IWAKI PUMPS

Hi-Techno Pump

IX PROFIBUS converter

Instruction manual

Thank you for choosing our product.

⚠ Please read through this instruction manual before use.

This instruction manual describes important precautions and instructions for the product. Always keep it on hand for quick reference.

Contents

Safety instructions

Read through this section before use. This section describes important information for you to prevent personal injury or property damage.

■ Symbols

In this instruction manual, the degree of risk caused by incorrect use is noted with the following symbols. Please pay attention to the information associated with the symbols.

⚠ **WARNING**	**Indicates mishandling could lead to a fatal or serious injury accident.**
⚠ **CAUTION**	**Indicates mishandling could lead to personal injury or property damage.**

A symbol accompanies each precaution, suggesting the use of "Caution", "Prohibited actions" and specific "Requirement".

⚠Export Restrictions

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control.
Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

⚠WARNING


Electrical shock

Turn off power before service

Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.


Requirement

Stop operation

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.


Prohibition

Do not use the converter in any condition other than its intended purpose

The use of this product in any conditions other than those clearly specified may result in failure or injury. Use this product in specified conditions only.


Do not remodel

Do not modify the converter

Alterations to this product carries a high degree of risk. It is not the manufacturer's responsibility for any failure or injury resulting from alterations to the converter.


Wear protectors

Wear protective clothing

Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.


Prohibition

Do not operate this product in a flammable atmosphere

Do not place explosive or flammable material near this product.

⚠CAUTION


Requirement

Qualified personnel only

This product should be handled or operated by qualified personnel with a full understanding of the PROFIBUS converter. Any person not familiar with the converter should not take part in the operation or management of this product.


Prohibition

Keep electric parts and wiring dry

Risk of fire or electric shock. Install this product where it can be kept dry.


Prohibition

Do not install/store the converter:

- In a flammable/corrosive atmosphere.
- In a dusty/humid environment.
- Where ambient temperature can exceed 0-50°C (32-122°F).
- In direct sunlight or wind & rain.


Prohibition

Do not use this product in a wet location

The PROFIBUS converter is not waterproof. Use of this product in wet or extremely humid locations could lead to electric shock or short circuit.


Requirement

Preventative maintenance

Follow instructions in this manual for replacement of wear parts. Do not disassemble this product beyond the extent of the instructions.


Requirement

Disposal of a used converter

Dispose of any used or damaged converter in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company.

Precautions for use

- Electrical work should be performed by a qualified electrician. Otherwise, personal injury or property damage may result.

- Do not install this product:
  - –In a flammable atmosphere.
  - –In a dusty/humid place.
  - –In direct sunlight or wind & rain.
  - –Where ambient temperature can exceed 0-50°C (32-122°F).

- Select a level location, free from vibration, that won't hold liquid. Anchor the converter with four M4 bolts so it doesn't vibrate.

- Allow sufficient space around the converter for easy access and maintenance.

- Use care handling this product. Do not drop. An impact may affect the converter performance. Do not use a converter that has been damaged to avoid the risk of electrical damage or shock.

- This product is not waterproof. Do not use the converter while wet with solution or water. Failure or injury may result. Immediately dry off the converter if it gets wet.

- Do not clean this product or nameplate with a solvent such as benzine or thinner. This may discolour the converter or erase printing. Use a dry or damp cloth or a neutral detergent.

Overview

The information such as characteristics and features are described in this section.

