12.1 to 12.8 but subject to the CCA, the Seller shall not be liable for any defect or damage which may be caused or partly caused by or arise as a result of:

(a) the Customer failing to properly maintain or store any Goods;
(b) the Customer using the Goods for any purpose other than that for which they were designed;
(c) the Customer continuing the use of any Goods after any defect became apparent or should have become apparent to a reasonably prudent operator or user;
(d) the Customer failing to follow any instructions or guidelines provided by the Seller;
(e) fair wear and tear, any accident, or act of God.

12.10 Notwithstanding anything contained in this clause if the Seller is required by a law to accept a return then the Seller will only accept a return on the conditions imposed by that law.

13. Intellectual Property

13.1 Where the Seller has designed, drawn or developed Goods for the Customer, then the copyright in any designs and drawings and documents shall remain the property of the Seller.

13.2 The Customer warrants that all designs, specifications or instructions given to the Seller will not cause the Seller to infringe any patent, registered design or trademark in the execution of the Customer's order and the Customer agrees to indemnify the Seller against any action taken by a third party against the Seller in respect of any such infringement.

14. Default and Consequences of Default

14.1 Interest on overdue invoices shall accrue daily from the date when payment becomes due, until the date of payment, at a rate of two and a half percent (2.5%) per calendar month (and at the Seller's sole discretion such interest shall compound monthly at such a rate) after as well as before any judgment.

14.2 If the Customer owes the Seller any money the Customer shall indemnify the Seller from and against all costs and disbursements incurred by the Seller in recovering the debt (including but not limited to internal administration fees, legal costs on a solicitor and own client basis, the Seller's contract default fees, and bank dishonour fees).

14.3 Without prejudice to any other remedies the Seller may have, if at any time the Customer is in breach of any obligation (including those relating to payment) under these terms and conditions the Seller may suspend or terminate the supply of Goods to the Customer. The Seller will not be liable to the Customer for any loss or damage the Customer suffers because the Seller has exercised its rights under this clause.

14.4 Without prejudice to the Seller's other remedies at law the Seller shall be entitled to cancel all or any part of any order of the Customer which remains unfulfilled and all amounts owing to the Seller shall, whether or not due for payment, become immediately payable if:
(a) any money payable to the Seller becomes overdue, or in the Seller's opinion the Customer will be unable to make a payment when it falls due;
(b) the Customer becomes insolvent, convenes a meeting with its creditors or proposes or enters into an arrangement with creditors, or makes an assignment for the benefit of its creditors; or
(c) a receiver, manager, liquidator (provisional or otherwise) or similar person is appointed in respect of the Customer or any asset of the Customer.

15. Cancellation

15.1 The Seller may cancel any contract to which these terms and conditions apply or cancel delivery of Goods at any time before the Goods are delivered by giving written notice to the Customer. On giving such notice the Seller shall repay to the Customer any money paid by the Customer for the Goods. The Seller shall not be liable for any loss or damage whatsoever arising from such cancellation.

15.2 In the event that the Customer cancels delivery of Goods the Customer shall be liable for any and all loss incurred (whether direct or indirect) by the Seller as a direct result of the cancellation (including, but not limited to, any loss of profits).

15.3 Cancellation of orders for Goods made to the Customer's specifications, or for non-stocklist items, will definitely not be accepted once production has commenced, or an order has been placed.

16. Privacy Act 1988

16.1 The Customer agrees for the Seller to obtain from a credit reporting agency a credit report containing personal credit information about the Customer in relation to credit provided by the Seller.

16.2 The Customer agrees that the Seller may exchange information about the Customer with those credit providers either named as trade referees by the Customer or named in a consumer credit report issued by a credit reporting agency for the following purposes:
(a) to assess an application by the Customer; and/or
(b) to notify other credit providers of a default by the Customer; and/or
(c) to exchange information with other credit providers as to the status of this credit account, where the Customer is in default with other credit providers; and/or
(d) to assess the creditworthiness of the Customer.

The Customer understands that the information exchanged can include anything about the Customer's creditworthiness, credit standing, credit history or credit capacity that credit providers are allowed to exchange under the Privacy Act 1988.

16.3 The Customer consents to the Seller being given a consumer credit report to collect overdue payment on commercial credit (Section 18K(1)(h) Privacy Act 1988).

16.4 The Customer agrees that personal credit information provided may be used and retained by the Seller for the following purposes (and for other purposes as shall be agreed between the Customer and Seller or required by law from time to time):
(a) the provision of Goods; and/or
(b) the marketing of Goods by the Seller, its agents or distributors; and/or
(c) analysing, verifying and/or checking the Customer's credit, payment and/or status in relation to the provision of Goods; and/or
(d) processing of any payment instructions, direct debit facilities and/or credit facilities requested by the Customer; and/or
(e) enabling the daily operation of Customer's account and/or the collection of amounts outstanding in the Customer's account in relation to the Goods.

16.5 The Seller may give information about the Customer to a credit reporting agency for the following purposes:
(a) to obtain a consumer credit report about the Customer;
(b) allow the credit reporting agency to create or maintain a credit information file containing information about the Customer.

16.6 The information given to the credit reporting agency may include:
(a) personal particulars (the Customer's name, sex, address, previous addresses, date of birth, name of employer and driver's licence number);
(b) details concerning the Customer's application for credit or commercial credit and the amount requested;
(c) advice that the Seller is a current credit provider to the Customer;
(d) advice of any overdue accounts, loan repayments, and/or any outstanding monies owing which are overdue by more than sixty (60) days, and for which debt collection action has been started;
(e) that the Customer's overdue accounts, loan repayments and/or any outstanding monies are no longer overdue in respect of any default that has been listed;
(f) information that, in the opinion of the Seller, the Customer has committed a serious credit infringement (that is, fraudulently or shown an intention not to comply with the Customer's credit obligations);
(g) advice that cheques drawn by the Customer for one hundred dollars ($100) or more, have been dishonoured more than once;
(h) that credit provided to the Customer by the Seller has been paid or otherwise discharged.

17. Unpaid Seller's Rights

17.1 Where the Customer has left any item with the Seller for repair, modification, exchange or for the Seller to perform any other service in relation to the item and the Seller has not received or been tendered the whole of any moneys owing to it by the Customer, the Seller shall have, until all moneys owing to the Seller are paid:
(a) a lien on the item; and
(b) the right to retain or sell the item, such sale to be undertaken in accordance with any legislation applicable to the sale or disposal of uncollected goods.

17.2 The lien of the Seller shall continue despite the commencement of proceedings, or judgment for any moneys owing to the Seller having been obtained against the Customer.

18. General

18.1 The failure by the Seller to enforce any provision of these terms and conditions shall not be treated as a waiver of that provision, nor shall it affect the Seller's right to subsequently enforce that provision. If any provision of these terms and conditions shall be invalid, void, illegal or unenforceable the validity, existence, legality and enforceability of the remaining provisions shall not be affected, prejudiced or impaired.

18.2 These terms and conditions and any contract to which they apply shall be governed by the laws of New South Wales in which the Seller has its principal place of business, and are subject to the jurisdiction of the courts in New South Wales.

18.3 Subject to clause 12 the Seller shall be under no liability whatsoever to the Customer for any indirect and/or consequential loss and/or expense (including loss of profit) suffered by the Customer arising out of a breach by the Seller of these terms and conditions (alternatively the Seller's liability shall be limited to damages which under no circumstances shall exceed the Price of the Goods).

18.4 The Customer shall not be entitled to set off against, or deduct from the Price, any sums owed or claimed to be owed to the Customer by the Seller nor to withhold payment of any invoice because part of that invoice is in dispute.

18.5 The Seller may license or sub-contract all or any part of its rights and obligations without the Customer's consent.

18.6 The Customer agrees that the Seller may amend these terms and conditions at any time. If the Seller makes a change to these terms and conditions, then that change will take effect from the date on which the Seller notifies the Customer of such change. The Customer will be taken to have accepted such changes if the Customer makes a further request for the Seller to provide Goods to the Customer.

18.7 Neither party shall be liable for any default due to any act of God, war, terrorism, strike, lock-out, industrial action, fire, flood, storm or other event beyond the reasonable control of either party.

18.8 The Customer warrants that it has the power to enter into this agreement and has obtained all necessary authorisations to allow it to do so, it is not insolvent and that this agreement creates binding and valid legal obligations on it.

From: Alex Lyovin
To: Johan Dreyer
Subject: RE: Warranty Statement
Date: Friday, 11 July 2014 10:49:45 AM

Hello Johan,

Please see below:

6. WARRANTIES & LIABILITIES

6.1 The Seller warrants that the Goods conform to their published specifications as at the time of delivery and will be new and free of defects in material and workmanship. The Seller
further warrants that it will repair or replace, in its sole discretion, any defects in material or workmanship which become apparent within 12 months from the date of shipment.

6.2 Notwithstanding the above, the Seller shall be under no liability in respect of any defect arising from any drawing, design or specification supplied by the Buyer. Any defect arising
from fair wear and tear, wilful damage, negligence, abnormal working conditions, failure to comply with the Seller's instructions (whether in writing or oral), misuse, alteration or
repair of the Goods without the Seller's written consent or use or application of the Goods with incompatible products will render all claims null and void.

6.3 The above warranty does not cover or extend to parts, materials or equipment not manufactured by the Seller in which respect the Buyer shall only be entitled to the benefit of any
such warranty or guarantee given to or extended by the original manufacturer or third party to the Seller.

6.4 Subject to clause 6.5, the Seller shall not be liable for any injury, loss or damage (whether direct or consequential) arising from any defect in, or in the operation of, any Goods or
part thereof or from loss of use thereof caused by any act or omission of the Seller or its servants or agents (including negligent acts or omissions). The Buyer, in purchasing Goods
from the Seller agrees in this respect to further fully indemnify the Seller against any claims which may be made against the Seller by any third party in respect of such injury, loss or
damage.

6.5 Nothing in these terms and conditions excludes, restricts or modifies any condition, warranty, right or remedy conferred on the Buyer by the Trade Practices Act 1974 (Cth) or any
other applicable law that cannot be excluded, restricted or modified by agreement. To the fullest extent permitted by law, the Seller's liability for a breach of a non-excludable
condition or warranty referred to above, is limited at its option to the repair or replacement of the relevant product or to the payment of the cost of repairing or replacing the relevant product.

Best regards,
Alex Lyovin
Electrical Engineering Manager

Weidmuller – Your partner in Industrial Connectivity
We look forward to sharing ideas with you – **Let's connect.**

Weidmuller Pty Ltd
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Email: alex.lyovin@weidmuller.com.au – Web: www.weidmuller.com.au

WEIDMULLER STANDARD TERMS & CONDITIONS OF SALE – Effective 1st June 2006

Weidmüller (Australia) Pty Ltd, ABN 98 000 938 590

1. DEFINITIONS

Buyer means the Company, authorised person and/or person who accepts the quotation from the Seller for the sale of Goods or whose order for the Goods is accepted by the Seller.

Goods mean the merchandise or service that the Seller agrees to supply to the Buyer.

Seller means Weidmuller Pty. Ltd. and/or its subsidiary companies with whom the Buyer has contracted for the supply of Goods.

Contract means the legal relationship created between the Buyer and Seller in agreeing to an exchange of Goods in return for consideration resulting from an offer and acceptance. All contracts are deemed to be governed by these terms and conditions of sale unless specifically excluded (in writing) in an alternate contract.

2. VALIDITY & ACCEPTANCE

Quotation validity of all offers is 30 days from the date of quotation, unless specifically shown elsewhere on the quotation or an extension to quotation validity is granted in writing. The acceptance of our quotation must be confirmed in writing and followed by a purchase order. In the event we do not receive your purchase order within 3 working days of receiving your written acceptance of our quotation we will proceed with supply of Goods on the basis of our terms and conditions of sale. Our quotation includes only such equipment, accessories and work as specified therein. Any verbal instruction to proceed with the supply of Goods will be deemed to be on the basis of our terms and conditions of sale.

3. ORDERS & SPECIFICATIONS

3.1 Any advice or recommendation given by the Seller or its employees or authorised agents to the Buyer or its employees or authorised agents regarding storage, use or application of the Goods is given in good faith and does not constitute a guarantee of suitability or fitness for use. The Buyer shall at all times remain responsible for the application of the Goods and the Seller's liability in this regard shall be limited absolutely to the providing of Goods in compliance with published specifications.

3.2 Any typographical, clerical or other error or omission in any sales literature, quotation, price list, acceptance of offer, invoice or other document or information issued by the Seller shall be subject to correction without any liability on the part of the Seller.

3.3 The Buyer shall be responsible to the Seller for ensuring the accuracy of the terms of the order submitted together with supplying any necessary information pertinent to the Goods within a sufficient time to enable the Seller to perform the terms of the order.

