User's Manual

OpreX™ Pressure Transmitter

EJX110S, EJX310S, EJX430S, EJX510S and EJX530S Differential Pressure Transmitter Hardware Edition

IM 01C33B01-01EN

YOKOGAWA
Yokogawa Electric Corporation

IM 01C33B01-01EN
1st Edition

OpreX Pressure Transmitter
EJX110S, EJX310S, EJX430S, EJX510S and EJX530S
Differential Pressure Transmitter Hardware Edition

IM 01C33B01-01EN 1st Edition

Contents

1. Introduction

Thank you very much for using our differential pressure and pressure transmitters. This is an instruction manual that describes the installation, wiring, and maintenance of the EJX S Series differential pressure and pressure transmitter hardware. When handling products, please be sure to read this document and the instructions and specifications (General Specifications) according to the specifications shown in Tables 1.1 and 1.2 to understand the contents before using them correctly.
You can download each instruction manual and specification as a PDF file from our website. Please contact our sales or distributors for the purchase of printed materials.

Japanese Instruction Manual: https://www.yokogawa.co.jp/library/
English Instruction Manual: https://www.yokogawa.com/library/

When downloading the document, enter the following document number accurately on the above site. Search for the desired document and download it.

Table 1.1 Instruction Manual

Document Title	Document No.	Shipped Together/Web Download
EJX S Series Read Me First	IM 01C33A01-01Z1	Shipped together
EJX110S, EJX310S, EJX430S, EJX510S and EJX530S Differential Pressure Transmitter Hardware Edition (This document)	IM 01C33B01-01EN	Web Download/Sold separately
EJX S Series HART Communication Type	IM 01C33A10-01EN	Web Download/Sold separately
EJX S Series PROFINET Communication Type	IM 01C33A11-01EN	Web Download/Sold separately
EJX S Series Explosion Protection for ATEX and IECEx	IM 01C33A20-01EN	Shipped together (For Certification codes -K☐1 or -S☐1 or -VU1)
EJX S Series Explosion Protection for US and CANADA	IM 01C33A21-01EN	Shipped together (For Certification codes -F☐1 or -C☐1 or -VU1)
EJX S Series Functional Safety Manual	TI 01C33A01-01Z1	Web Download

Table 1.2 General Specification

Models	Document No.
EJX110S	GS 01C33C10-01EN
EJX110S for Low Flow measurement	GS 01C33C10-02EN
EJX310S	GS 01C33D10-01EN
EJX430S	GS 01C33E10-01EN
EJX510S and EJX530S	GS 01C33F30-01EN
EJX530S for Hygienic	GS 01C33F20-01EN

■ Notes on this document

- This document must be delivered to the end user.
- The contents of this document are subject to change without notice.
- Unauthorized reproduction or reproduction of all or part of the contents of this document is prohibited.
- This document does not warrant the marketability of the instrument or its suitability for your specific purpose.
- We have made every effort to ensure the contents of this document, but if you notice any suspicious points or errors, please contact our sales offices or the agency where you purchased them. The URL of our website is listed on the back cover of each of our sales offices, so please check the website for the latest information.
- Special specifications are not listed in this document.
- Please note that this document may not be revised each time for specification changes, structural changes, or changes to parts used that are not particularly affected in terms of function or performance.
- This instrument is available in a variety of shapes and specifications and is specified by the customer. In this book, we explain using specifications with typical configurations.
  Please note that the figures may differ from the product purchased by the customer.

■ Safety and modification precautions

- For the protection and safety of the human body and the instrument and the systems incorporating it, follow the safety instructions and other precautions in this document when handling this instrument. If the instrument is treated in violation of these instructions, the protective function of the instrument may be impaired, and its function may not be fully demonstrated. In this case, the Company does not guarantee the quality, performance, function, or safety of the product.
- Modification of this instrument is strictly prohibited. Any modification or replacement will void the certification of each explosion protection and other certification.
- If the customer repairs the explosion-proof instrument and cannot restore it to its original state, the explosion-proof structure of the instrument will be damaged and cause a dangerous situation. Please be sure to consult us for repairs.
- When replacing parts of this instrument, be sure to use our designated products.
- When installing protection and safety circuits for this instrument or control system, such as lightning protection devices and equipment in the system controlled by this instrument, or designing and installing processes using this instrument or control system, line design, fail-safe design, or other protection and safety circuits, please do so at your discretion and appropriately. In addition, please consider and prepare separately for realization with equipment other than this instrument.
- This instrument is not designed or manufactured for use in situations that directly affect human beings, such as nuclear and radiation-related equipment, railway facilities, aviation equipment, marine equipment, aviation facilities, medical equipment, etc. When applying to a system that requires safety directly related to personal safety, please build a system that ensures personal safety with equipment and devices other than this instrument at your own risk.
- This instrument must be disposed of in accordance with local and national laws/regulations.
- This instrument and this document use the following safety symbols and signal terminology.

WARNING

This display is used when it is foreseen that a dangerous situation that could result in death or serious injury if not avoided is foreseen. This book provides precautions to avoid such dangers in such cases.

CAUTION

This display is used when it is foreseen that a dangerous situation will result in minor injury or property damage if not avoided. This document describes precautions to avoid danger if there is a risk of danger to the handler's body or damage to the instrument.

IMPORTANT

It describes what to pay attention to if the instrument is damaged or there is a risk of system trouble.

NOTE

It lists the things you need to pay attention to when knowing the operation and functions.

In addition, several symbols are written on the body of the device. Its meaning is as follows:

⏚	Functional grounding terminal
⎓	Direct current
⚠	Caution This symbol indicates that the operator must refer to an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the instrument.

1.1 For Safe Use of this Instrument

For the protection and safety of the Product and the systems it contains, please follow the safety instructions in this document when handling the Product. If the product is treated in violation of these instructions, the protective function of the product may be impaired, and its function may not be fully demonstrated. In this case, the Company shall not be liable for any indirect damages arising from the use or inability to use the Product.

WARNING

- Installation, wiring, and maintenance of this instrument must be performed by someone who has knowledge and training of product characteristics and safety. Do not perform any installation, wiring, or maintenance matters as an operator.
- Use appropriate wires, crimp terminals, and tighten the wiring with the correct torque value. Use crimped terminals with insulation covers for power and ground wiring. To prevent electric shock due to damage, do not pull the wiring cord too hard.
- Do not open the cover in rainy weather or in places with high humidity. When the cover is opened, the protective performance by the prescribed container is not maintained.
- Use with the cover closed during normal operation.
- When opening and closing the cover, handle it with great care to avoid damage or foreign objects on the screws and O-rings.
- This product uses some parts that are damaged by static electricity. When handling the device, use a wrist strap to prevent static electricity, and be careful not to directly touch each electronic component or circuit.
- Make sure that the voltage on the supply side is within the rated voltage range of this product before connecting the power cord. Also, make sure that there is no voltage on the power cord when connecting.
- Tighten the cover completely after wiring to prevent electric shock.
- To prevent electric shock, do not apply more voltage than the rated value to each input and output terminal.
- Close the wiring ports that are not in use with the closed plugs supplied or purchased from us. If there is no blockage with the supplied closure plug, it is not protected by the prescribed container.
- Wiring, switch operation, and maintenance should be performed in an ambient temperature of -40°C or higher (the indicator should be at least -30°C).
- The temporary installation specification of the closing plug is shipped with the closing plug temporarily installed for the purpose of transportation and storage. If you use a closing plug to install equipment, be sure to reinstall the closing plug before use.
- In all items in this document, such as installation, piping, wiring, operation, and maintenance, there may be no handling or precautions specific to the selected specifications, such as explosion proof, which may not be described in this document. In addition, depending on the specification, it may be necessary to handle it differently than the content described in this document, in which case the information in the instruction manual of each specification will take precedence. Please be sure to refer to the instruction manual shown in Table 1.1 and perform correct handling according to each specification.

(1) Installation

WARNING

- Please install it in an environment within the specifications of each transmitter.
- All matters related to installation must be carried out in accordance with the laws and regulations of each country and the Electrical Code.
- This instrument is a heavy object. Please be careful not to damage the human body by accidentally dropping it or using excessive force.
- Donotapplyaloadtothisinstrumentbyapersonridingonitorputtingyourfeeton it.
- Defective protective function If you believe that the protective function of this product is defective, do not operate this product. Also, check for defects in the protection function before operating this product.
- For use in gas In an explosion-proof environment, please choose the explosion-proof specification. If you choose the generic form, do not operate this product in the presence of flammable or explosive gases, vapors or flammable dust. It is very dangerous to use this instrument in such an environment. Prolonged use in environments with high concentrations of corrosive gases (H2S, SOx, etc.) can cause failure.
- Damage to the protective structure Performing any operation not described in this document and the instruction manual in Table 1.1 may damage the protective structure of this product.
- If there is a motor, transformer, inverter, or other power source near this product, it may cause induction failure, so be careful not to come close to these equipment.

(2) Wiring

WARNING

- When connecting the wiring, make sure that the voltage on the supply side is within the rated voltage range of this instrument before connecting the power cable. Also, make sure that there is no voltage on the power cable when connecting.
- Use external wiring with a permissible temperature of at least 15°C higher than the ambient temperature.
- When wiring a conduit, use a flood control ground to prevent water from flowing through the conduit to the electrical connection. Also, install a drain drain valve and drain regularly.
- Do not connect cables outdoors in rainy weather to ensure insulation inside the terminal box and prevent failure due to condensation.

(3) Operation

WARNING

After setting the parameters, to prevent unintentional parameter changes, use the write protection function to prevent parameter writing as necessary.
For the hardware write protection function, refer to Chapter 3 “Component Names” and Section 7.2 “Transmitter Status Check and Parameter Settings.” For the software write protection function, refer to the communication type manual listed in Table 1.1 of the related documentation.

(4) Maintenance

WARNING

- If you wish to perform maintenance, refer to the maintenance section of this document. Do not perform any maintenance that is not listed. If necessary, please contact our distributors or our nearest sales office.
- If the process fluid is hot/cold, the equipment body may be hot/cold, so be careful not to burn yourself.
- Because the differential pressure and pressure transmitters installed in the process are under pressure, tightening or loosening the tightening bolts or process connections in the pressure receiving section can risk the process fluid to erupt. Never do it.
- When removing the drain or gas in the transmitter pressure section, if the process fluid is harmful to the human body, be careful not to adhere the fluid to the skin or eyes, or to inhale the effluent gas.
- If the process fluid is a substance harmful to the human body, handle the instrument carefully even after removing it from the line for maintenance, etc., and be careful not to adhere to the human body or inhale residual gases.
- Be careful not to get dirt or dirt on the glass or nameplate of the display part. If it sticks, wipe it off with a soft cloth.

(5) Explosion-proof instruments

WARNING

This instrument is a product that has been certified as an explosion-proof specification device. Please note that there are strict restrictions on the structure, installation location, external wiring work, maintenance, repair, etc. of this equipment, and violation of these may lead to dangerous conditions. Before handling, be sure to read the instruction manual for the explosion-proof specification described in Table 1.1 related documents.

(6) PED (European Pressure Vessel Directive)

WARNING

If you want to use it as a PED compliant product, please be sure to read the “PED” (European Pressure Vessel Directive) in Read me First (IM 01C33A01- 01Z1) before handling.

(7) Retrofit

We are not responsible for any failures or damages resulting from any modifications you make to this equipment.

(8) Disposal of products

Equipment must be disposed of in accordance with local and national laws/regulations.

1.2 Post-delivery Warranty

- The warranty period for this instrument is the period stated in the quotation submitted by us at the time of purchase. Any breakdowns that occur during the warranty period will be repaired free of charge.
- You can contact us about a malfunction at our distributor or the nearest sales office.
- If you encounter any malfunction with this instrument, please contact us with specific details regarding the issue and its progress, clearly stating the device's model and serial number. I would appreciate it if you could attach a schematic diagram or data.
- The appropriateness of free repair of the malfunctioning instrument shall be based on the results of the Company's investigation.

■ **Please note that the following cases are not covered for free repairs even within the warranty period.**

- In the event of a malfunction due to improper or inadequate maintenance by the customer.
- Failure or damage due to handling, use, or storage beyond design and specification requirements.
- Failure due to use in a location that does not meet the installation site standards set by the Company and improper maintenance of the installation site.
- Failure and damage due to improper relocation after delivery.
- Natural disasters such as fires, earthquakes, storms, floods, lightning, etc., as well as failures and damages caused by reasons other than this instrument.
- Failure or damage caused by modification or repair by someone other than the Company or a person commissioned by the Company.

1.3 Trademarks

- HART is a registered trademark of FieldComm Group.
- PROFINET is a registered trademark of PROFIBUS Nutzerorganisation e.V.
- Trade names of Yokogawa products used in this text are registered trademarks or trademarks of Yokogawa.
- Company names and product names used in this text are registered trademarks or trademarks of their respective companies.
- In this manual, trademarks or registered trademarks are not marked with ™ or ®.

2. Precautions for Handling

When this instrument arrives in your hands, check the exterior to make sure it is not damaged and that it comes with the transmitter mounting parts as shown in Table 2.1 after referring to the specification code in Figure 2.1.

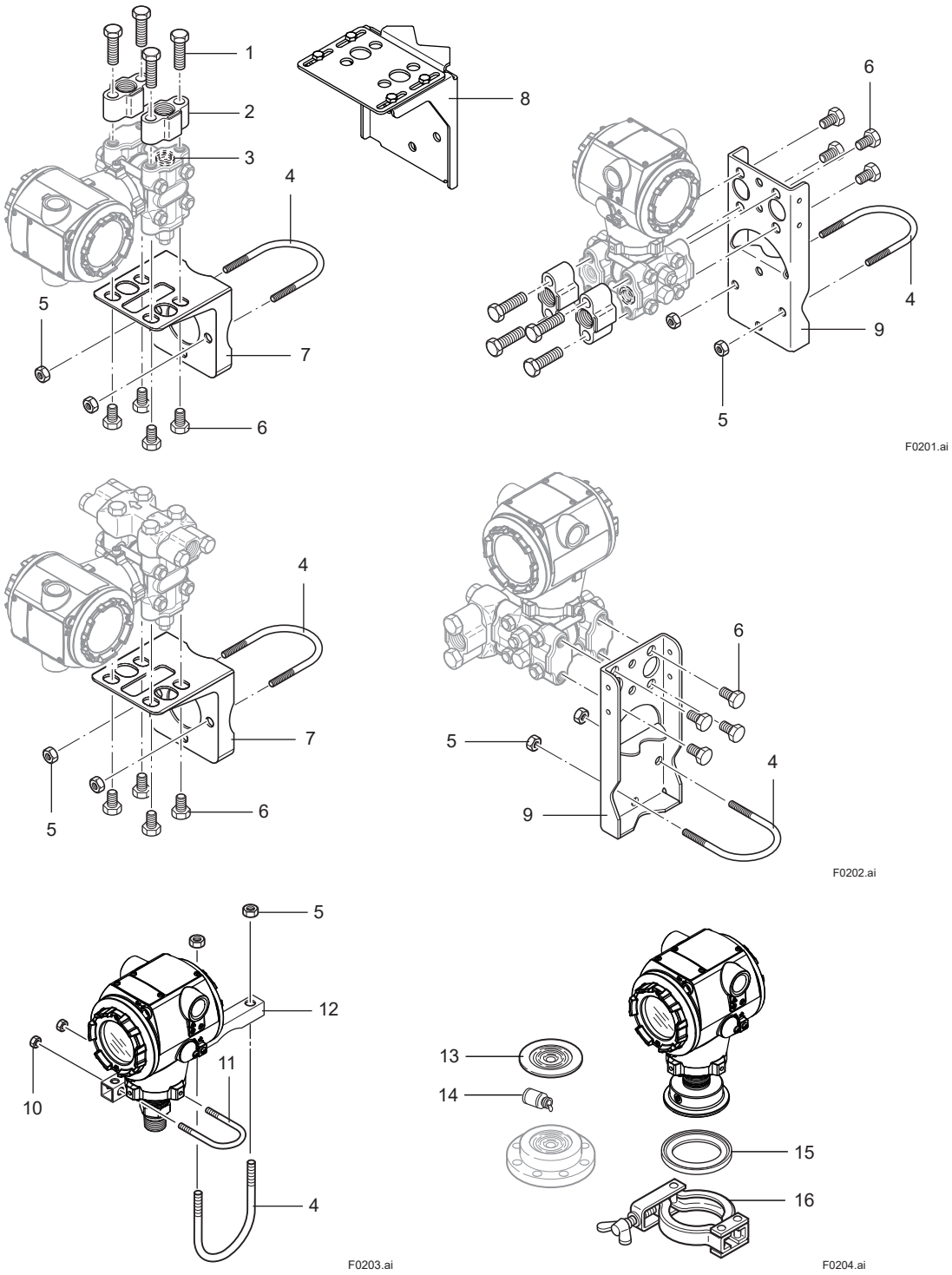
Table 2.1

Target form Name	Specification Code	Part Name	Quantity
EJX110S	Process Connection Codes 1, 2, 3, 4	Process connector tightening bolt *	4
		Process connector *	2
		Process connector gasket *	2
EJX310S EJX430S	Process Connection Codes 1, 2, 3, 4	Process connector clamping bolt	2
		Process connector	1
		Process connector gasket	1
EJX110S EJX310S EJX430S	Mounting Bracket Codes B, D, J, K	U-bolt	1
		U-bolt nut	2
		Mounting bracket (L-shaped or flat shape)	1
		Transmitter fastening bolt	4
EJX110S EJX310S EJX430S	Mounting Bracket Code P	U-bolt	1
		U-bolt nut	2
		Mounting bracket (L shape)	1
		Plate	1
		Position adjustment screw	4
		Transmitter fastening bolt	4
EJX110S EJX510S EJX530S	Mounting Bracket Codes L, M	U-bolt (L and S)	1 each
		U-bolt nuts (for L and S)	2 each
		Mounting bracket	1
EJX530S	Additional Specification Code /W□1	Gasket	1
		Mounting bracket (clamp) Clamp mounting type only	1

*: For the optional code/BS, the uantity will be half.

	01	02	03	04	05	06	07	08	09	10	11	12	13	14
EJX110S EJX310S EJX430S	-□□□	-□	□	□	□	-□	□	□	0 1 2 3 4 5 W	□	□	-B -D -J -K -M -P -N	□	/□
EJX510S EJX530S	-□□□	-□	□	□	□	-□	□	□	2 4 6 7 8 9 A W	N	0	-L -N	N	/□
Model	Approval	Output signal	Housing	Electrical connection	Display and interface	Capsule range	Wetted parts material	Fill fluid	Process connection	Bolts and nuts material	Installation	Mounting bracket	Orifice for low flow measurement (only for EJX110S)	Optional codes

Figure 2.1 MS Code and Installation Part Specification Code



1	Bolt	9	Mounting bracket (Flat type)
2	Process connector	10	U-bolt nut (S)
3	Process connector Gasket	11	U-bolt (S)
4	U-bolt	12	Mounting bracket
5	U-bolt nut	13	Teflon film
6	Transmitter mounting bolt	14	Fluorinated oil
7	Mounting bracket (L type)	15	Gasket
8	Position adjustable bracket for vertical piping	16	Clamp

Figure 2.2 Transmitter Mounting Parts

2.1 Model and Specifications Check

The main nameplate contains the model name and specifications. The model name and product specifications indicated on the nameplate are those at the time of shipment. The sub nameplate contains the ordering information. Please make sure that the contents of your order match the contents of the nameplates. The sub nameplate can be replaced by the customer.

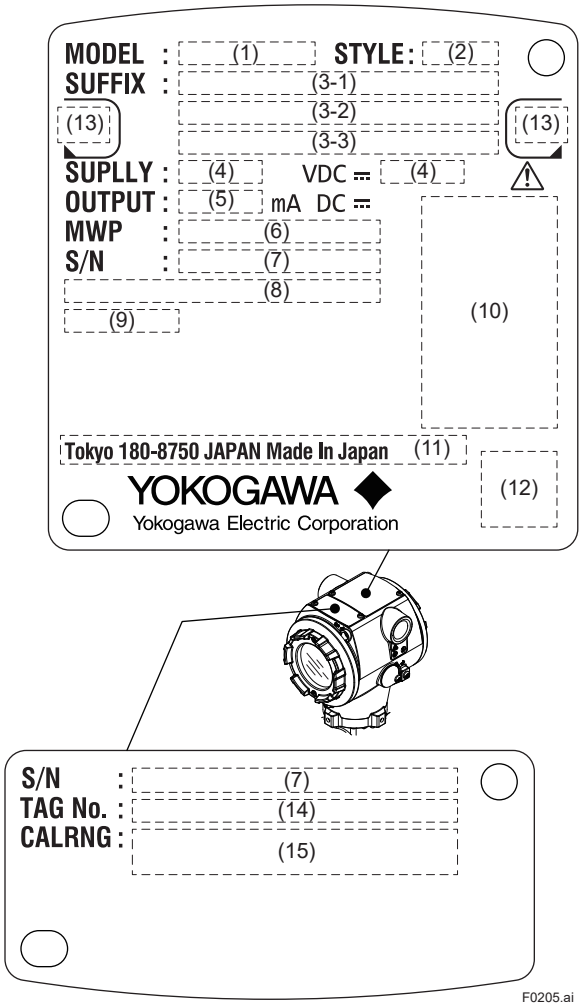


Figure 2.3 Main nameplate (top), Sub nameplate (bottom)

2.1.1 Main Nameplate, Sub Nameplate Presentation Item

(1)	Model name
(2)	Style code
(3)	Suffix code / Optional code
(4)	Power supply voltage: Units vary depending on specifications.
(5)	Output
(6)	MAX working pressure
(7)	Serial number 9 letters: AAnnnnnnn AA: Identification code of production site Japan: “91” or “90” Brazil: “B1” Germany: “D1” CHINA: “S7” USA: “U1” India: “Y1” Saudi Arabia: “Y3” UAE: “Y4”
(8)	Custom-made number
(9)	Date of manufacture: YYYY.MM
(10)	The description will change depending on the selected specifications.
(11)	The address of the production location will be listed.
(12)	QR code: It can check the specifications of the applicable products on the Customer Portal site.
(13)	The screw types of the left and right electrical connection.
(14)	TAG No.
(15)	Customer specified range

Yokogawa products are gradually being equipped with QR codes that comply with the international standard IEC61406-1. Please scan the QR code with your smartphone or tablet to access the URL. You can register the product directly on our member site (https://myportal.yokogawa.com), and easily check the specifications, refer to the instruction manual, and make inquiries.

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For more information, please see here (https://www.yokogawa.com/qr-code).
Providing electronic information via QR code contributes to reducing CO2 consumption and saving resources (wood, water, energy).
QR Code is a registered trademark of DENSO WAVE INCORPORATED.

2.2 About Transportation

To prevent damage due to accidents during transportation, this transmitter should be transported to the installation site in the packaging state it was shipped in as much as possible.

2.3 Storage Location

If you expect to store it for a long time, please note the following:

(1) Please select a storage location that meets the following conditions.

- Away from rain and water.
- Low vibration and shock location.
- Where the temperature and humidity of the storage area are: It is desirable to have room temperature and humidity (25°C, about 65%) as much as possible.

  Temperature: -40 to 85°C without display
  -30 to 80°C with display

  Humidity: 0 to 100%RH (no condensation)

(2) Please store this instrument in the packaging state in which it was shipped from our company as much as possible. In particularly humid places, it should be stored in the same packaging as when it was shipped from us.

(3) When storing this instrument once used, thoroughly clean the measuring fluid remaining in the cover flange. Also, make sure that the transmission and pressure parts are securely fixed before storing them.

2.4 About the Installation Location

This instrument is designed to operate under harsh environmental conditions, but please note the following points in order to ensure stable, accurate and long-term use.

■ Ambient temperature

Avoid installing them in places with high temperature gradients or temperature fluctuations as much as possible. When the equipment receives direct sunlight or radiant heat from the plant side, install it with insulation measures or to improve ventilation.
Also, avoid installing in places where the high temperature and humidity environment will continue for a long time.

■ Atmosphere conditions

Avoid installing them in corrosive atmospheres as much as possible. When using in a corrosive atmosphere, consider good ventilation and prevent rainwater from entering or stagnating in the conduit.

■ Shock and vibration

They are designed to be resistant to shock and vibration, but place them in a place with as little shock and vibration as possible.

■ Noise Avoidance

The pressure transmitter should be installed away from electrical motors, transformers, and other power sources in order to avoid interference with measurement.

■ Installation of explosion-proof instruments

Certified explosion-proof instruments can be installed and used in hazardous areas according to the explosive atmosphere. For the handling of explosion-proof instruments, please follow the contents of the instruction manual of each explosion-proof specification and install them correctly in accordance with the laws and regulations of each explosion-proof standard and place of use.

2.5 About the Pressurized Part

WARNING

- Since the differential pressure and pressure transmitter installed in the process is in a pressurized state, tightening or loosening the tightening bolts or mounting brackets or union nuts in the pressure receiving part may cause the process fluid to erupt. Never do it.
- When removing the condensation or gas in the pressure part of the transmitter, if the process fluid is harmful to the human body, be careful not to adhere the fluid to the skin or eyes, or to inhale the effluent gas.

When pressurizing this transmitter, please pay attention to the following points for safe use.

(1) • EJX110S, EJX310S and EJX430S Make sure that the process connector tightening bolts (differential pressure gauge: 4 pieces, pressure gauge: 2 pieces) or process connection of the transmitter are sufficiently tightened.

• EJX110S For low flow measurement (Orifice for low flow measurement code: 1 to 6) Ensure the manifold bolts (4 bolts) and the manifold process connector bolts (4 bolts) are sufficiently tightened.

• EJX510S Make sure that the process connections of the EJX530S transmitters are sufficiently tightened.

• EJX530S Make sure that the sanitary type (wetted material codes 1 and 2) gaskets are installed correctly and that the mounting brackets (clamps) or union nuts are sufficiently tightened.

(2) Make sure there are no leaks in the conductive piping.

(3) Do not apply more pressure than prescribed.

2.6 About Waterproofing of Electrical Connections

The cable wiring of this transmitter must be coated with a non-hardening sealing material and waterproofed to the threaded parts.

2.7 Using Transceivers

IMPORTANT

Although this transmitter has sufficient consideration and countermeasures against high-frequency noise, if the transceiver is used near the transmitter and its wiring, it may be affected by high-frequency noise. Therefore, when using a transceiver, gradually move the transceiver closer than a few meters to the transmitter, while studying the effect of the transceiver on the transmitter loop and using the transceiver at a distance that does not cause problems.

2.8 EMC Conformity Standards

EN 61326-1 Class A, Table2

EN 61326-2-3

Immunity influence during the test
*Differential pressure / Pressure: Output shift is specified within ±1% of X/URL Max span.
Static pressure: Output shift is specified within ±2% of 1 MPa span.

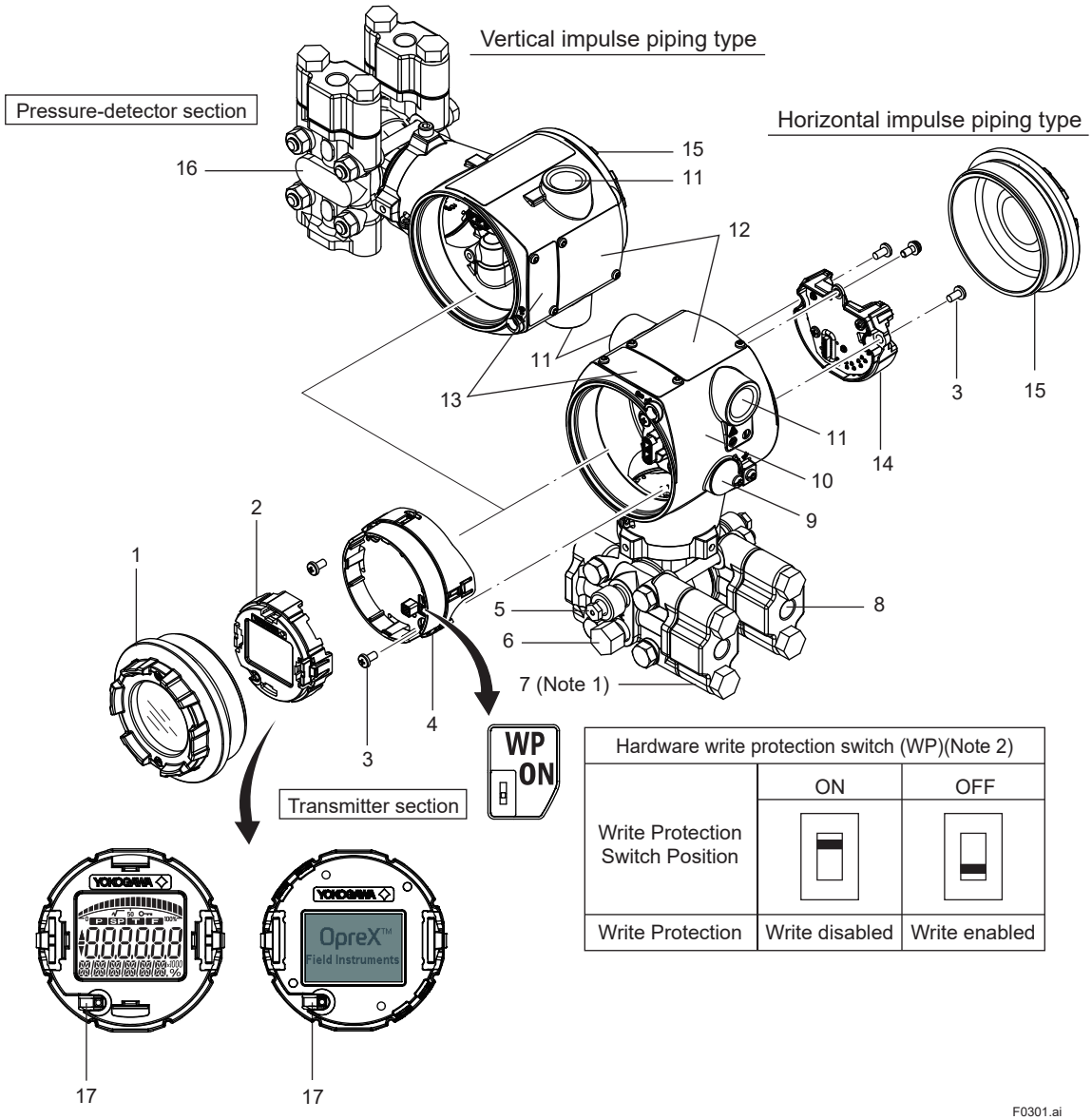
* X: Pressure Reference (Product-specific values)

CAUTION

To meet EMC regulations, Yokogawa recommends that customers run signal wiring through metal conduits or use shielded twisted pair cabling when installing EJX S Series transmitters in a plant.
This equipment is a Class A product, and it is designed for use in the industrial environment.
Please use this instrument in the industrial environment only.

3. Component Names

3.1 EJX110S, EJX310S and EJX430S



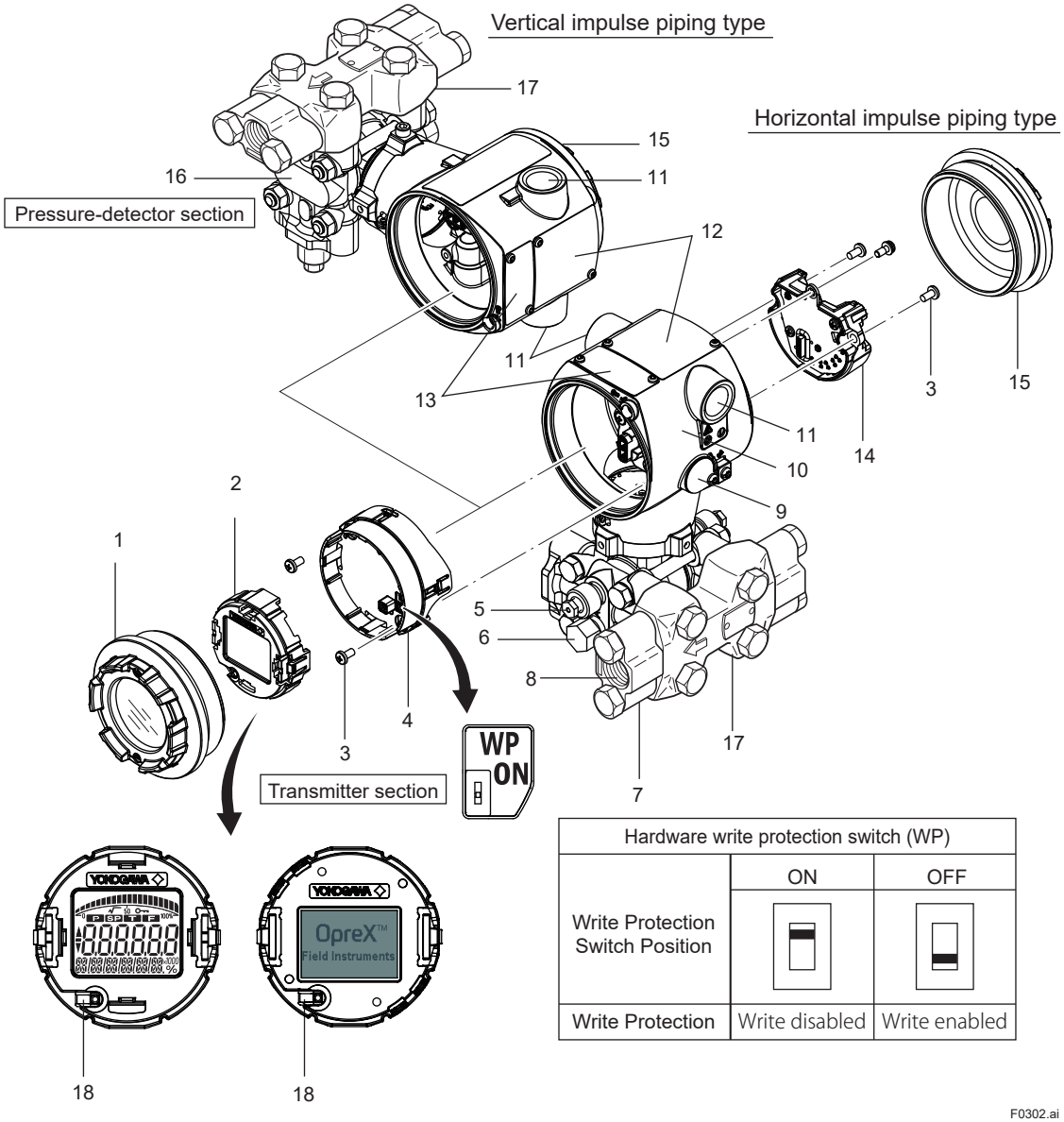
Hardware write protection switch (WP)(Note 2)		
	ON	OFF
Write Protection Switch Position		
Write Protection	Write disabled	Write enabled

Note 1: Please refer to the code table in the specification sheet (GS) of each product depending on your specification.
EJX310S, for EJX430S, there is no low-pressure side process connector.
Also, if the EJX110S has an additional specification code/BS, there is no low-pressure process connector.