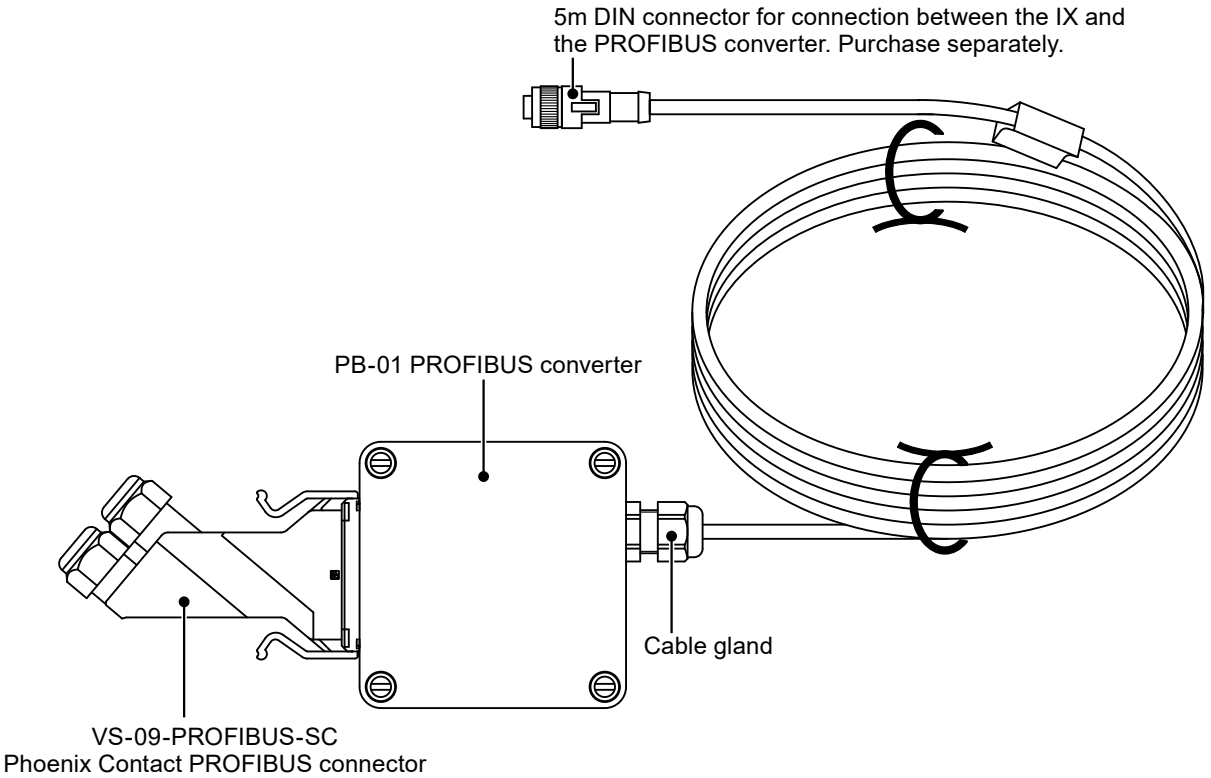
Introduction

Use this product with the IX series pumps in order to operate the pump in a PROFIBUS communication system.

GSD (General Station Description) file

Obtain A GSD file from your local distributor or directly from us.

Part names



Functions

This section describes features of the PROFIBUS converter.

From a slave (pump) to a master (user's PLC)

Start bite	Byte length	Items	Unit
0	2	Operating condition	Bit
2	4	Flow rate indication	Numeric value
6	2	Input information	Bit
		Output information	Bit
8	4	Calibration	Numeric value
12	2	Error	Bit
14	2	Others	Bit
16	4	Accumulated number of operating hours	Numeric value
20	4	Accumulated total flow	Numeric value
24	4	Operating hours	Numeric value
28	4	Number of turning on power	Numeric value
32	4	Controller type	Characters
36	2	Software version	Numeric value

From a master (user's PLC) to a slave (pump)

Start bite	Byte length	Items	Unit
38	2	Operation	Bit
40	4	Manual	Numeric value
44	2	Analogue	Bit
46	4	Pulse	Numeric value
50	4	Batch	Numeric value
54	2	Interval Batch control period	Numeric value
56	4	Interval Batch control behaviour	Numeric value
60	2	Others	Bit
		External input	Bit
62	2	ALM1 (ALM2 : IX-B)	Bit
		ALM2 (ALM1 : IX-B)	Bit
64	4	External input (AUX)	Numeric value
68	2	Clear error	Bit
70	2	Data log clear	Bit

Status

This section describes details info on the above features.
Note that things need set in big endian.

From a slave (pump) to a master (user's PLC)

■ Operating condition

Bit	Items	Description	
15	Operation	0 : Stop	1 : Start
14	Operation mode	0 : Manual	1 : Analogue preset
13		2 : Pulse	3 : Batch
12		4 : Interval batch	5 : Analogue variable
11			
10	Diaphragm replacement	0 : OFF	1 : MAX IN
9		2 : MAX OUT	
8 - 0			

■ Flow rate indication

Bit	Items	Description		
long	B007	LPH	0 - 750000	(× 0.00001)
		GPH	0 - 1980000	(× 0.000001)
	B015	LPH	0 - 1500000	(× 0.00001)
		GPH	0 - 3960000	(× 0.000001)
	B030	LPH	0 - 3000000	(× 0.00001)
		GPH	0 - 7900000	(× 0.000001)
	B045	LPH	0 - 4500000	(× 0.00001)
		GPH	0 - 11800000	(× 0.000001)
	C060	LPH	0 - 60000	(× 0.001)
		GPH	0 - 158500	(× 0.0001)
	C150	LPH	0 - 150000	(× 0.001)
		GPH	0 - 396000	(× 0.0001)
	D150	LPH	0 - 150000	(× 0.001)
		GPH	0 - 396000	(× 0.0001)
	D300	LPH	0 - 300000	(× 0.001)
		GPH	0 - 790000	(× 0.0001)

*A decimal point is not shown.

■ Input information

Bit	Items	Description	
15	STOP	0 : Active	1 : Inactive
14	PreSTOP	0 : Active	1 : Inactive
13	Interlock	0 : Active	1 : Inactive
12	Current	0 : Active	1 : Inactive
11	Pulse	0 : Active	1 : Inactive
10 - 8			

■ Output information

Bit	Items	Description
7	ALM2	0 : Active 1 : Inactive
6	ALM1	0 : Active 1 : Inactive
5 - 0		

■ Calibration

Bit	Items	Description
long	Calibration	0 - nnnnn (mL × 0.01) *A decimal point is not shown.

■ Error

Bit	Items	Description
15	Leak	0 : Active 1 : Inactive
14	Over Load	0 : Active 1 : Inactive
13	Driver	0 : Active 1 : Inactive
12 - 0		

■ Others

Bit	Items	Description
15 - 14		
13	Anti-chattering	0 : 1 msec 1 : 2 msec 2 : 5 msec
12		
11	Language setting	0 : English 1 : German
10		2 : Spanish 3 : Danish
9		4 : French 5 : Dutch
8	Buffer	0 : OFF 1 : ON

■ Accumulated number of operating hours

Bit	Items	Description
long	Accumulated number of operating hours	0 - 999999 hours

■ Accumulated total flow

Bit	Items	Description
long	Accumulated total flow	0 - 99999999 liter

■ Operating hours

Bit	Items	Description
long	Accumulated number of operating hours	0 - 999999 hours

■ Number of turning on power

Bit	Items	Description
long	Number of turning on power	0 - 999999 times

■ Controller type

Bit	Items	Description
char	Controller type	

■ Software version

Bit	Items	Description
short	Software version	000 - 999 *A decimal point is not shown.