3.4 The quantity, quality and description of, and any specification of the Goods shall be those stipulated in the Seller's quotation (if accepted by the Buyer) or the Buyer's order (if accepted by the Seller). Unless otherwise accepted by the Seller, minimum or standard-pack quantities for the Goods, as shown in the Seller's Price List, are applicable and may only be ordered accordingly.

3.5 The Seller reserves the right to make any changes in the specification of the Goods necessary to conform with any applicable safety or other statutory requirements or, where the Goods are to be supplied to the Seller's specification, which do not materially affect its quality or performance.

3.6 If the Goods are to be assembled, produced and/or additional processing added by the Seller in accordance with the specification stipulated by the Buyer, then the Buyer shall indemnify the Seller against any loss, damages, costs and expenses awarded against or incurred by the Seller in any infringement of Intellectual Property Rights, which may result from the Buyer's specification.

3.7 In the event the Buyer suspends or cancels any part or all of the order, the Seller reserves the right to seek compensation from the Buyer for all costs incurred or committed inclusive of any other expenses and loss of profits as at the date of suspension or cancellation.

4. PRICES & PAYMENT TERMS

4.1 Unless otherwise specified, all prices are quoted nett FOB (Free on Board) or FOT (Free on Truck), Point of Supply in Australian Dollars. Point of Supply shall be the Seller's office on which the Buyer placed the order for Goods. All prices exclude freight, carriage, insurance, non-standard packaging charges, GST and sales taxes (as applicable).

4.2 Where the Buyer requires freight to be pre-paid goods despatched to the metropolitan areas of Adelaide, Brisbane, Canberra, Melbourne, Newcastle, Perth, Sydney and Wollongong via the Seller's normal carriers shall incur a standard handling charge of $10.00 per order. Freight charges for goods despatched to other areas or by other than the Seller's normal carriers shall be billed to the Buyer's account at cost.

4.3 For orders with a nett value of less than $100.00 a small order surcharge of $10.00 will apply.

4.4 Standard payment terms for Buyers who have approved credit accounts with the Seller are nett 30 days from the date of Statement. Payment terms for Buyers without approved credit accounts are full payment by cash or company cheque prior to shipment or collection. For overseas Buyers without approved credit accounts full payment is due by telegraphic transfer prior to shipment or collection or may be made by an irrevocable letter of credit payable on presentation of shipping documents with provision for partial and third party shipments.

4.5 The goods shall be at the sole risk of the Customer as soon as they are delivered or deemed to be delivered. Property in and title to the goods will not pass to the Customer until those goods and all other amounts owed to the Supplier by the Customer have been paid in full.

4.6 Weidmuller Pty Ltd reserves the right to charge interest at the rate of 1.5% per month on all overdue accounts.

4.7 I/we agree that expenses and disdursements incurred in recovering any overdue payment including debt collection agency costs will be charged to my account.

5. DELIVERY, STORAGE & RETURNS

5.1 All dates quoted for delivery of Goods are approximate and are subject to prior sale. The Seller shall not be liable for any delay in delivery of the Goods howsoever caused. Time of delivery shall not be the essence of the contract unless agreed in writing. The Seller however reserves the right to make partial delivery of the Goods and each partial shall for the purpose of payment be deemed as a separate contract and will be invoiced respectively. The Goods may be delivered by the Seller in advance of the quoted delivery date unless specifically excluded by the Buyer in his written purchase order.

5.2 Where no method of delivery of the Goods has been specified, the Buyer shall give the Seller all necessary instructions and authority for making all necessary arrangements such that the delivery may be effected within 5 working days after the Seller notifies the Buyer of the availability of the Goods. All claims for non-delivery or damage to the Goods must be made in writing to the Seller within 14 days of despatch date.

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5.3 In the event of any delay or failure of delivery due to unforeseen circumstances or beyond the control of the Seller, the Seller shall not be deemed to be in breach of the contract, and the Buyer shall grant the Seller an extension of the delivery time so as to fulfil the obligations of the Contract.

5.4 The Buyer may not return the Goods or any part of the Goods to the Seller after delivery unless an approved returned goods authorisation number is obtained in advance and a copy of same is issued to Seller on return of Goods as evidence of acceptance of return. The Seller will not under any circumstance accept for credit any goods returned without approval and will not be held responsible for their disposition.

5.5 In the event the Seller agrees to accept Goods for return by issuing a returned goods authorisation number the following conditions will apply to the return of such goods.

- All freight charges incurred to return Goods to point of supply must be prepaid by the Buyer.
- A copy of the original Seller's invoice must accompany all returned Goods.
- Goods to be returned must be either the original supplied quantities or in full pack quantities and be in "as new" saleable condition.
- Goods specially ordered on indent or those of a custom nature are not returnable.
- All applications for return of Goods must be made within 90 days of the original invoice date.
- No returns will be accepted for goods with an invoice value less than $50.00
- A restocking charge of 20% of the invoice value will apply to Goods accepted for return. If the Buyer orders (at the time of return of goods) alternate Goods with a value equivalent to the invoice value of the returned Goods, or higher, this restocking charge will be reduced to 10% of the invoice value.

6. WARRANTIES & LIABILITIES

6.1 The Seller warrants that the Goods conform to their published specifications as at the time of delivery and will be new and free of defects in material and workmanship. The Seller further warrants that it will repair or replace, in its sole discretion, any defects in material or workmanship which become apparent within 12 months from the date of shipment.

6.2 Notwithstanding the above, the Seller shall be under no liability in respect of any defect arising from any drawing, design or specification supplied by the Buyer. Any defect arising from fair wear and tear, wilful damage, negligence, abnormal working conditions, failure to comply with the Seller's instructions (whether in writing or oral), misuse, alteration or repair of the Goods without the Seller's written consent or use or application of the Goods with incompatible products will render all claims null and void.

6.3 The above warranty does not cover or extend to parts, materials or equipment not manufactured by the Seller in which respect the Buyer shall only be entitled to the benefit of any such warranty or guarantee given to or extended by the original manufacturer or third party to the Seller.

6.4 Subject to clause 6.5, the Seller shall not be liable for any injury, loss or damage (whether direct or consequential) arising from any defect in, or in the operation of, any Goods or part thereof or from loss of use thereof caused by any act or omission of the Seller or its servants or agents (including negligent acts or omissions). The Buyer, in purchasing Goods from the Seller agrees in this respect to further fully indemnify the Seller against any claims which may be made against the Seller by any third party in respect of such injury, loss or damage.

6.5 Nothing in these terms and conditions excludes, restricts or modifies any condition, warranty, right or remedy conferred on the Buyer by the Trade Practices Act 1974 (Cth) or any other applicable law that cannot be excluded, restricted or modified by agreement. To the fullest extent permitted by law, the Seller's liability for a breach of a non-excludable condition or warranty referred to above, is limited at its option to the repair or replacement of the relevant product or to the payment of the cost of repairing or replacing the relevant product.

***7.* INTELLECTUAL PROPERTY**

7.1 Unless otherwise agreed in writing with the Seller, copyright exists in all documents supplied to the Buyer or produced by the Seller under the Buyer's instructions and is retained by the Seller. The contents of such documents or any part thereof shall not be disseminated in any form to any unauthorised person, institution, organisation or company either directly or indirectly without the prior consent, in writing, of the Seller.

7.2 The Intellectual Property Rights in or relating to the Goods shall remain exclusively the property of the Seller and neither the Buyer nor any agent or subcontractor or any other person authorised by the Buyer shall, at any time, make use of same without prior written authorisation.

7.3 Unless specified otherwise in our quotation, all specifications, drawings and other particulars including weights and dimensions are approximate only. Descriptions and illustrations contained in our catalogues and other illustrated materials are intended only as a conceptual presentation of the equipment or merchandise described therein and none of these shall form part of the Contract.

7.4 All Weidmuller specifications, software, firmware, drawings and technical details submitted with, in support of or in connection with our quotation are our exclusive copyright property and material. All such material, information and application knowledge, whenever supplied, shall at all times be treated by the Buyer or its employees or authorised persons, as confidential and shall not be used, without our consent, for purposes other than the following:-

i) evaluation of Seller's quotation,
ii) confirmation of order or contract with the Seller,
iii) the operation or application of the equipment or merchandise.

7.5 The designs and features of the Goods offered by the Seller are, in many cases, protected under patents, either existing or pending, and unauthorised reproduction of same constitutes an infringement of the Seller's rights.

8. INSPECTION, TEST AND CERTIFICATION

All goods, as far as practicable, will be subjected to our internal test, quality and inspection procedures. These standard tests, inspections and certifications may be witnessed by the Buyer at no extra charge provided Buyer notifies us of their intent to witness these tests (in our facility) at time of order placement. Buyer's wishing to avail of this service will be advised of availability of Goods and must attend within 5 working days of such notification failing which the Seller will complete the activity independently and ship the Goods without further notice. Unless specified in our quotation all other tests, inspections and/or certifications are chargeable and must commence within 10 working days of notification.

9. DISPUTES AND ARBITRATION

Any and all disputes which cannot be settled between the Buyer and Seller in amicable dialogue shall be passed to arbitration for resolution which shall be final and binding on both parties. Arbitration shall be in Sydney, Australia and shall be governed by the International Rules of Arbitration.

10. VARIATION TO TERMS AND CONDITIONS OF SALE

These Terms and Conditions of Sale shall apply to all Contracts between the Seller and the Buyer unless otherwise agreed in writing by an authorised officer of the Seller.

COMMERCIAL SUMMARY

Validity	This offer is available for a period up to 30 days. Any extension of this offer must be agreed to in writing by an authorised representative of Yokogawa Australia Pty Ltd.
Delivery	Delivery Time is , EXW (Ex Works Sydney)
Terms and Conditions	All goods and services are offered subject to Yokogawa Australia Pty Ltd's standard terms and conditions of supply, unless otherwise stated. Refer to WIF-0500-005 document. Copies can be supplied on request.
Terms of Payment	Payment in full is required before goods will be either a) ordered for manufacture or b) released from our store.
Exchange Rate Variation	Price quoted is fixed and firm and not subject to exchange rate variation.
Warranty	All Yokogawa manufactured goods are warranted against faulty workmanship or materials for a period of 12 months after goods are delivered. Yokogawa Australia Pty Ltd reserves the right to refuse and/or void all warranties if, in their opinion, the equipment is serviced or modified without their consent.
Insurance	The goods will be shipped EXW (Ex Works Sydney). When goods are transported by carriers contracted or arranged by or its agents the goods WILL NOT BE INSURED by Yokogawa Australia Pty Ltd from the point that the goods are delivered to or picked up by your appointed carrier.
Goods and Services Tax	A tax invoice will be issued when goods and or services are provided. GST will be chargeable at the rate of 10% on the order of goods relating to this quote.
Returns Policy	Only goods supplied ex stock will be considered for return, contingent on the condition of the goods and packaging. All returns will be subject to a 30% handling fee. No items manufactured to order will be accepted for return. Refer to WIF-0500-005 document (copies can be supplied on request).

13 SPARES AND SPECIAL TOOLS

13.1 Spare Schedule

The basic spare-part-kit for the PickChiller PC19 is supplied. This includes seals, pump membrane, V-belt, sensors and special connections for the refrigerant hose.

No other spare parts are supplied.

13.2 Special Tools

The following special tools are provided for maintenance on the Pink Chiller:

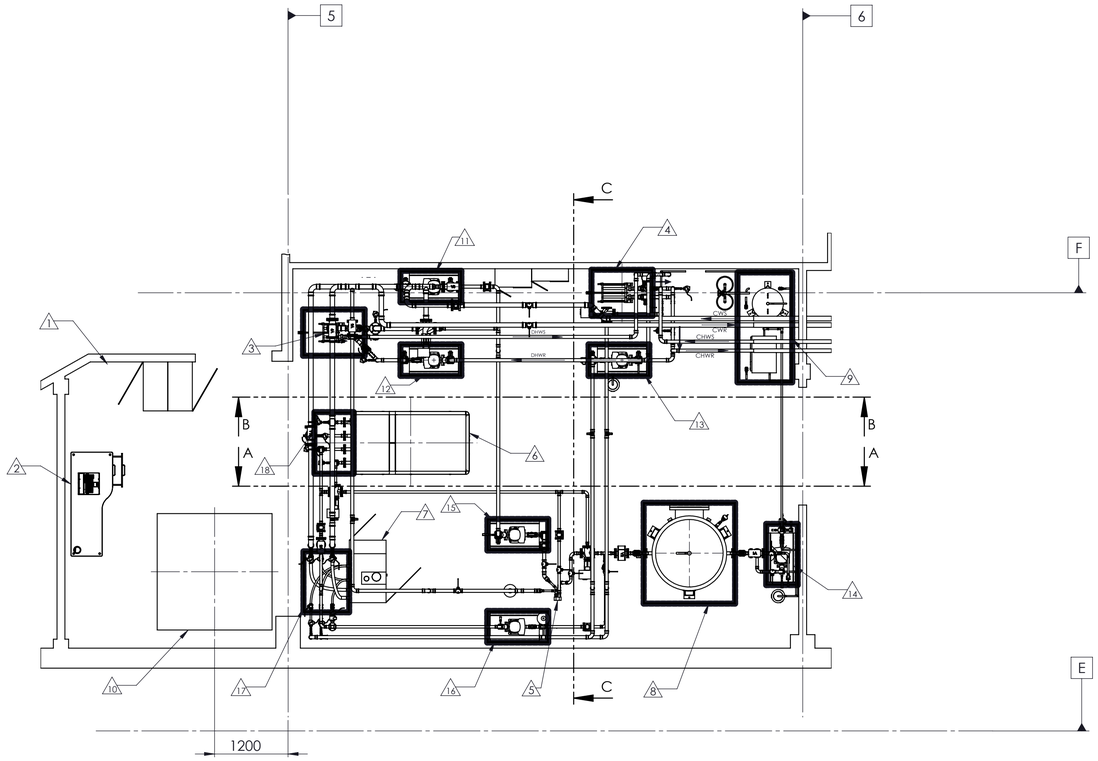
- Venturi based vacuum pump
  - Uses venturi principle to create vacuum.
  - Used to draw vacuum on system when evacuating the emptied system and prior to filling the system with ammonia and water.
  - Connect water hose to venturi
  - Connect drain hose to venturi
  - Drain to sewer
  - Connect vacuum pump to system.
  - Run water through venturi and open system valve to evacuate
- Adaptor – pipe to hose fitting
  - Used to connect the system piping to a hose to fill the system with water.
- Adaptor and fill hose.
  - Used to connect the Ammonia tank with the system when filling.
- Adaptor – ammonia drain fitting
  - Used to drain the ammonia from the system and dilute it with water for disposal into sewer.