Note 2:
- The setting method for write protection is to slide the setting switch shown in the figure. The setting at the time of delivery is set to OFF (writable).
- The setting status can be checked by the display symbol on the display or by the communication parameter Write Protect Status.
- To change the switch, please prepare the tip of the tweezers or a thin tip width of about 1 mm.

1	Housing cover with window	**7**	Process connector	**12**	Main nameplate
2	Display	**8**	Process connection	**13**	Sub nameplate
3	Mounting screw	**9**	Zero-adjustment screw	**14**	Terminal module
4	Main module	**10**	Housing	**15**	Housing cover
5	Vent plug	**11**	Conduit connection and external indicator conduit connection	**16**	Cover flange
6	Drain plug			**17**	Push button

3.2 EJX110S Low Flow Measurement (Orifice for Low Flow Measurement Code: 1 to 6)



Hardware write protection switch (WP)		
	ON	OFF
Write Protection Switch Position		
Write Protection	Write disabled	Write enabled

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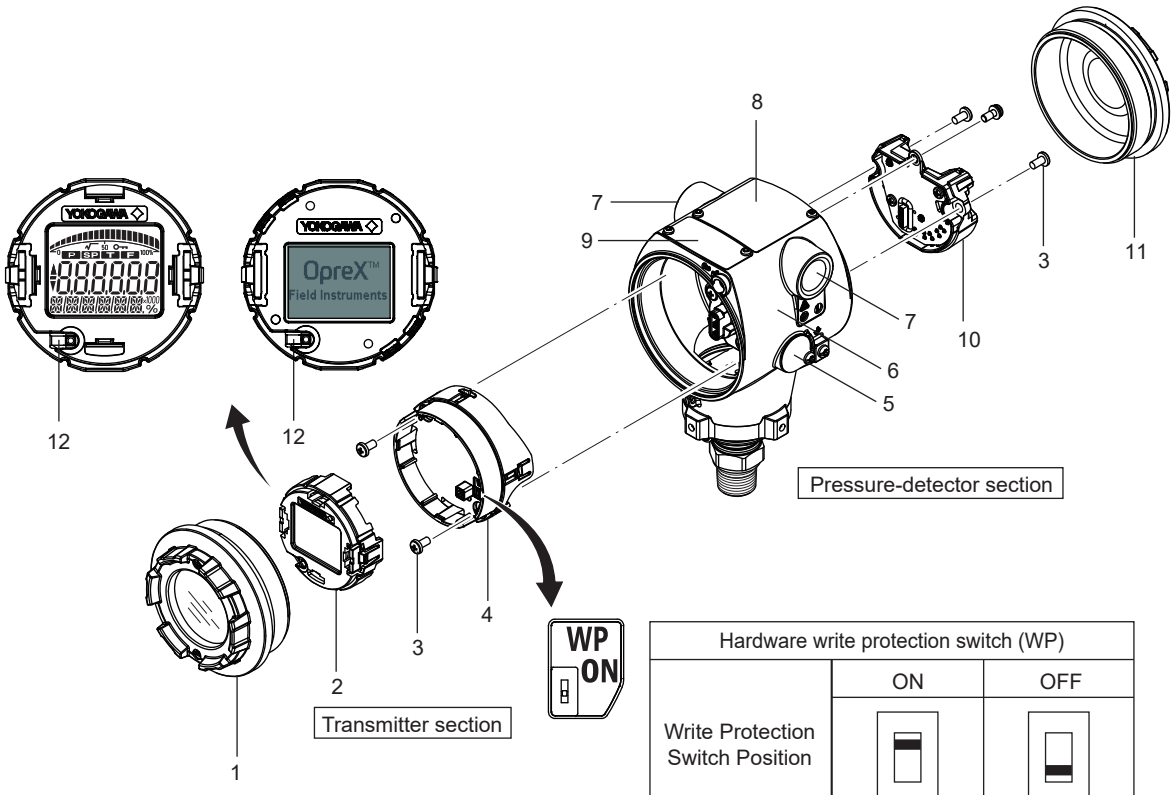
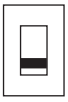
Note 1: Please refer to the code table in the specification sheet (GS) of each product depending on your specification.
Note 2:
- The setting method for write protection is to slide the setting switch shown in the figure. The setting at the time of delivery is set to OFF (writable).
- The setting status can be checked by the display symbol on the display or by the communication parameter Write Protect Status.
- To change the switch, please prepare the tip of the tweezers or a thin tip width of about 1 mm.

1	Housing cover with window	**8**	Process connection	**14**	Terminal module
2	Display	**9**	Zero-adjustment screw	**15**	Housing cover
3	Mounting screw	**10**	Housing	**16**	Cover flange
4	Main module	**11**	Conduit connection and external indicator conduit connection	**17**	Manifold
5	Vent plug			**18**	Push button
6	Drain plug	**12**	Main nameplate		
7	Process connector	**13**	Sub nameplate		

3.3 EJX510S and EJX530S



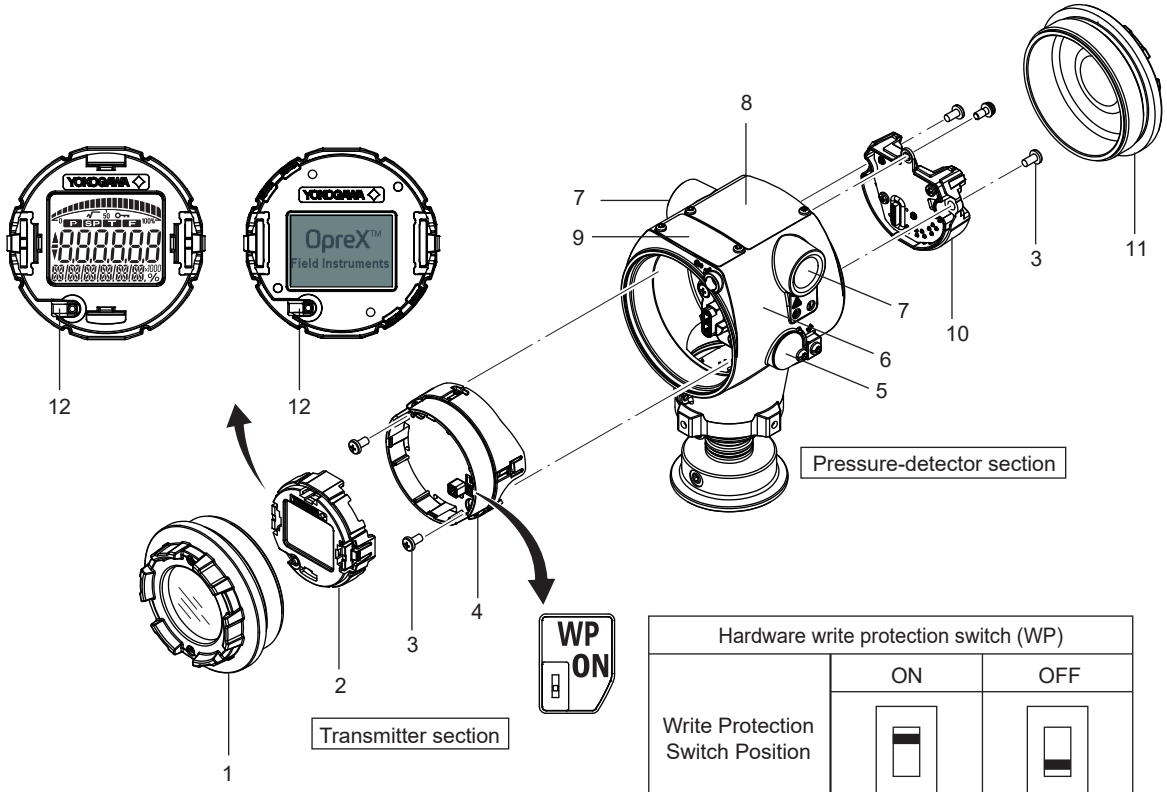
Hardware write protection switch (WP)		
	ON	OFF
Write Protection Switch Position		
Write Protection	Write disabled	Write enabled

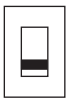
F0303.ai

Note 1: Please refer to the code table in the specification sheet (GS) of each product depending on your specification.
Note 2: - The setting method for write protection is to slide the setting switch shown in the figure. The setting at the time of delivery is set to OFF (writable).
- The setting status can be checked by the display symbol on the display or by the communication parameter Write Protect Status.
- To change the switch, please prepare the tip of the tweezers or a thin tip width of about 1 mm.

1	Housing cover with window	**6**	Housing	**10**	Terminal module
2	Display	**7**	Conduit connection and external indicator conduit connection	**11**	Housing cover
3	Mounting screw			**12**	Push button
4	Main module	**8**	Main nameplate		
5	Zero-adjustment screw	**9**	Sub nameplate		

3.4 EJX530S for Hygienic (Wetted Material Code: 1, 2)



Hardware write protection switch (WP)		
	ON	OFF
Write Protection Switch Position		
Write disabled	Write disabled	Write enabled

F0304.ai

Note 1: Please refer to the code table in the specification sheet (GS) of each product depending on your specification.
Note 2: - The setting method for write protection is to slide the setting switch shown in the figure. The setting at the time of delivery is set to OFF (writable).
- The setting status can be checked by the display symbol on the display or by the communication parameter Write Protect Status.
- To change the switch, please prepare the tip of the tweezers or a thin tip width of about 1 mm.

1	Housing cover with window	**6**	Housing	**10**	Terminal module
2	Display	**7**	Conduit connection and external indicator conduit connection	**11**	Housing cover
3	Mounting screw			**12**	Push button
4	Main module	**8**	Main nameplate		
5	Zero-adjustment screw	**9**	Sub nameplate		

4. Installation

4.1 Precautions for Installation

When installing this transmitter, refer to the precautions in Section 2.4 “About the installation location”. Please check the specification sheet (GS) for each model for the selected model and other conditions depending on the specification.

IMPORTANT

- When performing welding work such as on-site piping work, be careful not to flow the welding current to the transmitter.
- Do not use this transmitter as a scaffolding.

4.2 Installation of EJX110S, EJX310S and EJX430S

IMPORTANT

- In the case of EJX430S, rainwater and other intrusions through atmospheric openings must be avoided. Do not install it in such a way that the atmospheric opening hole is facing upwards.
- When installing the process connector, make sure that no foreign matter is adhered to the part that is the sealing surface of the gasket (or O-ring) before assembling it. If foreign objects are on it, it may lead to leaks. In addition, in the case of O-rings, it is known that applying grease improves sealing, but if you do not use grease, make sure that there are no foreign objects on it.

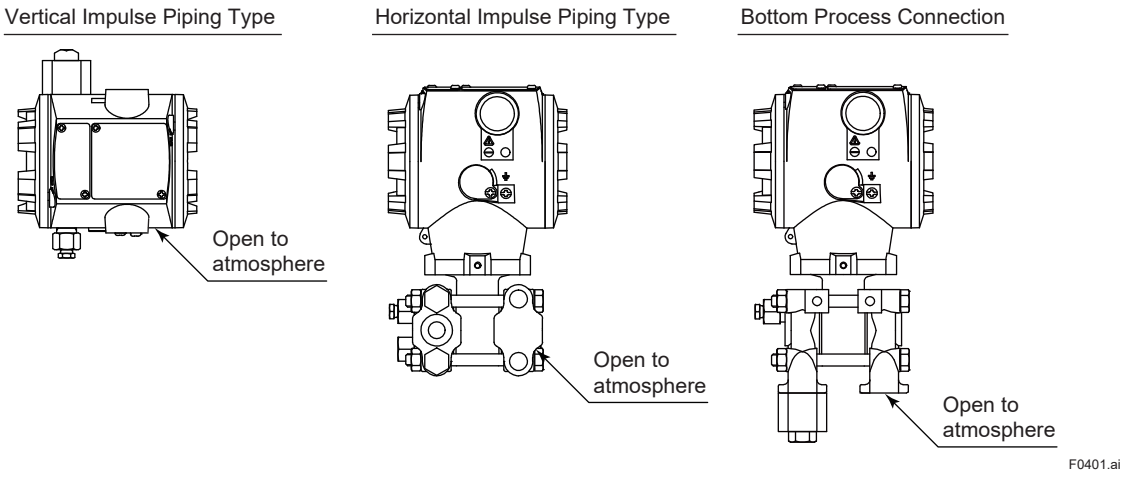


Figure 4.1 Open to atmosphere (for EJX430S)

4.2.1 Mounting Method

- Always use the process connector for each product.
- The direction of the process connection will be shipped with the specified content. If you want to change the direction of the process connection, see Section 4.3.
- The transmitter is mounted on a 50A (2B) pipe using a mounting bracket as shown in Figure 4.3 to 4.4. It can be installed on both horizontal and vertical pipes.
- When attaching the mounting bracket to the transmitter, tighten the transmitter fixing bolts (4 pieces) with a torque of about 39 N·m {4 kgf·m}.
- The pressure pipe connection size of the process connector is usually 54 mm. When using our 3-valve manifold, it can be used with this dimension. By changing the mounting direction of the process connector, it can also be used with a three-valve manifold with a 51 mm or 57 mm connection dimension. In addition, 3-valve manifolds may not be combined not only in size but also in some models due to differences in seal structures.
  Be sure to use a 3-valve manifold that is suitable for the combination with each transmitter.

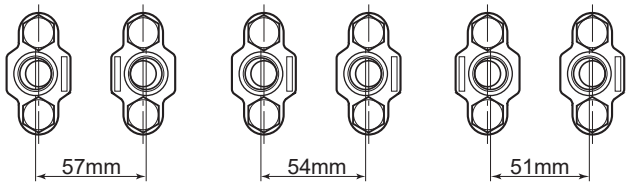


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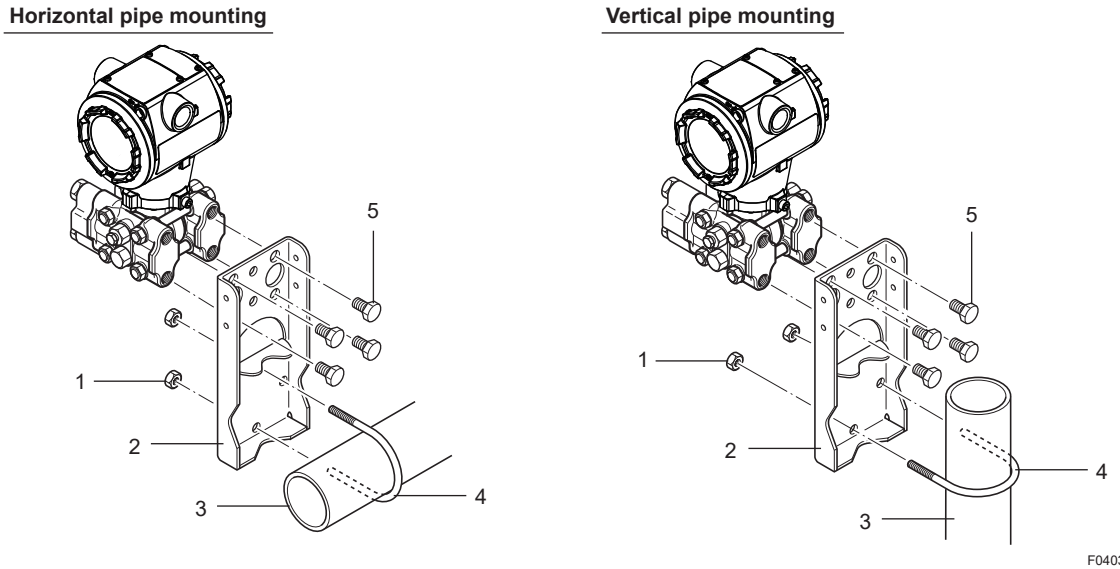
Figure 4.2 Process Connector Impulse Piping Connection Distances for Differential Pressure Transmitters

- The mounting direction of the manifold is shipped as the upper or lower side depending on the specification.
- To achieve correct flow measurement, the flow path must be constantly filled with fluid. If it is not met, accuracy cannot be guaranteed.
- When the capsule part is connected to a vertical pipe, it is recommended to install the manifold on the top for fluid flow measurement as shown in Figure 4.5, and the manifold on the bottom for gas flow measurement.

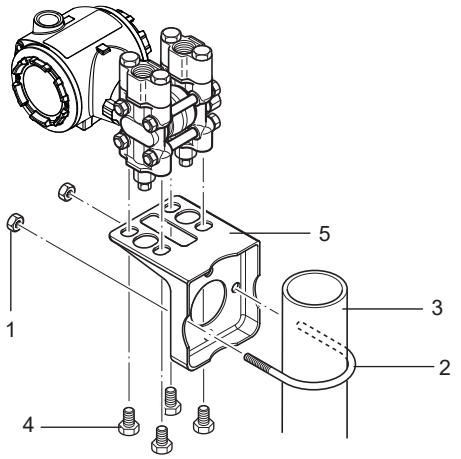


F0403.ai

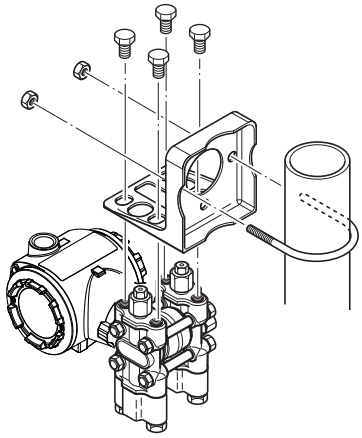
1	U-bolt nut	**3**	2-inch pipe	**5**	Transmitter fastening bolt
2	Mounting bracket	**4**	U-bolt		

Figure 4.3 Mounting of a Transmitter (Horizontal Impulse Piping Type)

Vertical pipe mounting
(Process connector upside)

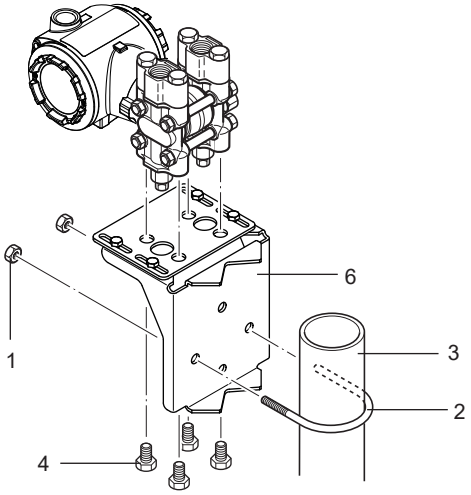


Vertical pipe mounting
(Process connector downside)

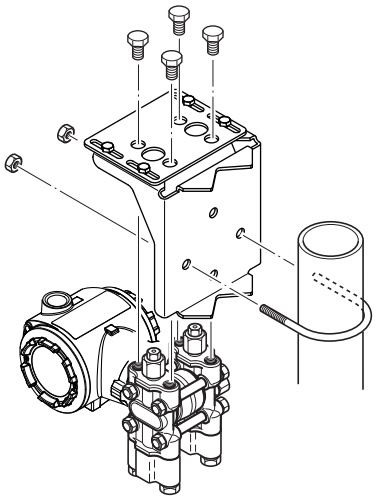


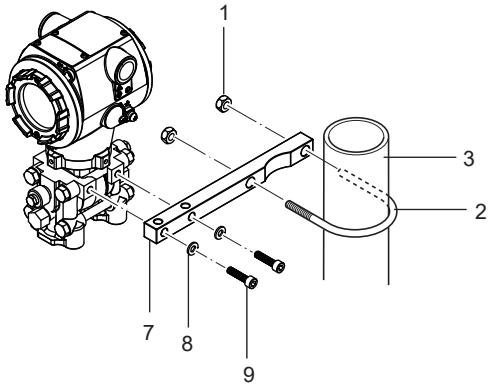
■ **In the case of position adjustable bracket**

Vertical pipe mounting
(Process connector upside)



Vertical pipe mounting
(Process connector downside)





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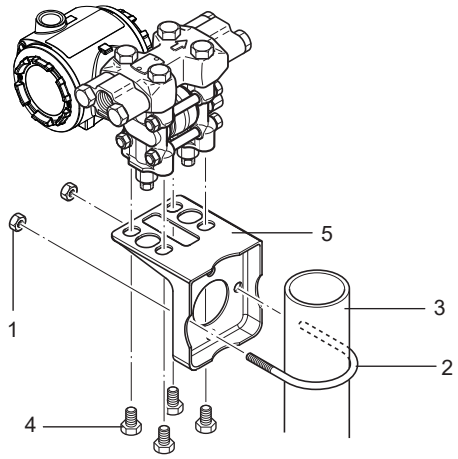
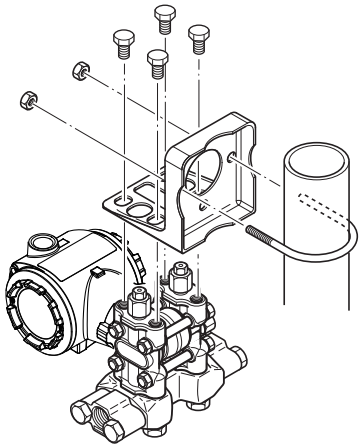
1	U-bolt nut	**4**	Transmitter mounting bolt	**7**	Mounting bracket
2	U-bolt	**5**	Mounting bracket	**8**	Washer
3	2-inch pipe	**6**	Position adjustable bracket	**9**	Transmitter fastening bolt

Figure 4.4 Transmitter Mounting (Vertical Piping Connection)

Vertical pipe mounting
(Process connector upside)

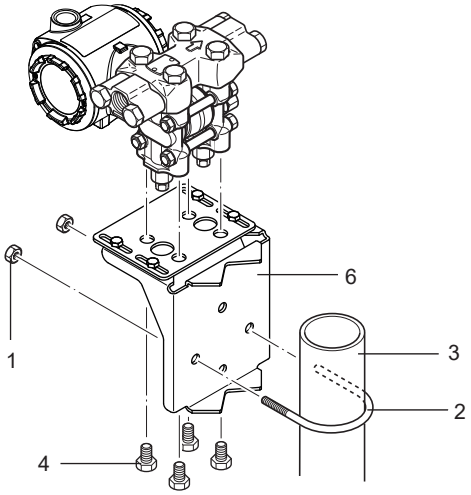


Vertical pipe mounting
(Process connector downside)

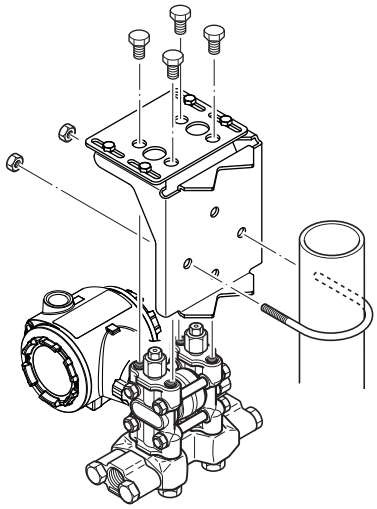


■ **In the case of position adjustable bracket**

Vertical pipe mounting
(Process connector upside)



Vertical pipe mounting
(Process connector downside)



F0404.ai

1	U-bolt nut	**3**	2-inch pipe	**5**	Mounting bracket
2	U-bolt	**4**	Transmitter mounting bolt	**6**	Position adjustable bracket

Figure 4.5 Transmitter Mounting (for Low Flow Measurement Vertical Impulse Piping Type)

4.2.2 How to Install the Position Adjustable Bracket

The steps for installing the movable mounting bracket (L type) are described below.
(See Figure 4.6)

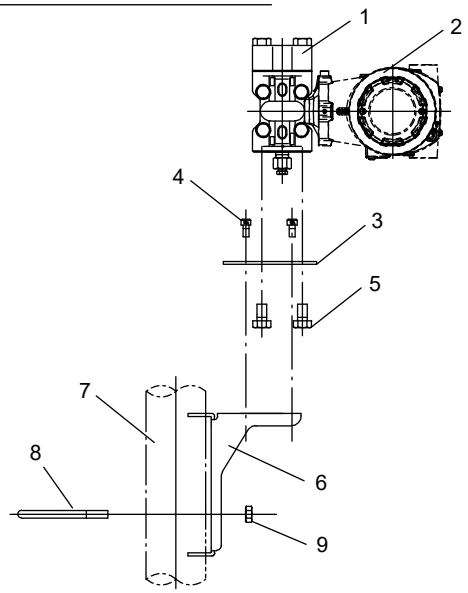
(1) Firmly fasten the transmitter and movable plate using the transmitter fixing bolts. The transmitter fixing bolts (4 pieces) should be tightened with a torque of about 39 N·m {4 kgf·m}.

(2) Install the bracket on the 50A (2B) pipe, aligning the height with the process piping.

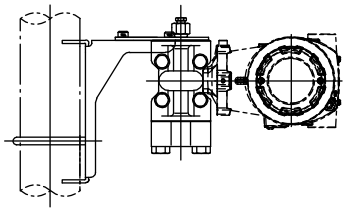
(3) Loosen the position adjustment screw and slide the movable plate on the bracket to align the position relationship between the 50A (2B) pipe and the process piping. *1

(4) Tighten each of the four position adjustment screws to firmly fix the movable plate and bracket. After fixing, make sure it does not move.

Process connection upside



Process connection downside



Mount the bracket in the direction as described in the figure.

F0406.ai

1	Process connector	**4**	Position adjustment screw (4 places)	**7**	2-inch pipe
2	Transmitter	**5**	Transmitter mounting bolt	**8**	U-bolt
3	Position adjusting plate	**6**	bracket	**9**	U-bolt nut

Figure 4.6 Mounting with the Position Adjustable Bracket

*1: The movable plate can be adjusted in the range of 75 to 132 mm depending on the mounting orientation on the bracket. Please note that the adjustment width varies depending on the model and specifications. (See Figure 4.7 to 4.8)

*2: EJX110S Capsule range codes 1, 2, 3, 5, 6 (for high pressure) and the process connector is mounted at the bottom, the movable plate can only be used in the inverted state as shown in Figure 4.8.

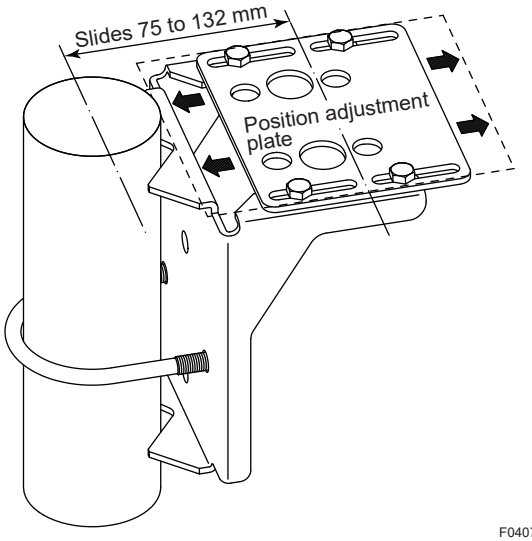
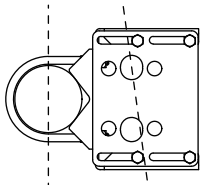
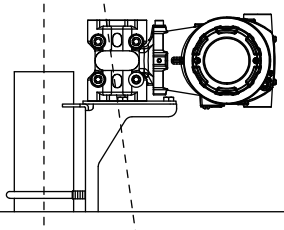
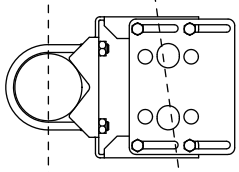
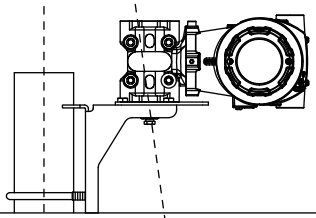
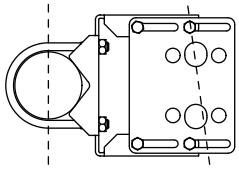
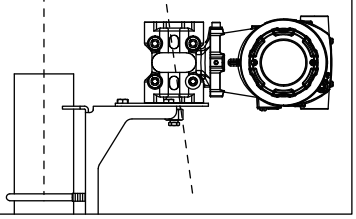


Figure 4.7 Adjustable Range of the Plate

	The state of the plate seen from the above	The state of the plate seen from the side (EJX110S)
Plate in minimum position (75 mm)		
Plate in maximum position (110 mm)		
Inverted plate in maximum position (132 mm)*2		

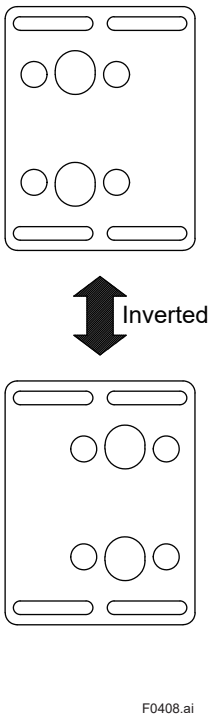


Figure 4.8 The Adjustable Range by the Mounting Direction of the Plate

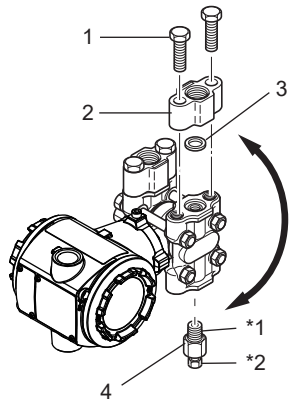
4.2.3 Changing the Process Connection

The process connection is shipped according to the content specified at the time of ordering. For example, if you want to change the ship status of the process connection to the lower side, follow this section.
Refer to Figure 4.9 and slowly turn the drain (vent) plug with a spanner to remove it and install it on the upper side. In addition, wrap sealing tape around the threaded part of the drain (vent) plug (*1 in the figure below), apply lubricant to the threaded part of the drain (vent) screw (to *2 in the figure below) and screw it in. (Drain (vent) plugs should be tightened with a torque of 34 to 39 N·m {3.5 to 4 kgf·m}) The bolts to install the process connector should be tightened uniformly and tightly with the torque shown in Table 4.1 to ensure that there is no leakage.

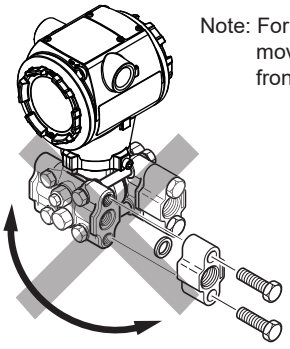
IMPORTANT

When installing the process connector, make sure that no foreign objects are adhered to the sealing surface of the gasket (or O-ring) before assembling it. If foreign objects are on it, it may lead to leaks. In addition, in the case of O-rings, it is known that applying grease improves sealing, but if you do not use grease, make sure that there are no foreign objects on it.

Vertical impulse piping type



Horizontal impulse piping type



Note: For a horizontal impulse piping type, moving the process connectors from the front side to the back cannot be made.

F0409.ai

1	Bolt	**3**	Gasket
2	Process connector	**4**	Vent/Drain plug

Figure 4.9 Changing Process Connection

Table 4.1 Tightening Torque

Model	EJX110S, EJX310S, EJX430S (Except the code on the right)	EJX110S	EJX430S
		Bolts and nuts material code	Capsule range code
		M, P	D
Torque(N·m) {kgf·m}	39 to 49 {4 to 5}	49 to 59 {5 to 6}	49 to 59 {5 to 6}

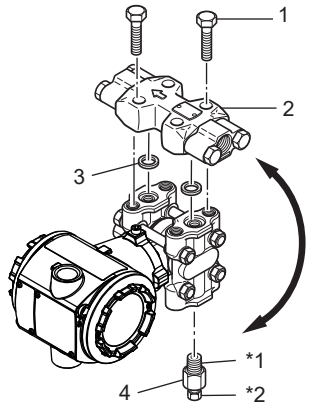
4.2.4 When Changing the Mounting Position of the Manifold (EJX110S for Low Flow Measurement Type)

The mounting position of the manifold is shipped according to the contents specified at the time of ordering. For example, if you want to change the shipping status of the manifold mounting position to the lower side, please follow this section.
Refer to Figure 4.10 and slowly turn the drain (vent) plug with a spanner to remove it and attach it to the upper side. In addition, wrap sealing tape around the threaded part of the drain (vent) plug (*1 in the figure below), apply lubricant to the threaded part of the drain (vent) screw (to *2 in the figure below) and screw it in.
Tighten the drain (vent) plug with a torque of 34 to 39 N·m {3.5 to 4 kgf·m}. The bolts to install the manifold should be tightened uniformly and tightly with a torque of 39 to 49 N·m {4 to 5 kgf·m} to avoid leakage.