From a master (user's PLC) to a slave (pump)

■ Operation

Bit	Items	Description
15	Operation	0 : Stop 1 : Start
14	Operation mode	0 : Manual 1 : Analogue preset
13		2 : Pulse 3 : Batch
12		4 : Interval batch 5 : Analogue variable
11		
10	Diaphragm replacement	0 : OFF 1 : MAX IN
9		2 : MAX OUT
8 - 0		

■ Manual operation

Bit	Items	Description		
long	B007	LPH	750 - 750000	(× 0.00001)
		GPH	1980 - 1980000	(× 0.000001)
	B015	LPH	1500 - 1500000	(× 0.00001)
		GPH	3960 - 3960000	(× 0.000001)
	B030	LPH	3000 - 3000000	(× 0.00001)
		GPH	7900 - 7900000	(× 0.000001)
	B045	LPH	4500 - 4500000	(× 0.00001)
		GPH	11800 - 11800000	(× 0.000001)
	C060	LPH	80 - 60000	(× 0.001)
		GPH	210 - 158500	(× 0.0001)
	C150	LPH	200 - 150000	(× 0.001)
		GPH	500 - 396000	(× 0.0001)
	D150	LPH	200 - 150000	(× 0.001)
		GPH	500 - 396000	(× 0.0001)
	D300	LPH	400 - 300000	(× 0.001)
		GPH	1000 - 790000	(× 0.0001)

*Always check pump spec. Do not set a flow rate over the maximum rate.
*A decimal point is not shown.

■ Analogue operation

Bit	Items	Description
15	Analogue preset	0 : 4-20 1 : 20-4
14		2 : 0-20 3 : 20-0
13	Analogue variable	0 : LINEAR 1 : BOX
12		2 : LIMIT
11 - 0		

■ Pulse

Bit	Items	Description		
long	B007	mL/PLS	694 - 15000000	(× 0.000001)
		G/PLS	1830 - 38000000	(× 0.0000000001)
	B015	mL/PLS	1389 - 30000000	(× 0.000001)
		G/PLS	3670 - 75000000	(× 0.0000000001)
	B030	mL/PLS	2778 - 60000000	(× 0.000001)
		G/PLS	7320 - 150000000	(× 0.0000000001)
	B045	mL/PLS	4167 - 90000000	(× 0.000001)
		G/PLS	10930 - 200000000	(× 0.0000000001)
	C060	mL/PLS	625 - 12000000	(× 0.00001)
		G/PLS	1651 - 31700000	(× 0.000000001)
	C150	mL/PLS	1560 - 30000000	(× 0.00001)
		G/PLS	4126 - 79000000	(× 0.000000001)
	D150	mL/PLS	1560 - 30000000	(× 0.00001)
		G/PLS	4126 - 79000000	(× 0.000000001)
	D300	mL/PLS	3130 - 60000000	(× 0.00001)
		G/PLS	8255 - 158000000	(× 0.000000001)

■ Batch

Bit	Items	Description		
long	B007	L/PLS	694 - 15000000	(× 0.000001)
		G/PLS	1830 - 38000000	(× 0.0000001)
	B015	L/PLS	1389 - 30000000	(× 0.000001)
		G/PLS	3670 - 75000000	(× 0.0000001)
	B030	L/PLS	2778 - 60000000	(× 0.000001)
		G/PLS	7320 - 150000000	(× 0.0000001)
	B045	L/PLS	4167 - 90000000	(× 0.000001)
		G/PLS	10930 - 200000000	(× 0.0000001)
	C060	L/PLS	625 - 12000000	(× 0.00001)
		G/PLS	1651 - 31700000	(× 0.000001)
	C150	L/PLS	1560 - 30000000	(× 0.00001)
		G/PLS	4126 - 79000000	(× 0.000001)
	D150	L/PLS	1560 - 30000000	(× 0.00001)
		G/PLS	4126 - 79000000	(× 0.000001)
	D300	L/PLS	3130 - 60000000	(× 0.00001)
		G/PLS	8255 - 158000000	(× 0.000001)

■ Interval batch control period

Bit	Items	Description
short	Date	0 - 9
	Hour	0 - 23
	Minute	0 - 59
		0 - 14399 (min)

■ Interval Batch control behaviour

Bit	Items	Description		
long	B007	L	694 - 15000000	(× 0.000001)
		G	1830 - 38000000	(× 0.0000001)
	B015	L	1389 - 30000000	(× 0.000001)
		G	3670 - 75000000	(× 0.0000001)
	B030	L	2778 - 60000000	(× 0.000001)
		G	7320 - 150000000	(× 0.0000001)
	B045	L	4167 - 90000000	(× 0.000001)
		G	10930 - 200000000	(× 0.0000001)
	C060	L	625 - 12000000	(× 0.00001)
		G	1651 - 31700000	(× 0.000001)
	C150	L	1560 - 30000000	(× 0.00001)
		G	4126 - 79000000	(× 0.000001)
	D150	L	1560 - 30000000	(× 0.00001)
		G	4126 - 79000000	(× 0.000001)
	D300	L	3130 - 60000000	(× 0.00001)
		G	8255 - 158000000	(× 0.000001)