14 DRAWINGS

14.1 List of Drawings

DRAWING FILE NAME	DRAWING FILE NUMBER	DRAWING NAME	STATUS	REVISION
CB1113EP	24480	SOLAR THERMAL TRIGEN SYSTEM - PLANT ROOM LAYOUT PAGE 1/2	AS-BUILT	4
CB1113EP	24481	SOLAR THERMAL TRIGEN SYSTEM - PLANT ROOM LAYOUT PAGE 2/2	AS-BUILT	4
CB1113ES	24483	SOLAR THERMAL TRIGEN SYSTEM - MECHANICAL SERVICES AND PIPING LAYOUT	AS-BUILT	3
CB11RFED	24490	SOLAR THERMAL TRIGEN SYSTEM - ROOF PIPEWORK LAYOUT	AS-BUILT	2
CB11RFED	24491	SOLAR THERMAL TRIGEN SYSTEM - ROOF PIPEWORK LAYOUT PAGE 2/2	AS-BUILT	2
CB11RFED	24492	SOLAR THERMAL TRIGEN SYSTEM - ROOF PIPEWORK LAYOUT PAGE 3/3 - TO Follow	AS-BUILT	2
CB1113ED	24493	SOLAR THERMAL TRIGEN SYSTEM - CIRCUIT SOLAR DISTRIBUTION	AS-BUILT	3
CB1113ED	24494	SOLAR THERMAL TRIGEN SYSTEM - CIRCUIT COOL WATER	AS-BUILT	3
CB1113ED	24495	SOLAR THERMAL TRIGEN SYSTEM - CIRCUIT HEAT DUMP	AS-BUILT	3
CB1113ED	24496	SOLAR THERMAL TRIGEN SYSTEM - CIRCUIT DOMESTIC HOT WATER	AS-BUILT	3
CB1113ED	24497	SOLAR THERMAL TRIGEN SYSTEM - CIRCUIT CHILLED WATER	AS-BUILT	3
CB1113ED	24498	SOLAR THERMAL TRIGEN SYSTEM - CIRCUIT SOLAR FIELD	AS-BUILT	3
CB1113ED	24500	SOLAR THERMAL TRIGEN SYSTEM - CIRCUIT LAYOUT	AS-BUILT	3
CB1113ED	24544	SOLAR THERMAL TRIGEN SYSTEM UTS PLANT LAYOUT- EQUIPMENT LAYOUT	AS-BUILT	2

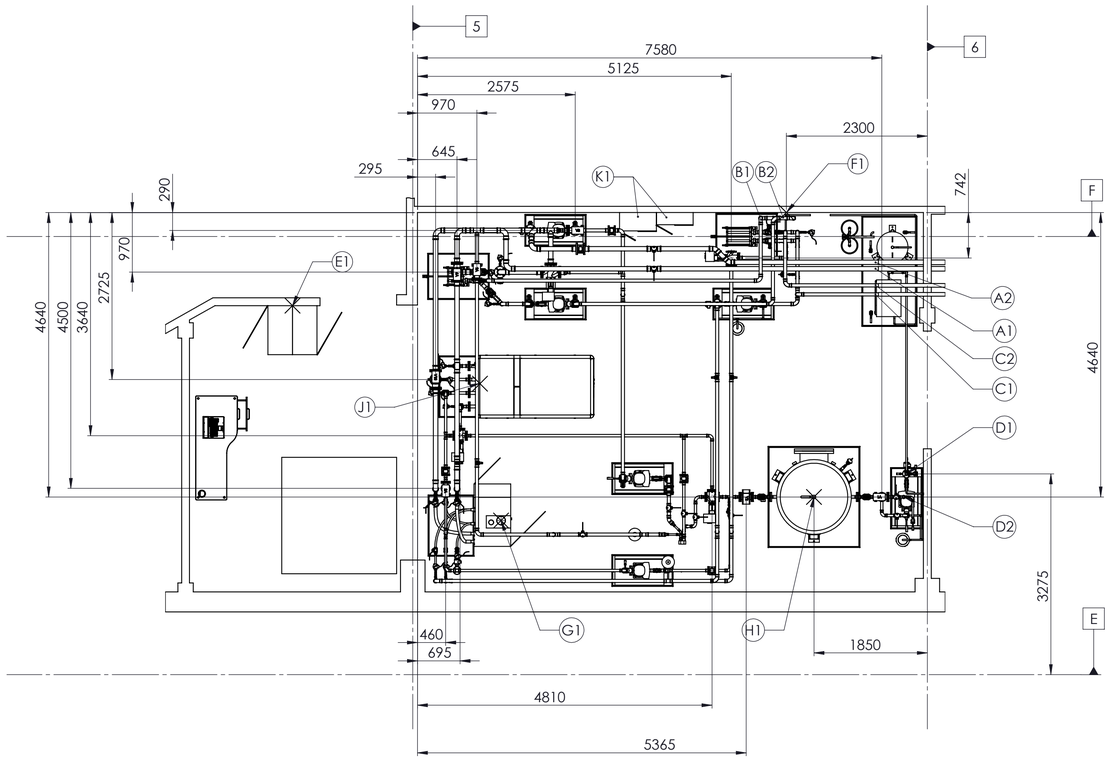
1. ELECTRICAL MECHANICAL AND CONTROL DISTRIBUTION BOARD 2 X ELECTRICAL CABINETS 1200 X 400
2. WORSTATION BY OTHERS. SOLAR TRIGEN TO PROVIDE PC AND HMI SCREEN
3. DHW HEAT EXCHANGER 1005 x 755
4. CHILLED WATER HEAT EXCHANGER 1005 x 755
5. SOLAR DISTRIBUTION HEAT EXCHANGER (WALL MOUNTED)
6. ENFTECH / ORC 1950 x 1050
7. CHILLER 600 x 1050
8. BUFFER TANK 1500 x 1650
9. EXPANSION AND PRESSURISATION SYSTEM
10. AREA RESERVED FOR CHILLER #2 1900 x 1900
11. DHW / RECOOLING PUMP 1000 x 520
12. DHW PUMP 1000 x 520
13. CHILLED WATER PUMP 1000 x 520
14. SOLAR FIELD PUMP 1000 x 520
15. DHW / HEAT PUMP 1000 x 520
16. SOLAR DISTRIBUTION PUMP 1000 x 520
17. CHILLER DRIP TRAY 750 x 1000
18. ORC DRIP TRAY 500 x 1200

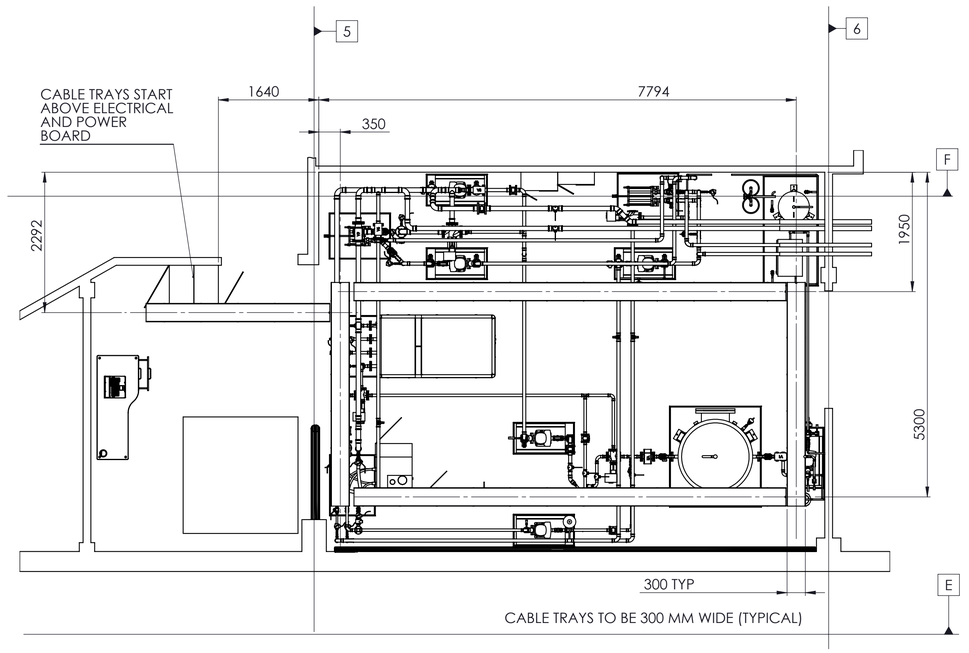


PLAN VIEW EXCLUDING CABLE TRAYS

INTERFACES

- INDICATES PRESENCE OF DRIP TRAY UNDER EQUIPMENT
- A1 TO HYBRID COOLING TOWER BUTTERFLY VALVE DN 65 FLANGED
- A2 FROM HYBRID COOLING TOWER BUTTERFLY VALVE DN 65 FLANGED
- B1 TO DOMESTIC HOT WATER DN 50 FLANGED
- B2 FROM DOMESTIC HOT WATER DN 50 FLANGED
- C1 TO CHILLED WATER DN 50 FLANGED
- C2 FROM CHILLED WATER DN 50 FLANGED
- D1 TO SOLAR FIELD EAST SIDE GRID 12 / 13 DN40 PIPE
- D2 FROM SOLAR FIELD WEST SIDE GRID 6 / 7 DN 40 PIPE
- E1 POWER AND DATA FROM HERE TO SOLAR COLLECTOR END GRID 12 / 13
- F1 MAKE UP COLD WATER (BY HYDRAULICS) TO CONNECT TO EXPANSION AND PRESSURISATION SYSTEM
- G1 Ø 75 MM FLUE FOR VENTILLATION OF AMMONIA CHILLER. CAN BE TAKEN THROUGH ROOF OR SOUTHER WALL. TBC BY ARCHITECT.
- H1 PRESSURE RELIEF VALVE VENT THROUGH ROOF
- J1 ELECTRICAL POWER OUTPUT FROM ORC: 400V / 50Hz, 3x32A. (3p+N+PE) CIRCUIT BREAKER OR FUSES CLASS C CONNECTION BY NEP CABLE TO PECC BY OTHERS
- K1 63A DISTRIBUTION BOARD BY ELECTRICAL





PLAN VIEW INCLUDING CABLE TRAYS

General Notes
Do not scale from drawing. Use marked dimensions.
To be read in conjunction with all other Consultant's drawings.
The Architect to be immediately notified of any discrepancies.