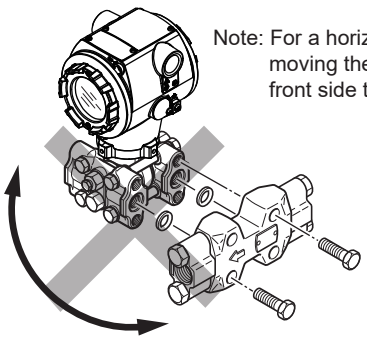
IMPORTANT

When installing the manifold, make sure that no foreign matter is attached to the part that is the sealing surface of the gasket before assembling it. If foreign objects are on it, it may lead to leaks.

Vertical impulse piping type



Horizontal impulse piping type



Note: For a horizontal impulse piping type, moving the Manifold Assembly from the front side to the back cannot be made.

F0410.ai

1	Bolt	**3**	Gasket
2	Manifold	**4**	Vent/Drain plug

Figure 4.10 Changing Process Connection

4.2.5 When Changing the High Voltage Side

IMPORTANT

This section applies to EJX110S. However, the capsule range code -V or -3 of the EJX110S is not applicable.
EJX310S and EJX430S is not applicable.

If the capsule part is connected to a vertical piping, the high-pressure side can be changed by rotating the pressure receiving part 180°.
Rotate the pressure part 180° by following these steps: As a general rule, this work should be done in a maintenance room with the necessary tools, and the high-pressure side should be changed before being installed on site.

(1) Loosen the set screws with hexagonal holes (two places) at the meeting part between the pressure receiving part and the transmission part with a hexagonal bar spanner (JIS B4648 called 2.5).

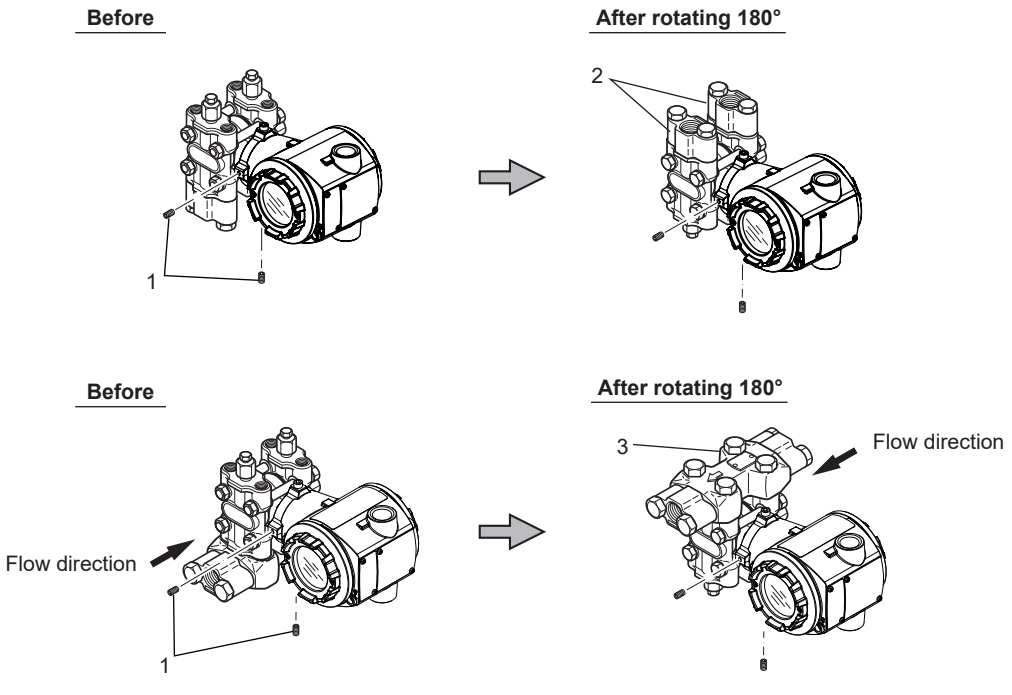
(2) Leave the transmission part as it is, and rotate slowly 180° only for the pressure part.

(3) Lightly press the transmission section toward the pressure-receiving part, then tighten the two hex socket set screws to secure the pressure-receiving part and transmission part. (Tighten to a torque of 1.5 N·m)

(4) The drain (vent) plug is facing up, so if you want to use the process connection upwards, replace the plug and process connector according to Section 4.3.

IMPORTANT

Rotate within a limited range with a rotating stopper fixed to the transmission section.



1	Setscrew	2	Process connector	3	Manifold

Figure 4.11 Before and After Modification

4.2.6 When Rotating the Transmission Unit

WARNING

In the case of explosion-proof products, do not rotate the transmission part while energizing on. Please refer to the instruction manual for each explosion-proof.

Each model of the EJX S Series can rotate the transmission section within a range of about 360° (within the stopper limit) and fix it at any angle.

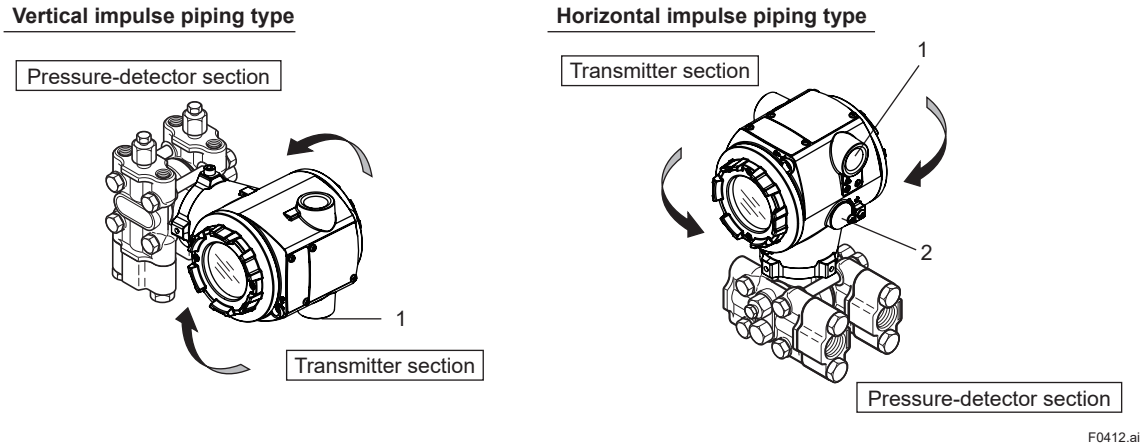
(1) Loosen the set screws with hexagonal holes (two places) at the meeting part of the transmission and pressure parts with a hexagonal bar spanner.

(2) Slowly rotate the transmission unit to the desired angle.

(3) Lightly press the transmission section toward the pressure-receiving part, then tighten the two hex socket set screws to secure the pressure-receiving part and transmission part. (Tighten to a torque of 1.5 N·m)

IMPORTANT

Turn it within a limited range with a stopper fixed to the transmission section.



1	Conduit connection	2	Zero-adjustment screw

Figure 4.12 Rotating Transmitter Section (Left Side High Pressure Type)

4.3 Installation of EJX510S and EJX530S

IMPORTANT

If the capsule range code is A, B or C, the intrusion of rainwater and other elements through atmospheric open vents must be avoided. Do not install it in such a way that the atmospheric opening hole is facing upwards. Also, be sure to use the pipe installed in the air opening hole with it installed. If used without pipes, performance may be affected.

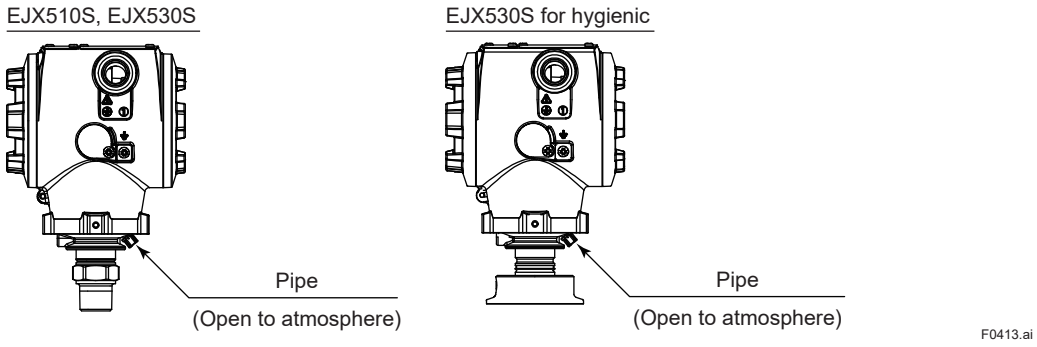


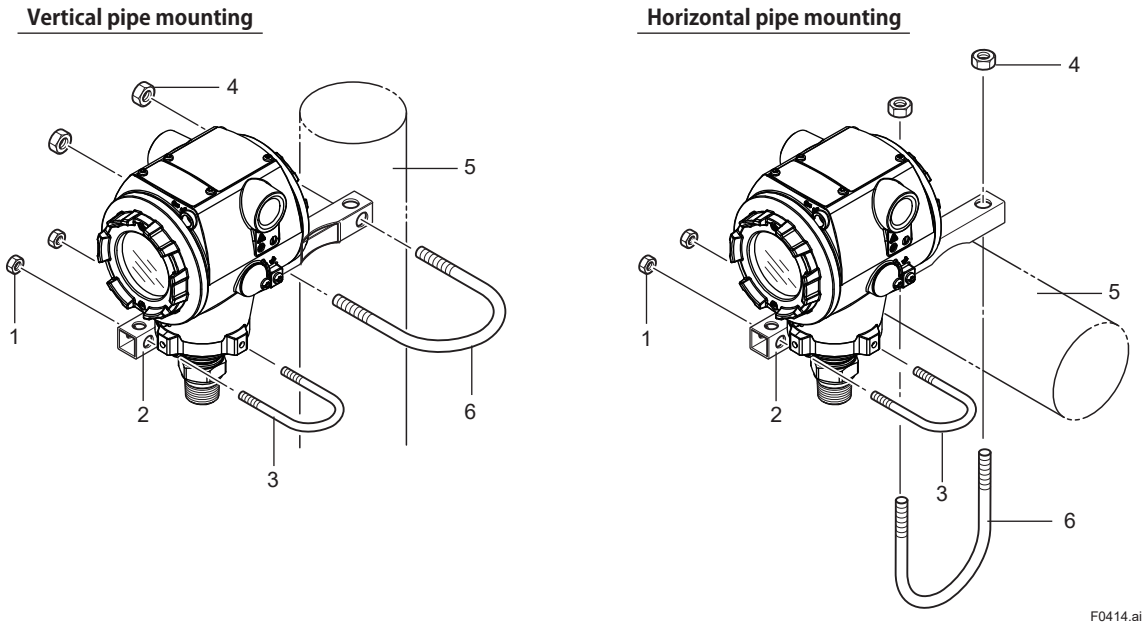
Figure 4.13 Atmospheric Open Holes and Pipes

4.3.1 Mounting Method

IMPORTANT

The pressure diaphragm is thin and easily damaged, so avoid pushing or bumping against it.

- The process connection of the transmitter may have a plastic cap to prevent dust, so please remove it before piping. (Be careful not to scratch the screw part when removing the cap.) Do not push the screwdriver or remove it.
- The transmitter is mounted on a 50A (2B) pipe using a mounting bracket as shown in Figure 4.14.
- If you specify A in the process connection code, you will need a gasket to assemble as shown in Figure 4.15, so please prepare it.



1	U-bolt nut (S)	**3**	U-bolt (S)	**5**	2-inch pipe
2	Mounting bracket	**4**	U-bolt nut (L)	**6**	U-bolt (L)

Figure 4.14 Transmitter Mounting

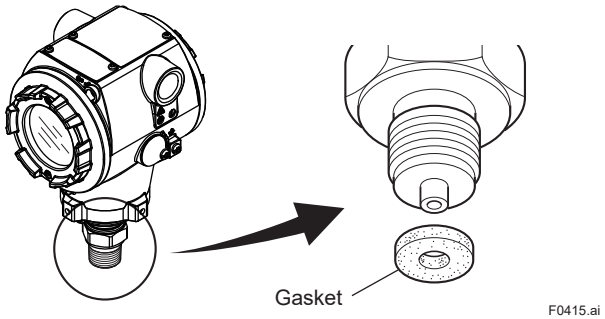


Figure 4.15 Gasketing

IMPORTANT

Tighten the hex nut of the pressure bearing part as shown in Figure 4.16.

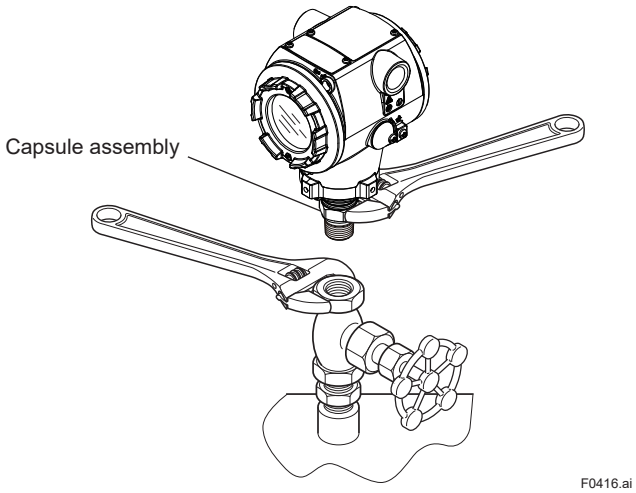
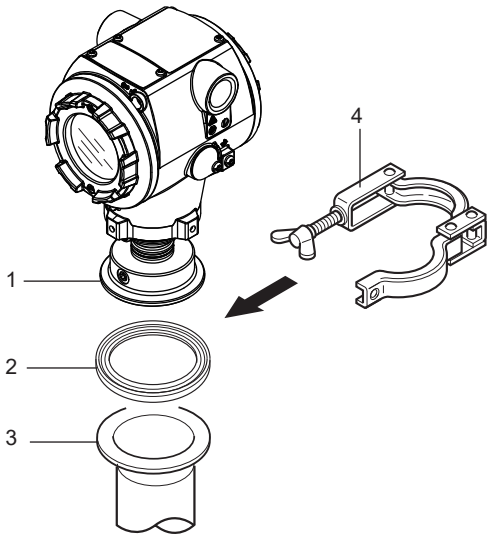


Figure 4.16 Tightening Transmitter

■ Mounting bracket (clamp) installation procedure

(1) Attach the gasket to the transmitter.

(2) Attach the gasketed transmitter to the sleeve and secure it with the mounting bracket.



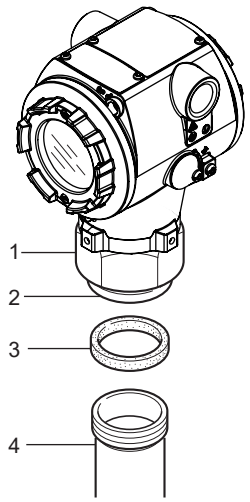
1	Diaphragm seal	**3**	Sleeves
2	Gasket	**4**	Mounting bracket (Clamp)

Figure 4.17 Mounting on the Tank with Mounting Brackets

■ Union nut installation procedure

(1) Attach the gasket to the diaphragm seal.

(2) Attach the diaphragm seal part with the gasket to the sleeve and secure it with a union nut.



1	Union nut	**3**	Gasket
2	Diaphragm seal section	**4**	Sleeve

Figure 4.18 Mounting on the Tank with Mounting Brackets

IMPORTANT

When installing the transmitter in a horizontal direction, fix the pipe (atmospheric opening hole) so that it is facing horizontally to downward. Be sure to fix the zero-tone screw so that it is facing downward.

Example of horizontal installation of pipe

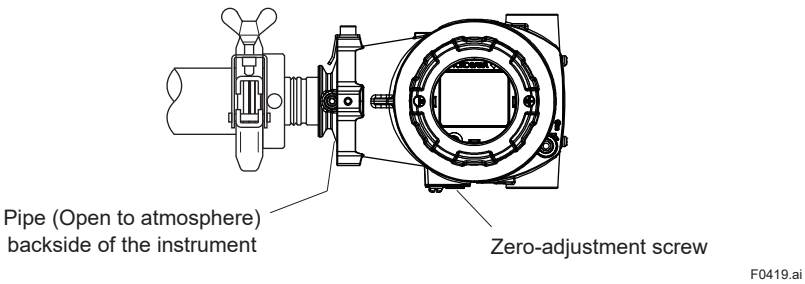


Figure 4.19 Transmitter Mounting (Horizontal)

Please install the display in an easy-to-see direction as shown in the picture above. After installing the transmitter, if the zero-tuning screw is in a direction other than downward, rotate the transmitter and fix it in a position where the zero-tuning screw is facing downward. (See Section 4.3)

4.3.2 When Rotating the Transmission Unit

WARNING

In the case of explosion-proof products, do not rotate the transmission part while energizing on. Please refer to the instruction manual for each explosion-proof.

Each model of the EJX S Series can rotate the transmission section within a range of about 360° (within the stopper limit) and fix it at any angle.

(1) Loosen the set screws with hexagonal holes (two places) at the meeting part of the transmission and pressure parts with a hexagonal bar spanner.

(2) Slowly rotate the transmission unit to the desired angle.
If the stopper hits the open air pipe and does not rotate further, remove the pipe and turn the case before installing the pipe.

(3) Tighten the set screw with hexagonal holes (2 places) and fix the transmission andpressureparts.(Tightenwithatorqueof1.5N·m.)

IMPORTANT

Turn it within a limited range with a stopper fixed to the transmission section.

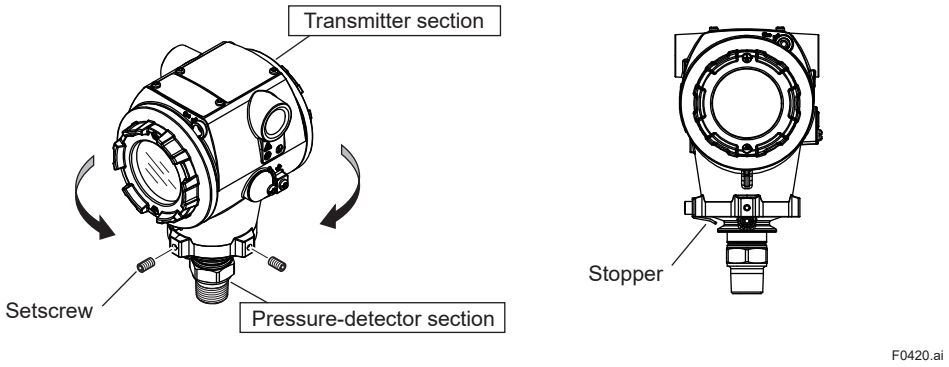


Figure 4.20 Rotating Transmitter Section

4.4 Changing the Orientation of the Display

WARNING

In the case of explosion-proof products, be sure to turn off the power and perform installation in a non-hazardous place when opening and closing the housing cover, removing and removing the display, and installing it.

IMPORTANT

Please be sure to remove and install the display after turning off the power.

The orientation of the display can be changed by altering the orientation of the indicator module. The LCD display can be rotated in the following four directions.

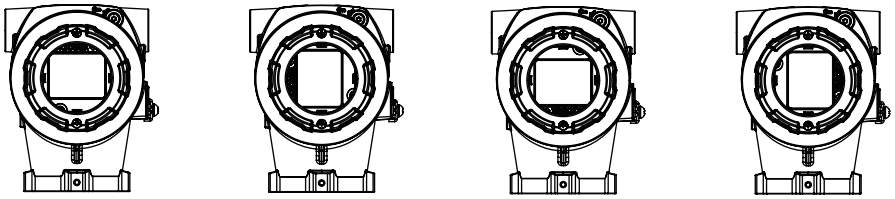


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Figure 4.21 LCD display Orientation

The Graphic display can be rotated in the following two directions to invert the display. For details on display inversion, refer to Subsection 7.8.18.

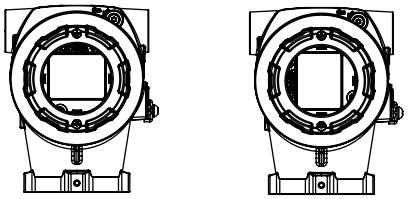

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Figure 4.22 Graphic display Orientation

Change the orientation to an easy-to-see orientation according to the direction in which the instrument is installed. Please refer to Section 8.4 for details.

5. Piping

5.1 Installing Impulse Piping

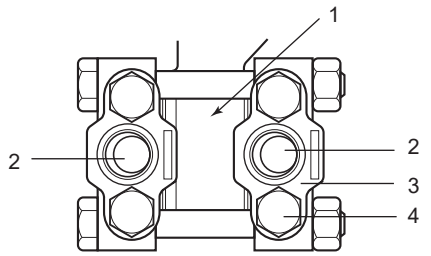
■ Precautions when Piping

The pressure pipe that directs the process pressure to the transmitter must accurately transmit the process pressure to the transmitter. For example, if gas accumulates in the liquid in the pressure pipe, or if condensation accumulates in the gas in the pressure pipe, “accurate pressure transmission” will not be possible. In such cases, there will be errors in the measured pressure, so it is necessary to choose the appropriate piping method for the process fluid (gas, liquid, steam). When connecting the pressure pipe to the transmitter and piping the pressure pipe, please pay attention to the following points.

5.1.1 Connecting Impulse Piping to a Transmitter

(1) Check the high and low-voltage side connections of the transmitter

The capsule assembly is marked with the symbols H (high pressure side) and L (low pressure side). Connect the high-pressure side of the process pressure to the H side and the low-pressure side to the L side. If it is equipped with an additional specification code/BS, it is not possible to connect the low-pressure side pressure pipe to the L side.



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1	“H” and “L” are shown	**3**	Process connector
2	Process connection	**4**	Bolt

Figure 5.1 H and L Display Points of Capsule Assembly

(2) Change of Process Connector Pressure Conduit Connection Dimension

By changing the mounting direction of the process connector, the dimensions of the conduit connection can be changed to three types: 51 mm, 54 mm or 57 mm. It is convenient for alignment when connecting the pressure tube to the process connector.

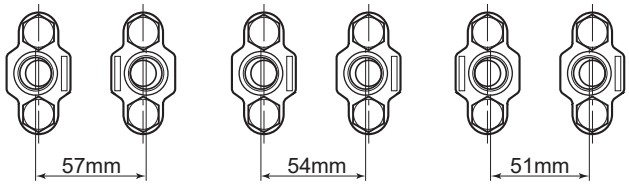


Figure 5.2 Process Connector Impulse Piping Connection Distances for Differential Pressure Transmitters

(3) Process connector mounting bolt tightening

The bolts on which the process connector is installed should be uniformly tightened with a torque of 39 to 49 N·m (EJX110S bolt and nut material code M·P and 49 to 59 N·m for EJX430S capsule range code D) after connecting the pressure pipe.

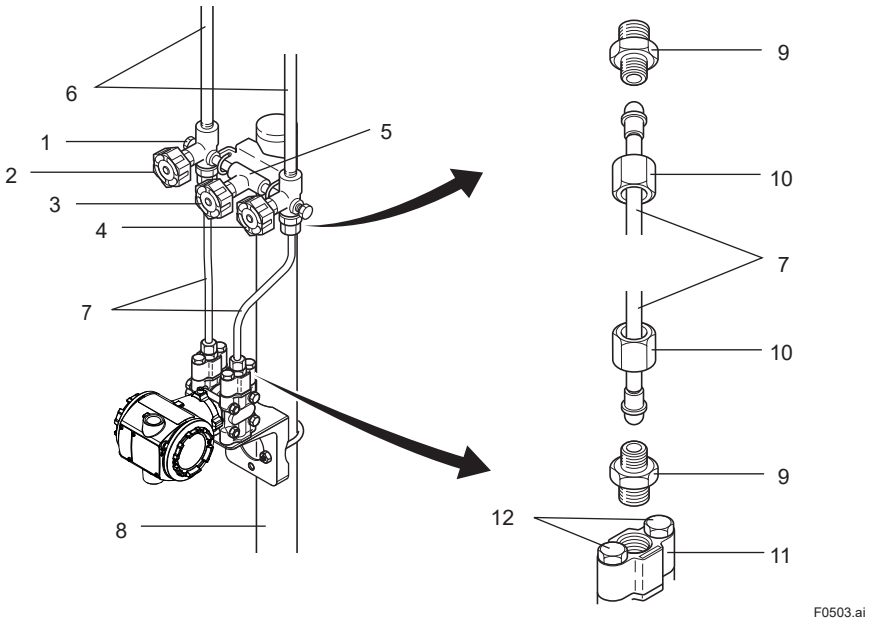
IMPORTANT

When installing the process connector, make sure that no foreign objects are adhered to the sealing surface of the gasket (or O-ring) before assembling it. If foreign objects are on it, it may lead to leaks.
Also, in the case of O-rings, it is known that applying grease improves sealing, but if you do not use grease, make sure that there are no foreign objects on it.

(4) Connecting the transmitter to the 3-valve manifold (example of EJX110S)

The 3-valve manifold consists of two stop valves to shut off the process pressure and one pressure equalization valve to equalize the pressure on the high and low pressure sides of the transmitter. This is useful when removing the transmitter from the pressure tube or when adjusting the transmitter to zero point.
There are piping and direct connection types for 3-valve manifolds, but please note the following points when connecting to the transmitter.

■ In the case of piping type



1	Vent plug (Optional)	**5**	3-valve manifold	**9**	Nipple
2	Stop valve (Low pressure side)	**6**	Impulse piping	**10**	Ball head lock nut
3	Equalizing valve (Balancing)	**7**	Pipe	**11**	Process connector
4	Stop valve (High pressure side)	**8**	2-inch pipe	**12**	Process connector bolt

Figure 5.3 3-Valve Manifold (Pipe-Mounting Type)

(1) Screw the nipple into the transmitter side connection of the 3-valve manifold body and the pressure pipe connection of the process connector. (Wrap sealing tape around the threaded part of the nipple to maintain sealing.)

(2) The 3-valve manifold body is mounted on a 2-inch pipe with a U-bolt mounting bracket. At this time, leave the U-bolt in a temporary tightening state.

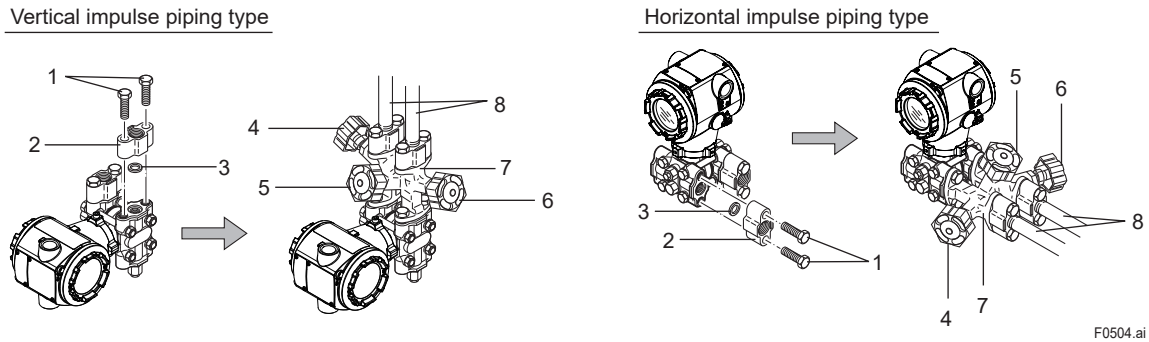
(3) Place the pipe assembly between the 3-valve manifold and the process connector and leave it in a temporary tightening state with a bag nut. (The ends of the pipe assembly are spherical.) If you scratch the spherical surface, the sealing effect will be impaired, so please handle it with care.

(4) Tighten each screw part thoroughly in the following order. Process Connector Bolts → Transmitter Side Bag Nuts → 3 Valve Manifold Side Bag Nuts → 3 Valve Manifold Mounting Bracket U Bolt Nuts

■ **In the case of direct connection**

(1) Install a 3-valve manifold on the transmitter. (The two gaskets and four bolts used for installation are those supplied with the three-valve manifold.) Tighten the bolts evenly.

(2) Install the process connector and the gasket for the process connector on the top of the three-valve manifold (the side where the pressure pipe is connected).



1	Bolt	**4**	Stop valve (Low Pressure Side)	**7**	3-valve manifold
2	Process connector	**5**	Equalizing valve	**8**	Impulse piping
3	Gasket	**6**	Stop valve (high pressure side)		

Figure 5.4 3-Valve Manifold (Direct Connection)

IMPORTANT

When the connection between the transmitter and the 3-valve manifold is completed, close the high-pressure and low-pressure side stop valves and leave the pressure equalization valve open. This operation is necessary to prevent overloading in one direction on the high or low voltage side of the transmitter, so please strictly observe it.

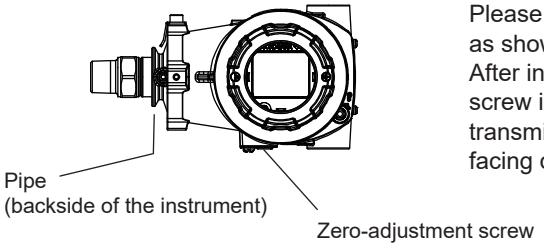
(5) EJX510S and EJX530S mounting (horizontal)

IMPORTANT

The transmitter can be mounted on horizontal piping by tilting it 90°. When doing so, fix the pipe (Note 1) (atmospheric opening) so that it is facing downward rather than horizontally.
Fix the zero thread so that it is always facing downward.

Note 1: The pipe (atmospheric opening) is installed on the main unit only when A, B, or C is specified in the measurement span (capsule) code.

Example of installing a pipe horizontally



Please install the display in an easy-to-see direction as shown in the figure.
After installing the transmitter, if the Zero-adjustment screw is in a direction other than downward, rotate the transmission part and fix the Zero-adjustment screw facing downward.

Figure 5.5 Transmitter Mounting (Horizontal)

5.1.2 Piping Methods for Pressure Pipes

(1) Process pressure take-out angle

If condensation, gases, or sediments from the process piping enter the pressure pipe, it can cause errors in the measured pressure. To eliminate these factors, depending on the fluid to be measured, the extraction angle of the process pressure must be as shown in Figure 5.6.

NOTE

- If the process fluid is gaseous, within 45° of vertical upward or vertical upward.
- If the process fluid is liquid, the water should be within 45° below the horizontal or horizontal direction.
- If the process fluid is steam, the water should be within 45° above the horizontal or horizontal direction.

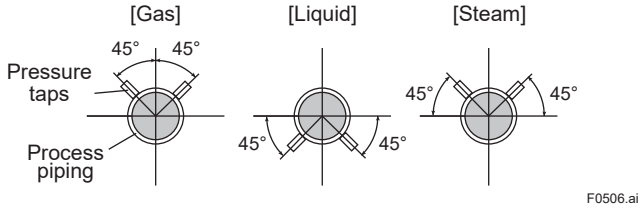


Figure 5.6 Process Pressure Extraction Angle (for horizontal piping)

(2) Position of the process pressure take-out and transmitter

If the condensation (or gas) generated in the pressure pipe accumulates in the pipe, it is necessary to drain (or degasse) regularly. However, this drain (or degassing) operation will cause a temporary disturbance to the measured pressure. For this reason, the condensation (or gas) generated in the pressure pipe must be piping in such a way that it returns to the process piping.

- If the process fluid is gaseous, as a general rule, the transmitter should be installed at a higher position than the process pressure take-out.
- If the process fluid is liquid or vapor, as a general rule, the transmitter should be installed lower than the process pressure take-out.

(3) Slope of the pressure pipe

The pressure pipe should only have a rising or descending slope, and even if it is a horizontal part, it should have a slope of 1/10 or more to prevent condensation (or gas) from stagnating in the pipe.

(4) Temperature difference between two pressure pipes

If there is a temperature difference between the pressure pipe on the high and low pressure sides, there will also be a difference in the density of the liquid in the tube, which will be an error in the measured pressure. For example, in the case of flow measurement, it is necessary to align the piping so that there is no temperature difference between the two pressure pipes.

(5) Condensation tank (condenser pot) when measuring steam flow

If the liquid in the pressure pipe repeatedly condenses and evaporates due to changes in ambient temperature or process temperature, there may be a difference in the liquid head between the high-pressure side and the low-pressure side. In order to avoid errors in the measured pressure due to the difference in liquid head, a coagulation bath is used when measuring the flow rate of steam.

(6) Windproof measures when measuring micro pressure

IMPORTANT

When a differential pressure transmitter is used for micro pressure (draft pressure) measurement, the pressure pipe connection on the low pressure side is opened to atmospheric pressure (reference pressure). If the reference pressure changes due to the wind around the differential pressure transmitter and there is an error in the measured pressure, it is necessary to store the entire transmitter in a box, or to pipe a pressure pipe on the low-pressure side and insert its tip into a windproof pot (a cylindrical one with a bottom plate). We have a windproof pot, so please ask separately.

(7) Freeze prevention

If there is a risk of freezing (solidification) of the process fluid in the transmitter and pressure pipe, keep it warm with a steam jacket or heater.

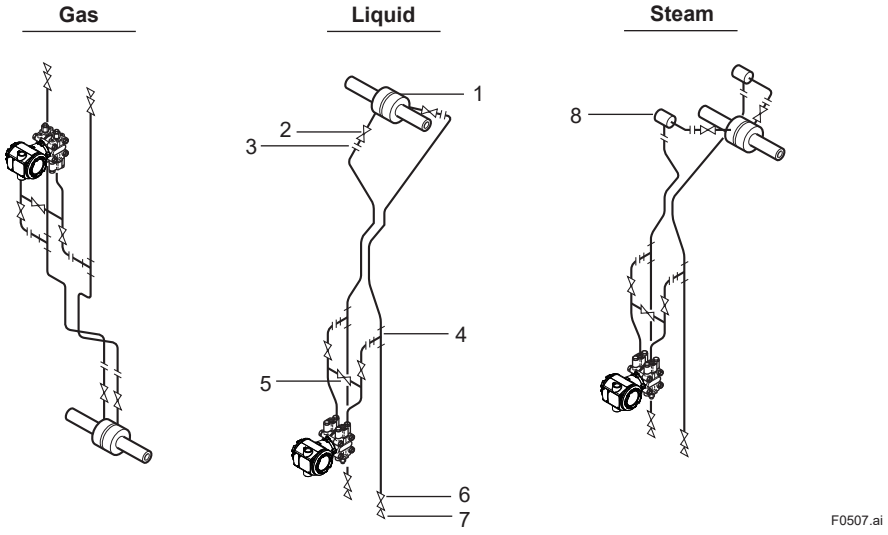
NOTE

After piping is completed, keep the valves closed to prevent condensation, sediment, dust, etc. from the process piping from entering the pressure pipe.