■ Others

Bit	Items	Description
15 - 14		
13	Anti-chattering	0 : 1msec 1 : 2msec
12		2 : 5msec
11	Language setting	0 : English 1 : German
10		2 : Spanish 3 : Danish
9		4 : French 5 : Dutch
8	Buffer	0 : OFF 1 : ON

■ External input

Bit	Items	Description
7	STOP	0 : OFF 1 : ON
6	PreSTOP	0 : OFF 1 : ON
5	Interlock	0 : OFF 1 : ON
4	Leak	0 : OFF 1 : ON
3 - 0		

■ ALM1 (ALM2 : IX-B)

Bit	Items	Description
15	STOP	0 : OFF 1 : ON
14	PreSTOP	0 : OFF 1 : ON
13	Interlock	0 : OFF 1 : ON
12	Leak	0 : OFF 1 : ON
11	Motor Over Load	0 : OFF 1 : ON
10	Drive Error	0 : OFF 1 : ON
9	Batch Complete	0 : OFF 1 : ON
8		

■ ALM2 (ALM1 : IX-B)

Bit	Items	Description
7	STOP	0 : OFF 1 : ON
6	PreSTOP	0 : OFF 1 : ON
5	Interlock	0 : OFF 1 : ON
4	Leak	0 : OFF 1 : ON
3	Motor Over Load	0 : OFF 1 : ON
2	Drive Error	0 : OFF 1 : ON
1	Batch Complete	0 : OFF 1 : ON
0	Volume proportional pulse output	0 : OFF 1 : ON

■ External input (AUX)

Bit	Items	Description		
long	B007	LPH	750 - 750000	(× 0.00001)
		GPH	1980 - 1980000	(× 0.000001)
	B015	LPH	1500 - 1500000	(× 0.00001)
		GPH	3960 - 3960000	(× 0.000001)
	B030	LPH	3000 - 3000000	(× 0.00001)
		GPH	7900 - 7900000	(× 0.000001)
	B045	LPH	4500 - 4500000	(× 0.00001)
		GPH	11800 - 11800000	(× 0.000001)
	C060	LPH	80 - 60000	(× 0.001)
		GPH	210 - 158500	(× 0.0001)
	C150	LPH	200 - 150000	(× 0.001)
		GPH	500 - 396000	(× 0.0001)
	D150	LPH	200 - 150000	(× 0.001)
		GPH	500 - 396000	(× 0.0001)
	D300	LPH	400 - 300000	(× 0.001)
		GPH	1000 - 790000	(× 0.0001)

*A decimal point is not shown.

■ Error deletion

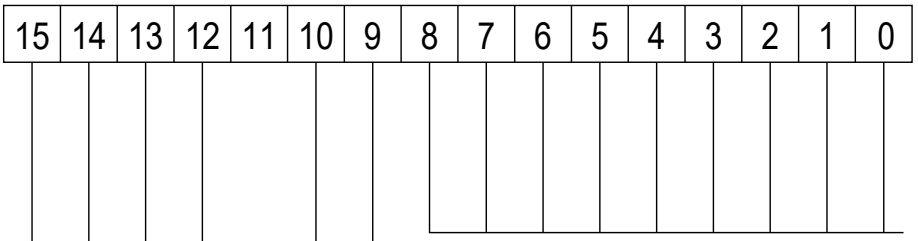
Bit	Items	Description	
15	Leak	0 : Cancel	1 : Clear
14	Over Load	0 : Cancel	1 : Clear
13	Driver	0 : Cancel	1 : Clear
12 - 0			

■ Data log deletion

Bit	Items	Description	
15	Accumulated number of operating hours	0 : Cancel	1 : Clear
14	Accumulated total flow	0 : Cancel	1 : Clear
13	Operating hours	0 : Cancel	1 : Clear
12	Number of turning on power	0 : Cancel	1 : Clear
11 - 0			

Word

See below for detail info about word for operating conditions.



Diaphragm replacement

Bit No.	Binary digit		Description
0	0	0	OFF
1	0	1	MAX IN
2	1	0	MAX OUT

Control mode

Bit No.	Binary digit			Description
0	0	0	0	Manual
1	0	0	1	Analogue preset
2	0	1	0	Pulse
3	0	1	1	Batch
4	1	0	0	Interval batch
5	1	0	1	Analogue variable

Operating mode

Bit No.	Binary digit	Description
0	0	Stop
1	1	Start

Installation

This section describes the installation of the PROFIBUS converter. Read through this section before service is performed.

Points to be observed

- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.
- Do not place explosive or flammable material near this product.
- Use of a damaged product could lead to an electric shock or death.

Converter mounting

Select an installation location and mount the PROFIBUS converter.

Necessary tools

- Four M4 Phillips screws (fixing screws)

1 Select a suitable place.

Select a level location, free from vibration. See page 6 for detail.

NOTE

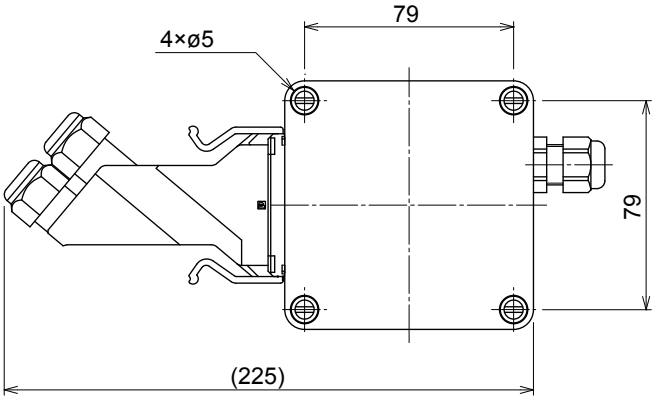
Allow sufficient space around the converter for easy access and wiring.