NOTES
1. References marked as ☐ refers to building grid references.
2. All drip trays are to be plumbed to tundishes under raised floor. Tundishes to be provided by hydraulics.
3. Pipes to be insulated and clad. Allowance made for the following thickness:

PIPE OD	INSULATION (mm)
<25 mm	20 mm
25-35 mm	30 mm
35-45 mm	40 mm
>45 mm	50 mm

No.	Date	Dwn	Chk	App	Revision or reason for issue
A	15.04.13	KK	JD	JD	Preliminary
B	17.05.13	KK	JD	JD	For interface discussion
1	29.05.13	KK	JD	JD	For construction
2	03.07.13	KK	JD	JD	Update to include stuctural steel
3	10.04.14	KK	JD	JD	Update to new piping layout
4	06.05.14	KK	JD	JD	AS BUILT

Scale / North Point
1:50 0 0.25m 0.50m 1.0m 1.50m 2.50m

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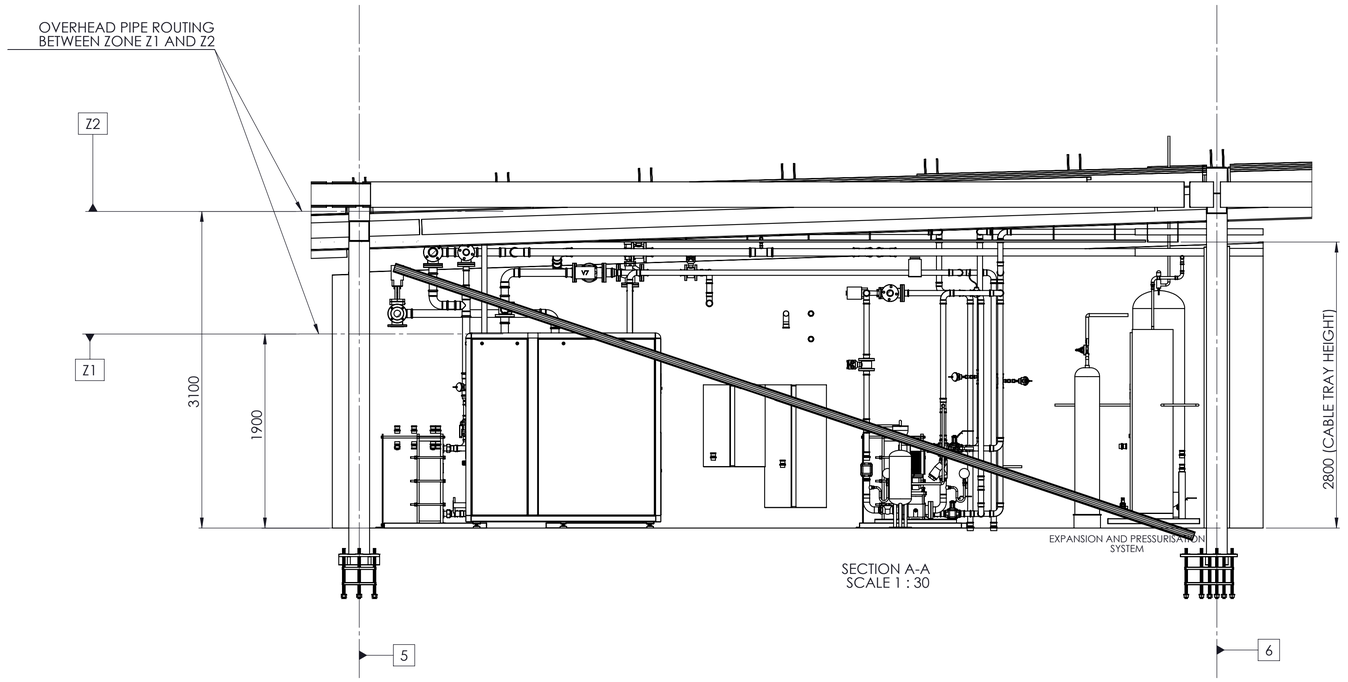
Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
PLANT ROOM LAYOUT
SHEET 1/2 (FOR SHEET 2/2 SEE 24481)

Project Number
7352

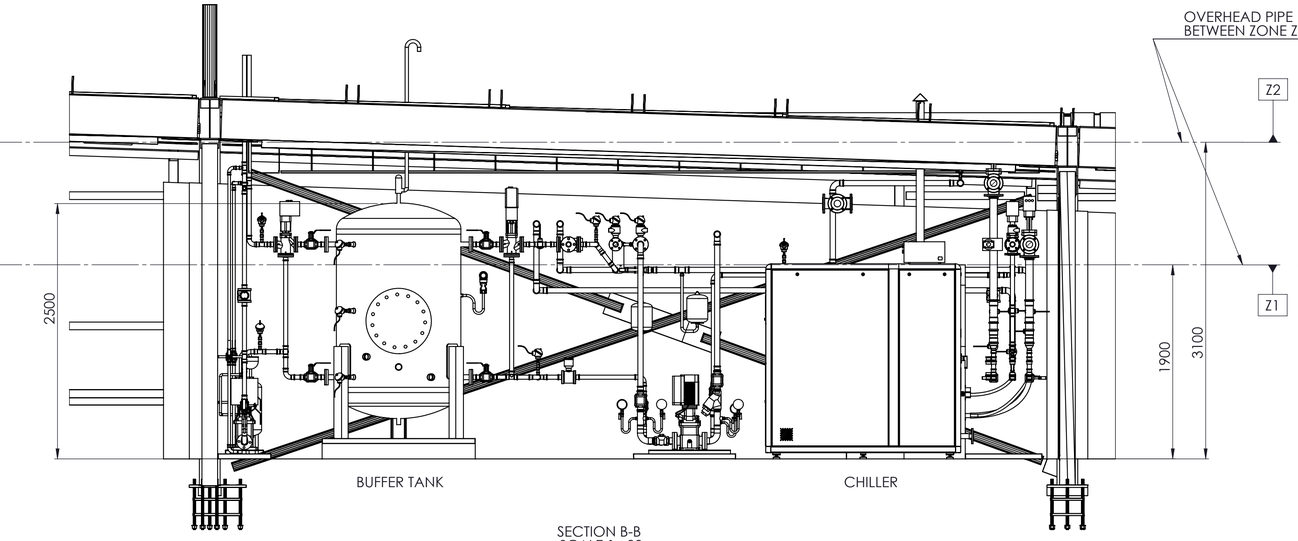
Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
1:50	AS BUILT	A1

UTS Drg File Name	UTS Drg File No	Rev No
CB1113EP	24480	4

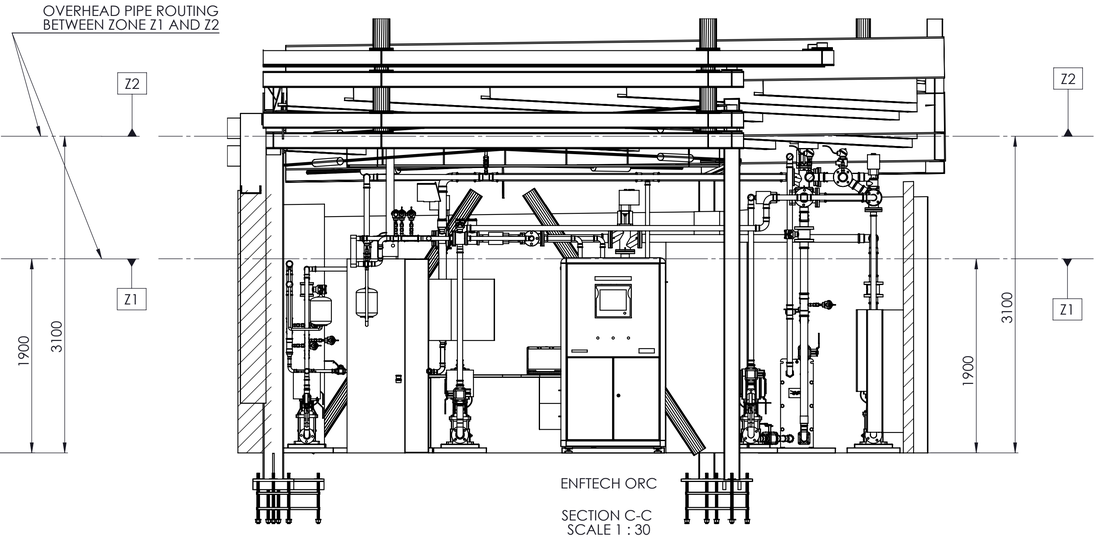


SECTION A-A
SCALE 1 : 30



SECTION B-B
SCALE 1 : 30

CROSS SECTIONS SHOW STRUCTURAL STEEL
ROOF SHEETING OMITTED



SECTION C-C
SCALE 1 : 30

General Notes
Do not scale from drawing. Use marked dimensions.
To be read in conjunction with all other Consultant's drawings.
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ROOF SHEET SHOWN
STRUCTURE OMITTED

No.	Date	Dwn	Chk	App	Revision or reason for issue
A	15.04.13	KK	JD	JD	Preliminary
B	17.05.13	KK	JD	JD	For interface discussion
1	29.05.13	KK	JD	JD	For construction
2	03.07.13	KK	JD	JD	Update to include stuctural steel
3	10.04.14	KK	JD	JD	Update to new piping layout
4	06.05.14	KK	JD	JD	AS BUILT

Scale / North Point

1:50 0 0.25m 0.50m 1.0m 1.50m 2.50m

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Drawing Title
SOLAR THERMAL TRIGEN SYSTEM

PLANT ROOM LAYOUT

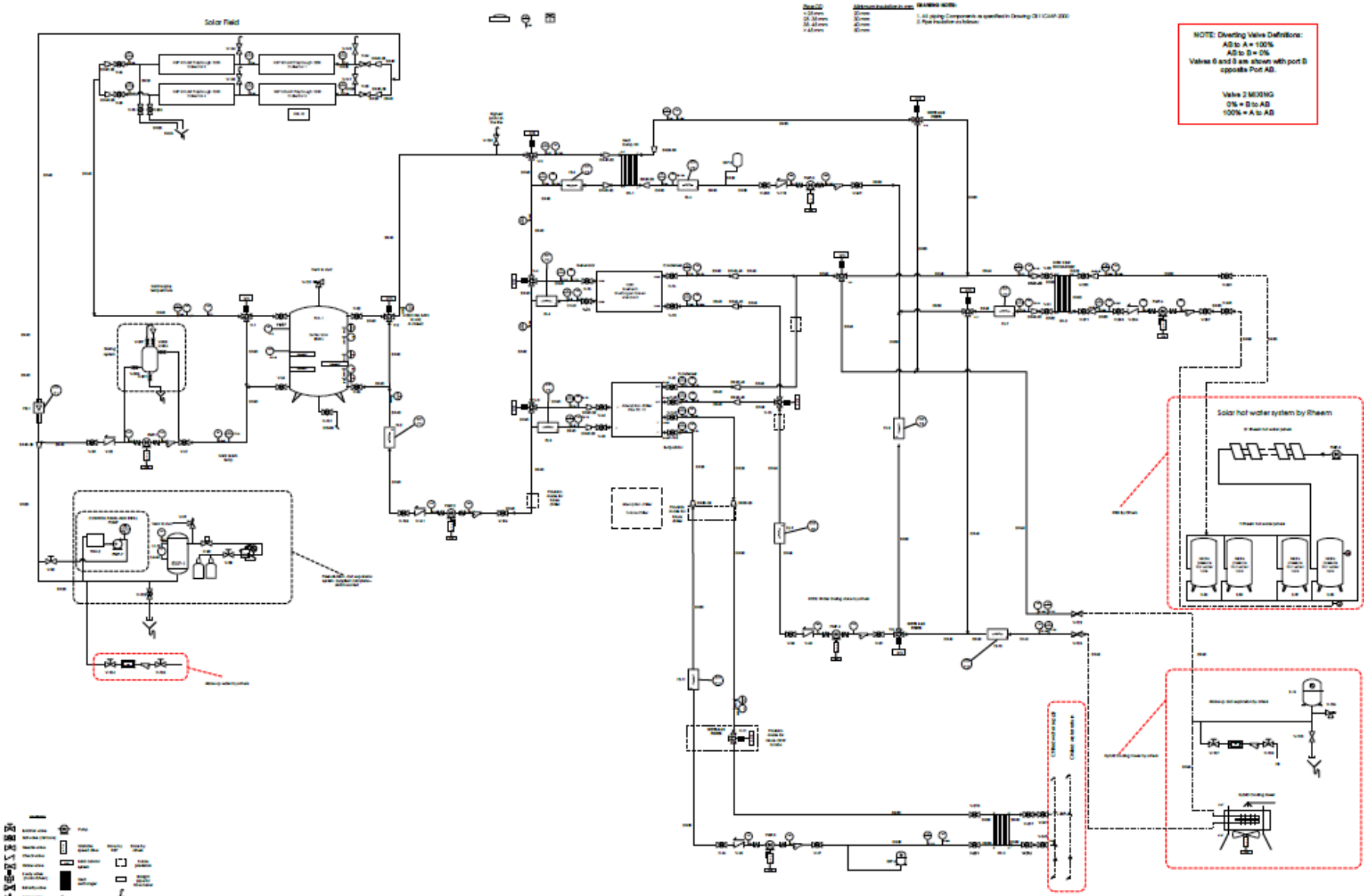
SHEET 2/2 (FOR SHEET 1/2 SEE 24480)

Project Number
7352

Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
1:30	CONSTRUCTION	A1

UTS Drg File Name	UTS Drg File No	Rev No
CB1113EP	24481	4



No.	Date	Dwn	Chk	App	Reason for Issue
1.	20.05.2013	JO	JD	JD	FOR CONSTRUCTION
2.	10.04.2014	JO	JD	JD	REVISED FOR CONSTRUCTION
3.	06.05.2014	JO	JD	JD	AS BUILT