5.2 Example of Pressure Pipe Piping

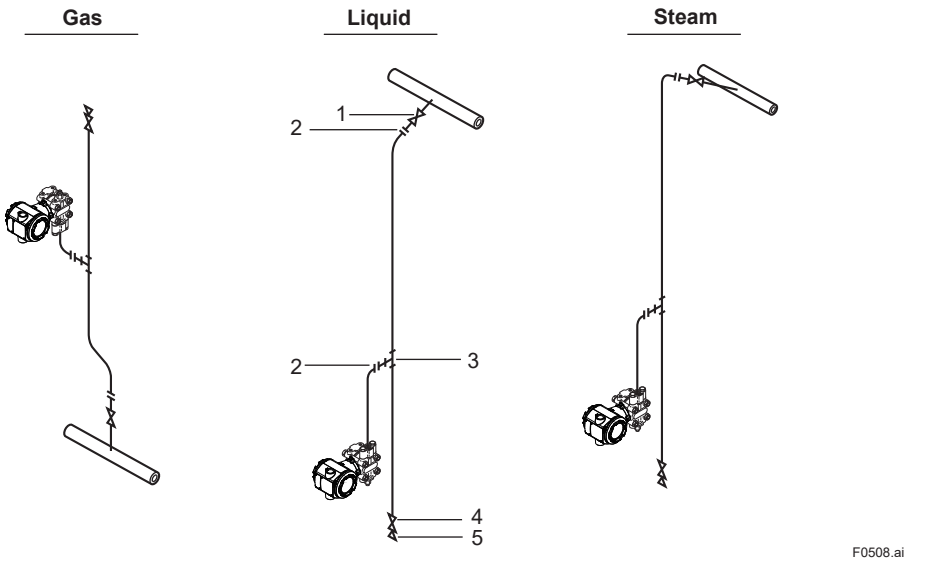
Examples of typical pressure pipe piping where the process fluids are gases, liquids, and vapors are shown in Figures 5.7, 5.8, and 5.9. When actually piping, consider the nature of the process fluid (corrosive, toxic, flammable, etc.), the state of the process piping, the location of the transmitter, etc., and make changes or additions as appropriate. Please note the following points when referring to this piping example.

- If the distance of the pressure pipe is long, it should be fixed to a support to prevent runout.
- The pressure conductor used should be commensurate with the process pressure, temperature, etc.
- Process pressure release valves (main valves) are available in various types depending on the connection type (flange, thread, weld), structure (globe valve, gate valve, ball valve), operating temperature, pressure, etc. Select the one that matches the conditions of the process fluid.



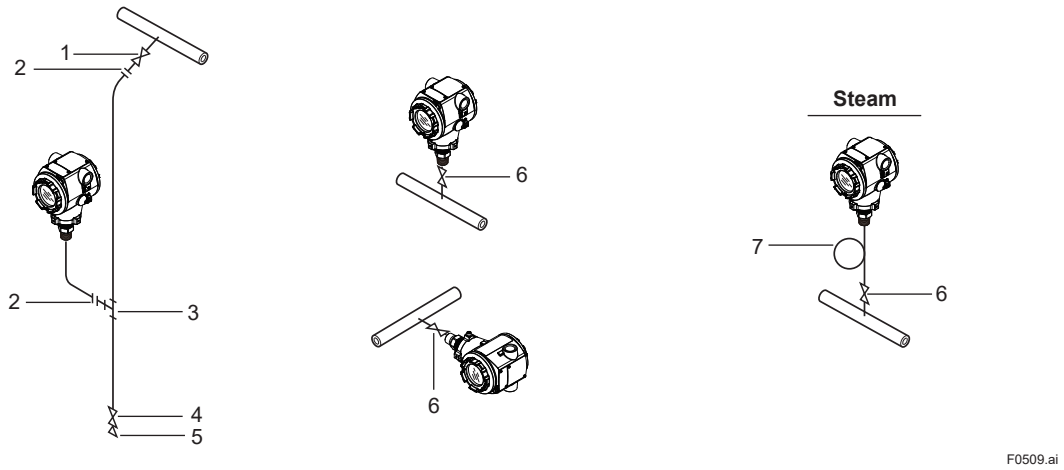
1	Orifice	**4**	Tee	**7**	Drain plug
2	Tap valve	**5**	3-valve manifold	**8**	Condensate pot
3	Union or flange	**6**	Drain valve		

Figure 5.7 Piping Example (Flow Measurement with Differential Pressure Transmitter)



1	Tap valve	**3**	Tee	**5**	Drain plug
2	Union or flange	**4**	Drain valve		

Figure 5.8 Piping Example (Pressure Measurement)



1	Tap valve	**4**	Drain valve	**7**	Stop valve
2	Union or flange	**5**	Drain plug		
3	Tee	**6**	Stop valve		

Figure 5.9 Piping example (EJX510S and EJX530S)

5.3 Piping of Microflow Transmitters

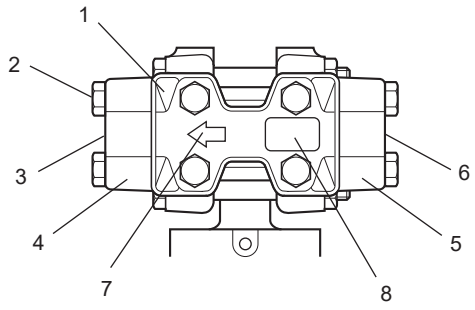
■ Precautions when Piping

The manifold has a built-in small-diameter orifice. In the case of right-hand high-voltage transmitters, this orifice is oriented to allow normal flow measurement when flowing process fluid from right to left (front-side). If the orifice is removed from the manifold, it must be installed so that it does not misalign. (Please refer to Subsection 8.4.5 for disassembly and assembly procedures.) When connecting process piping to a transmitter and piping, please pay attention to the following points:

5.3.1 Connecting Process Piping to a Transmitter

(1) Confirmation of the flow direction of the process fluid

The markings on the manifold indicate the direction in which the process fluid will flow (from right to left). When connecting process piping to a process connector, check the flow direction of the process fluid.



1	Manifold	**4**	Process connector (Low pressure side)	**7**	Flow direction (From right to left)
2	Bolt	**5**	Process connector (High pressure side)	**8**	Orifice nameplate
3	Process connection (Outflow side)	**6**	Process connection (Inflow side)		

Figure 5.10 Manifold and Flow Direction Display

(2) Process connector mounting bolt tightening

The bolts that install the process connector are shipped loose (pre-tightened). After connecting the process pipe, tighten it evenly with a torque of 39 to 49 N·m.

(3) Removing the dust-proof cap of the process connector

The threaded part of the process connector may have a plastic cap to prevent dust, so remove it before piping. (Be careful not to scratch the screw part when removing the cap. Do not push the screwdriver or remove it.)

5.3.2 Piping Methods for Process Piping

(1) Mounting position of process fluid and manifold (in the case of a transmitter with a vertical piping connection)

If the condensation (or gas) generated in the process piping accumulates in the transmitter pressure section, it is necessary to drain (or degasse) regularly. However, this drain (or degassing) operation will cause a temporary disturbance to the measured pressure. For this reason, it is necessary to use a piping method that prevents condensation (or gas) generated in the process piping to prevent it from accumulating in the transmitter pressure section. (Figure 5.11)

NOTE

- If the process fluid is gaseous, as a general rule, the manifold is installed at the bottom of the transmitter pressure receiving part.
- If the process fluid is liquid, as a general rule, the manifold is installed on the top of the transmitter pressure section.

(2) Process piping size

Use 15A (1/2B) of process piping to connect to the process connector.

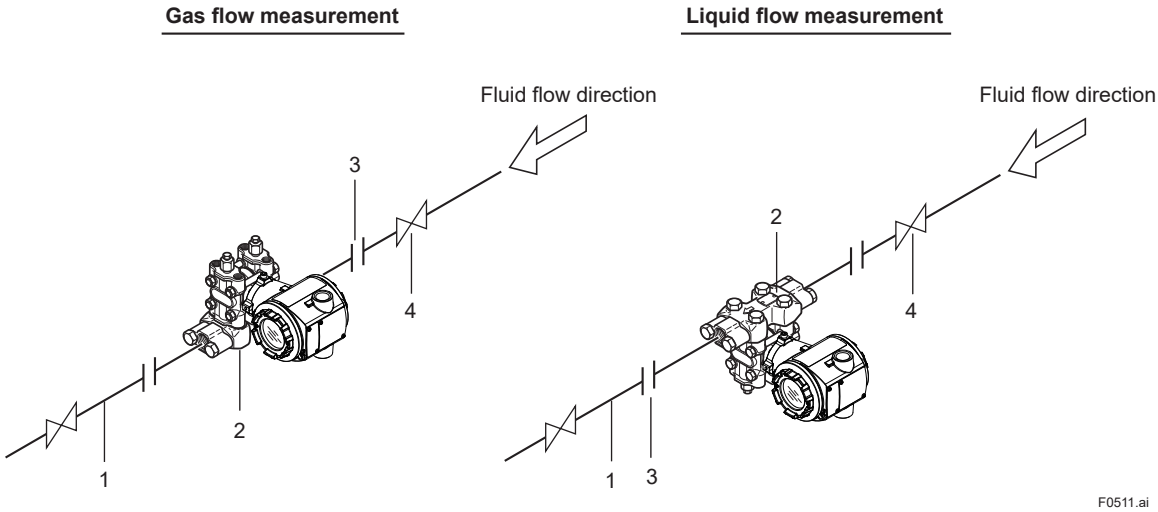
(3) Freeze prevention

If there is a risk of freezing of the process fluid in the transmitter pressure section, keep it warm with a steam jacket or heater.

(4) Piping examples

A typical piping example where the process fluid is gaseous and liquid is shown in Figure 5.11. When actually piping, consider the nature of the process fluid (corrosive, toxic, flammable, etc.), the state of the process piping, and the location of the transmitter, and make changes and additions as appropriate. Please note the following points when referring to this piping example.

- The piping used should be commensurate with the process pressure, temperature, etc.
- Stop valves installed in process piping are available in various types depending on the connection type (flange, thread, weld), structure (globe valve, gate valve, ball valve), operating temperature, pressure, etc.
  Select the one that matches the conditions of the process fluid.



1	Process piping	**3**	Union or flange
2	Manifold	**4**	Stop valve

Figure 5.11 Piping Example of a Microflow Transmitter.

6. Wiring

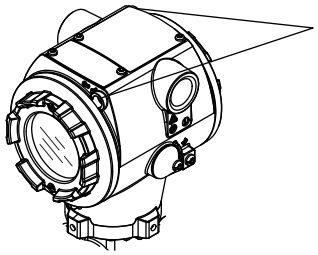
6.1 Precautions When Wiring

WARNING

Wiring must comply with the laws and regulations of the country/region where the equipment is used, as well as the electrical code.
In particular, for equipment used in hazardous locations, be sure to select explosion-proof instruments that meet the requirements, and when installing and wiring, follow the instruction manual of each explosion-proof specification and the applicable local laws and regulations.

IMPORTANT

- Avoid noise sources such as high-capacity transformers, motors, or power supplies.
- For noise prevention, do not use the same duct for signal and power cables.
- Wiring is routed by removing the dust-proof plug on the terminal cover and electrical connection.
- When waterproof performance is required for the product, be sure to waterproof the threaded parts of the electrical connection. (For waterproofing treatment, werecommendanon-curingsealant.)
- Use external wiring with a permissible temperature of at least 15°C above ambient temperature.
- In the case of explosion-proof specifications, it is necessary to wire in accordance with laws and regulations to maintain explosion-proof performance.
- For explosion-proof types, turn the locking bolt clockwise to unlock the cover and then remove the cover.
  When installing the cover, be sure to turn the locking bolt counterclockwise to lock the cover. (Locks with 0.7 N·m torque)



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6.2 Wiring Method

■ Current output (HART communication type)

The current output of this instrument is a two-wire transmission system, which uses both power and signal wiring. The power supply voltage range is as shown in Figure 6.1. For Display and interface codes: E (LCD display) or N (no display), 10.5 to 42 VDC. For F (Graphic display), 12 to 42 VDC.
When configuring a loop, make sure that the sum of the wire resistance and load resistance of the loop and the distributor to be installed is within the range of Figure 6.1. If the load resistor is not used by the distributor, connect it to the -side of the power supply.

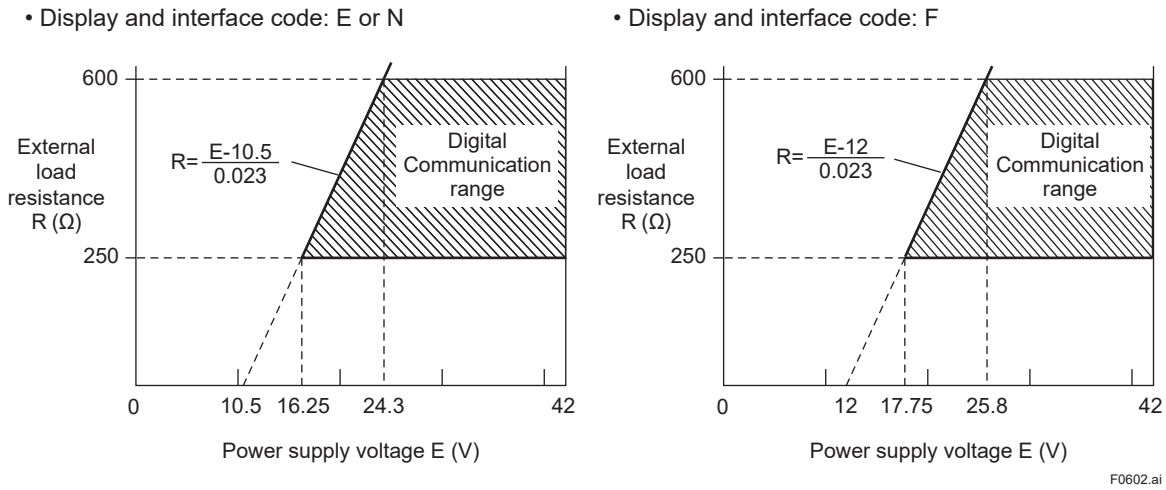


Figure 6.1 Supply Voltage and Load Resistance

■ PROFINET communication type

The PROFINET communication interface of the EJX S Series is based on PA profile revision 4.02 and Ethernet-APL port profile specification V1.2.
The electrical specification of the output signal is Port profile class SLAA. It can be combined with ports of SPAA or SPCC specifications.

Supply voltage	9 to 15VDC (Ethernet-APL line)
Current draw	22 to 55.56 mA
Power load (Max)	APL field switches must comply with the relevant protocol specifications.

6.3 Selection of Wires

When selecting wires for transmission loops, consider the following items.

■ HART communication type

(1) Use stranded wires or cables with the same or higher performance as 600V vinyl insulated wires (JIS C 3307) for wiring.

(2) When installing a transmitter in areas affected by noise, use shielded cables.

(3) When wiring in a place with high or low ambient temperature, use the wire or cable suitable for the place of use.

(4) When using in an atmosphere with harmful gases or liquids, or oils or solvents, use wires or cables made of materials that can withstand them.

(5) The outer diameter of the terminal screw for cable terminals and grounding is 4 mm.

(6) For the terminal of the wire, it is recommended to use crimping terminals with insulating sleeves (for 4 mm screws).

■ PROFINET communication type

Cable type	Type A (shield for each pair of strands)
Cable format	#18AWG (0.82 mm^2)
Maximum cable length	200 m

6.4 Connections

IMPORTANT

Be sure to use a DC power supply within the specifications. Connecting a commercial AC power supply will damage the equipment.

The locations of each connection terminal are shown in Figures 6.2 and 6.3.
Table 6.1 shows an example of wiring.
Differential pressure and pressure transmitters must be grounded and used.

■ HART communication type

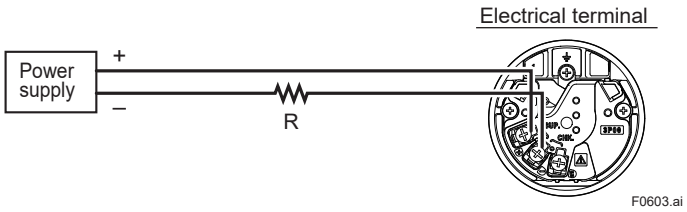


Figure 6.2 Terminal Diagram (HART communication type)

■ PROFINET communication type

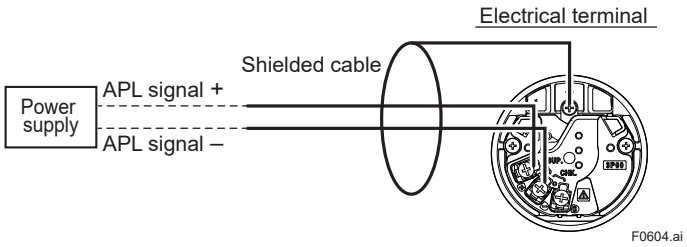
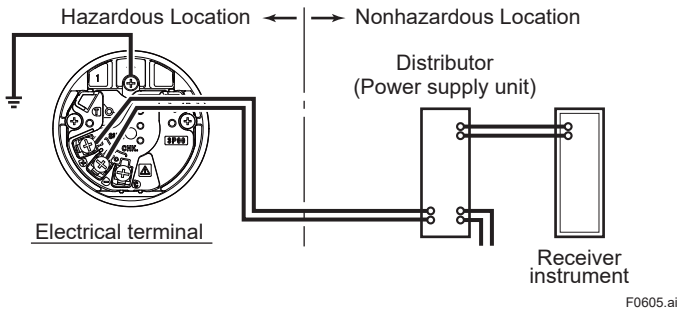
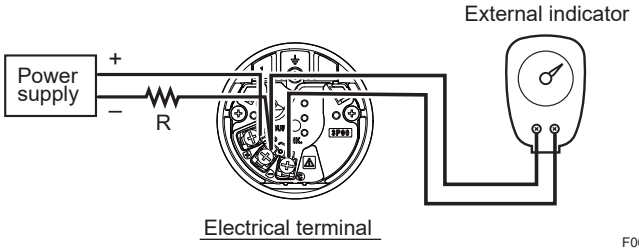
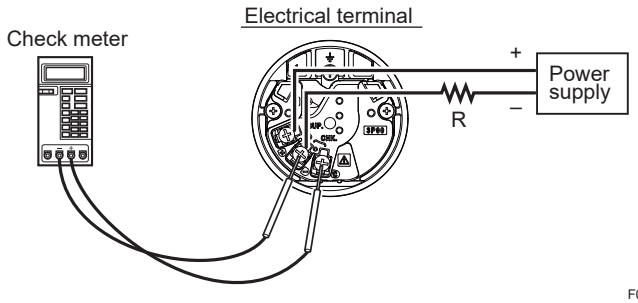
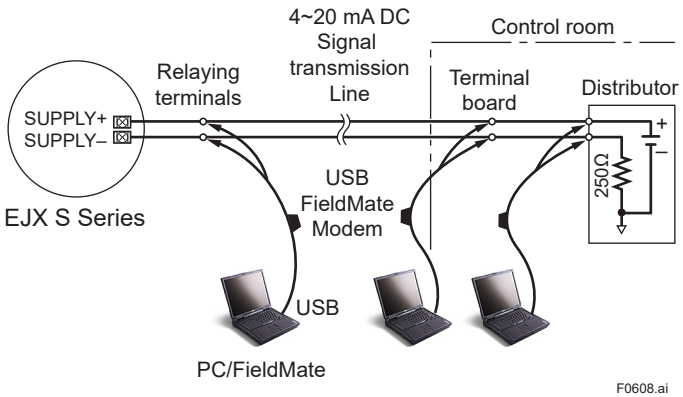


Figure 6.3 Terminal Diagram (PROFINET communication type)

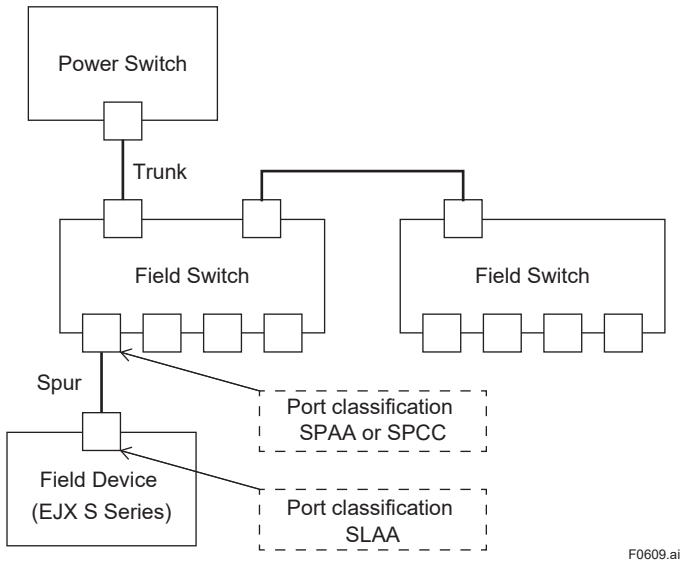
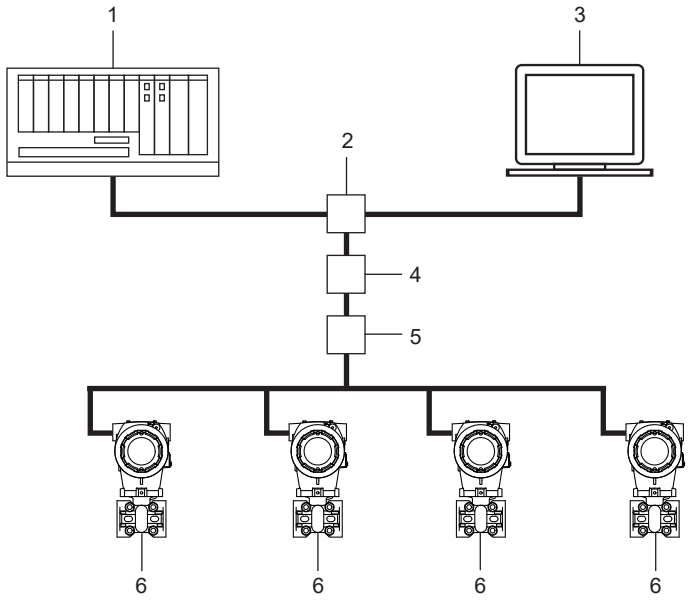
Table 6.1 Wiring Example

■ HART communication type

Item	How to connect
Distributor connection (general or explosion-proof)	

Item	How to connect
Connecting the field indicator (analog)	**IMPORTANT** Use a external indicator whose internal resistance is 10 Ω or less. 
Connect the checkmeter	**IMPORTANT** Use a check meter whose internal resistance is 10 Ω or less. 
Connecting the HART Configurator	**IMPORTANT** If there is a load resistance of 250 Ω or more between the HART Configurator Connector and the instrument, it can be connected to the relay terminal in the instrument room or transmission loop for communication. To communicate, the HART configuration tool and the product must be connected in parallel. Polarity is irrelevant to the connection. * Please refer to the instruction manual of the terminal and configuration tool as well. 

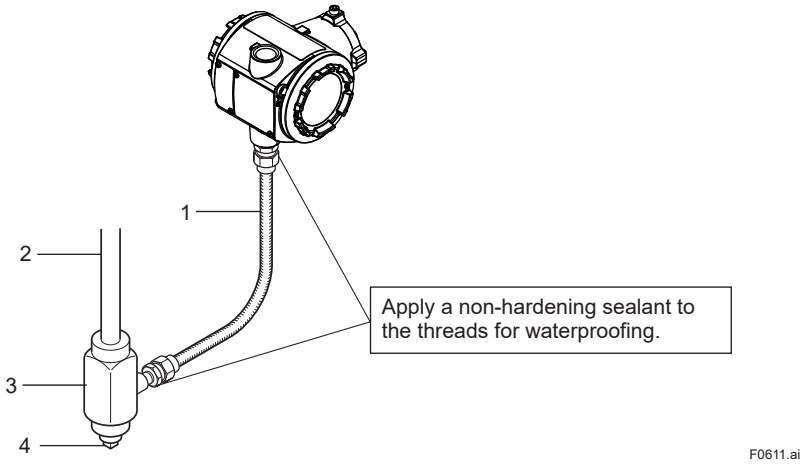
■ PROFINET communication type

Item	How to connect
Connection with APL field switch (Spur wiring)	
Example of system configuration including top	

6.5 Wiring Work

(1) In the case of general type and intrinsically safe type

Cable wiring is performed using metal pipe wiring or flood control ground (wire penetration hardware JIS F 8801).
The electrical ports and threaded parts of flexible fittings are waterproofed by applying a non-hardening sealant.



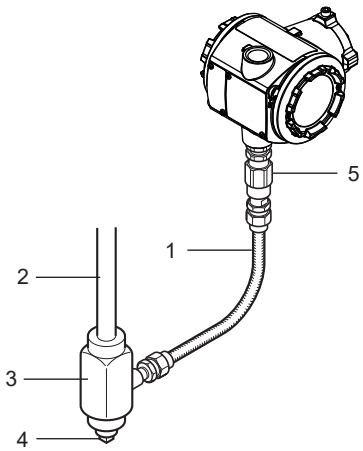
1	Flexible metal conduit	**3**	Tee
2	Wiring metal conduit	**4**	Drain plug

Figure 6.4 Wiring Using Conduit

(2) When using pressure-resistant packing fittings

Cable routing is performed using pressure-resistant packing fittings.
Pressure-resistant packing fittings must be selected by our company.

■ Cable wiring with pressure-resistant packing hardware



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1	Flexible metal conduit	**3**	Tee	**5**	Flameproof packing adapter
2	Wiring metal conduit	**4**	Drain plug		

Figure 6.5 Cable Wiring (Example using pressure-resistant packing fittings)

■ Selecting Pressure-Resistant Packing

- Measure the outer dimensions of the cable in two directions, down to 0.1 mm.
- Calculate the average of the two directions and select the gasket with the inner diameter closest to that value from the attached options. (See Table 6.2)

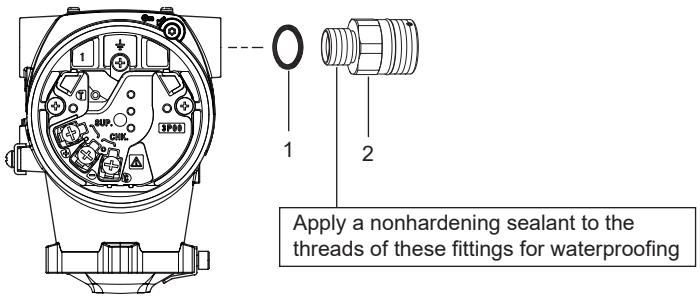
Table 6.2 Packing Type and Applicable Cable Outer Diameter

Optional Specification Code	Wiring Port Screw Diameter	Applicable Cable Outer Diameter (mm)	Identification Mark	Part Number
V11 V12	G 1/2	8 to 12	ø10 (for 8-10) ø12 (for 10-12)	B1030EN

■ Pressure-Resistant Packing Fitting Installation Procedure

(1) Loosen the screws on the pressure-resistant packing fitting (cable gland) and remove all components.

(2) Remove the dust cap from the wiring port and screw the pressure-resistant packing fitting body into the wiring port. In this case, screw it in until the O-ring is compressed into the wiring port.



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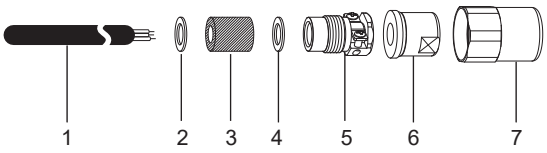
1	O-ring	**2**	Cable gland

Figure 6.6 Installation of Transmitter Pressure-Resistant Packing Fittings

(3) Insert the cable terminal, washer, rubber gasket, washer, gland, union coupling, and union cover in that order.

EJX S Series Terminal Side



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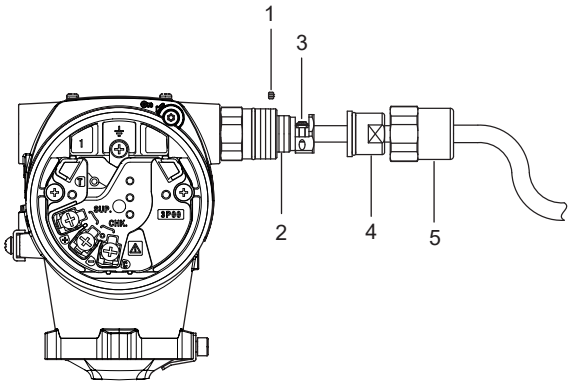
1	Cable	**4**	Washer	**7**	Union Cover
2	Washer	**5**	Ground		
3	Rubber gasket	**6**	Union coupling		

Figure 6.7 Installation of Cable Pressure-Resistant Packing Fittings

(4) Insert the cable end with the terminal connection into the terminal box and connect it to the terminal.

(5) Screw the gland into the main body secured in step (2) until the cable stops moving, then tighten it firmly by one full turn or more to compress the rubber gasket. (Tightening torque: 15 to 20 N·m)
Next, lock the set screw with a hex wrench, then secure the clamp with the Phillips screw (Tightening torque: 1 to 1.2 N·m) to secure the cable.



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1	Set screw	**3**	Pan head screw	**5**	Union cover
2	Gasket	**4**	Union Coupling		

Figure 6.8 Cable Pressure-Resistant Packing Fitting Stop Position

(6) Screw the union cover onto the main body secured at (2).

(7) If conduit is required for cable protection, thread the cable through the conduit and then screw it into the union coupling.

(8) Verify that the connector is securely inserted.

CAUTION

After securing the cable, avoid pulling on it or subjecting it to excessive mechanical impact.
Do not forget to verify that the connector is securely inserted.

6.6 Grounding

Please perform Type D grounding work (grounding resistance 100Ω or less). However, if a surge protection device is installed, please perform Class C grounding work (grounding resistance of 10Ω or less).
The grounding terminals are located inside and outside the terminals. It doesn't matter which terminal you use. When installing a transmitter in areas affected by noise, connect the enclosure to earth using the ground terminal.

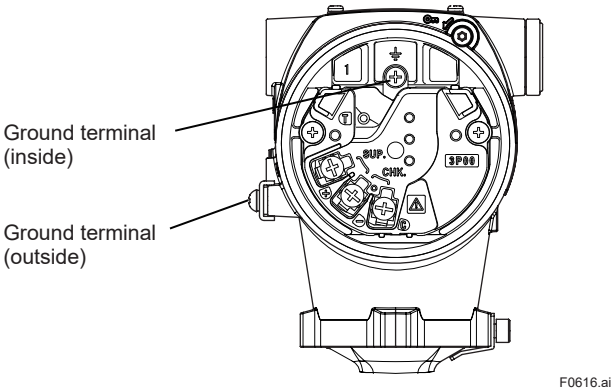
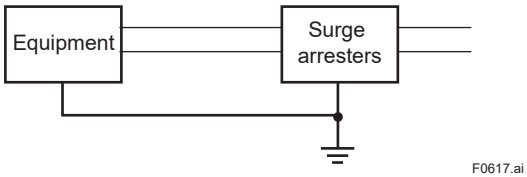


Figure 6.9 Ground Terminals

CAUTION

If using an external surge arrester, perform connected grounding as shown in the figure below, and perform Type C grounding work (grounding resistance 10Ω or less) on the arrester side.



7. Operation

NOTE

For the HART communication type, refer to IM 01C33A10-01EN, and for the PROFINET communication type, refer to IM 01C33A11-01EN.

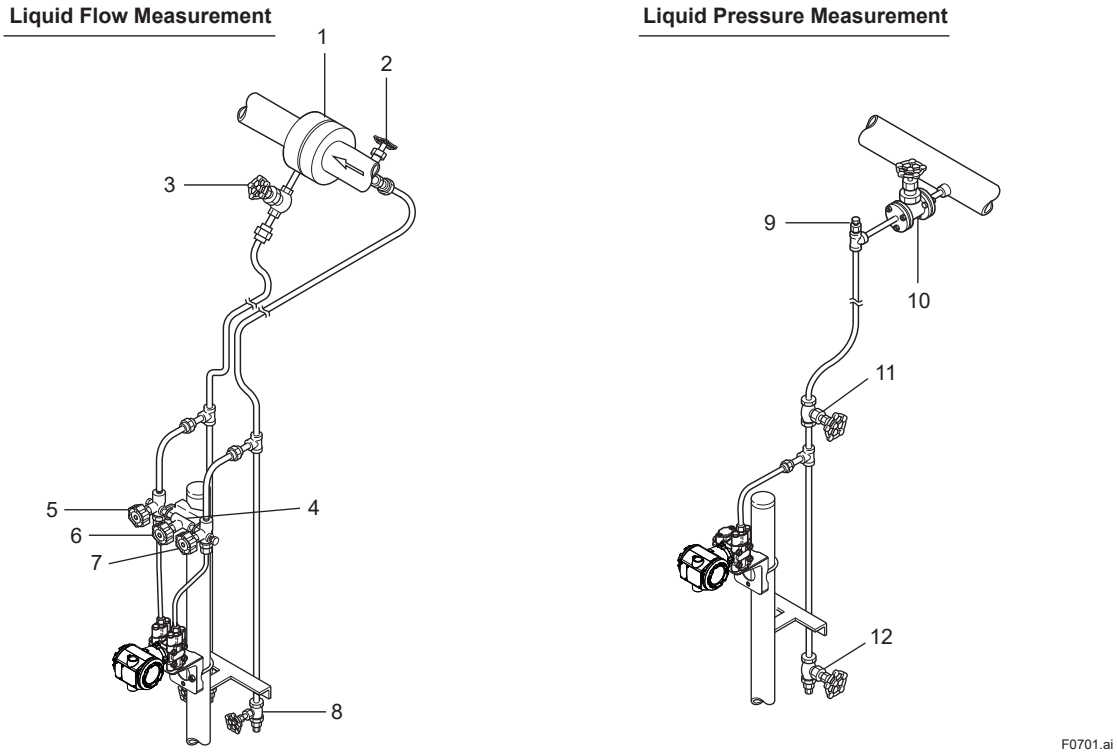
7.1 Preparing for Operation

7.1.1 EJX110S, EJX310S and EJX430S

This section describes the procedure for preparing for the start of operation when measuring the flow rate of a liquid using a EJX110S (vertical pipe connection type, right high pressure) and when measuring the pressure of a fluid using a EJX430S. (Figure 7.1) For EJX110S with an orifice for microflow measurement, refer to 7.1.3.