2 Open the cover.

Unscrew the cover with a flathead screw driver.

3 Anchor this product with four M4 screws.

Fit the converter on a mounting plate through four M4 screw holes located on its back face. Replace the cover after wiring in the converter has been completed.



Wiring

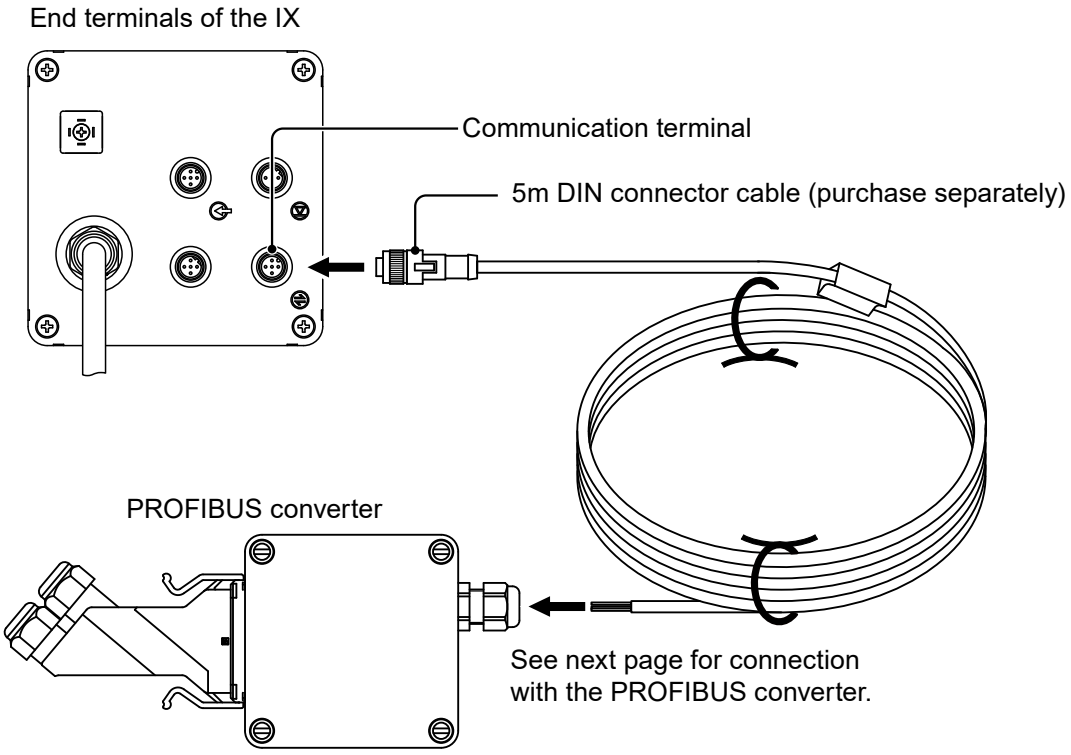
Connect signal cables.

Points to be observed

- Electrical work should be performed by a qualified electrician. Always observe local electric codes.
- Do not apply power other than that specified on the nameplate. Otherwise, failure or fire may result.
- Do not perform wiring work while electric power is on. Otherwise, an electrical shock or a short circuit may result. Be sure to turn off the power before wiring work.
- Be careful for electric power not to be turned on during work.

Signal cable connection with the pump

See the following diagram for detail.

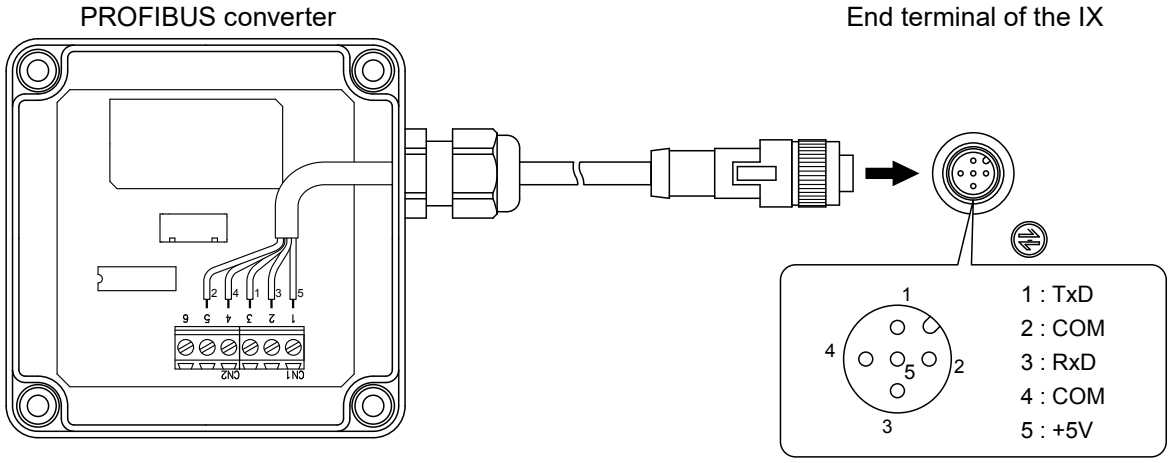


NOTE

- Use E04SR401938 split type ferrite cores (SEIWA ELECTRIC MFG. Co., Ltd.), RFC-20 Sleeve Ferrite Clamps (KITAGAWA INDUSTRIES CO.,LTD), or equivalent devices for the purpose of providing electromagnetic compatibility (EMC).
- Pass the 5m DIN connector cable and a PROFIBUS compliant cable separately through different cores (or clamps) twice. The cores (or the clamps) should be positioned close to the PROFIBUS converter.