Scale / North Point

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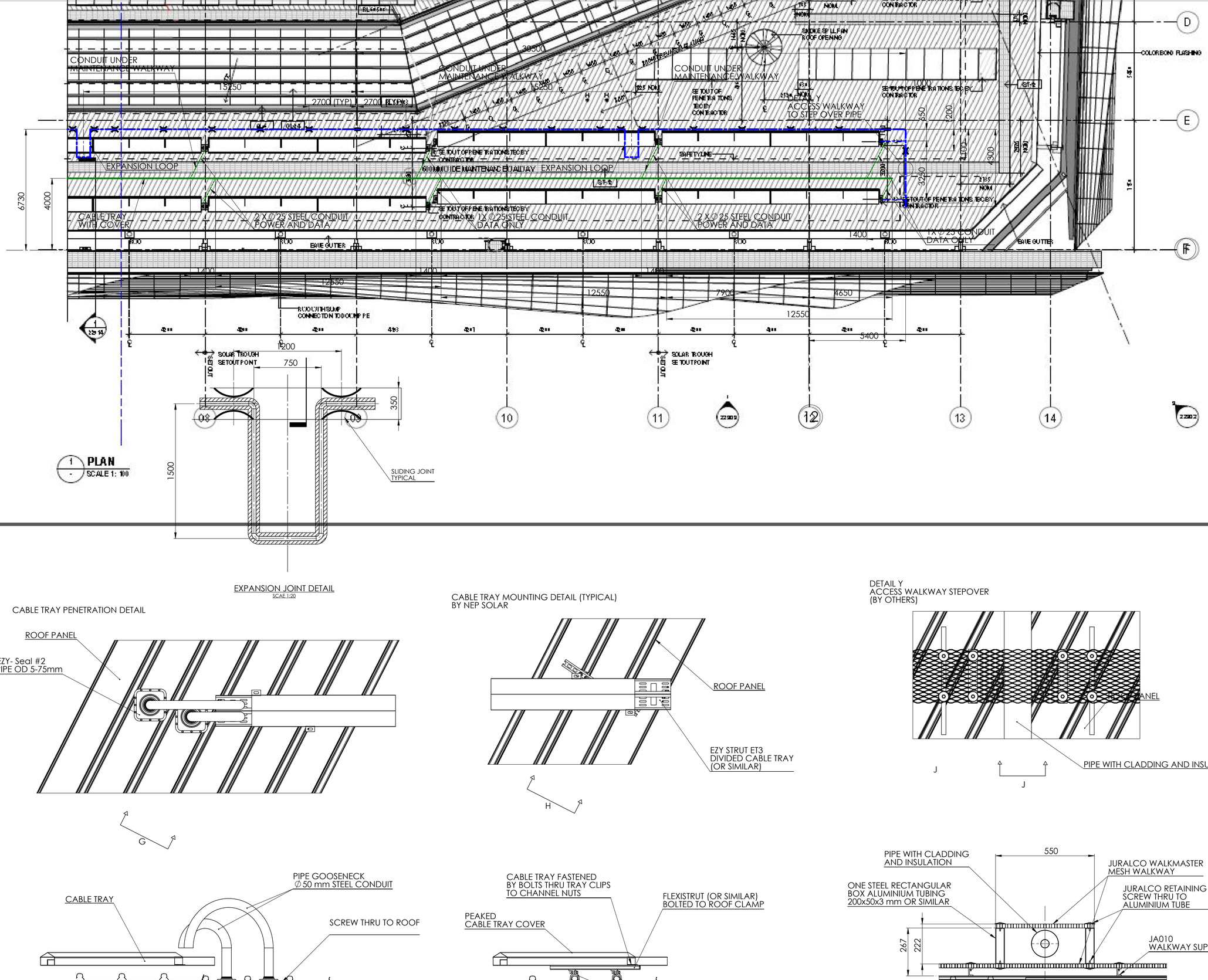
Drawing Title
UTS SOLAR TRIGEN
PROCESS AND INSTRUMENTATION DIAGRAM

Project Number 7362

Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

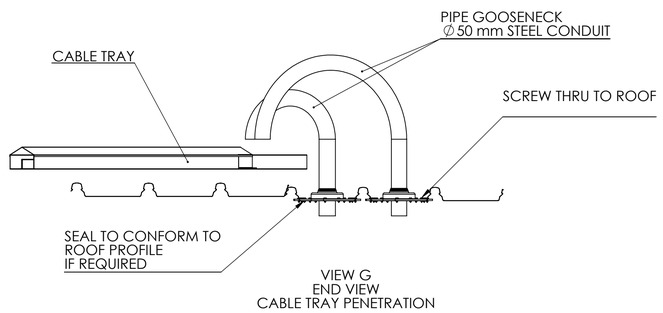
Drawing Scale	Drawing Status	Sheet
1:20	AS BUILT	A3
UTS Drg File Name	UTS Drg File No	Rev No
C81113E0	24483	3



1 PLAN
SCALE 1: 100

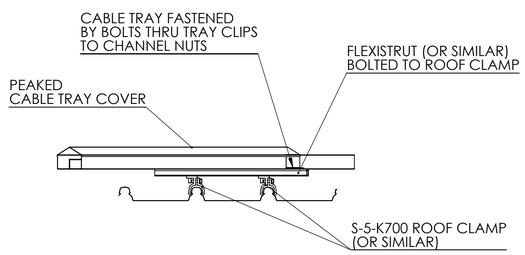
EXPANSION JOINT DETAIL
SCAE 1:20

CABLE TRAY PENETRATION DETAIL



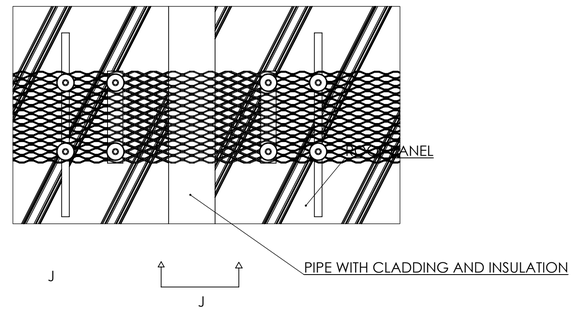
VIEW G
END VIEW
CABLE TRAY PENETRATION

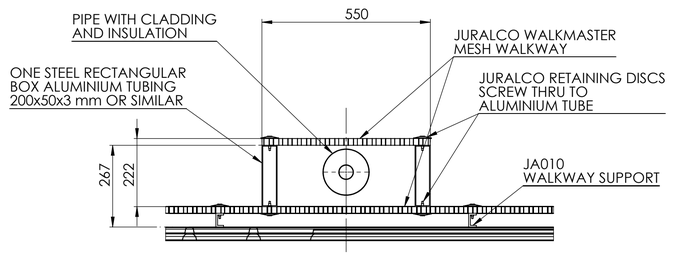
CABLE TRAY MOUNTING DETAIL (TYPICAL)
BY NEP SOLAR



VIEW H
END VIEW
CABLE TRAY MOUNTING

DETAIL Y
ACCESS WALKWAY STEPOVER
(BY OTHERS)





VIEW J
STEPOVER WALKWAY BY OTHERS

General Notes
Do not scale from drawing. Use marked dimensions.
To be read in conjunction with all other Consultant's drawings.
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■ INDICATES A FIXED PIPE ANCHOR

✕ INDICATES A SLIDING PIPE ANCHOR

ROOF PENETRATIONS BY NEP SOLAR

WATER PROOFING BY ROOFING CONTRACTOR

STEPOVERS ON WALWAY BY WALKWAY CONTRACTOR

No.	Date	Dwn	Chk	App	Revision or reason for issue
1.	31/5/13	KK	JD	JD	A PRELIMINARY DISCUSSION
2.	07/06/13	KK	JD	JD	B UPDATE ROUTE AND DETAILS
3.	07/06/13	KK	JD	JD	C ADD PENETRATION DETAILS
4.	19/06/13	KK	JD	JD	D ADD WALKWAY STEPOVER DETAILS
5.	04/07/13	KK	JD	JD	1 RELEASE FOR CONSTRUCTION
6.	06/05/14	KK	JD	JD	2 AS BUILT

Scale / North Point
1:50 0 0.5 m 1.5 m 2.5m
1:100 1.0 m 3.0 m 5.0 m

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Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
ROOF PIPE LAYOUT

SHEET 2/2 (FOR SHEET 1/2 SEE 24490)

Project Number
7352

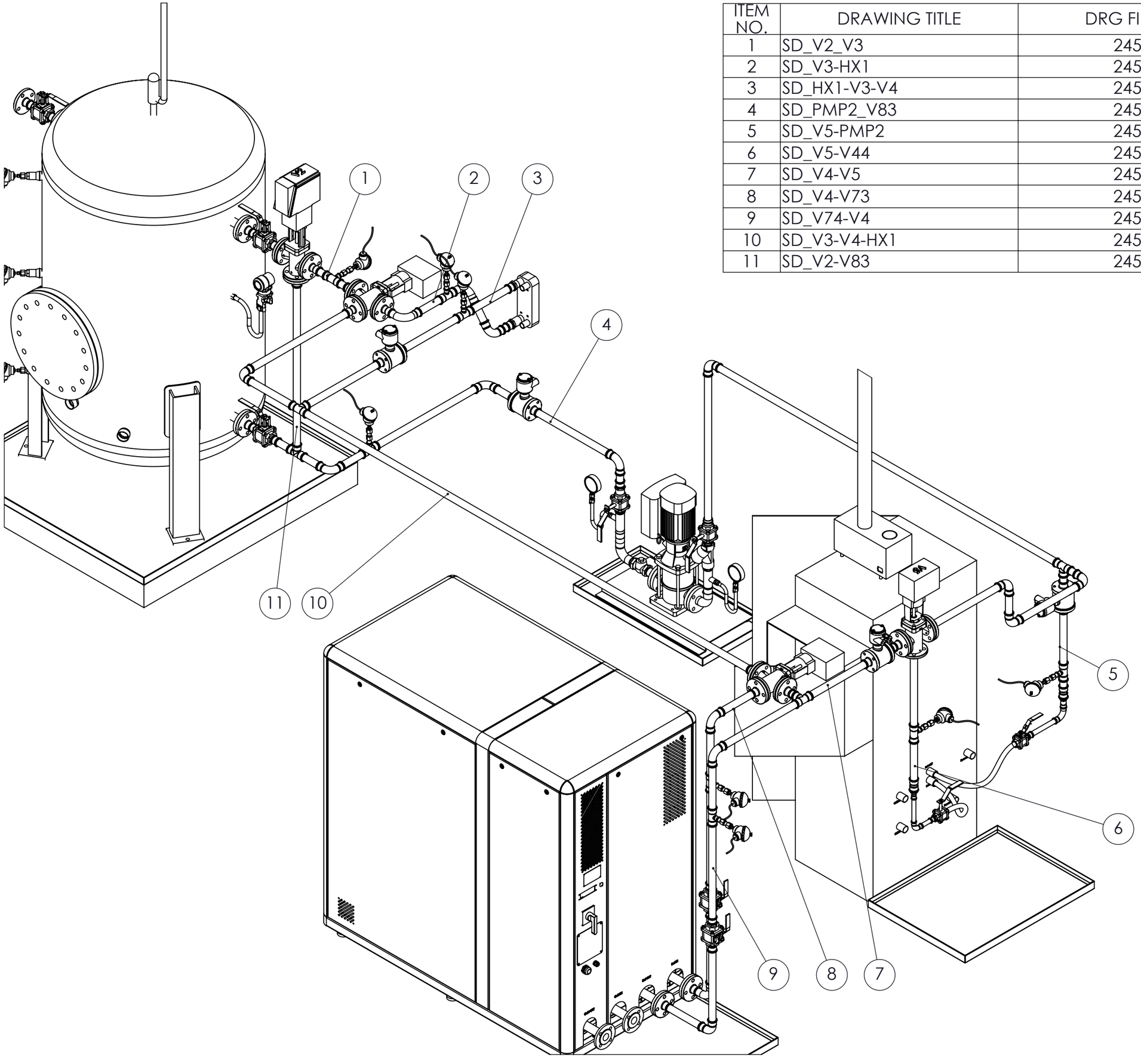
Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
1:100	AS BUILT	A1

UTS Drg File Name	UTS Drg File No	Rev No
CB11RFED	24491	2

NEPSOLAR

Denton Corker Marshall
architecture and urban design



ITEM NO.	DRAWING TITLE	DRG FILE NO
1	SD_V2_V3	24501
2	SD_V3-HX1	24502
3	SD_HX1-V3-V4	24503
4	SD_PMP2_V83	24506
5	SD_V5-PMP2	24507
6	SD_V5-V44	24511
7	SD_V4-V5	24510
8	SD_V4-V73	24509
9	SD_V74-V4	24508
10	SD_V3-V4-HX1	24505
11	SD_V2-V83	24504

General Notes

Do not scale from drawing. Use marked dimensions. To be read in conjunction with all other Consultant's drawings.
The Architect to be immediately notified of any discrepancies.