NOTE

Check that the process pressure tap valves, drain valves, and 3-valve manifold stop valves on both the low pressure and high pressure sides are closed, and that the 3-valve manifold equalizing valve is opened.



1	Orifice	**5**	Stop valve (Low pressure)	**9**	Vent plug (Fill plug)
2	Tap valve (High pressure)	**6**	Equalizing valve	**10**	Tap valve
3	Tap valve (Low pressure)	**7**	Stop valve (High pressure)	**11**	Stop valve
4	3-valve manifold	**8**	Drain valve (High pressure)	**12**	Drain valve

Figure 7.1 Measurement Example (EJX110S, EJX310S and EJX430S)

(a) Follow the procedures below to introduce process pressure into the impulse piping and transmitter.

■ Differential Pressure Transmitters

(1) Open the low pressure and high pressure tap valves to fill the impulse piping with process liquid.

(2) Slowly open the high pressure stop valve to fill the transmitter pressure-detector section with process liquid.

(3) Close the high pressure stop valve.

(4) Gradually open the low pressure stop valve and completely fill the transmitter pressure-detector section with process liquid.

(5) Close the low pressure stop valve.

(6) Gradually open the high pressure stop valve. At this time, equal pressure is applied to the low and high pressure sides of the transmitter.

(7) Check that there are no liquid leaks in the impulse piping, 3-valve manifold, transmitter, or other components.

■ Gauge/Absolute Pressure Transmitters

(1) Open the tap valve (main valve) to fill the impulse piping with process fluid.

(2) Gradually open the stop valve to introduce process fluid into the transmitter pressure-detector section.

(3) Confirm that there is no pressure leak in the impulse piping, transmitter, or other components.

(b) Venting Gas from the Transmitter Pressure-detector.

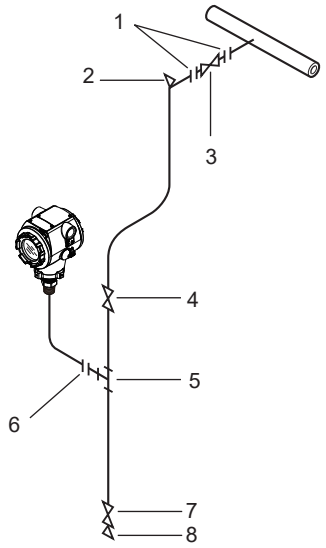
- Since the piping in the example of Figure 7.1 is constructed to be self-venting, no venting operation is required. If it is not possible to make the piping self-venting, refer to Section 7.5 for instructions. Leave the equalizing valve open even after venting gas.

7.1.2 EJX510S and EJX530S

Figure 7.2 using EJX530S describes the procedure for preparing for operation when measuring the pressure of the liquid.

NOTE

Check that the process pressure tap valves, drain valves, and stop valves are closed.



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1	Union or flange	**4**	Stop valve	**7**	Drain valve
2	Vent plug (Fill plug)	**5**	Tee	**8**	Drain plug
3	Tap valve	**6**	Union or flange		

Figure 7.2 Measurement Example (EJX510S and EJX530S)

The following procedure is used to introduce the process fluid into the pressure pipe and transmitter.

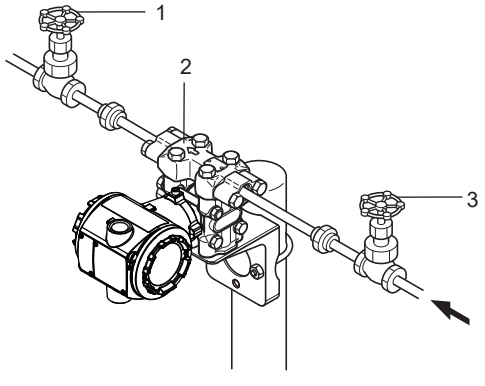
(1) Open the tap valve (main valve) to fill the impulse piping with process fluid.

(2) Gradually open the stop valve to introduce process fluid into the transmitter pressure detector section.

(3) Confirm that there is no pressure leak in the impulse piping, transmitter, or other components.

7.1.3 EJX110S With Orifice for Low Flow Measurement

EJX110S Differential Pressure Transmitters with Orifices for Low Flow Measurement (hereinafter referred to as IFO) are used for flow measurement of liquids or gases. Here, we describe the procedure for preparing for the start of operation when measuring the flow rate of liquid as shown in Figure 7.3 using the vertical piping connection type and the right high pressure type.



1	Stop valve (Downstream side)	**2**	Manifold	**3**	Stop valve (Upstream side)

Figure 7.3 Measurement Example (EJX110S+IFO)

(a) Follow the procedures below to introduce process pressure into the transmitter.

(1) Open the stop valve on the downstream side.

(2) Gradually open the stop valve on the upstream side to introduce process fluid into the transmitter pressure-detector section.
This will cause process fluid to flow into the orifice built in the manifold, and apply flow-dependent differential pressure to the high and low pressure sides of the transmitter.

(3) Confirm that there are no pressure leaks in the stop valves on the upstream and downstream sides, process piping connection or transmitter, etc.

(b) Venting Gas from the Transmitter Pressure-detector.

Since the piping in the example of Figure 7.3 is constructed to be self-venting, no venting operation is required. If it is not possible to make the piping self-venting, refer to Section 7.6 for instructions.

7.2 Transmitter Status Check and Parameter Setting

(1) Checking the normal state of the transmitter

After energizing on, connect the parameter setting tool and make sure the transmitter is in normal condition.
The normal status can also be confirmed on the display if the transmitter has a display.

NOTE

During HART communication, the communication signal is superimposed on the output signal. In order to reduce the impact of communication signals on the accuracy of current output, it is recommended to set a low-pass filter of about 0.1 seconds on the receiver side. When communicating online, please make sure that the communication signal does not affect the higher-level system before communicating.

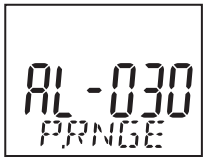
■ Confirmation with parameter setting tool

The parameter setting tool ensures that no alarms have occurred on the transmitter.

■ Display confirmation

- If there is an abnormality in the wiring system, the display part will be in the “off” state.
- If there is an abnormality in the transmitter, an “Error No.” corresponding to the abnormal content will be displayed on the display part.

Self-diagnostic error on the integral indicator (Faulty transmitter)



Example of Error Display
(LCD display)

Example of Error Display
(Ggraphic display)

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Figure 7.4 Example of Display Error Display

(2) Checking and changing the parameter setting value of the transmitter

The following parameters are the minimum settings required to operate the transmitter. It is shipped with the values specified at the time of ordering. Please check or change the settings as necessary. For confirmation and configuration, please refer to the instruction manual for each communication. If it is equipped with a display, you can check and set some parameters with the local parameter setting function (LPS only). Refer to Section 7.7, “LCD Display Local Parameter Setting (LPS)” and Section 7.8, “Graphic Display Local Parameter Setting (LPS)”

- Measuring range (lower limit, upper value, unit of measuring range)
- Output/built-in indicator mode (proportional mode/flat mode)

■ Burnout direction in the event of hardware failure

parameters. The factory is basically set to the High side, but if it is specified when ordering, it will be set to the specified direction. You can check the settings in the parameters and LPS.
For the conditions for burnout, refer to Abnormal Contents and Countermeasures for HART Communication IM.
If it detects a fault that does not allow the current value to be controlled correctly, it burns out to the Low side.

■ Write Protection

The write protection function includes hardware write protection by switch and software write protection by parameter setting. If either Hardware Write Protect or Software Write Protect settings are turned on, it will be write-protected.
Hardware write protection is performed by sliding the setting switch shown in Chapter 3. At the factory, the write protection is set to the OFF side (writable). When removing the hardware write protection, it is done with a switch inside the device, so it is necessary to open and close the housing cover.

7.3 Zero Point Adjustment and Span Adjustment

IMPORTANT

- Do not turn off the power of the transmitter immediately after the zero point adjustment. Please note that if the power is turned off within 10 seconds, the adjustment amount at the zero point will return to the value before adjustment.
- After the adjustment work with the zero-adjustment screw is completed, be sure to return the cover of the zero-adjustment screw to its original position.

NOTE

- Since the output value is affected by the attitude of the transmitter, the zero point adjustment should be performed in the installed state. When adjusting the instrument room or other than the installation state, it must be carried out according to the installation posture.
- The absolute pressure transmitter EJX310S is adjusted to the zero point according to the specified transmitter mounting direction (horizontal or vertical mounting) when it is shipped from the workshop.
  When turning the zero-adjustment screw at high speed (over one revolution per 0.5 seconds), it may not respond correctly. Therefore, turn it while checking the display's reaction.

The instrument is precisely calibrated from the factory based on specifications, but may cause slight errors depending on the installation environment and mounting posture. There is a zero point/span adjustment function to fine-tune those errors.
The zero point adjustment is a one-point adjustment that matches the output on the lower limit of the measurement range. It is used to compensate for the differential pressure error due to the mounting posture of the transmitter body and static pressure.
The span adjustment is an adjustment that aligns the output on the upper end of the measurement range. Adjusts the input/output characteristics between the two points relative to the zeroing point. It is used when it is used to meet customer-specific pressure standards, when there is a suspicion of span drift, or when it is not possible to create a zero state such as absolute pressure.
The zero point adjustment and span adjustment have a Trim Point and a T rim Deviation, respectively.

- Zero Trim Point: The pressure value from the last zero point adjustment.
- Span Trim Point: The pressure value from the last span adjustment.
- Zero Trim Deviation: The value of the zero point adjustment used for the calculation.
- Span Trim Deviation: The value of the span adjustment used for the calculation.

7.3.1 Flow of Zero Point Adjustment and Span Adjustment

The ideal relationship between the measured value and the input pressure is that the measured value = input pressure. By adjusting the zero point and span, the input pressure is close to the measured value.
Zero point adjustment and span adjustment are performed in the following steps. Be sure to adjust the span after the zero point adjustment.

The relationship between the measured value and the input pressure taking into account the adjustment amount is defined in the following first-order model:

Y = Slope × X + Offset

Y: Adjusted output (measured value)
X: Input pressure
Slope: Tilt
Offset: Offset

The relationship between Offset and Zero Trim Deviation is as follows:

Zero Trim Deviation = Offset

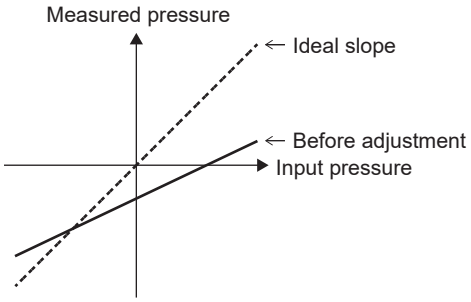
The relationship between Slope and Span Trim Deviation is as follows:

Span Trim Deviation = (Slope – 1) * (URV – LRV)

The span adjustment is the adjustment amount that indicates how much the output will be changed relative to the span of the measurement range (URV - LRV).

(1) Before adjustment

Before adjustment, the input pressure and the read measurement value do not match.
By adjusting the zero point and span, the measured value is brought closer to the input pressure.



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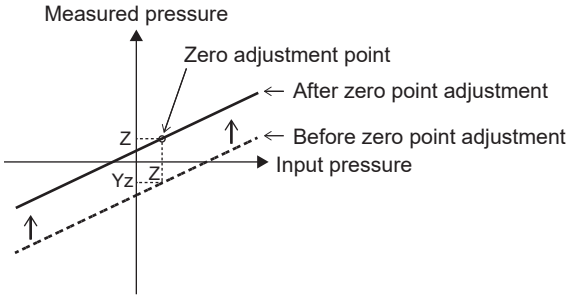
(2) Zero point adjustment

Zero point adjustment is an adjustment that compensates for the input pressure and measured value at the lower end of the measurement range. Zero point adjustment is an operation that moves the entire straight line in parallel in the vertical direction.

For example, if the input pressure is 10 kPa and the measured value is 8 kPa, the error is corrected by zeroing to match it to 10 kPa.



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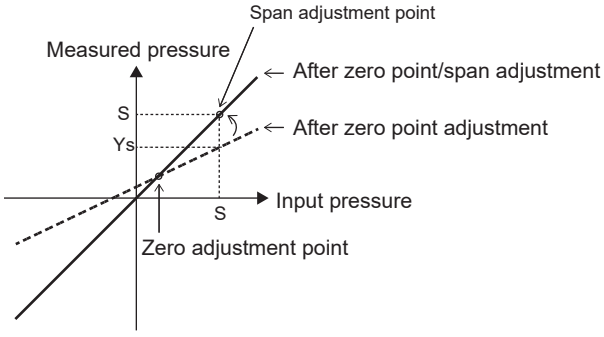
(3) Span adjustment

The span adjustment is an adjustment that corrects the input pressure and the measured value on the upper limit of the measurement range so that it matches. Span adjustment is an operation that adjusts the slope of a measured value relative to a change in input pressure relative to the zeroing point. Be sure to do it after the zero point adjustment.

For example, if the input pressure is 90 kPa and the measurement reads 88 kPa, the span adjustment compensates for the error to match 90 kPa.



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7.3.2 Zeroing Point Adjustment Using External Zero-Adjustment Screws

By turning the zero-adjusting screw on the outside of the housing, the differential pressure/ pressure can be adjusted to zero point.
Open the zero-adjustment screw cover. While observing the output value displayed on the screen, use a flathead screwdriver to turn the zero-adjustment screw on the outside of the housing until the output value reads zero. The output value increases when turned clockwise and decreases when turned counterclockwise. The resolution is 0.01% of the measuring range. The amount of adjustment changes according to the speed at which you turn the zero-adjustment screw. For fine adjustments, turn slowly. For coarse adjustments, turn quickly.
Zero adjustment via zero-adjustment screws can be enabled or disabled. Enabled or disabled settings are configured via the Local Operation Enable parameter. When using zero-adjust screws, set this to 'Enabled'. In PROFINET communication mode, zero point adjustment is possible even with the prohibited setting when not in cyclic communication.

[Root Menu] → Device Settings → Detailed Setup → Device Information → Field Device Information →	
Local Operation Enable	Select Enabled or Disabled. Enabled: Allow zero-adjustment with using zero-adjustment screw. Disabled: Prohibit zero-adjustment with using zero-adjustment screw.

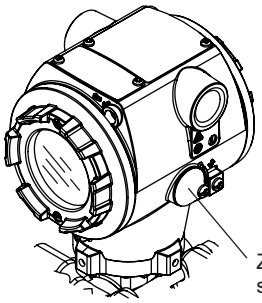

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Figure 7.5 Zero-adjustment screw cover

7.3.3 Differential Pressure/Zero Set of Pressure

This is an adjustment function that resets the measured value to 0 (zero).
Correct the current measurement to 0 kPa.

• Calling the zero point adjustment parameter (Pres Zero T rim)

[Root Menu] → Maintenance → Pres Sensor Trim →	
Pres Zero Trim	Verify that the readings are stable and run

On the Pres Zero Trim parameter screen, check that the pressurized pressure of 0 (zero) is stable, and then run it.

7.3.4 Setting Adjustment Units (HART only)

When performing adjustment operations, you can switch the units used to either "%" or "pressure units". This is done in the Trim Unit parameter.

• Calling Pres Trim Unit parameters

[Root Menu] → Maintenance → Pres Sensor Trim →	
Pres Trim Unit	PRES UNIT (adjusted in pressure units) or % (adjusted in % units)

• Invoking SP Trim Unit parameters

[Root Menu] → Maintenance → SP Sensor Trim →	
SP Trim Unit	PRES UNIT (adjusted in pressure units) or % (adjusted in % units)

Depending on the adjustment unit setting, the units of the following adjustment parameters will change:

Zero/Span Trim Point
Zero/Span Trim Deviation

For example, if you set the Trim Unit to %, these parameters will be displayed as % values calculated based on the measurement range.
On the other hand, if the Trim Unit is set to PRES UNIT, the parameters are displayed in the set pressure units (e.g. kPa, MPa).

7.3.5 Differential Pressure/Pressure Zero/Span Adjustment

The zero point adjustment is a one-point adjustment that matches the output on the lower limit of the measurement range.
The span adjustment is an adjustment that aligns the output on the upper end of the measurement range. This function changes the input/output characteristics between two points relative to the zeroing point.
Be sure to adjust the span (adjust the upper limit) after the zero point adjustment (adjust the lower limit). There are two types of adjustment methods: automatic adjustment and manual adjustment.

(1) Auto Sensor Trim

When the pressure of the point you want to adjust is applied and the pressure value is set to a parameter, the adjustment amount is automatically calculated and adjustments are made.

• Calling and setting automatic adjustment parameters (Pres Trim)

[Root Menu] → Maintenance → Pres Sensor Trim → Pres Trim →	
Auto, Zero Trim Point	Auto trim for 0% point
Auto, Span Trim Point	Auto trim for 100% point

a) Automatic zero point adjustment

For applications such as tank level measurement, it may not be possible to set the actual water level to zero level. In such cases, it is possible to match the output to the actual level values obtained by other measuring instruments, such as glass gauges.

Here are some examples of the following conditions:
Measuring range: 0 to 25.00 kPa
Current level: 13.50 kPa
Current output: 13.83 kPa

In this case, select Auto and Zero Trim Point on the Pres Trim parameter screen, then enter the actual level value (13.50 kPa) on the display screen. The output will be corrected from 13.83 kPa to 13.50 kPa and adjusted to match the actual level.After performing the adjustment, the Zero Trim Deviation will be updated.

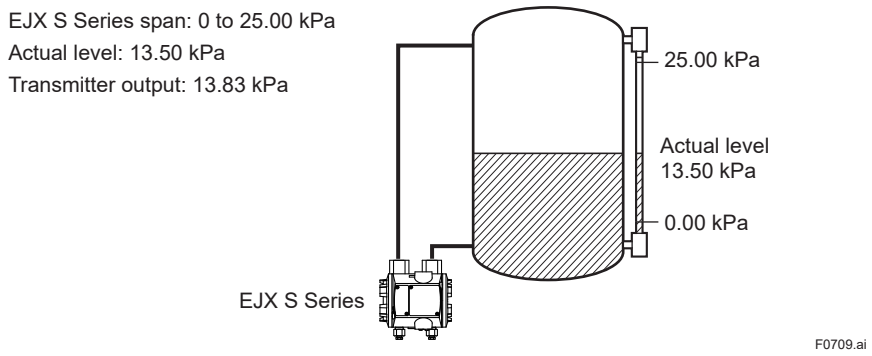


Figure 7.6 Tank level measurement

b) Automatic span adjustment

As with automatic zero point adjustment, this is an example of span adjustment on the upper end of the measurement range. Match the output to the actual level values obtained by other measuring instruments.

Here are some examples of the following conditions:
Measuring Range: 0 to 25.00 kPa
Current Level: 22.00 kPa
Current Output: 21.45 kPa

In this case, if you select Auto and Span Trim Point on the Pres Trim parameter screen and enter the actual level value (22.00 kPa) on the display screen, the output will be corrected from 21.45 kPa to 22.00 kPa and adjusted to match the actual level.
When you make an adjustment, the Span Trim Deviation is updated. The Zero Trim Deviation is also updated to ensure that the output of the zeroing point does not change.

(2) Manual adjustment

This is a way to set the amount of adjustment of the zero point and span directly to the parameters.
Calculate the zero point and span adjustment amount from the actual applied pressure and the output of this instrument, and set it to the following parameters:

Pres Zero Trim Deviation
Pres Span Trim Deviation

Here is an example of a setting to adjust to a measurement range of 10 to 30 kPa.
As a prerequisite, assume that you already have the following adjustment quantities set:

Pres Zero Trim Deviation = -0.04 kPa
Pres Span Trim Deviation = -0.03 kPa

(1) Call the lower limit adjustment parameter Manual, Zero Trim Point.

[Root Menu] → Maintenance → Pres Sensor Trim → Pres Trim → Manual, Zero Trim Point

(2) Add a reference pressure of 10 kPa to the lower limit of this instrument. Suppose the output display at this time is 9.94 kPa.

(3) Calculate the zero adjustment amount by adding the output error (10-9.94 = 0.06 kPa) to the previous adjustment amount (-0.04 kPa).

(4) Manual, enter 0.02 for Zero Trim Point.

(5) Next, call the upper limit adjustment parameter Manual, Span Trim Point.

[Root Menu] → Maintenance → Pres Sensor Trim → Pres Trim → Manual, Span Trim Point

(6) Add the upper limit of 30 kPa to the instrument. Suppose the output display at this time was 30.15 kPa.

(7) Calculate the output error.

$$\text{Slope Error} = \frac{\text{Applied Pressure Value - Value of Pres for Trim}}{\text{Applied Pressure Value}} \times (\text{URV - LRV})$$

$$= \frac{30.00 - 30.15}{30.00} \times (30.00 - 10.00) = -0.1$$

(8) The output error (-0.1 kPa) is added to the previous adjustment amount (-0.03 kPa) to calculate the span adjustment amount.

(9) Manual, enter -0.13 for Span Trim Point.

7.3.6 Zero/Span Adjustment for Static Pressure

Zero/span adjustment can be made for static pressure (SP) on the high pressure side.
Use the setting tool to adjust as well as the differential pressure/pressure zero/span adjustment.

• Recall of static pressure zero/span adjustment parameters

[Root Menu] → Maintenance → SP Sensor Trim → Static Pres Trim →	
Auto, Zero Trim Point	Zero point automatic adjustment
Auto, Span Trim Point	Automatic Span Adjustment
Manual, Zero Trim Point	Zero Point Manual Adjustment
Manual, Span Trim Point	Sspanmanual adjustment

7.3.7 Erasing Adjustments

Various adjustment values can be cleared.

• Calling the adjustment amount erasure parameters (Clear Pres Trim, Clear SP Trim)

Differential Pressure/Pressure Parameters
[Root Menu] → Maintenance → Pres Sensor Trim → Clear Pres Trim

Static Pressure Parameters
[Root Menu] → Maintenance → SP Sensor Trim → Clear SP Trim

The adjustment parameters are reset as follows:

Zero Trim Point = LRV
Span Trim Point = URV
Zero Trim Deviation = 0
Span Trim Deviation = 0

Additionally, it is possible to reset the differential pressure/pressure adjustment to the factory default settings.

• Calling the factory state parameter (Factory Reset Pres Trim)

Differential Pressure/Pressure Parameters
[Root Menu] → Maintenance → Pres Sensor Trim → Factory Reset Pres Trim

The adjustment parameters will be reset as follows. The adjustment amount will be set to the value of Zero/Span Trim Deviation at Factory.

Zero Trim Point = LRV
Span Trim Point = URV
Zero Trim Deviation = Zero Trim Deviation at Factory
Span Trim Deviation = Span Trim Deviation at Factory

7.4 Starting Operation

When the zero point adjustment is completed, the operation of the differential pressure transmitter is started by following the steps below. In the case of a pressure transmitter, it is already in operation when the zero point adjustment is completed, so please do (3) or later.
If the EJX110S IFO is attached, open the stop valve in the order of downstream → upstream, and then perform (3) and beyond.

(1) Close the pressure equalization valve.

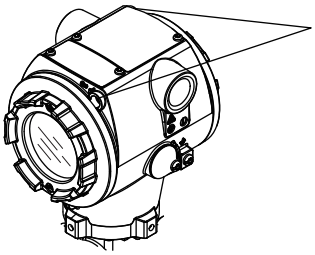
(2) Gradually open the stop valve on the low pressure side.
With this operation, the transmitter was brought into operation state.

(3) Check the operating status.
Periodic fluctuations in process pressure can cause the output signal to swing significantly (hunting state).
In such cases, the output signal of the transmitter can be damped by setting the parameters.
Check the hunting status on the receiver or display and set the optimal damping time constant.

(4) After confirming the operating status, make sure to implement the following items.

IMPORTANT

- Remove the setting tool from the terminals and make sure that there is no looseness on each terminal.
- Close the front and rear housing covers. Screw each cover tightly until it stops turning.
- Some explosion-proof types have locking bolts on the cover. Lock the cover by turning the locking bolt (bolt with a hexagonal hole) counterclockwise with a special tool (hex L wrench). (Locks with 0.7 N·m torque)



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- Make sure the cover does not open by hand.
- Fix the zero-adjustment screw cover in place and tighten the mounting screws.

7.5 Stopping the Operation

If you want to stop driving, follow the steps below. (For pressure gauges, only (1) is used.)
If the EJX110S has an IFO, close the stop valve after (1) in the order of upstream → downstream.

(1) Turn off the power.

(2) Close the stop valve on the low pressure side.

(3) Open the pressure equalization valve.

(4) Close the stop valve on the high pressure side.

(5) Close the main valve on the high and low pressure sides.

NOTE

- If the operation is stopped for a long period of time, drain the process fluid in the pressure pipe and the pressure bearing part of the transmitter.
- Keep the pressure equalization valve open.

7.6 Drain and Gas Drain in Transmitter Pressure

The vertical piping connection type of this transmitter has a self-draining and self-venting structure, so if the pressure conductor pipe is piped according to the self-draining (or self-venting), there is no need to drain the drain (or gas).
If condensation (or gas) accumulates in the transmitter pressure part, it will cause errors in the measured pressure. If the piping that matches the self-drain (or self-vent) cannot be made, loosen the vent drain screw of this transmitter and completely drain the drain (or gas). After removing the drain (or gas), tighten the vent drain screw again.

IMPORTANT

Do not operate during operation, as the operation of drain (or gas) will cause disturbances to the measured pressure.

7.6.1 Drain Removal

WARNING

If the drain is harmful to the human body, be careful not to let the drain get on the body.

(1) Gradually open the drain screw (or drain plug) and pull out the drain in the transmitter pressure part. (See Figure 7.7)

(2) When the drain is completely disconnected, close the drain screw (or drain plug). (Drain screw is tightened with a torque of 10 N·m, drain plug is tightened with a torque of 34 to 39 N·m)

When you loosen the drain screw or drain plug, the accumulated liquid will be expelled in the direction of the arrow.

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Figure 7.7 How to Drain the Drain

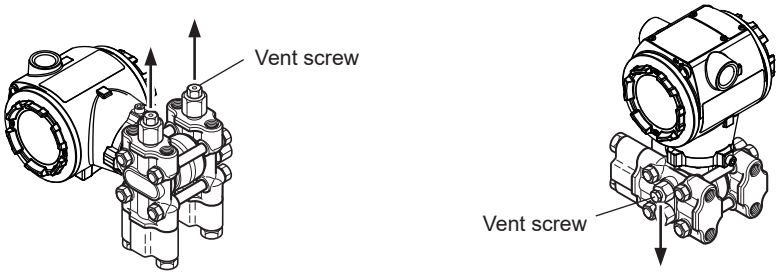
7.6.2 Degassing

WARNING

For process fluids (liquids) that are harmful to the human body, be careful not to let the process fluid get on the body.

(1) Gradually open the vent screw to release the gas in the transmitter pressure part. (See Figure 7.8)

(2) When the gas is completely drained, close the vent screw. (The vent screw tightens with a torque of 10 N·m)



When you loosen the vent screw, the gas escpes in the direction of the arrow.

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Figure 7.8 Method of Degassing

7.7 LCD Display Local Parameter Setting (LPS)

WARNING

Do not use the display push buttons in hazardous areas where flammable gases or vapors are generated. If you need to use the pushbuttons, operate them in a place where there is no danger. Especially for explosion-proof instrument, be sure to read the instruction manual for each explosion-proof device as well.

IMPORTANT

- Do not turn off the transmitter immediately after parameter setting. If you turn off the power within 10 seconds of performing this procedure, the parameters will return to their previous settings.
- To make this setting, the parameter to allow/disallow external zeroing (Local Operation Enable) must be set to Enabled. For configuration instructions, refer to each communication IM. Please note that if the additional specification codes CK or /CJ are attached, it is set to “Disabled”.
- If the ambient temperature is low, it will take longer for the LCD to update. It is recommended to use the LPS function at -10°C or higher.

NOTE

When turning the zero-adjustment screw at high speed (over one revolution per 0.5 seconds), it may not respond correctly. Therefore, turn it while checking the display’s reaction.

7.7.1 LPS Overview (LCD Display)

The configuration with a zero-adjustment screw and a pushbutton allows for quick setting and confirmation of the following parameters: (In the case of PROFINET communication type, only confirmation)

■ **HART communication type**

Loop Test (Test Output), Tag Number Setting, Measurement Range Unit Setting, Lower Limit of Measurement Range (LRV), Upper Limit (URV), Constant Setting of Damping, Setting Output Mode (Proportional/Open-Flat), Selecting Process Display, Resetting Range Using Real Pressure (LRV/URV), Burnout Direction (High/Low), ON/OFF Software Write Protection, Equipment Information

■ **PROFINET communication type**

VendorID, DeviceID, Device name , IP address

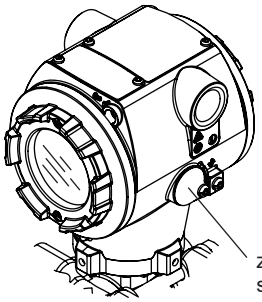


Figure 7.9 Zero-adjustment screw

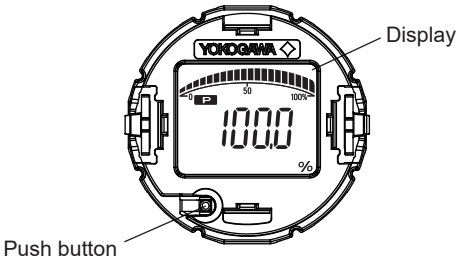


Figure 7.10 Push button

■ HART communication type

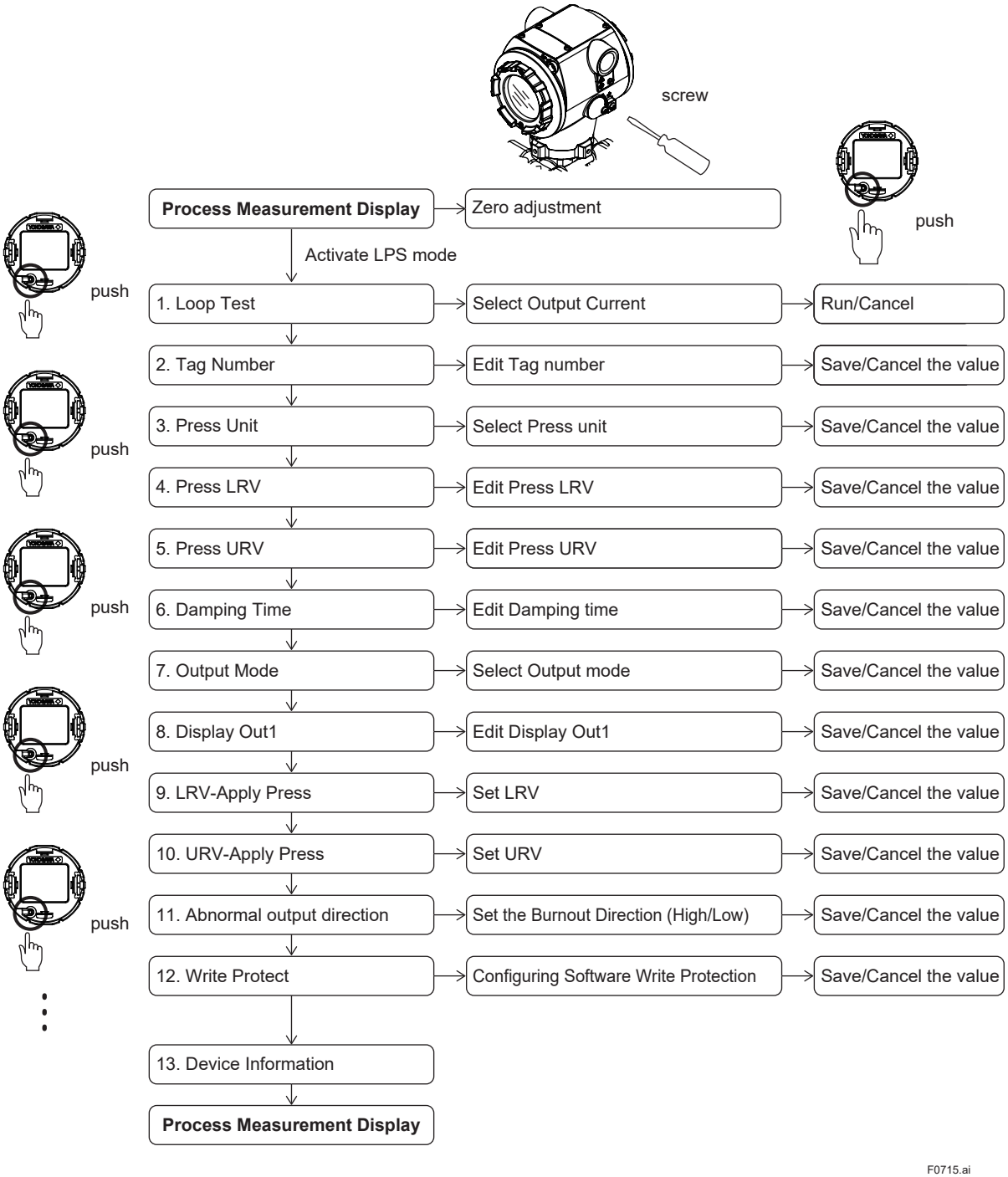


Figure 7.11 LPS Settings (HART communication type)

■ PROFINET communication type

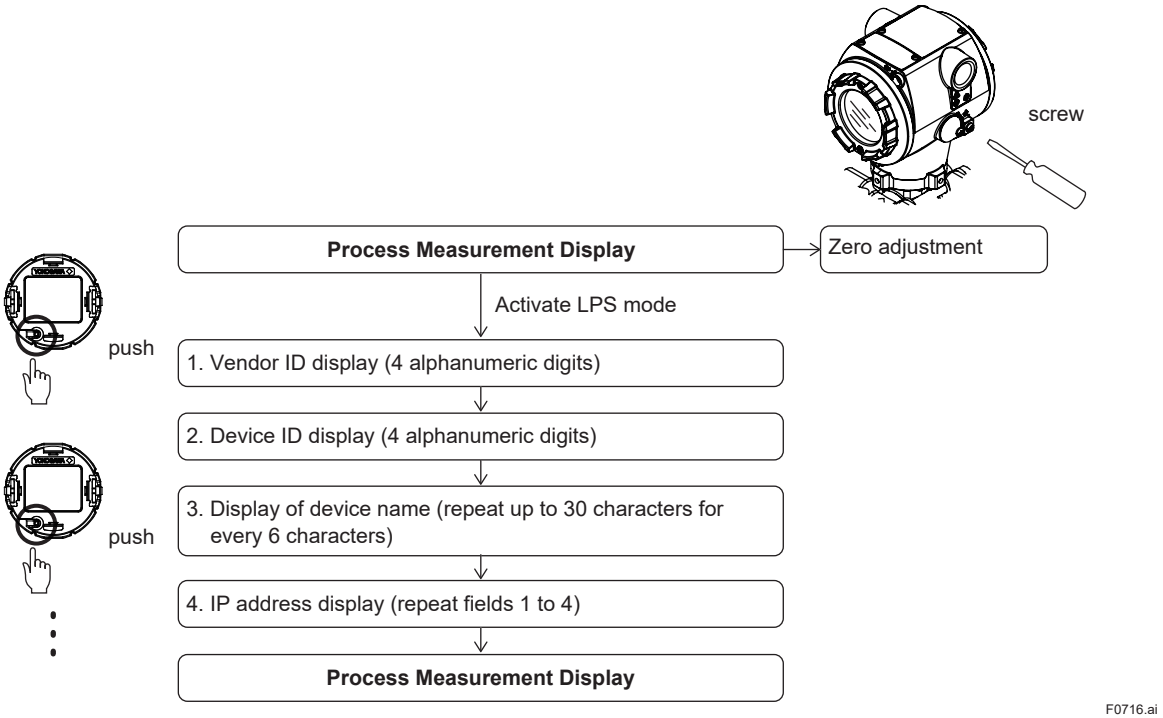


Figure 7.12 LPS Settings (PROFINET communication type)

7.7.2 Contents on Display

The display of this instrument is composed of the sections shown in Figure 7.13, and each section displays the information described in Table 7.1.