■ DIN connector cable connection

See the following diagram for detail. Note screw clamps on the terminal block are closed when shipped from our factory. First open the clamps. Then fasten screws to catch and secure cables.



Terminal No.		Cable colour (when using our option cable)
PROFIBUS converter	Communication terminal	
1	5	Green
2	3	Blue
3	1	Brown
4	4	Black
5	2	White

NOTE

Always replace the cover and tighten the cable gland after wiring work.

Applicable cables

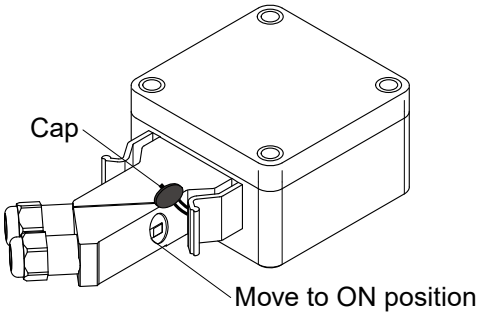
Use an optional Phoenix Contact DIN connector cable (purchase separately) for connection between the IX and the PROFIBUS converter. Or use a combination of a commercially available cable and a Binder 713 series 5-pin DIN female plug (PN: 99-0436-10-05). Note cable length must be 5m or shorter.

PROFIBUS cable connection

Provide the PROFIBUS converter with PROFIBUS compliant cables. See manufacturer's manual (MNR, 0083061-00/21.07.07) or http://www.profibus.com/ *for wiring with Phoenix Contact connector. Always use a combination of a PROFIBUS compliant cable and a Phoenix Contact connector.*

NOTE

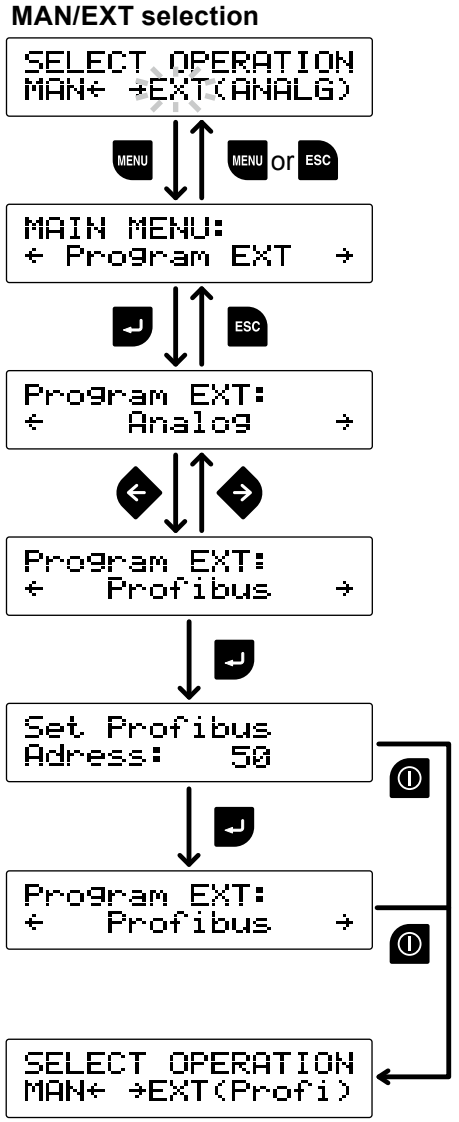
For the last BUS participant connected to a PROFIBUS compliant cable, remove a cap and slide the switch to "ON" position. Refit the cap afterwards.



This section describes pump operation and programming.

PROFIBUS setting

Turn on the IX and then go with the procedure below to select "Profibus" and enter an address.