NOTES
1. PIPES TO BE INSULATED AND CLAD. ALLOWAND MADE FOR THE FOLLOWING THICKNESS:

PIPE OD INSULATION (mm)

<25 mm	20 mm
25-35 mm	30 mm
35-45 mm	40 mm
>45 mm	50 mm

2. PIPES WELDED OR PRESS FIT ON SITE. IF PIPES PRE-FABRICATED THEN ADD UNIONS AT BALL VALVES AND HEAT EXCHANGERS TO ALLOW CONNECTION

3. MATERIAL: FULLY WELDED STAINLESS STEEL PIPE TO AS1449:1994 GRADE 304 OR 304L TO SCHEDULE 5S.

WELDED PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	33.7	1.6
1 1/4" OR DN32	42.4	1.6
1 1/2" OR DN40	48.3	1.6
2" OR DN50	60.3	1.6
2 1/2" OR DN65	76.1	2.11

PRESS FIT PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	28	1.2
1 1/4" OR DN32	35	1.5
1 1/2" OR DN40	42	1.5
2" OR DN50	54	1.5
2 1/2" OR DN65	76	1.6

No.	Date	Dwn	Chk	App	Revision	or reason for issue
1.	13/06/13	KK	JD	JD	A	FOR DISCUSSION
2.	04/07/13	KK	JD	JD	1	CONSTRUCTION
3.	06/04/14	KK	JD	JD	2	CONSTRUCTION
4	06/05/14	KK	JD	JD	3	AS BUILT

Scale / North Point

1:500 @ A1 0 5 10 15 25M
1:1000 @ A3

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Drawing Title

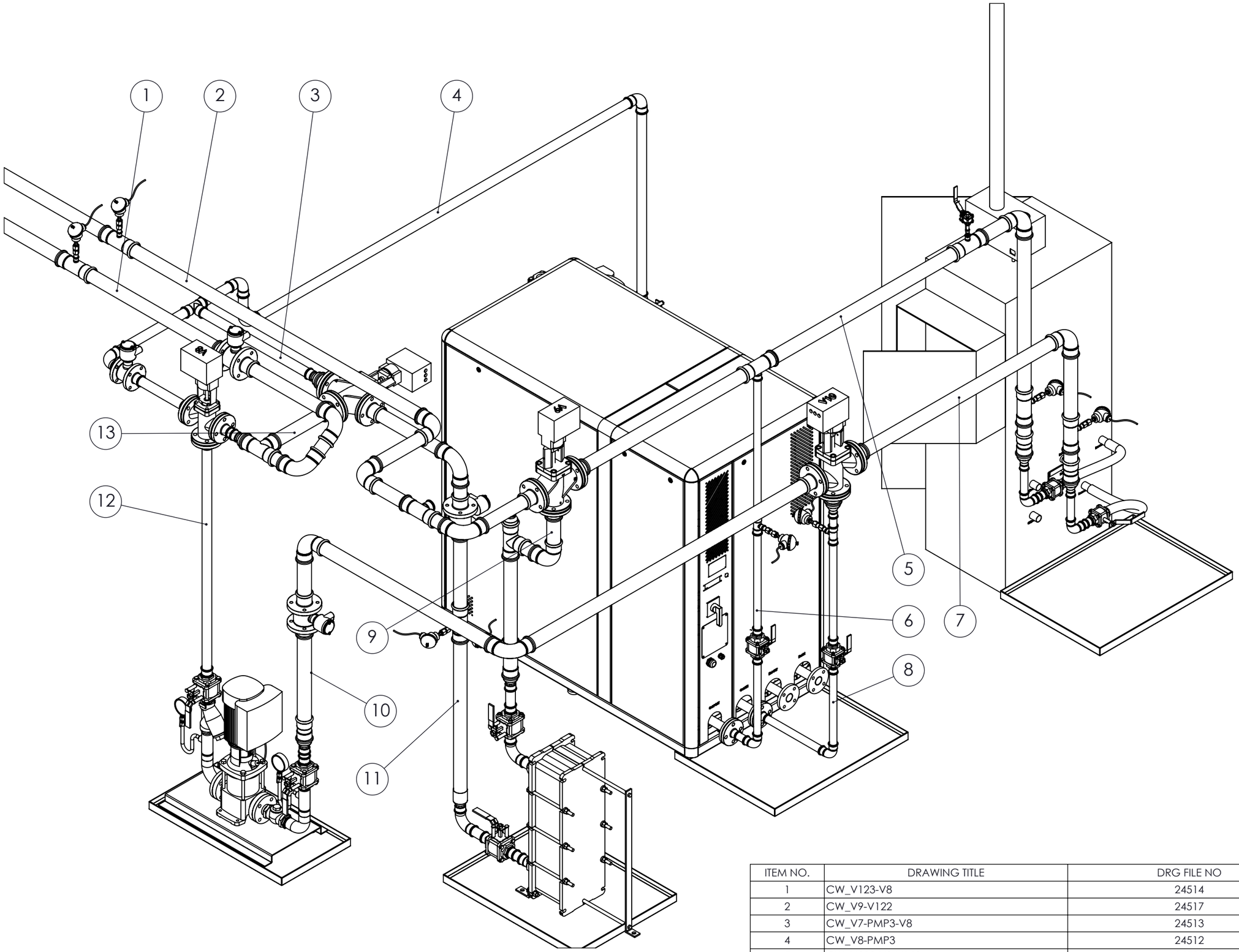
SOLAR THERMAL TRIGEN SYSTEM
CIRCUIT_SOLAR_DISTRIBUTION

Project Number 7352

Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
1:20	AS BUILT	A3

UTS Drg File Name	UTS Drg File No	Rev No
CB1113ED	24493	3



ITEM NO.	DRAWING TITLE	DRG FILE NO
1	CW_V123-V8	24514
2	CW_V9-V122	24517
3	CW_V7-PMP3-V8	24513
4	CW_V8-PMP3	24512
5	CW_V293-V9-V160	24522
6	CW_ORC-V293	24523
7	CW_V10-V159	24524
8	CW_V10-ORC	24521
9	CW_V9-V80	24520
10	CW_PMP4-V10	24518
11	CW_V81-V7	24519
12	CW_V8-PMP4	24515
13	CW_V7-V8	24516

General Notes

Do not scale from drawing. Use marked dimensions. To be read in conjunction with all other Consultant's drawings.
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NOTES
1. PIPES TO BE INSULATED AND CLAD. ALLOWAND MADE FOR THE FOLLOWING THICKNESS:

PIPE OD INSULATION (mm)

<25 mm 20 mm
25-35 mm 30 mm
35-45 mm 40 mm
>45 mm 50 mm

2. PIPES WELDED OR PRESS FIT ON SITE. IF PIPES PRE-FABRICATED THEN ADD UNIONS AT BALL VALVES AND HEAT EXCHANGERS TO ALLOW CONNECTION

3. MATERIAL: FULLY WELDED STAINLESS STEEL PIPE TO AS1449:1994 GRADE 304 OR 304L TO SCHEDULE 5S.

WELDED PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	33.7	1.6
1 1/4" OR DN32	42.4	1.6
1 1/2" OR DN40	48.3	1.6
2" OR DN50	60.3	1.6
2 1/2" OR DN65	76.1	2.11

PRESS FIT PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	28	1.2
1 1/4" OR DN32	35	1.5
1 1/2" OR DN40	42	1.5
2" OR DN50	54	1.5
2 1/2" OR DN65	76	1.6

No.	Date	Dwn	Chk	App	Revision	or reason for issue
1.	13/06/13	KK	JD	JD	A	FOR DISCUSSION
2.	04/07/13	KK	JD	JD	1	CONSTRUCTION
3.	06/04/14	KK	JD	JD	2	CONSTRUCTION
4	06/05/14	KK	JD	JD	3	AS BUILT

Scale / North Point

1:500 @ A1 0 5 10 15 25M
1:1000 @ A3

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PO Box 123 Ultimo NSW 2007
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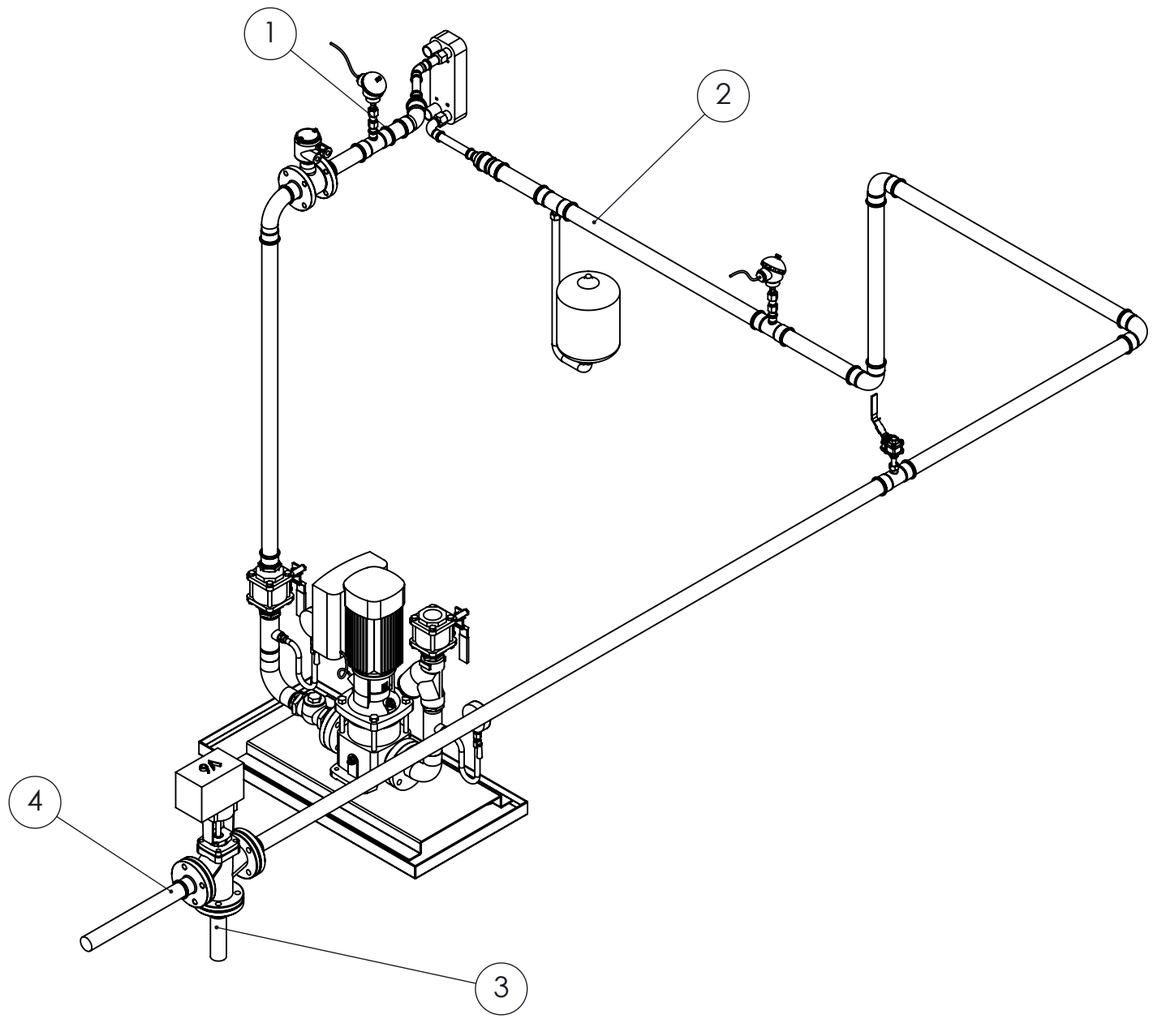
Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
CIRCUIT_COOL_WATER

Project Number			
7352			
Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14
Drawing Scale	Drawing Status		Sheet
1:20	AS BUILT		A3
UTS Drg File Name	UTS Drg File No		Rev No
CB1113ED	24494		3



ITEM NO.	DRAWING TITLE	DRG FILE NO
1	HD_PMP3-HX1	24526
2	HD_HX1-V6	24525
3	HD_V6-V9-V80	24527
4	HD_V6-V9-V122	24528

General Notes

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The Architect to be immediately notified of any discrepancies.