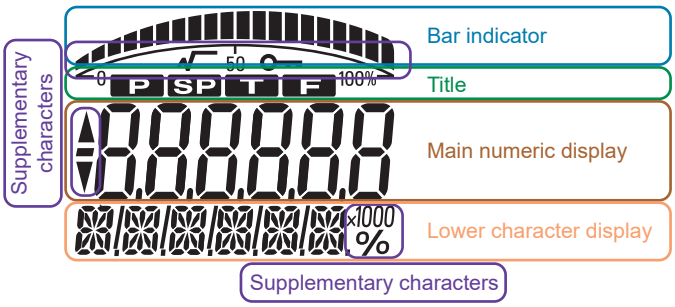


Figure 7.13 Each Section of Display

Table 7.1 Information on Display

Section	Descriptions	
Bar indicator	The variable (*) in the main numeric display is represented as a percentage scaled according to the setting range, and shown as a bar graph. The percentage is displayed in 20 divisions	
Main numeric display	Displays input/output variables. If an alarm is occurred, its alarm number is also alternately displayed.	
Lower character display	Displays parameter name, unit, and status of signal. If an alarm is occurred, its alarm number is also alternately displayed. The characters that can be displayed are alphanumeric characters, spaces, and the following symbols: - . _ / \ < > [ ] + = $ % * ? ° { }	
Title	Shows the type of the variable which is displayed in the main numeric display.	
	P	Illuminates for differential pressure / pressure.
	SP	Illuminates for static pressure.
	T	Illuminates for temperature.
	F	Illuminates when the value is flow. Not applicable for HART communication.
Supplementary characters	%	Illuminates when the variable of main numeric display is %.
	√	Illuminates when square root display is selected.
	Key Mark	Illuminates when write protect function is activated.
	×10 ×100 ×1000	Illuminates when exponent mode is set.

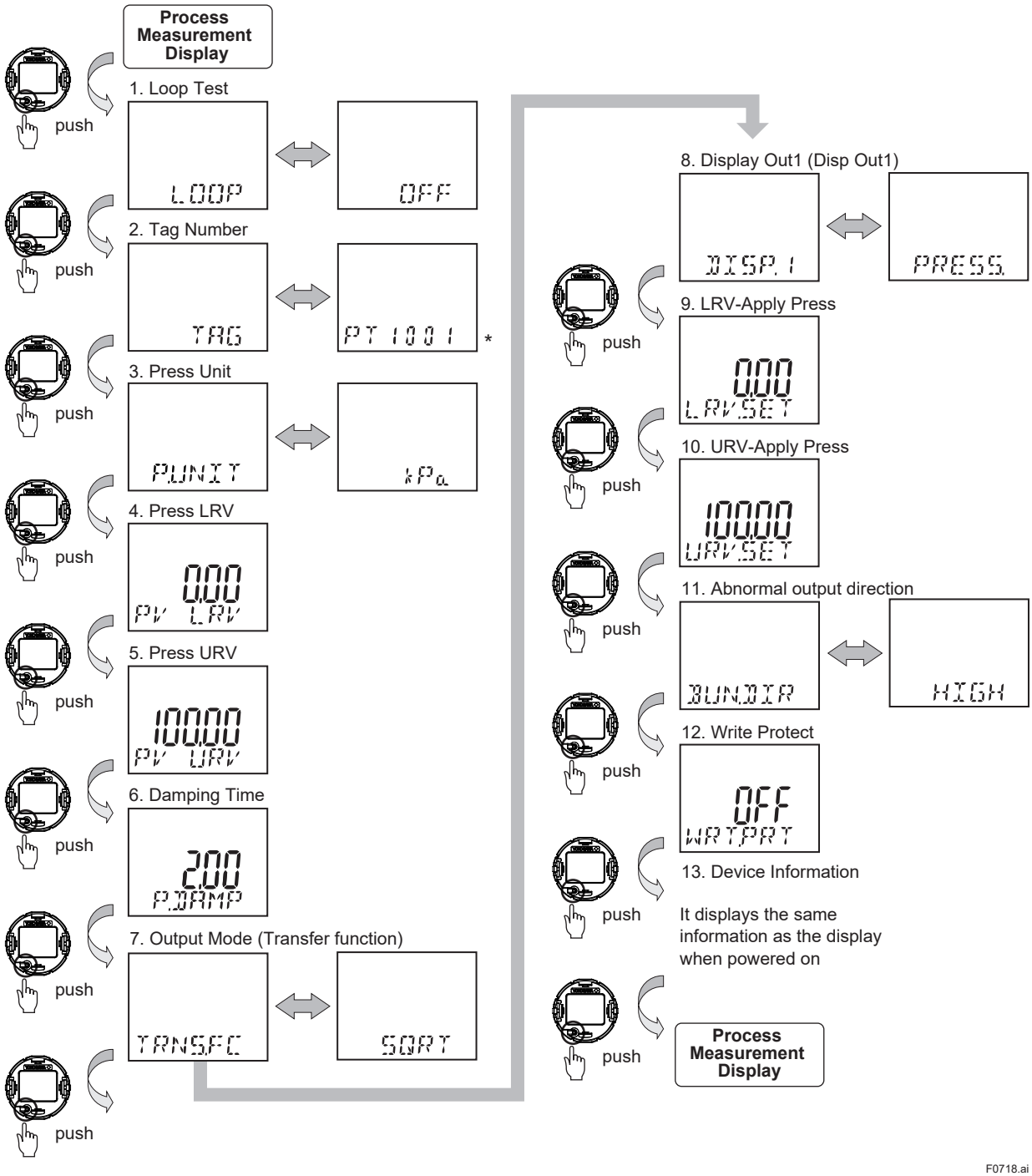
*: Except for temperature and the measured differential pressure (including % and user set scale value) while the bi-directional flow measurement mode is activated.

7.7.3 Enabling Local Parameter Settings

Press the push button on the display to activate the local parameter setting mode. After 10 minutes of inactivity, the transmitter will automatically exit the local parameter setting mode.

7.7.4 Checking Parameter Settings

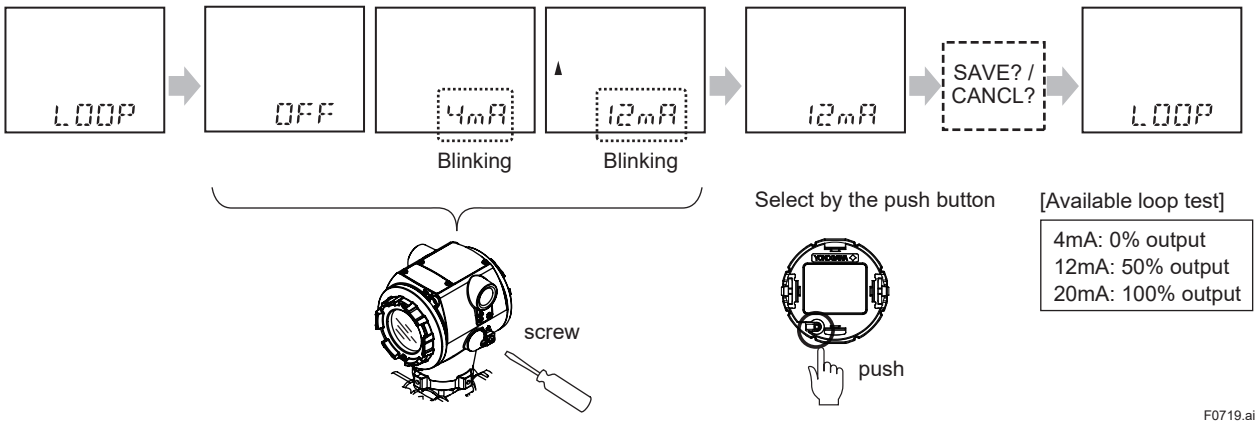
From now on, it will be an explanation of the HART communication form.
Each push button presses allow loop test (test output), tag number setting, measurement range unit setting, lower measuring range (LRV), upper limit value (URV), damping constant setting, output mode (proportional/flat/broken line) setting, display display (DispOut1) selection, range resetting using real pressure (LRV/URV), abnormal output direction, write protection , the current setting value of each parameter in the equipment information is displayed sequentially.



To set the value of each parameter, turn the zero-adjustment screw on each parameter screen and then put it into local parameter setting mode.
To finish setting local parameters, see Subsection 7.7.16, “Save or Cancel” and Subsection 7.7.17, “Abort Configuration”.

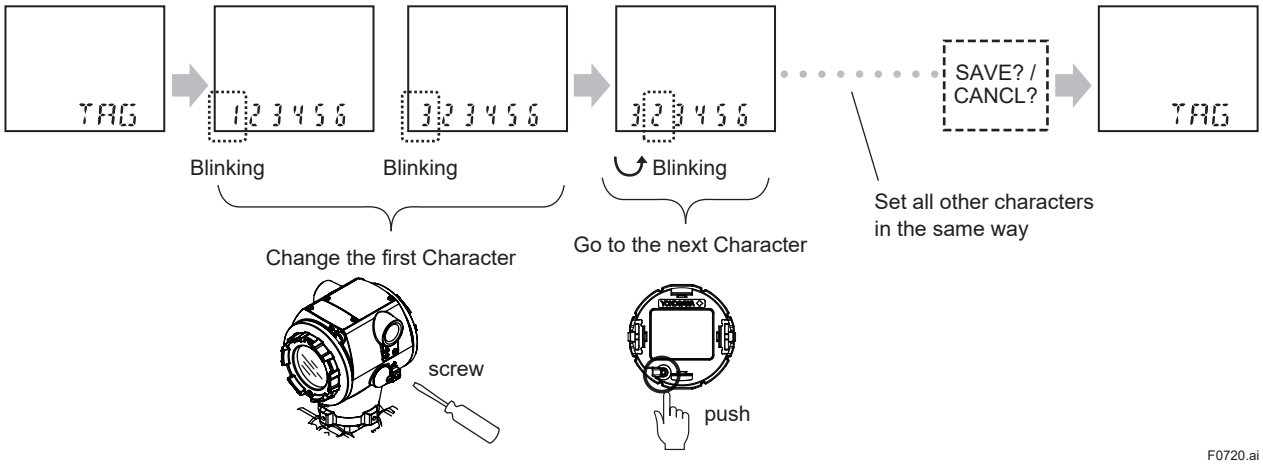
7.7.5 Loop Test Configuration

Loop test configuration can be changed as below. Output current value (4 mA, 12 mA or 20 mA) for Loop test can be selected by turning the zero-adjustment screw.



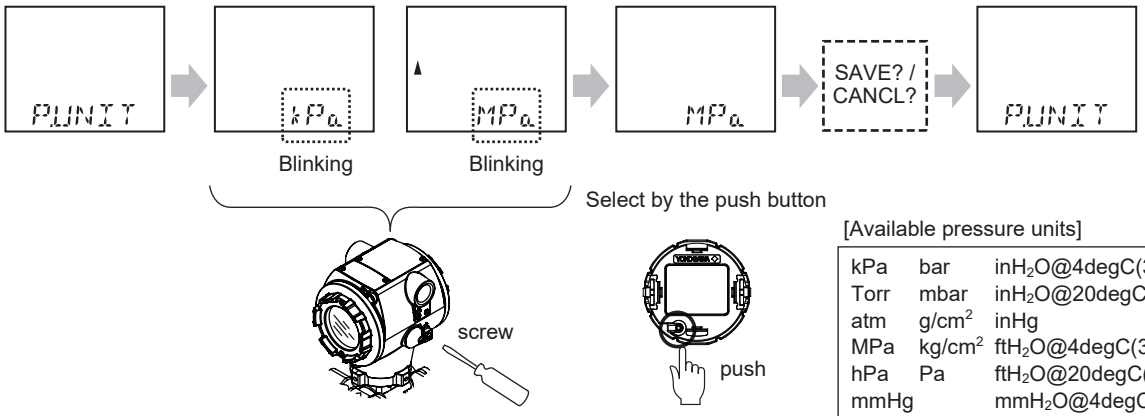
7.7.6 Tag Number Configuration

Tag Number is edited by turning the zero-adjustment screw. Up to 8 alphanumeric characters for HART can be set.



7.7.7 Pressure Unit Configuration

Pressure unit for the below table can be changed as below. By turning the zero-adjustment screw, user can scroll between the various available pressure units.



[Available pressure units]

kPa	bar	inH_2O@4degC(39.2degF)
Torr	mbar	inH_2O@20degC(68degF)
atm	g/cm^2	inHg
MPa	kg/cm^2	ftH_2O@4degC(39.2degF)
hPa	Pa	ftH_2O@20degC(68degF)
mmHg		mmH_2O@4degC(39.2degF)
psi		mmH_2O@20degC(68degF)

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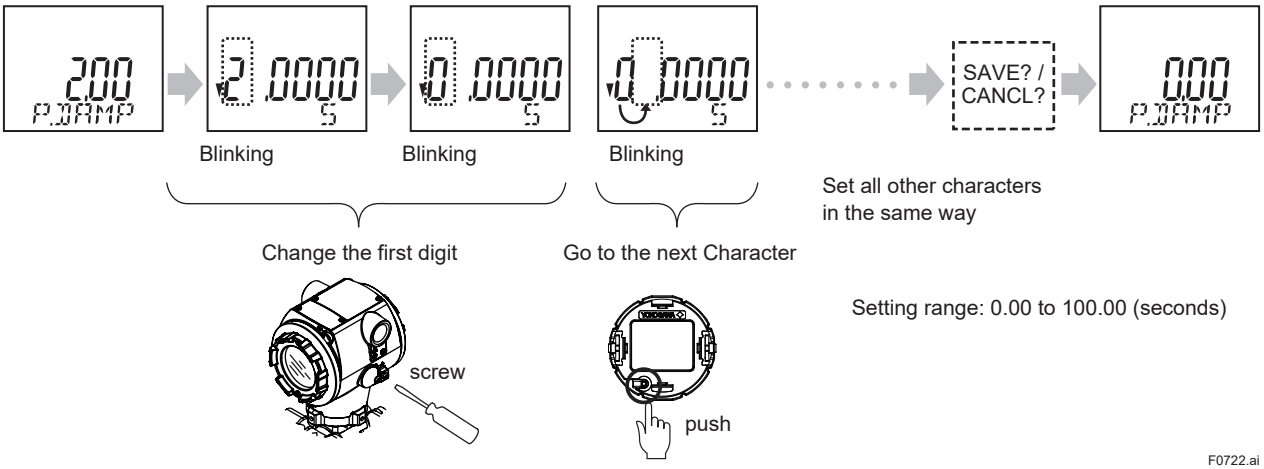
7.7.8 Pressure LRV/URV Configuration

Pressure LRV and URV can be set. The number for each digit is changed by turning the zero-adjustment screw and set by pressing the push button. Please refer to 7.7.9 Damping Time Constant Configuration for how to change the numerical value.
When the setting is out of the limit, an alarm will be generated.

7.7.9 Damping Time Constant Configuration

The damping time constant for the amplifier assembly can be set. Quick Response Parameter is automatically set to ON when the damping time constant is set to less than 0.5 seconds. Damping time constant is rounded off to two decimal places.



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During setting, the digit being edited flashes. Turning the zero-adjustment screw cycles through: value → r (return to previous digit) → . (dot) → value... Pressing the push button confirms the value and moves editing to the next digit. If a dot is to the left of the digit being edited, the dot cannot be selected.

7.7.10 Output Mode Configuration

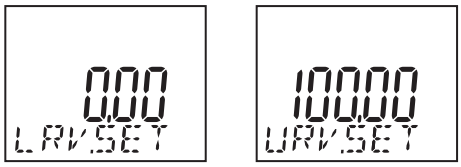
Pressure Output Mode (linear, square root or signal characterizer) can be selected by turning the zero-adjustment screw. Please refer to 7.7.7 Pressure Unit Configuration for how to select and set the enumerated value.

7.7.11 Display Out 1 Configuration

Display Out1 can be selected by turning the zero-adjustment screw. Available options include: differential pressure/pressure (PRESS), static pressure value (ST.PRES), sensor temperature value (SNSR.T), differential pressure/pressure % value (PRESS.%), static pressure % value (ST. PRS.%), user scale value (ENGR), output current mA value (OUTPUT). Please refer to 7.7.7 Pressure Unit Configuration for how to select and set the enumerated value.

7.7.12 Re-range by Applying Actual Pressure (LRV/URV)

This feature allows the lower and upper range values to be setup with the actual input applied.



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Follow the procedure below to change the LRV and URV settings.

[Example]

Rerange LRV to 0 and URV to 3 MPa.

(1) Connect the transmitter and apparatus as shown in Figure 8.1/8.2 and warm it up for at least 5 minutes.

(2) Enter the local parameter setting mode, and then display the Actual Pressure Range Reset “LRV.SET/URV.SET” screen.

(3) Apply a pressure of 0 kPa (atmospheric pressure) to the transmitter. (Note 1)

(4) Turn the zero-adjustment screw in the desired direction. The integral indicator displays the output signal in %. (Note 2)

(5) Press the push button as it is to save. This completes the setting of the lower limit (LRV). (Note 3)

(6) Press the push-button. The integral indicator then displays “URV.SET.”

(7) Apply a pressure of 3 MPa to the transmitter. (Note 1)

(8) Turn the zero-adjustment screw in the desired direction. The integral indicator displays the output signal in %. (Note 2)

(9) Press the push button as it is to save. This completes the upper limit (URV) settings. (Note 3)

(10) Press the push-button. The transmitter then switches back to the normal operation mode with the measurement range of 0 to 3 MPa.

Note 1: Wait until the pressure inside the pressure-detector section has stabilized before proceeding to the next step.
Note 2: If the pressure applied to the transmitter exceeds the previous LRV (or URV), the analog output fluctuates. After setting, if an error number is displayed, take the appropriate measure in reference to Subsection 8.6.3 “Abnormal Conditions and Countermeasures” and the “Errors and Countermeasures” section in each communication manual.
Note 3: You can also change the value using zero-adjust screws. Please refer to 7.7.9 “Damping Time Constant Configuration” for how to change the numerical value.

7.7.13 Abnormal Output Direction

By turning the zero-adjustment screw, you can select the output direction (High/Low) in case of abnormality.

7.7.14 Write Protection

The Software Write Protect password can be set Local Parameter Settings (LPS). The password can be set to a maximum of 16 characters, using uppercase letters, lowercase letters, and numbers.
Setting a password while the feature is disabled (OFF) will enable (ON) Software Write Protect.
Entering the previously set password while the feature is enabled (ON) will disable (OFF) it.
However, if the hardware switch is enabled (ON), the feature will remain enabled (ON).

7.7.15 Displaying Device Information

By pressing the pushbutton, the model name, communication protocol, device revision, and software revision are displayed in order.

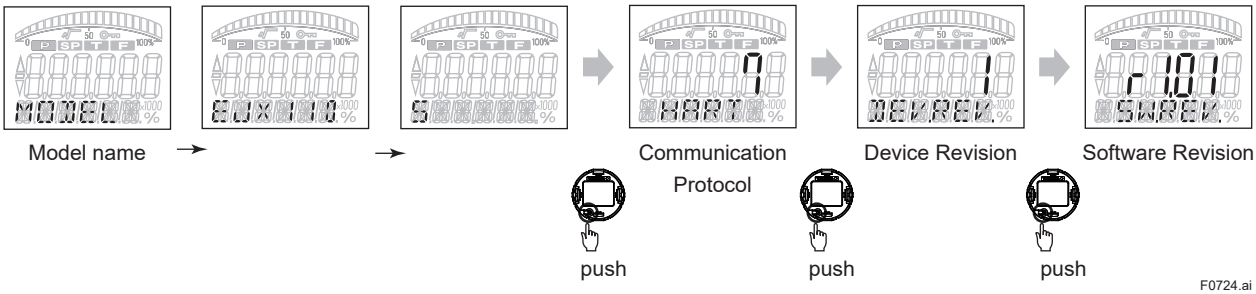
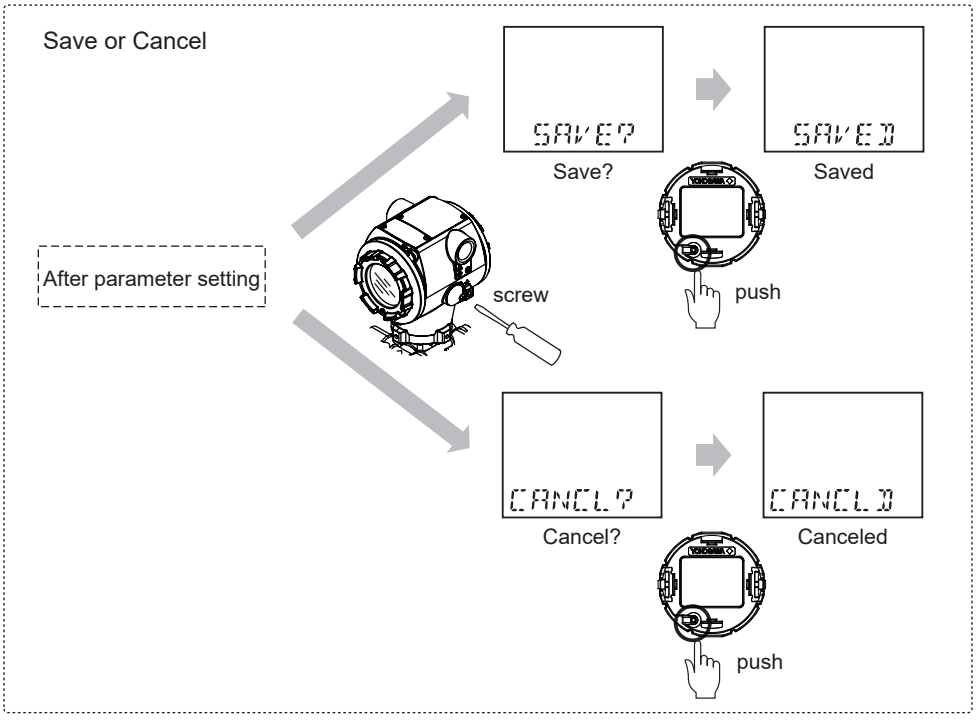


Figure 7.14 Example

7.7.16 Save or Cancel

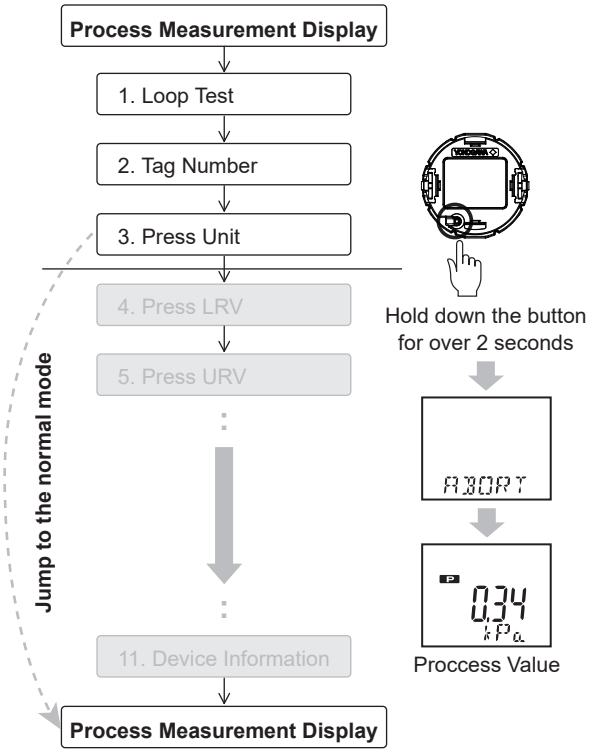
At the end of each parameter setting, select “Save” or “Cancel” by the zero-adjustment screw and press the push button to save or cancel the configuration.



7.7.17 Abort Configuration

7.7.17.1 Abort Configuration (Menu)

Hold down the push button for over 2 seconds to exit the Local Parameter Setting mode.



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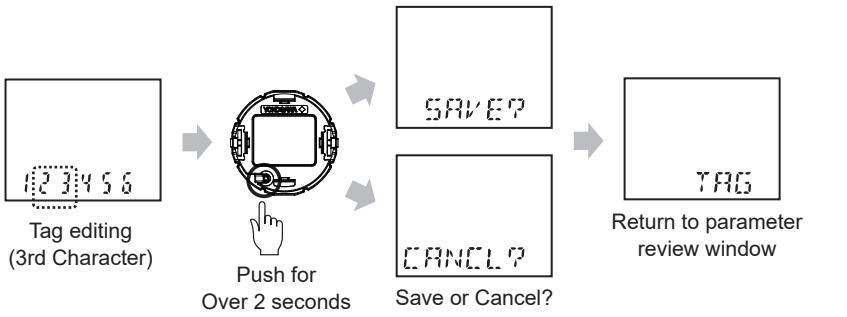
7.7.17.2 Abort Configuration (Parameter)

To exit the configuration while editing the value, hold down the push button for over 2 seconds and select “Save” or “Cancel.”



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7.7.18 Local Parameter Setting Lock

There are two ways to disable parameter changes in the local parameter settings.

	Protected features
Zero-adjustment screw, prohibit push-button operation (Local Operation Enable=Disable)	• External Zero Adjustment • Local Parameter Setting
Set the hardware write-protect switch or the software write-protect switch to the “write-disabled” .	• Local Parameter Setting • All Communication Parameters *

* Zero-adjustment screw are not locked.

Other than the hardware write protect setting switch is set using the Parameter Setting tool. For configuration instructions, refer to the HART Communication Instruction Manual (IM 01C33A10-01EN).
Even if Write Protection is enabled, you can still check the settings of local parameters with the push button on the display.

7.8 Graphic Display Local Parameter Setting (LPS)

WARNING

Do not use the display push buttons in hazardous areas where flammable gases or vapors are generated. If you need to use the pushbuttons, operate them in a place where there is no danger. Especially for explosion-proof instruments, be sure to read the instruction manual for each explosion-proof device as well.

IMPORTANT

- Do not turn off the transmitter immediately after parameter setting. If you turn off the power within 10 seconds of performing this procedure, the parameters will return to their previous settings.
- To make this setting, the parameter to allow/disallow external zeroing (Local Operation Enable) must be set to Enabled. For configuration instructions, refer to each communication IM. Please note that if the additional specification codes CK or /CJ are attached, it is set to “Disabled”.
- If the ambient temperature is low, it will take longer for the LCD to update. It is recommended to use the LPS function at -10°C or higher.

7.8.1 LPS Overview (Graphic Display)

The configuration with a zero-adjustment screw and a pushbutton allows for quick setting and confirmation of the following parameters: (In the case of PROFINET communication type, only confirmation)

■ **HART communication type**

Loop Test (Test Output), Tag Number Setting, Measurement Range Unit Setting, Lower Limit of Measurement Range (LRV), Upper Limit of Measurement Range (URV), Constant Setting of Damping, Setting Output Mode (Linear/Square-root), Selecting Process Display, Resetting Range Using Real Pressure (LRV/URV), Burnout Direction (High/Low), ON/OFF Software Write Protection, Equipment Information, Multiple Display*, Backlight Color*, Display Rotation*, Language*, LCD Contrast*

■ **PROFINET communication type**

Vendor ID, Device ID, Device Name , IP Address, Multiple Display*, Backlight Color*, Display Rotation*, Language*, LCD Contrast*

* These are dedicated parameters configurable only via LPS.

NOTE

Multiple Display, Backlight Color, Display Rotation, Language and LCD Contrast are dedicated parameters configurable only via LPS.