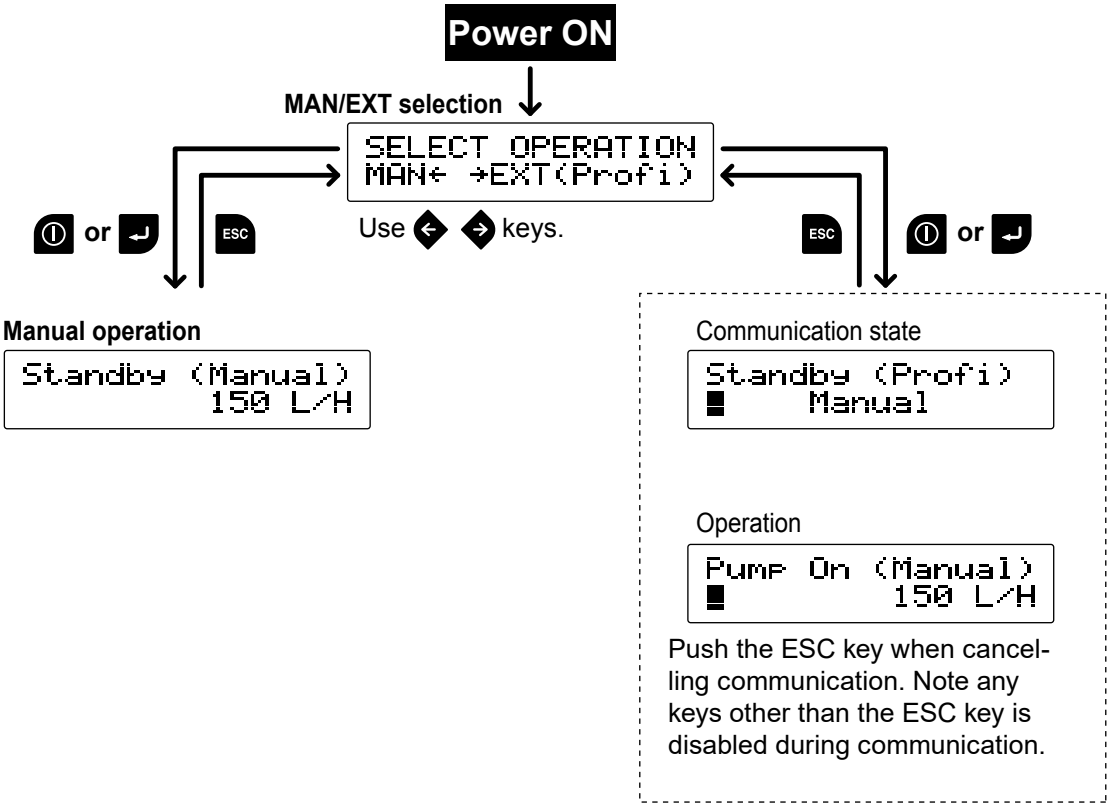
Select "Program EXT".

Push the right key 4 times to move from "Analog" to "Profibus".

Use the up and down keys and assign an address between 1-126. Push the Enter key to secure setting. The factory default setting is 50.

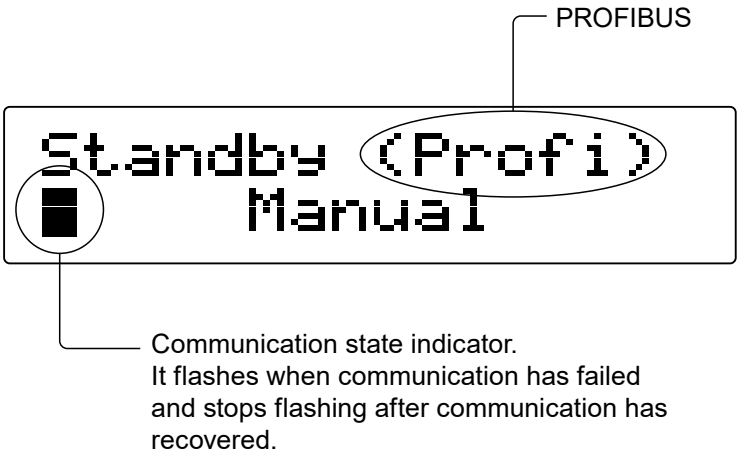
Pump operation

Place the IX into a PROFIBUS communication mode.



PROFIBUS communication mode display

The following display will appear while the IX is in a PROFIBUS communication mode.



NOTE

- The pump stops operation once communication has failed. The indicator will flashes in this case.
- Operation through the external input takes priority even in the PROFIBUS communication mode.

Maintenance

This section describes troubleshooting, maintenance, and specifications.

Points to be observed

- Observe instructions in this manual for maintenance and inspection.
- Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work.
- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.

Before unplugging the pump:

Always stop the pump by key operation and wait for three seconds, especially when disconnecting the pump from a piping system. Otherwise, the stop command may not be saved, and the pump may unintentionally start to run and deliver fluid into an imperfect piping system as it is powered on once again.

NOTE

When repair is needed to our pumps, contact us or the manufacturer of the machine in which our product is built.

Troubleshooting

First check the following points. If the following measures do not help remove problems, contact us or your nearest distributor.

States	Possible causes	Solutions
Communication failure (The indicator does not stop flashing.)	Faulty wiring/Disconnection	• Check connector connection. Refit as necessary. • Check D-sub connector wiring. • Replace as necessary.
	Address overlap	• Check an address. Reorient as necessary.
	The slide switch of the last BUS participant hasn't been changed to "ON" position.	• Change it to "ON" position.
The pump doesn't work as per setting.	Setting has been done in little endian.	• Reset in big endian.
Error & the data log is not cleared.	The bit remains in "1".	• Restore the bit to "0" and reset the bit to "1". Then the data log will be cleared.

Error messages

Follow steps as below when an error message appears on the pump screen. If the following measures do not help remove problems, contact us or your nearest distributor.