NOTES
1. PIPES TO BE INSULATED AND CLAD. ALLOWAND MADE FOR THE FOLLOWING THICKNESS:

PIPE OD INSULATION (mm)

<25 mm 20 mm
25-35 mm 30 mm
35-45 mm 40 mm
>45 mm 50 mm

2. PIPES WELDED OR PRESS FIT ON SITE. IF PIPES PRE-FABRICATED THEN ADD UNIONS AT BALL VALVES AND HEAT EXCHANGERS TO ALLOW CONNECTION

3. MATERIAL: FULLY WELDED STAINLESS STEEL PIPE TO AS1449:1994 GRADE 304 OR 304L TO SCHEDULE 5S.

WELDED PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	33.7	1.6
1 1/4" OR DN32	42.4	1.6
1 1/2" OR DN40	48.3	1.6
2" OR DN50	60.3	1.6
2 1/2" OR DN65	76.1	2.11

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1" OR DN25	28	1.2
1 1/4" OR DN32	35	1.5
1 1/2" OR DN40	42	1.5
2" OR DN50	54	1.5
2 1/2" OR DN65	76	1.6

No.	Date	Dwn	Chk	App	Revision or reason for issue
1.	13/06/13	KK	JD	JD	A FOR DISCUSSION
2.	04/07/13	KK	JD	JD	1 CONSTRUCTION
3.	06/04/14	KK	JD	JD	2 CONSTRUCTION
4	06/05/14	KK	JD	JD	3 AS BUILT

Scale / North Point

1:500 @ A1 0 5 10 15 25M
1:1000 @ A3

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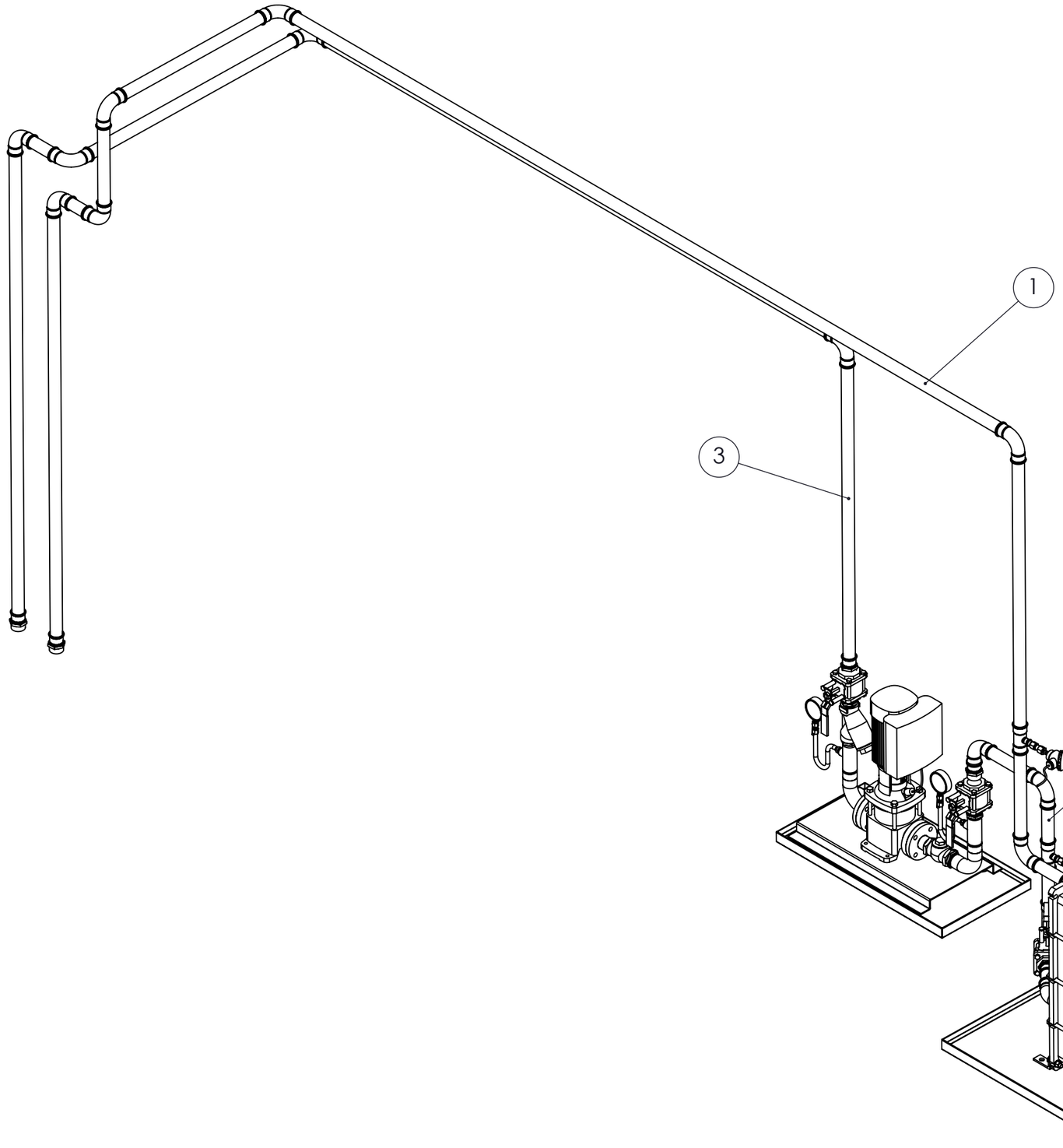
Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
CIRCUIT_HEAT_DUMP

Project Number 7352

Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
1:20	AS BUILT	A3
UTS Drg File Name	UTS Drg File No	Rev No
CB1113ED	24495	3



ITEM NO.	DRAWING TITLE	DRG FILE NO
1	DHW-HX2-V290	24529
2	DHW_PMP6-V291	24530
3	DHW_V287-PMP6	24531

General Notes

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NOTES
1. PIPES TO BE INSULATED AND CLAD. ALLOWAND MADE FOR THE FOLLOWING THICKNESS:

PIPE OD — INSULATION (mm)

<25 mm — 20 mm
25-35 mm — 30 mm
35-45 mm — 40 mm
>45 mm — 50 mm

2. PIPES WELDED OR PRESS FIT ON SITE. IF PIPES PRE-FABRICATED THEN ADD UNIONS AT BALL VALVES AND HEAT EXCHANGERS TO ALLOW CONNECTION

3. MATERIAL: FULLY WELDED STAINLESS STEEL PIPE TO AS1449:1994 GRADE 304 OR 304L TO SCHEDULE 5S.

WELDED PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	33.7	1.6
1 1/4" OR DN32	42.4	1.6
1 1/2" OR DN40	48.3	1.6
2" OR DN50	60.3	1.6
2 1/2" OR DN65	76.1	2.11

PRESS FIT PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	28	1.2
1 1/4" OR DN32	35	1.5
1 1/2" OR DN40	42	1.5
2" OR DN50	54	1.5
2 1/2" OR DN65	76	1.6

No.	Date	Dwn	Chk	App	Revision	Revision or reason for issue
1.	13/06/13	KK	JD	JD	A	FOR DISCUSSION
2.	04/07/13	KK	JD	JD	1	CONSTRUCTION
3.	06/04/14	KK	JD	JD	2	CONSTRUCTION
4	06/05/14	KK	JD	JD	3	AS BUILT

Scale / North Point

1:500 @ A1 1:1000 @ A3 — 0 5 10 15 25M

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Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
CIRCUIT_DOMESTIC_HOT_WATER

Project Number			
7352			
Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14
Drawing Scale	Drawing Status		Sheet
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UTS Drg File Name	UTS Drg File No		Rev No
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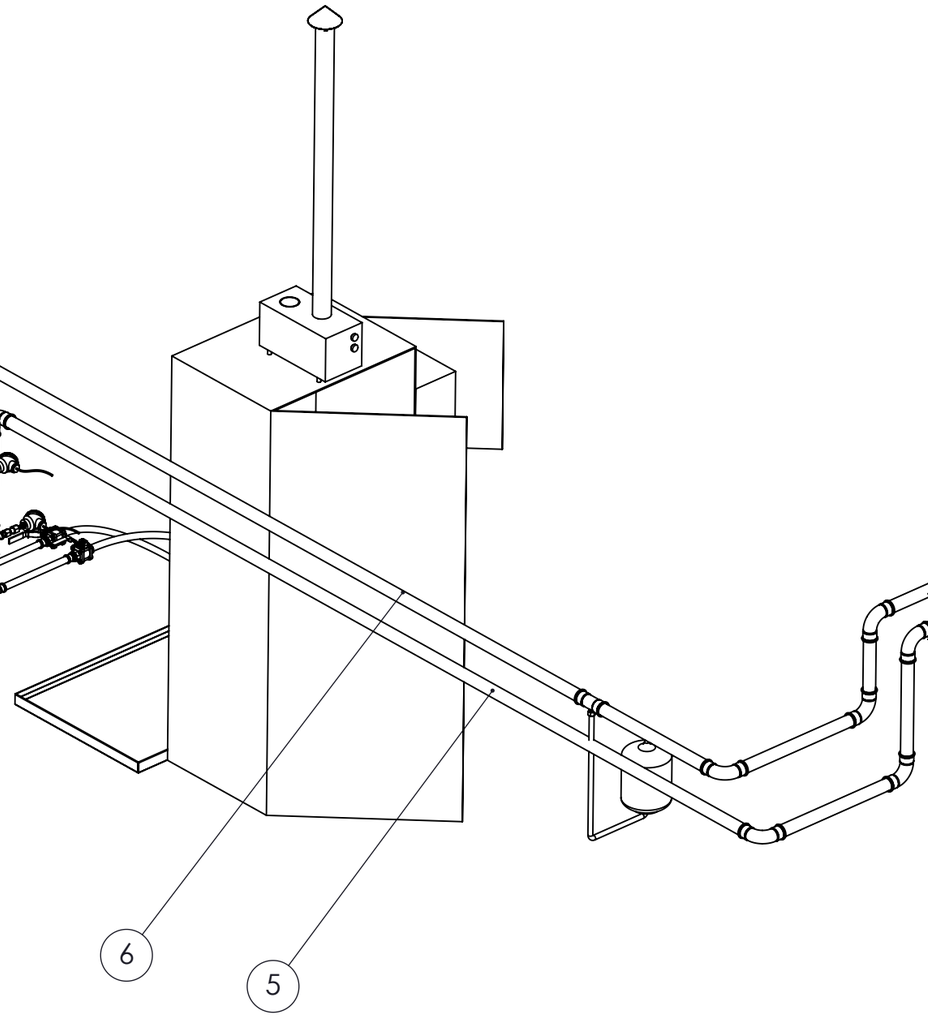

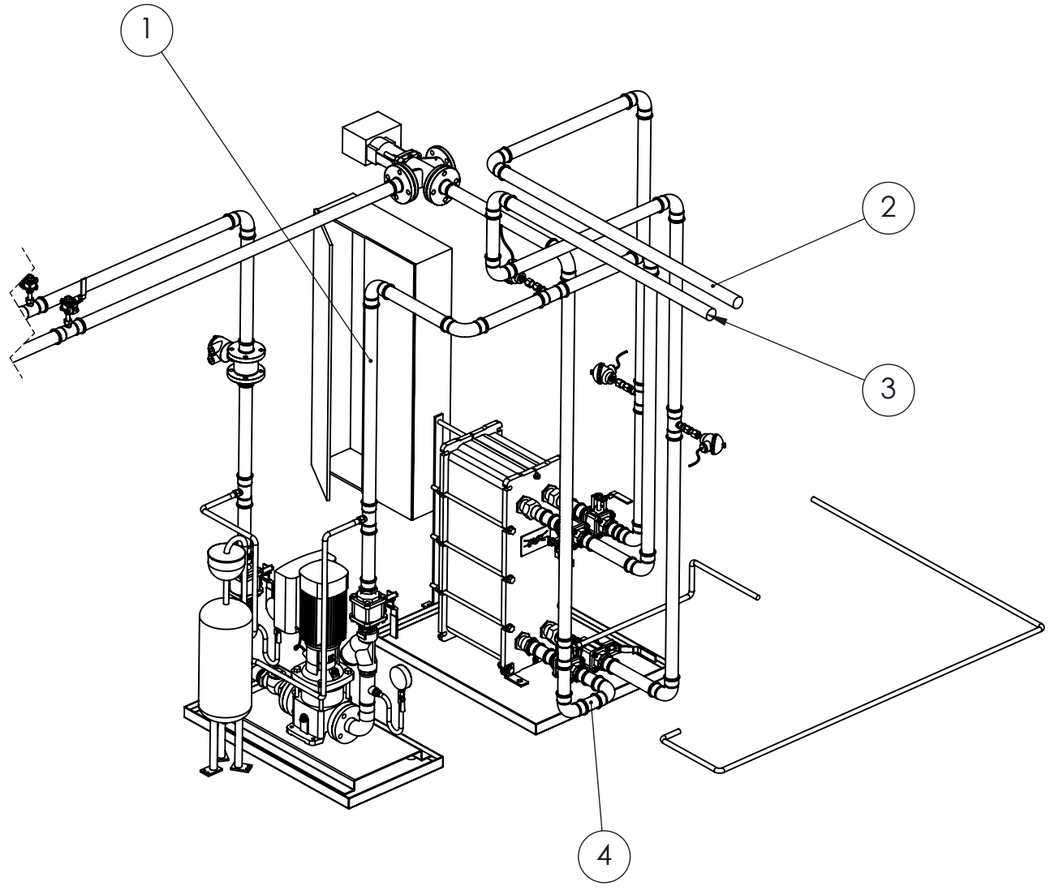

ITEM NO.	DRAWING TITLE	DRG FILE NO
1	CHW_HX3-PMP5	24541
2	CHW_V297-HX3	24539
3	CHW_HX3-V296	24540
4	CHW_V11-HX3	24538
5	CHW_CHILLER-V11	24536
6	CHW_PMP5-V163	24537