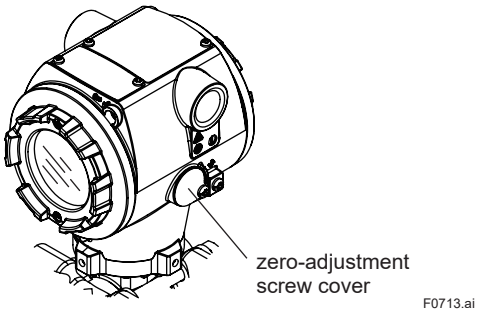


Figure 7.15 Zero-adjustment screw

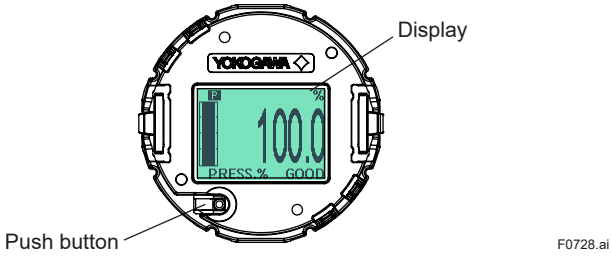


Figure 7.16 Push button

■ HART communication type

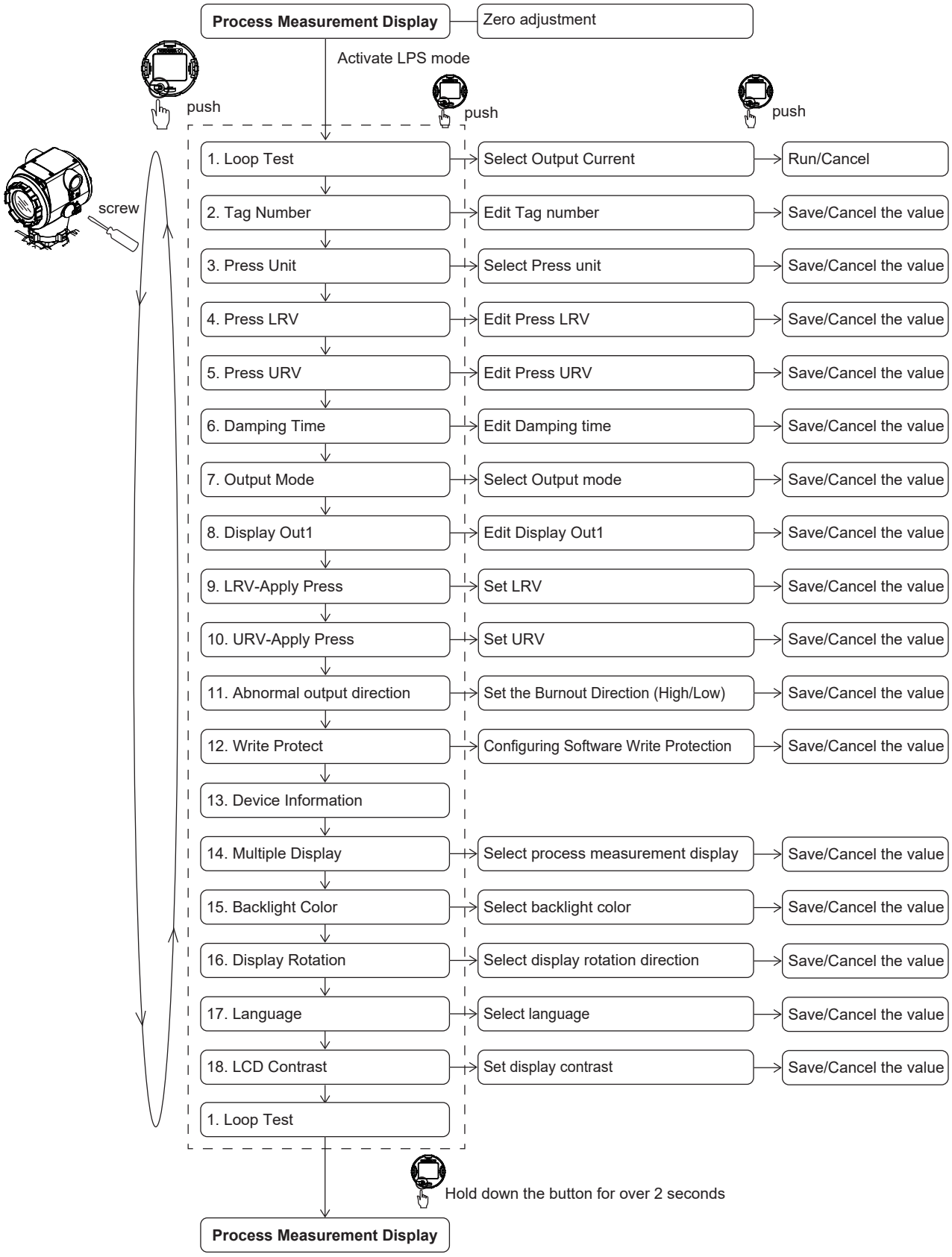


Figure 7.17 LPS Settings (HART communication type)

■ PROFINET communication type

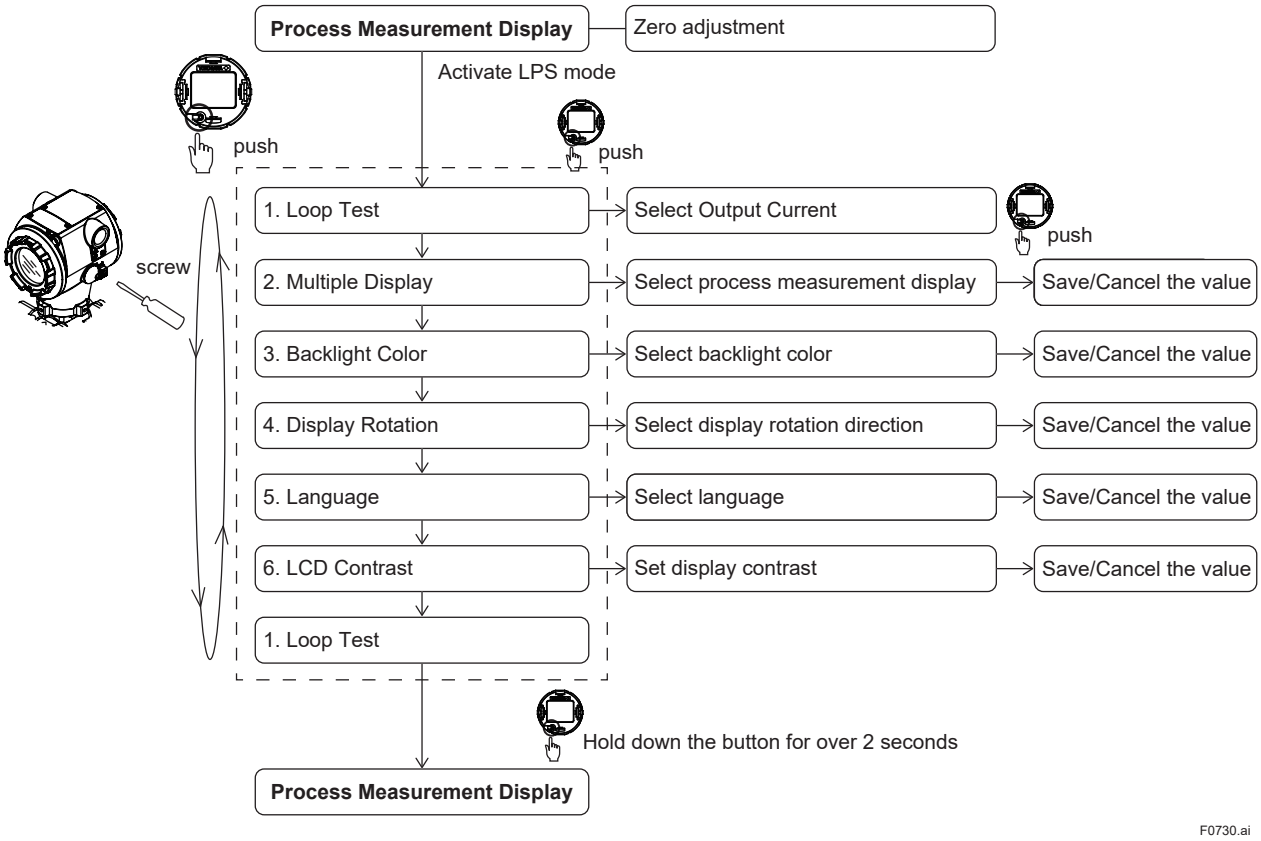


Figure 7.18 LPS Settings (PROFINET communication type)

7.8.2 Graphic Display Content

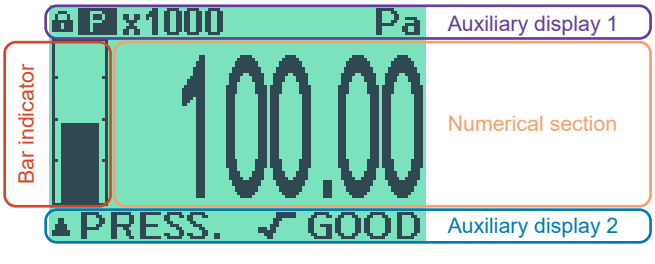


Figure 7.19 Each Section of Display

Table 7.2 Information on Display

Section	Descriptions	
Bar indicator	Displays a scale indicating the percentage obtained by scaling the numeric value shown at the center of the display within the specified range. For a single-screen display, the scale is divided into 55 segments; for a dual-screen display, it is divided into 35 segments.	
Numerical section	Displays input and output values.	
Auxiliary display 1	Key icon	Illuminates when Write Protection is activated.
	P	Illuminates when the value is pressure.
	SP	Illuminates when the value is static pressure.
	T	Illuminates when the value is temperature.
	F	Illuminates when the value is flow. Not applicable for HART communication.
	×10 ×100 ×1000	Illuminates when Exponent Mode is set.
	Unit	Displays the units for the numerical section.
Auxiliary display 2	▲ ▼	Illuminates the direction in which the zero-adjustment screw was turned.
	●	Pressing the push button in local parameter setting will display it.
	PRESS.	Parameter name or Tag number are displayed. The contents are displayed alternately. Not applicable for HART communication.
	√	Illuminates when the square root display is selected.
	Status	Displays the status of the numerical section. HART: GOOD, FIXED, POOR, BAD PROFINET: GOOD, UNCTN, BAD

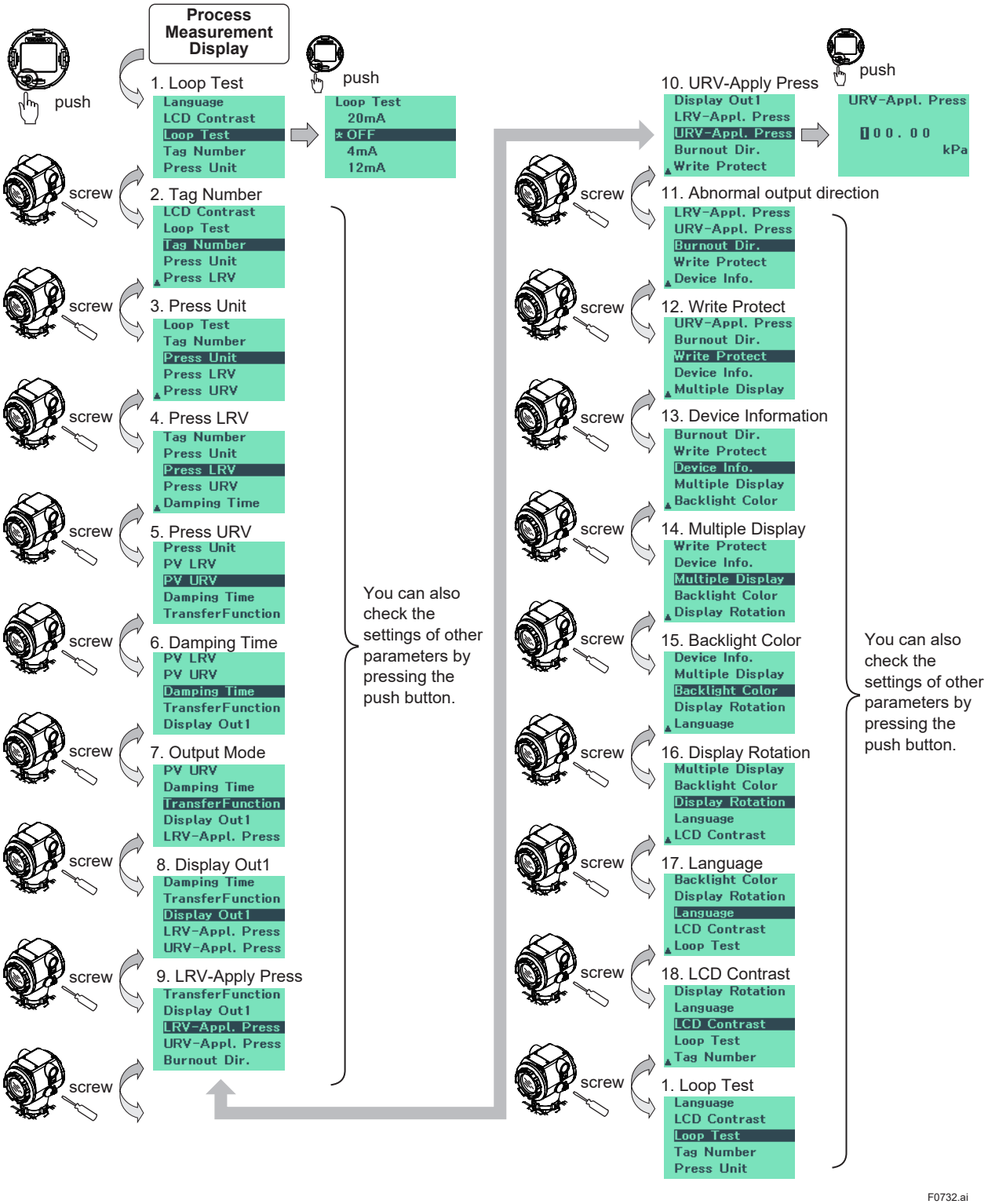
7.8.3 Enabling Local Parameter Settings

Press the push button on the display to activate the local parameter setting mode. After 10 minutes of inactivity, the transmitter will automatically exit the local parameter setting mode.

7.8.4 Checking Parameter Settings

The following section describes the case of HART communication type.
Each time the zero-adjustment screw is turned, the following parameters will be displayed with highlighting; loop test (test output), tag number setting, pressure unit selection, lower range value (LRV), upper range value (URV), damping time constant setting, output mode (liner/square root/ signal characterizer) selection, display output1 (DispOut1) selection, range resetting using real pressure (LRV/URV), analog alarm selection, write protection , the current setting value of each parameter in the equipment information, multiple display selection, backlight color selection, display rotation selection, language selection, and LCD contrast selection. When the push button is pressed while a parameter is highlighted, the current setting value of the highlighted parameter can be checked.

Depending on the direction in which the zero-adjustment screw is turned, you can move to the next parameter or return to the previous one. When the push button is held for more than 2 seconds in the menu display, the screen returns to the process measurement display.
(See Subsection 7.8.22)



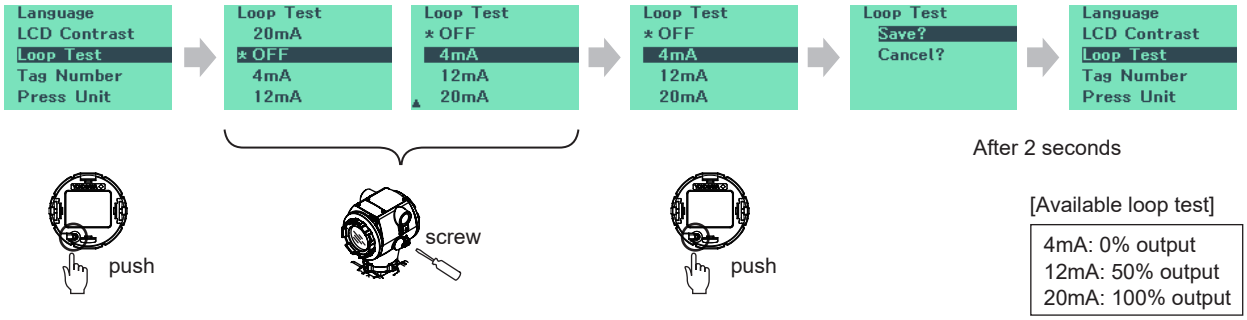
F0732.ai

To set the value of each parameter, press the push button on each parameter screen and then put it into local parameter setting mode.

To finish setting local parameters, see Subsection 7.8.21, “Save or Cancel” and Subsection 7.8.22, “Abort Configuration”.

7.8.5 Loop Test Configuration (Loop Test)

Loop test configuration can be changed as below. Output current value (4 mA, 12 mA or 20 mA) for Loop test can be selected by turning the zero-adjustment screw.
Selecting OFF will end the loop test. During loop testing, the backlight color changes to the simulation alarm color.



[Available loop test]

4mA: 0% output
12mA: 50% output
20mA: 100% output

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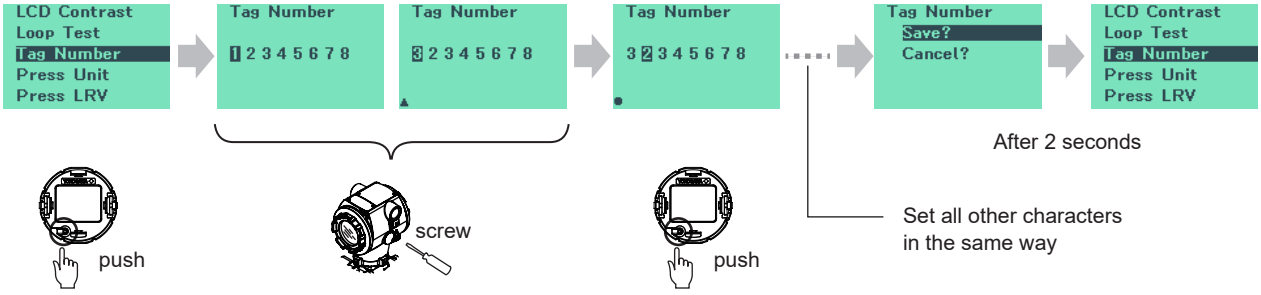
7.8.6 Tag Number Configuration (Tag Number)

Tag Number is edited by turning the zero-adjustment screw. Up to 8 alphanumeric characters for HART can be set.



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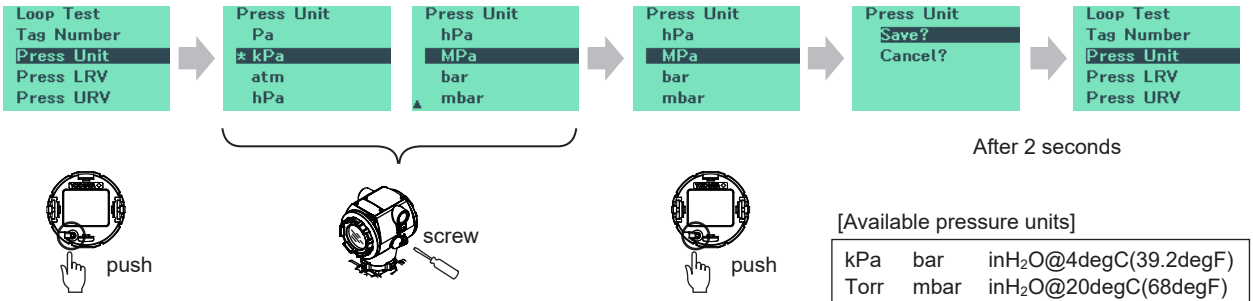
7.8.7 Pressure Unit Configuration (Press Unit)

Pressure unit for the below table can be changed as below. By turning the zero-adjustment screw, user can scroll between the various available pressure units.



[Available pressure units]

kPa	bar	inH_2O@4degC(39.2degF)
Torr	mbar	inH_2O@20degC(68degF)
atm	g/cm^2	inHg
MPa	kg/cm^2	ftH_2O@4degC(39.2degF)
hPa	Pa	ftH_2O@20degC(68degF)
mmHg		mmH_2O@4degC(39.2degF)
psi		mmH_2O@20degC(68degF)

F0735.ai

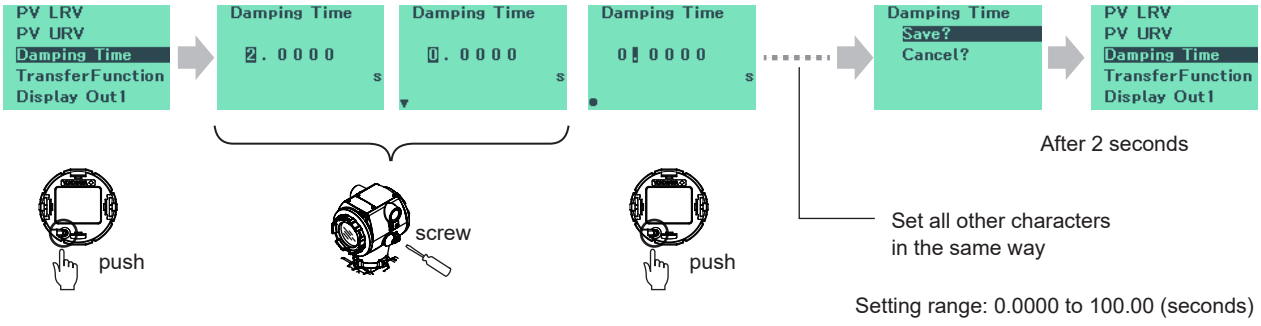
7.8.8 PV LRV/URV Configuration (PV LRV/URV)

PV (Pressure) LRV and URV can be set. The number for each digit is changed by turning the zero-adjustment screw and set by pressing the push button. Please refer to 7.8.9 “Damping Time Constant Configuration” for how to change the numerical value.

When the setting is out of the limit, an alarm will be generated.

7.8.9 Damping Time Constant Configuration (Damping Time)

The damping time constant for the amplifier assembly can be set. Quick Response Parameter is automatically set to ON when the damping time constant is set to less than 0.5 seconds. Damping time constant is rounded off to two decimal places.



F0736.ai

During setting, the digit being edited flashes. Turning the zero-adjustment screw cycles through: value → r (return to previous digit) → . (dot) → value... Pressing the push button confirms the value and moves editing to the next digit. If a dot is to the left of the digit being edited, the dot cannot be selected.

7.8.10 Output Mode Configuration (Transfer Function)

Pressure Output Mode (linear or square root or signal characterizer) can be selected by turning the zero-adjustment screw. Please refer to 7.8.7 “Pressure Unit Configuration” for how to select and set the enumerated value.

7.8.11 Display Out1 Configuration (Display Out1)

Display Out1 can be selected by turning the zero-adjustment screw. Available options include: differential pressure/pressure (PRESS), static pressure value (ST.PRES), sensor temperature value (SNSR.T), differential pressure/pressure % value (PRESS.%), static pressure % value (ST. PRS.%), user scale value (ENGR), output current mA value (OUTPUT). Please refer to 7.8.7 “Pressure Unit Configuration” for how to select and set the enumerated value.

7.8.12 Re-range by Applying Actual Pressure (LRV-Appl. Press/URV-Appl. Press)

This feature allows the lower and upper range values to be setup with the actual input applied.

F0737.ai

Follow the procedure below to change the LRV and URV settings.

[Example]

Rerange LRV to 0 and URV to 3 MPa.

(1) Connect the transmitter and apparatus as shown in Figure 8.1/8.2 and warm it up for at least for 5 minutes.

(2) Enter the local parameter setting mode, and then display the Actual Pressure Range Reset “LRV-Appl.Press/URV-Appl.Press” screen.

(3) Apply a pressure of 0 kPa (atmospheric pressure) to the transmitter. (Note 1)

(4) Press the push button. The display will show the current pressure value. (Note 2)

(5) Press the push button as it is to save. This completes the setting of the lower Range Value (LRV). (Note 3)

(6) Press the push button, then turn the zero-adjustment screw until “URV-Appl. Press” appears highlighted on the display.

(7) Apply a pressure of 3 MPa to the transmitter. (Note 1)

(8) Press the push button. The display will show the current pressure value. (Note 2)

(9) Press the push button as it is to save. This completes the setting of the upper Range Value (URV). (Note 3)

(10) Press the push-button. The transmitter then switches back to the normal operation mode with the measurement range of 0 to 3 MPa.

Note 1: Wait until the pressure inside the pressure-detector section has stabilized before proceeding to the next step.
Note 2: If the pressure applied to the transmitter exceeds the previous LRV (or URV), the analog output fluctuates. After setting, if an error number is displayed, take the appropriate measure in reference to Subsection 8.6.3 “Abnormal Conditions and Countermeasures” and the “Errors and Countermeasures” section in each communication manual.
Note 3: You can also change the value using zero-adjust screws. Please refer to 7.8.9 “Damping Time Constant Configuration” for how to change the numerical value.

7.8.13 Abnormal output Direction (Burnout Dir.)

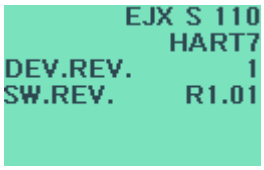
By turning the zero-adjustment screw, you can select the output direction (High/Low) in case of abnormality. Please refer to 7.8.7 “Pressure Unit Configuration” for how to select and set the enumerated value.

7.8.14 Write Protection (Write Protect)

The Software Write Protect password can be set Local Parameter Settings (LPS). The password can be set to a maximum of 16 characters, using uppercase letters, lowercase letters, and numbers.
Setting a password while the feature is disabled (OFF) will enable (ON) Software Write Protect.
Entering the previously set password while the feature is enabled (ON) will disable (OFF) it.
However, if the hardware switch is enabled (ON), the feature will remain enabled (ON).

7.8.15 Device Information (Device Info.)

The model, communication protocol, device revision, and software revision will be displayed.



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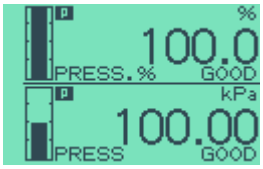
7.8.16 Multiple Display Selection (Multiple Display)

By turning the zero-adjustment screw, you can select the Multiple Display(single/dual) in case of measurement display. Please refer to 7.8.7 “Pressure Unit Configuration” for how to select and set the enumerated value.

Single



dual

F0739.ai

7.8.17 Backlight Color Selection (Backlight Color)

By turning the zero-adjustment screw, you can select the Backlight Color (White, Light green, Pink, Light purple). Please refer to 7.8.7 “Pressure Unit Configuration” for how to select and set the enumerated value.

White

Light green

Pink

Light purple

F0740.ai

7.8.18 Display Rotation Selection (Display Rotation)

By turning the zero-adjustment screw, you can select the Display Rotation (normal, upside down). Please refer to 7.8.7 “Pressure Unit Configuration” for how to select and set the enumerated value.

Normal Upside down

F0741.ai

7.8.19 Language Selection (Language)

By turning the zero-adjustment screw, you can select the Language (ENGLISH/FRANÇAIS/DEUTSCH/ITALIANO/ESPAÑOL/PORTUGUÊS/PYCCKNŇ/中文/日本語). Please refer to 7.8.7 “Pressure Unit Configuration” for how to select and set the enumerated value.

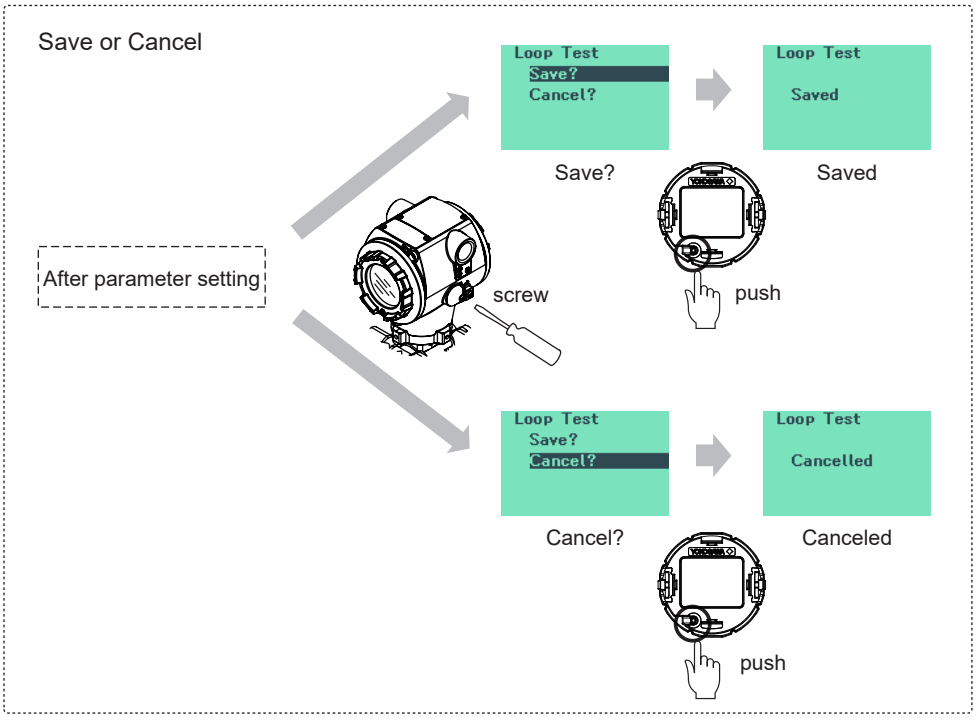
The display languages are English, French, German, Italian, Spanish, Portuguese, Russian, Chinese, and Japanese. The language corresponds to the parameter name and selection in the local parameter setting mode, as well as the alarm name.

7.8.20 Contrast Selection (LCD Contrast)

The display contrast can be adjusted in five levels. By turning the zero-adjustment screw, you can select the screen contrast (1, 2, 3, 4, 5).

7.8.21 Save or Cancel

At the end of each parameter setting, select “Save” or “Cancel” by the zero-adjustment screw and press the push button to save or cancel the configuration.



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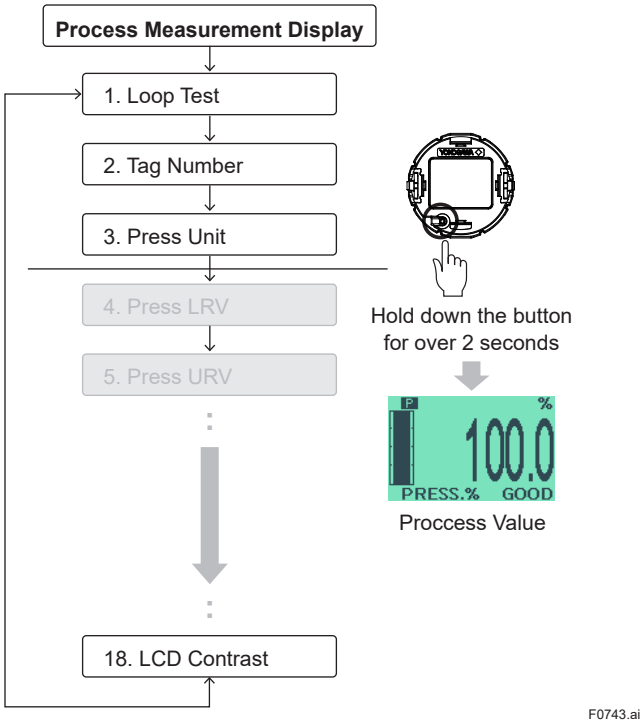
7.8.22 Abort Configuration

7.8.22.1 Abort Configuration (Menu)

Hold down the push button for over 2 seconds to exit the Local Parameter Setting mode.



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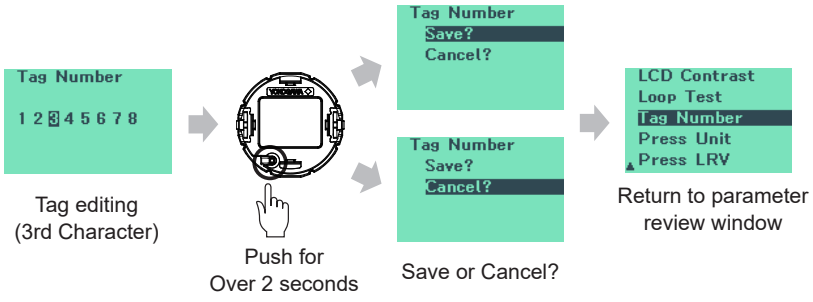
7.8.22.2 Abort Configuration (Parameter)

To exit the configuration while editing the value, hold down the push button for over 2 seconds and select “Save” or “Cancel.”



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7.8.23 Local Parameter Setting Lock

There are two ways to disable parameter changes in the local parameter settings.

	Protected features
Zero-adjustment screw, prohibit push-button operation (Local Operation Enable=Disable)	• External Zero Adjustment • Local Parameter Setting
Set the Hardware Write Protect Settings switch to non-writable	• Local Parameter Setting • All Communication Parameters *

* Zero-adjustment screw are not locked.

The above parameters are set using the Parameter Setting tool. For configuration instructions, refer to the HART Communication Instruction Manual (IM 01C33A10-01EN).
Even if Write Protection is enabled, you can still check the settings of local parameters with the push button on the display.

8. Maintenance

8.1 Overview

WARNING

- When removing the condensation or gas in the pressure part of the transmitter, if the process fluid is harmful to the human body, be careful not to adhere the fluid to the skin or eyes, or to inhale the effluent gas.
- If the process fluid is harmful to the human body, handle this instrument carefully even after removing it from the line for maintenance, etc., and be careful not to adhere to the human body or inhale residual gases.

Each part of this device is unitized, so it can be easily maintained. This chapter describes the procedures for disassembly and assembly work necessary for calibration, adjustment, and replacement of parts necessary for the maintenance of this device.
This device is a high-precision device, so please read the instructions for each item below carefully and handle it correctly when maintaining it.

IMPORTANT

- As a general rule, please perform maintenance on this device in the maintenance room where the necessary equipment is prepared.
- Handling of the main module The main module uses some parts that are functionally damaged by static electricity. Therefore, when handling the device, use a ground band to prevent static and take great care not to directly touch each electronic component or circuit. Also, take measures such as putting the removed main module in an anti-static bag.

8.2 Selection of Calibration Equipment

Table 8.1 lists this instrument required for calibration of this instrument and the recommended products for our equipment. Please select and use equipment that can calibrate or adjust the transmitter to the accuracy according to the purpose of use. When using calibration equipment, please use one that has sufficiently maintained the performance of each instrument.

Table 8.1 Instruments Required for Calibration

Nam	Calibration instrument specifications	Remarks
Power supply	Distributor	4 to 20 mA DC signal
Load resistor	Standard resistor [250 Ω ±0.005%, 3 W]	
Voltmeter	Digital multimeter Accuracy (10V DC range): ±(0.002% of rdg + 1 dgt)	
Digital manometer	Precision digital manometer 1) For 10 kPa class Accuracy: ±(0.015% of rdg + 0.0015 kPa) . . for 0 to 10 kPa 2) For 200 kPa class Accuracy: ±0.02% of rdg . . . . . for 25 to 200 kPa ±0.005 kPa . . . . . for 0 to 25 kPa 3) For 1000 kPa class Accuracy: ±(0.02% of rdg + 3 digits) . . . . . for 100 to 1000 kPa ±0.05 kPa . . . . . for 0 to 100 kPa 4) For 3500 kPa class Accuracy: ±(0.02% of rdg + 0.10 kPa). . . . . for 0 to 3500 kPa 5) For 130 kPa abs class Accuracy: ±(0.03% of rdg + 0.006 kPa). . . . . for 0 to 130 kPa abs	Select a manometer having a pressure range close to that of the transmitter.
Pressure generator	Pneumatic pressure standard for 200 kPa {2 kgf/cm^2}, 25 kPa {2500 mmH_2O} Accuracy: ±0.05% of F.S.	Requires air pressure supply.
	Dead weight gauge tester 25 kPa {2500 mmH_2O} Accuracy: ±0.03% of setting	Select the one having a pressure range close to that of the transmitter.
Pressure source	Pressure regulator (pressure pump) Pressure range: 0 to 133 kPa {1000 mmHg}	Prepare the vacuum pump for negative pressure ranges.

Note: The above table contains the instruments capable of performing calibration to the 0.2% level. Since special maintenance and management procedures involving traceability of each instrument to higher-level standards are required for calibration to the 0.1% or higher level, there may be difficulties in calibration to this level in the field. For calibration to the 0.1% level, contact Yokogawa representatives from which the instrument was purchased or the nearest Yokogawa office.