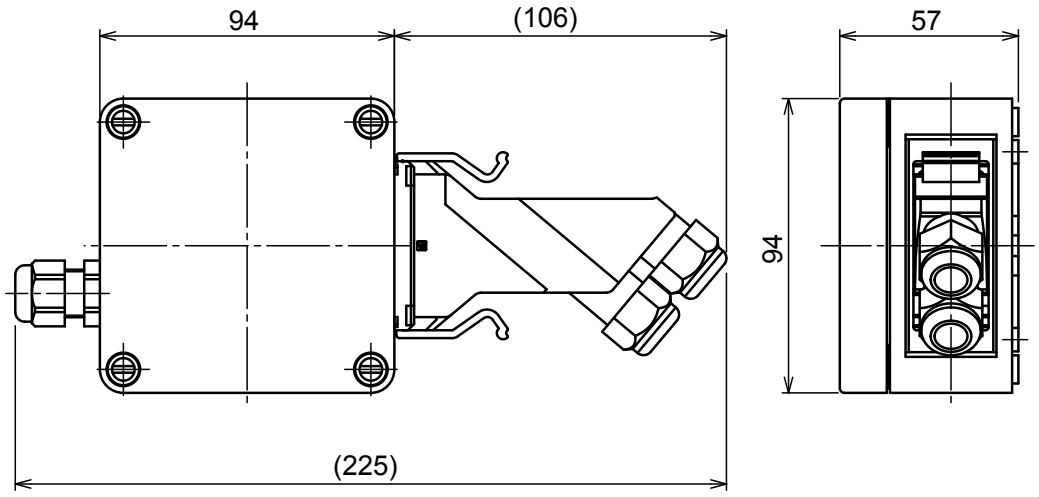
Displays	Possible causes	Measures
MOTOR OVERLOAD! ESC Key = Clear	An abnormal pressure is detected.	Push the ESC key on the pump to cancel communication. See the manual of the pump and remove problems. Cancel error recognition of a master before resuming communication.
LEAK DETECTED! ESC Key = Clear	A diaphragm has broken.	
DRIVE ERROR! ESC Key = Clear	A drive unit has failed.	

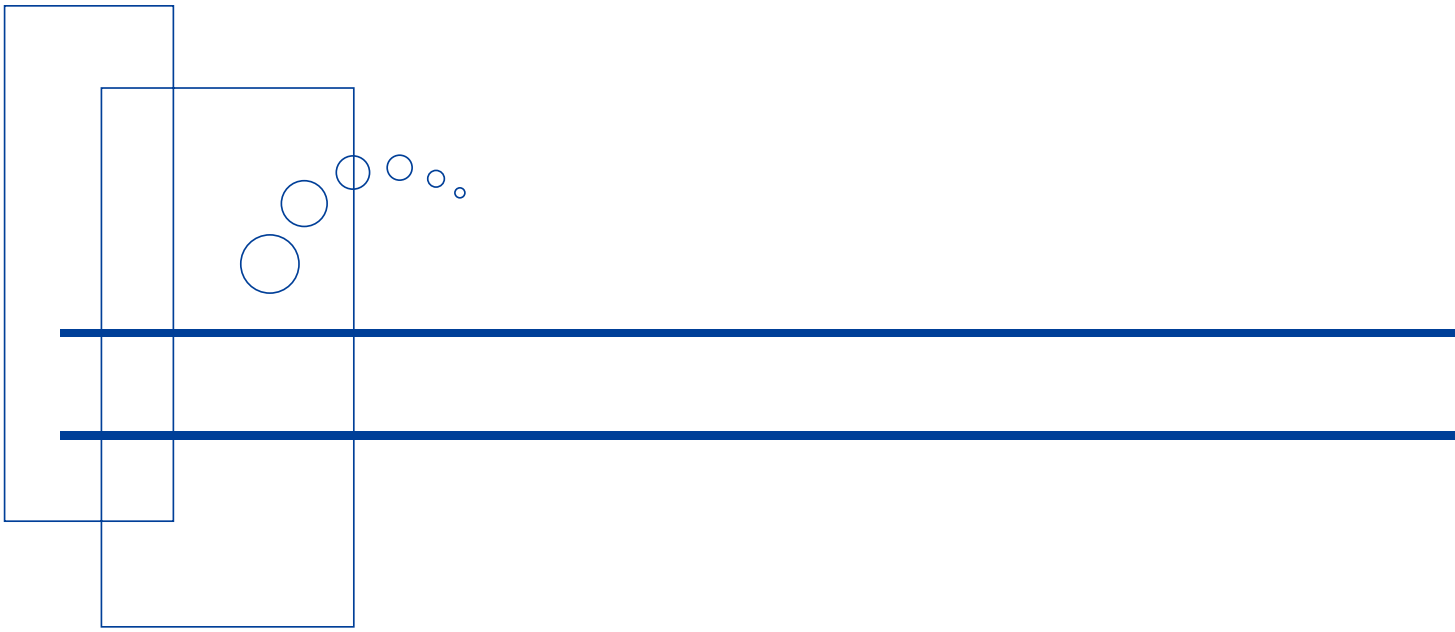
*It ends up with recurrence of error if communication is resumed without solving problems.
*Cancel error recognition of a master related to a slave before resuming communication.

Specification

Information in this section is subject to change without notice.

Communication protocol	PROFIBUS-DP 0V compliant
International standard	EN 50 170(IEC61158)
Physical layer electrical specification	RS-485 compliant
Applicable devices	Devices compliant to PROFIBUS-DP Master
Connection type	Bus connection
Transmission speed and range	9.6k bps → Max 1200m 19.2k bps → Max 1200m 45.45k bps → Max 1200m 93.75k bps → Max 1200m 187.5k bps → Max 1000m 500k bps → Max 400m 1.5M bps → Max 200m
Transmission procedure	Half duplex
Synchronous system	Asynchronous
Communication control	Polling/Selecting
Error correction	Frame Check Sequence
Data form	Start bit: 1bit Data: 8bit Parity check: 1bit (even) Stop bit: 1bit
Wiring connection	Terminal block (two wire system) Phoenix Contact connector
PROFIBUS cable	Shielded twisted pair cable
Number of nodes	A master and a slave Maximum 126 nodes (with repeaters) Maximum 32 nodes (with no repeater)
Communication speed setting	Automatically determined by transmit data from a master





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