NOTES
1. PIPES TO BE INSULATED AND CLAD. ALLOWAND MADE FOR THE FOLLOWING THICKNESS:

PIPE OD INSULATION (mm)

<25 mm 20 mm
25-35 mm 30 mm
35-45 mm 40 mm
>45 mm 50 mm

2. PIPES WELDED OR PRESS FIT ON SITE. IF PIPES PRE-FABRICATED THEN ADD UNIONS AT BALL VALVES AND HEAT EXCHANGERS TO ALLOW CONNECTION

3. MATERIAL: FULLY WELDED STAINLESS STEEL PIPE TO AS1449:1994 GRADE 304 OR 304L TO SCHEDULE 5S.

WELDED PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	33.7	1.6
1 1/4" OR DN32	42.4	1.6
1 1/2" OR DN40	48.3	1.6
2" OR DN50	60.3	1.6
2 1/2" OR DN65	76.1	2.11

PRESS FIT PIPE	OD (mm)	WALL THICKNESS (mm)
1" OR DN25	28	1.2
1 1/4" OR DN32	35	1.5
1 1/2" OR DN40	42	1.5
2" OR DN50	54	1.5
2 1/2" OR DN65	76	1.6

No.	Date	Dwn	Chk	App	Revision	or reason for issue
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2.	04/07/13	KK	JD	JD	1	CONSTRUCTION
3.	06/04/14	KK	JD	JD	2	CONSTRUCTION
4	06/05/14	KK	JD	JD	3	AS BUILT

Scale / North Point

1:500 @ A1 1:1000 @ A3 0 5 10 15 25M

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Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
CIRCUIT_CHILLED_WATER

Project Number 7352

Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
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UTS Drg File Name	UTS Drg File No	Rev No
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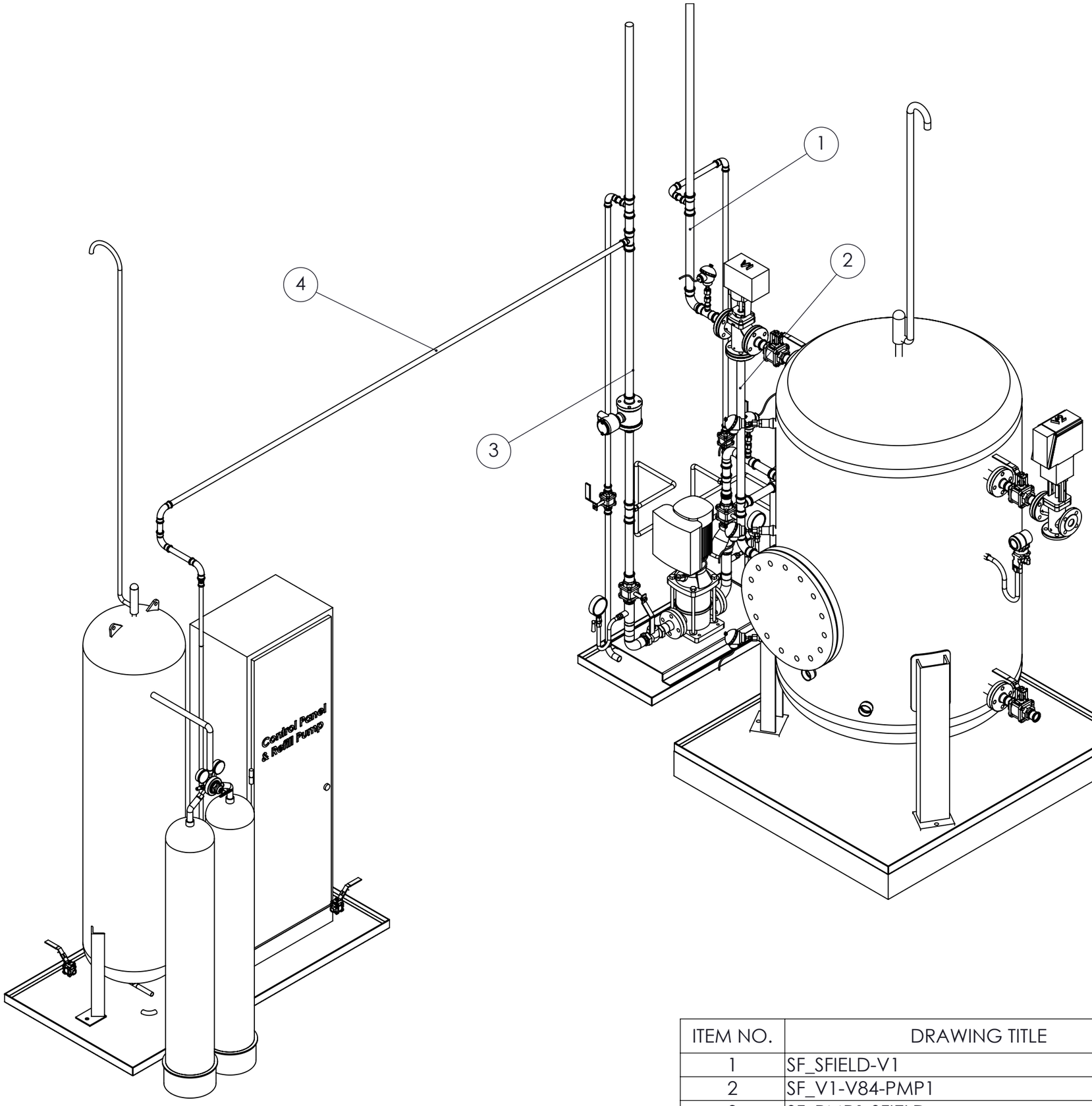

ITEM NO.	DRAWING TITLE	DRG FILE NO
1	SF_SFIELD-V1	24532
2	SF_V1-V84-PMP1	24533
3	SF_PMP1-SFIELD	24534
4	SF_PMP1-V104-EXPANSIONTANK	24535

General Notes

Do not scale from drawing. Use marked dimensions. To be read in conjunction with all other Consultant's drawings.
The Architect to be immediately notified of any discrepancies.

NOTES
1. PIPES TO BE INSULATED AND CLAD. ALLOWAND MADE FOR THE FOLLOWING THICKNESS:

PIPE OD — INSULATION (mm)

<25 mm — 20 mm
25-35 mm — 30 mm
35-45 mm — 40 mm
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No.	Date	Dwn	Chk	App	Revision	reason for issue
1.	13/06/13	KK	JD	JD	A	FOR DISCUSSION
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3.	06/04/14	KK	JD	JD	2	CONSTRUCTION
4	06/05/14	KK	JD	JD	3	AS BUILT

Scale / North Point

1:500 @ A1 1:1000 @ A3 — 0 5 10 15 25M

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Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
CIRCUIT_SOLAR_FIELD

Project Number 7352

Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
1:20	AS BUILT	A3

UTS Drg File Name	UTS Drg File No	Rev No
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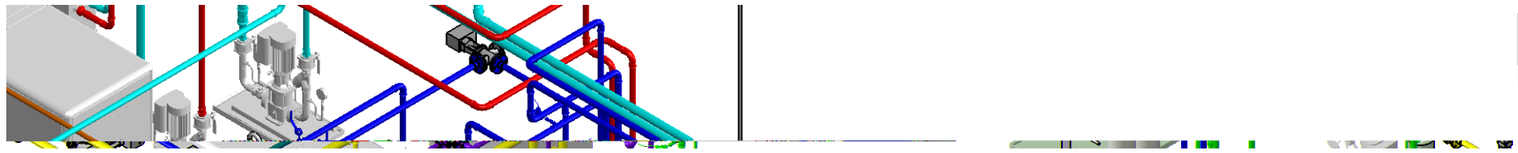
NEPSOLAR



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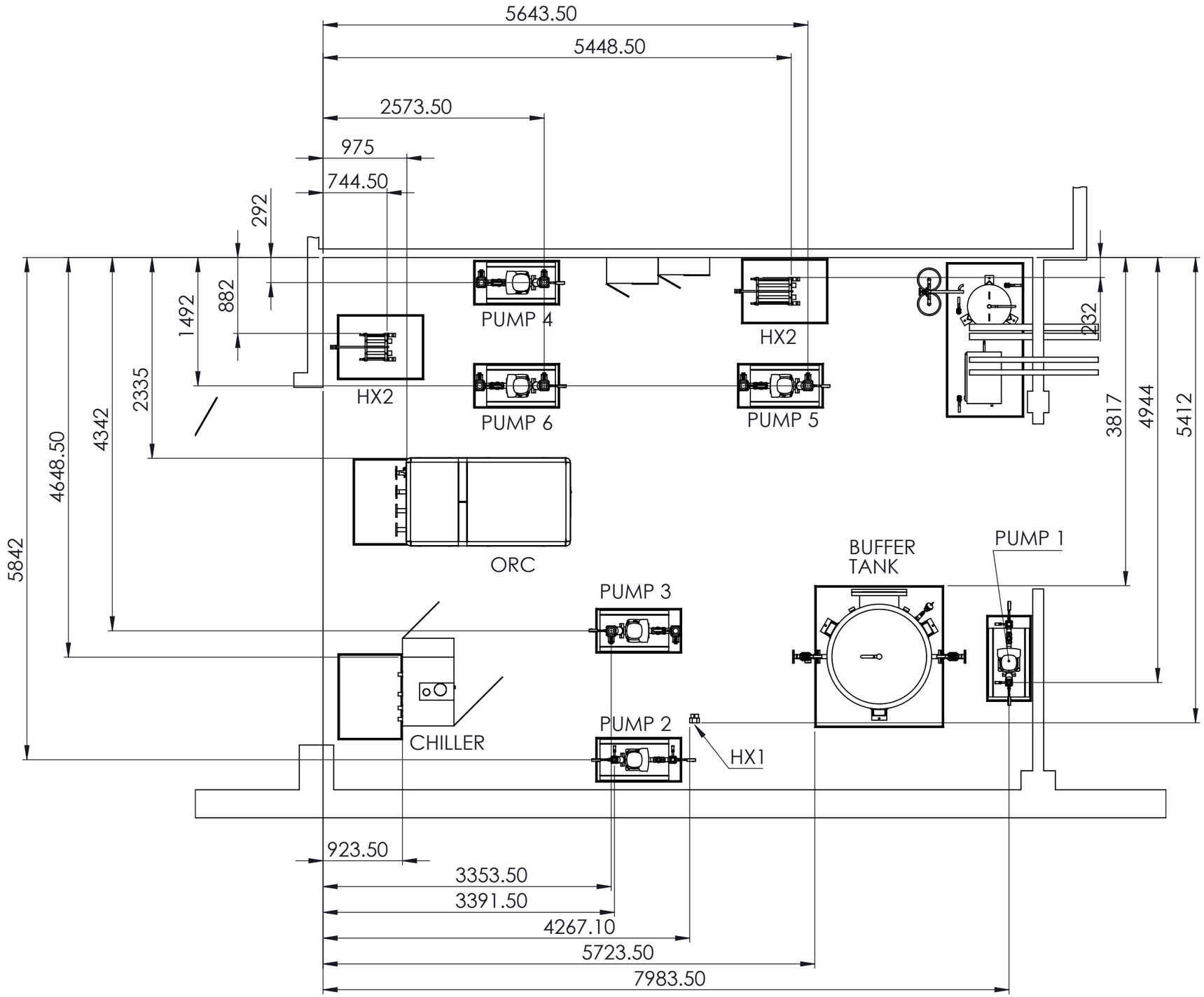

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1" OR DN25	28	1.2
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2" OR DN50	54	1.5
2 1/2" OR DN65	76	1.6

No.	Date	Dwn	Chk	App	Revision or reason for issue
1.	08/04/14	KK	JD	JD	1 CONSTRUCTION
2.	06/05/14	KK	JD	JD	2 AS BUILT

Scale / North Point

1:500 @ A1 1:1000 @ A3 0 5 10 15 25M

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Drawing Title
SOLAR THERMAL TRIGEN SYSTEM
UTS PLANT LAYOUT - EQUIPMENT LAYOUT

Project Number 7352

Drawn By	Checked By	Approved By	Date Issued
KK	JD	JD	06/05/14

Drawing Scale	Drawing Status	Sheet
1:50	AS BUILT	A3
UTS Drg File Name	UTS Drg File No	Rev No
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