8.3 Calibration

If you want to check the operation or accuracy of this device, such as during regular maintenance or fault search, please follow the following steps.

(1) Connect each device as shown in Figure 8.1 and 8.2 and let it warm up for at least 5 minutes.

NOTE

1. When adjusting this instrument to a high degree of accuracy, adjust the power supply voltage, lead wire, etc. to a load resistance similar to the state in which the transmitter is installed.
2. If 0% of the measuring range is transitioning to 0 kPa or in a positive direction, apply a reference pressure to the high-pressure side as shown in the figure below. If 0% of the measuring range is transitioned in the negative direction, in the case of a differential pressure gauge, a reference pressure is applied to the low pressure side. In the case of a pressure gauge, a vacuum pump is used to apply a negative pressure reference pressure.

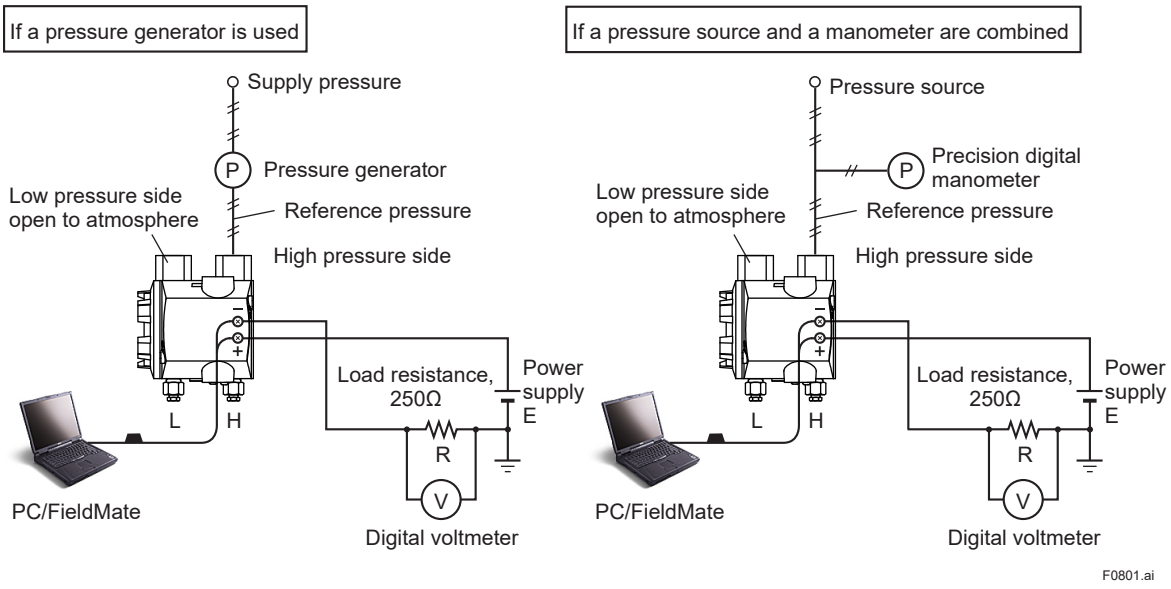


Figure 8.1 Connecting Devices (EJX110S)

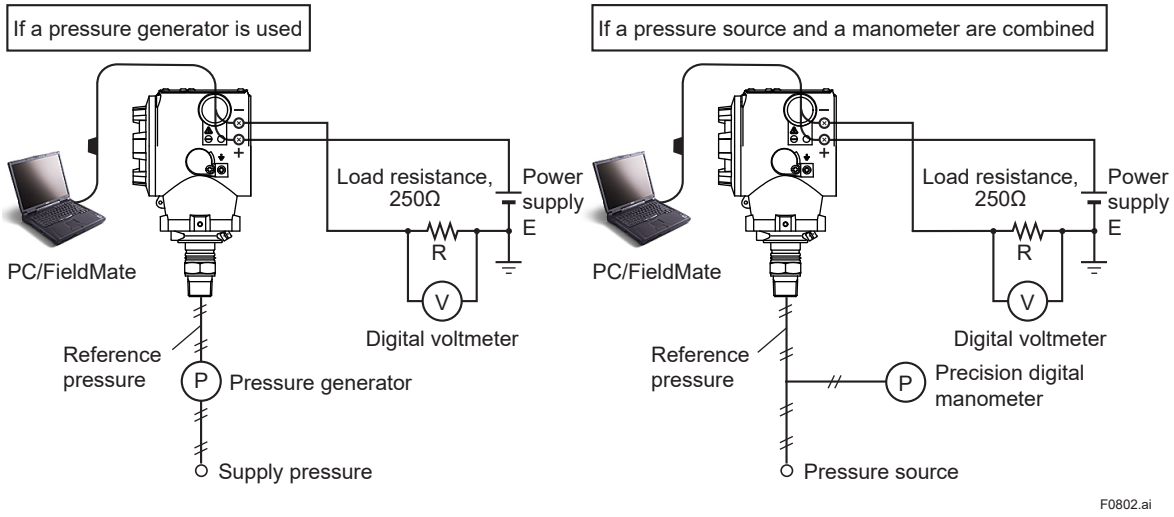


Figure 8.2 Connecting Devices (EJX530S)

(2) Apply reference pressures of 0%, 50%, and 100% of the measurement range to the transmitter. Calculate the errors (differences between digital voltmeter readings and reference pressures) as the pressure is increased from 0% to 100% and is decreased from 100% to 0%, and confirm that the errors are within the required accuracy.

Note: If the output mode is “Open Flat”, add a reference pressure equivalent to 0, 6.25, 25, 56.25, and 100% of the measuring range to the device.

8.4 Disassembly and Assembly

CAUTION

Notes on explosion-proof instruments
When disassembling explosion-proof instruments for parts replacement or maintenance, please contact your nearest sales office.

Instructions are provided for disassembling and assembling each part for part replacement or maintenance work.

CAUTION

Disassembly and assembly work must be done by turning off the power and turning off the pressure. Also, use the right tools.

Table 8.2 shows the tools required for disassembly and assembly of this appliance.

Table 8.2 Tools for Disassembly and Reassembly

Tool	Quantity	Remarks
Phillips screwdriver	1	ISO 8764-1 Tip2 (form PH)
Allen wrenches	3	ISO 2936 Hexagon socket screw keys (each one of nom. 2.5, 3, 4 and 6.) ASME B18.3. One nominal 1/4 Allen wrench (for 1/4NPT bug screen)
Wrench	1	Width across flats, 17 mm
Torque wrench	1	
Adjustable wrench	1	
Socket wrench	1	Width across flats, 16 mm
Tweezers	1	

8.4.1 Display Replacement

■ Remove the display (See Figure 8.3)

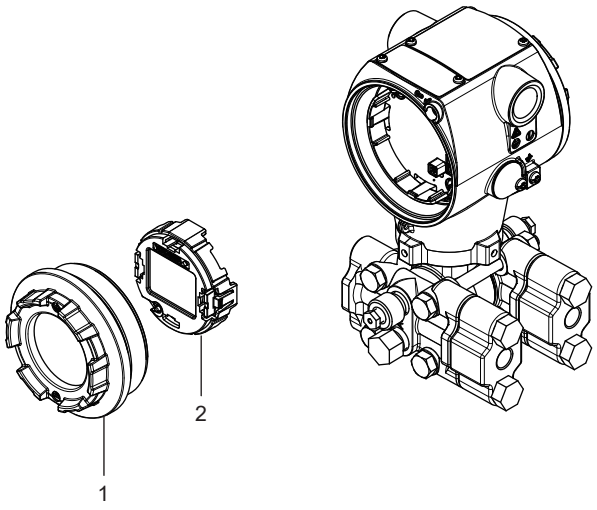
(1) Remove the housing cover with window.
To avoid gnawing problems, place the removed cover with the screw side facing up, or put it in a bag to prevent dust from sticking to it.

(2) Pulling the display straight up while press the knobs on both sides of the display module.

■ Display Installation

(1) Check the mounting direction of the display, align the module on the main unit, and insert it vertically.

(2) Install the housing cover with window.
Please close the housing cover until there are no gaps.



1	Housing cover with window	**2**	Display

Figure 8.3 Installing and Removing the Display

NOTE

It cannot change from an LCD display to a Graphic display, or from a Graphic display to an LCD display.

8.4.2 Replacing the Main Module

NOTE

After replacement, perform verification, adjustment, and calibration according to the following items in this manual.

7.2 Transmitter Status Verification and Parameter Setting
7.3 Zero Point Adjustment and Span Adjustment
8.3 Calibration

However, accuracy of 0.035% cannot be guaranteed. To guarantee accuracy, the instrument must be returned to the factory for calibration.
If parameter settings need to be transferred, follow the replacement procedure for the device: IM 01C33A10-01JA for HART communication models and IM 01C33A11-01JA for PROFINET communication models.
Parameters that cannot be written, such as the instrument number, and some other parameters cannot be transferred.

■ Removing the main module (See Figure 8.4)

(1) Remove the housing cover.
To avoid gnawing problems, place the removed housing cover with the screw side facing up, or put it in a bag to prevent dust from sticking to it. If it has a display, refer to Subsection 8.4.1 to remove it.

(2) Loosen the two mounting screws on the main module.
When loosening, be careful not to drop or lose the screw.

(3) Pull out the main module vertically. At this time, remove the cable connected to the internal board slowly so that it does not break.

(4) Remove the cable from the main module.
The cable is locked, so pull it out while pressing down on the cable connector and cable junction to unlock it.

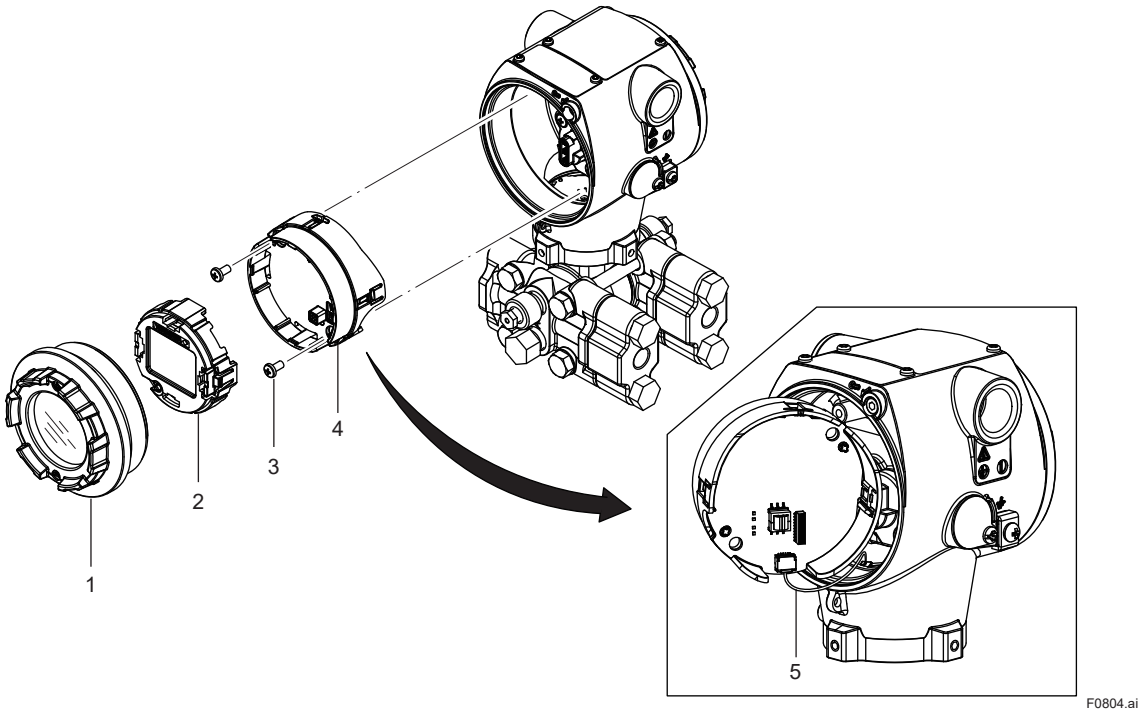
■ Installation of the main module

(1) Connect the cable to the main module.
If the cable is pushed in above a certain level, it will automatically lock.

(2) Snap the main module into the main module, taking care not to interfere with the internal parts.
The cable should be stored in the space on the underside of the internal parts.

(3) Tighten and fix the two screws with a torque of 0.7 N·m.
If it is equipped with a display, refer to Subsection 8.4.1 to install it.

(4) Install the housing cover.
Close the housing cover until there are no gaps.



1	Housing Cover with Window	**3**	Mounting screw	**5**	Cables
2	Display	**4**	Main module		

Figure 8.4 Installing and Removing the Main Module

NOTE

When installing the main module, take care not to pinch any cables between the housing and the main module.

8.4.3 Replacing the Terminal Block Module

For additional specification codes/A, terminal block modules incorporate a surge protection device (SPD).
If there is a possibility of deterioration of the SPD module, such as due to lightning strikes, the terminal block module can be replaced.

The steps are as follows:

■ Removing the terminal block module (See Figure 8.5)

(1) Remove the housing cover.
To avoid gnawing problems, place the removed housing cover with the screw side facing up, or put it in a bag to prevent dust from sticking to it.

(2) Loosen the three screws on the terminal module.
When loosening, be careful not to drop or lose the screw.

(3) Pull out the terminal block module vertically.
Do not reuse the removed terminal block module.

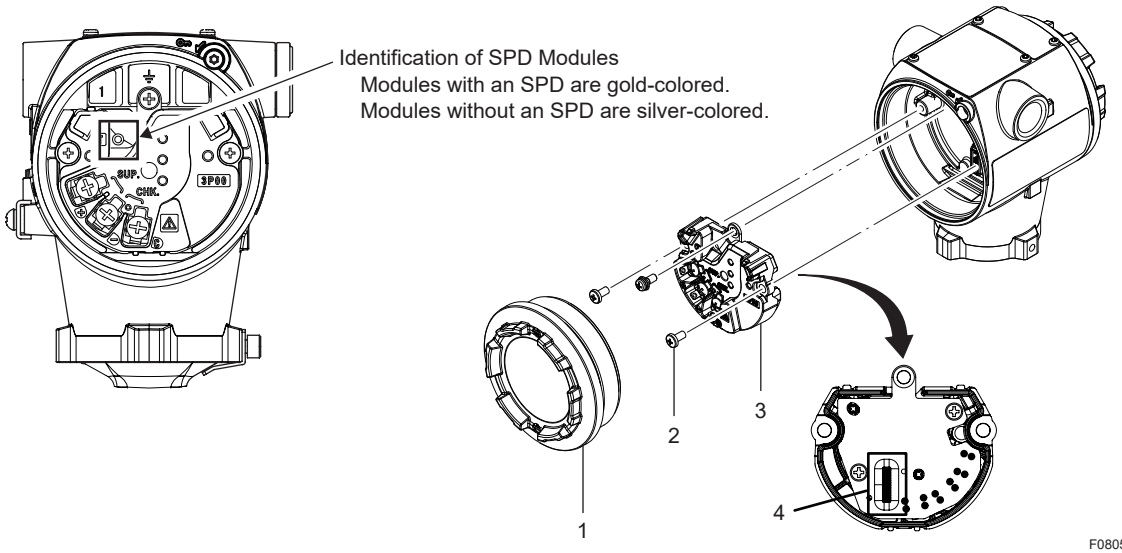
■ Installation of terminal block modules

(1) Plug the terminal block module vertically so that the connector pins do not break.
It should be installed so that it does not touch the liquid gasket, as it is necessary to avoid foreign objects.

(2) Tighten and fix the two screws on the left and right with a torque of 0.7 N·m.

(3) Tighten and fix the inner ground (screw) at the top with a torque of 0.7 N·m.

(4) Install the housing cover.
Please close the housing cover until there are no gaps.



1	Terminal box cover	**3**	Terminal module
2	Mounting screw	**4**	liquid gasket section

Figure 8.5 Installing and Removing the Terminal Block Module

WARNING

When removing a terminal module, always replace it with a new terminal module and install it. Once removed, the terminal module cannot be reused.

8.4.4 Replacing the Process Connector Gasket

CAUTION

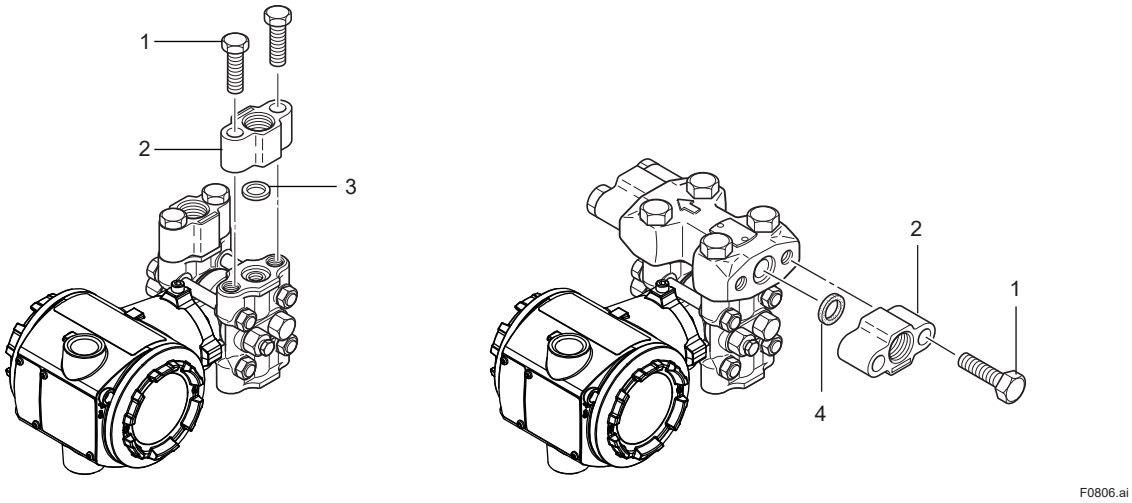
Operating parts other than those shown in Figure 8.6 may cause leakage of the process fluid. Contact Yokogawa service personnel for assistance.

The following are the steps for replacing the gasket of the process connector. (See Figure 8.6) Be sure to use the gasket (O-ring depending on the product) for each product.

(1) Loosen the two bolts and remove the process connector.

(2) Replace the process connector gasket.

(3) Install the process connector.
Ensure that the bolts are evenly tightened with the torque shown in Table 8.3 and that there is no pressure leakage.



1	Bolt	**3**	Process connector gasket (or O-Ring)
2	Process connector	**4**	Process connector gasket

Figure 8.6 Installing and Removing Process Connectors

Table 8.3 Tightening Torque (Process Connectors)

Model	EJX110S, EJX310S, EJX430S (Except for the code on the right)	EJX110S	EJX430S
		Bolts and nuts material code	Capsule range code
		M, P	D
Torque(N·m) {kgf·m}	39 to 49 {4 to 5}	49 to 59 {5 to 6}	49 to 59 {5 to 6}

8.4.5 Cleaning or Replacing the Bug Screen

The following are the steps for cleaning and replacing the bug screen. (See Figure 8.7)

(1) Loosen the bug screen (one screw) with a hexagonal bar spanner (JIS B4648 No. 6 or ASME B18.3 No. 1/4*1*2).

(2) Clean or replace the bug screen. (Tighten with a torque of about 3 N·m)

*1: In the case of EJX110S and EJX430S with additional specification code/BS and process connection ports 0, 1, and 2, please use a hexagonal bar spanner (JIS B4648 No. 6).

*2: For EJX110S and EJX430S with additional specification code /BS, and for process connections 3, 4, and 5, please use a hex bar spanner (ASME B18.3 called 1/4).

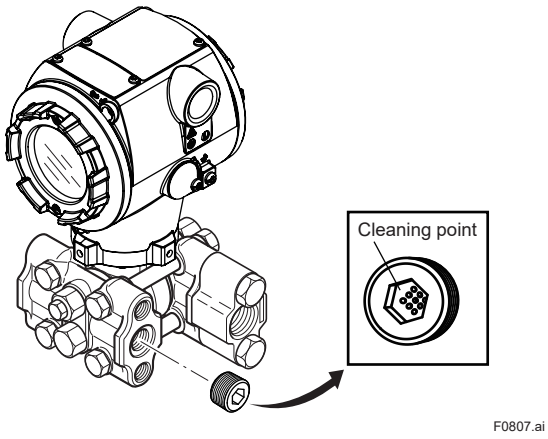


Figure 8.7 Installing and Removing the Bug Screen

IMPORTANT

When cleaning the bug screen, keep the following in mind:
- Do not use chlorine or acidic solutions for cleaning.
- After cleaning, rinse with clean water and dry until the moisture is completely gone.

8.5 About Insulation Resistance Test

IMPORTANT

(1) Even if the test voltage is overvoltage to the extent that it does not cause insulation breakdown, it may compromise safety due to insulation deterioration, so please limit the implementation of this test to the minimum necessary.
(2) The voltage of the insulation resistance test shall be less than 500V DC shall not be applied in the withstand voltage test.
(3) The test will be conducted in the following procedure: At this time, disconnect the wiring of the transmission line.

■ **Procedure for insulation resistance test**

(1) Wiring between the SUPPLY + terminal, the - terminal, and the check terminal of the terminal box.

(2) Connect the insulation resistance meter (power OFF) between the crossing wiring and the grounding terminal. The polarity is the positive electrode for the crossing wire and the negative electrode for the ground terminal.

(3) Turn on the power of the insulation ohmmeter and measure the insulation resistance. The voltage application time should be between 100 MΩ or more.

(4) After the test is completed, remove the insulation resistance gauge and connect a 100 kΩ resistor between the crossing wiring and the grounding terminal to discharge. Discharge for at least 1 second and do not touch the terminals with your bare hands during discharge.

8.6 Troubleshooting

If any abnormality appears in the measured values, use the troubleshooting flow chart below to isolate and remedy the problem. Since some problems have complex causes, these flow charts may not identify all. If you have difficulty isolating or correcting a problem, contact Yokogawa service personnel.

8.6.1 Basic Troubleshooting

First determine whether the process variable is actually abnormal or a problem exists in the measurement system.
If the problem is in the measurement system, isolate the problem and decide what corrective action to take.
This transmitter is equipped with a self-diagnostic function which will be useful in troubleshooting, and the transmitter equipped with an integral indicator will show an alarm code as a result of self-diagnosis.
See Subsection 8.6.3 for the list of alarms.
See also each communication manual.

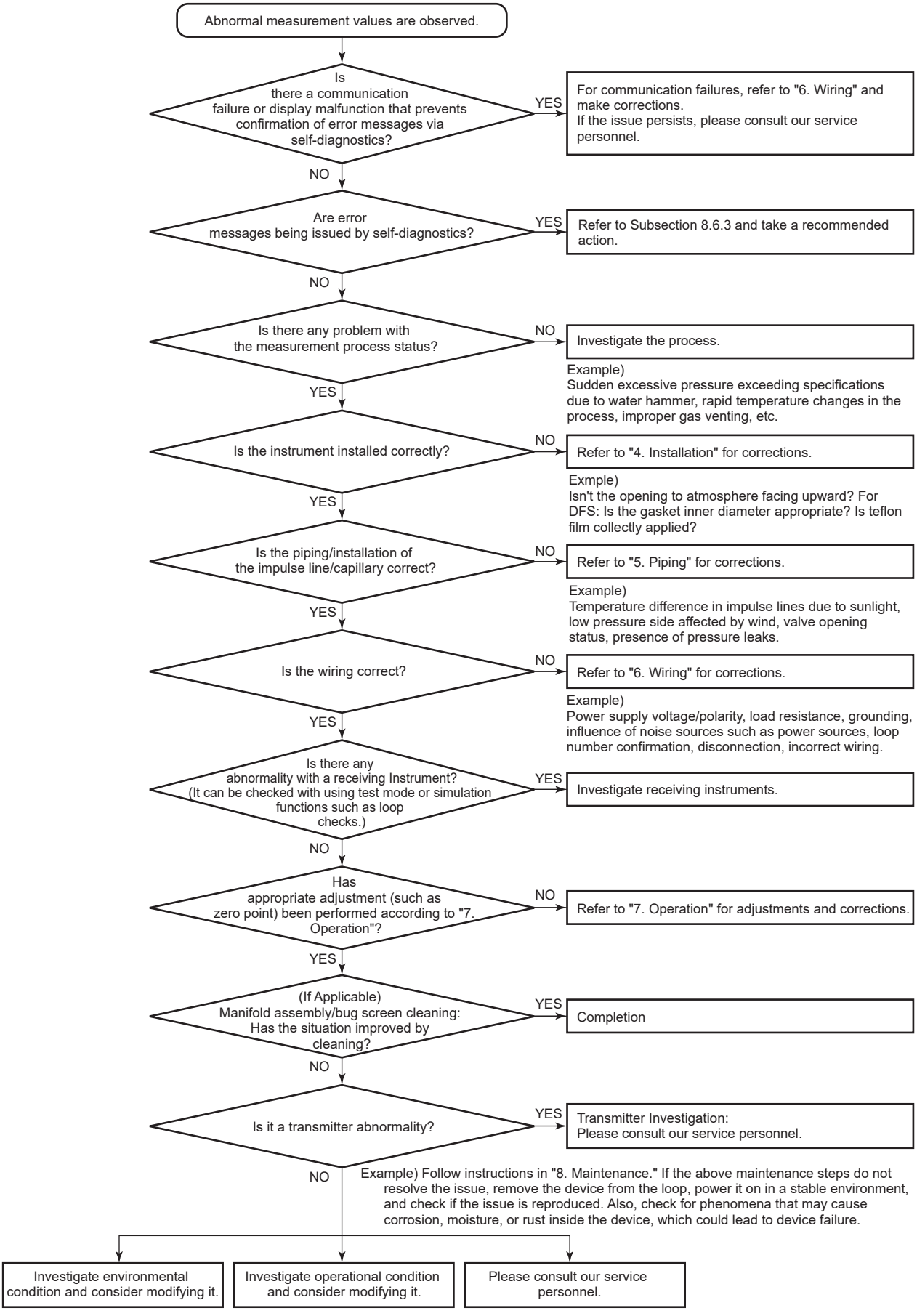
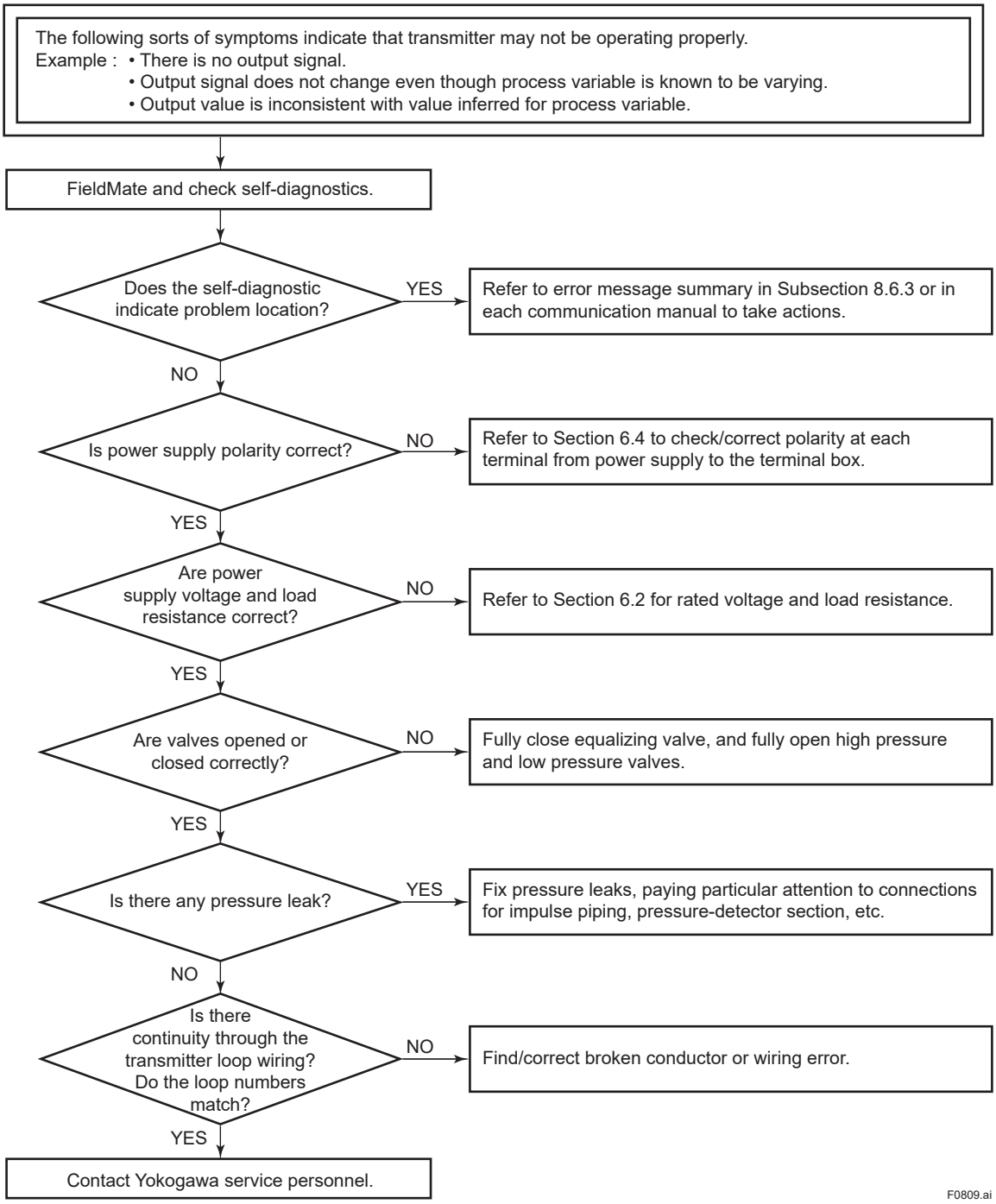


Figure 8.8 Basic Flow and Self-Diagnostics

8.6.2 Troubleshooting Flowcharts



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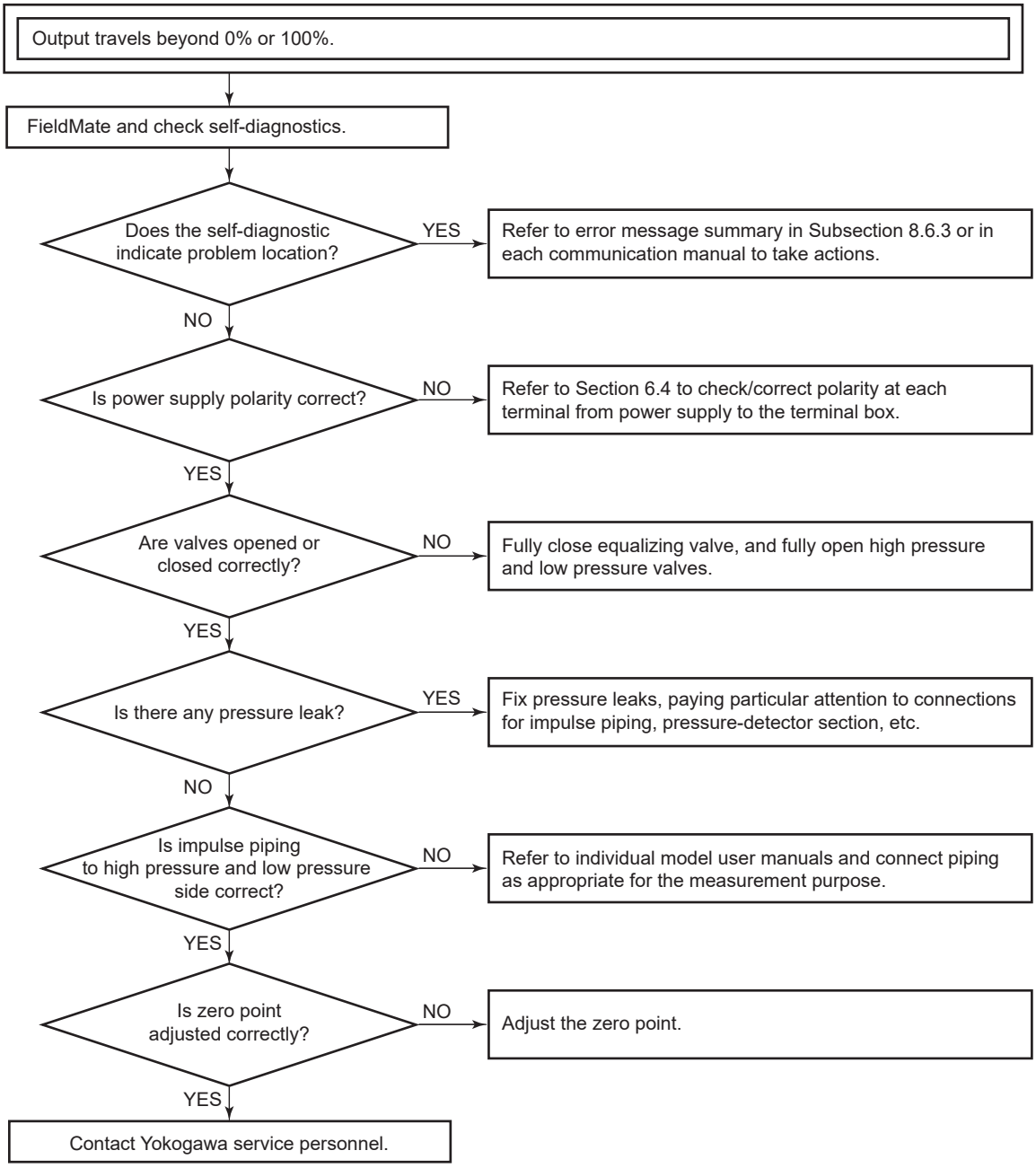
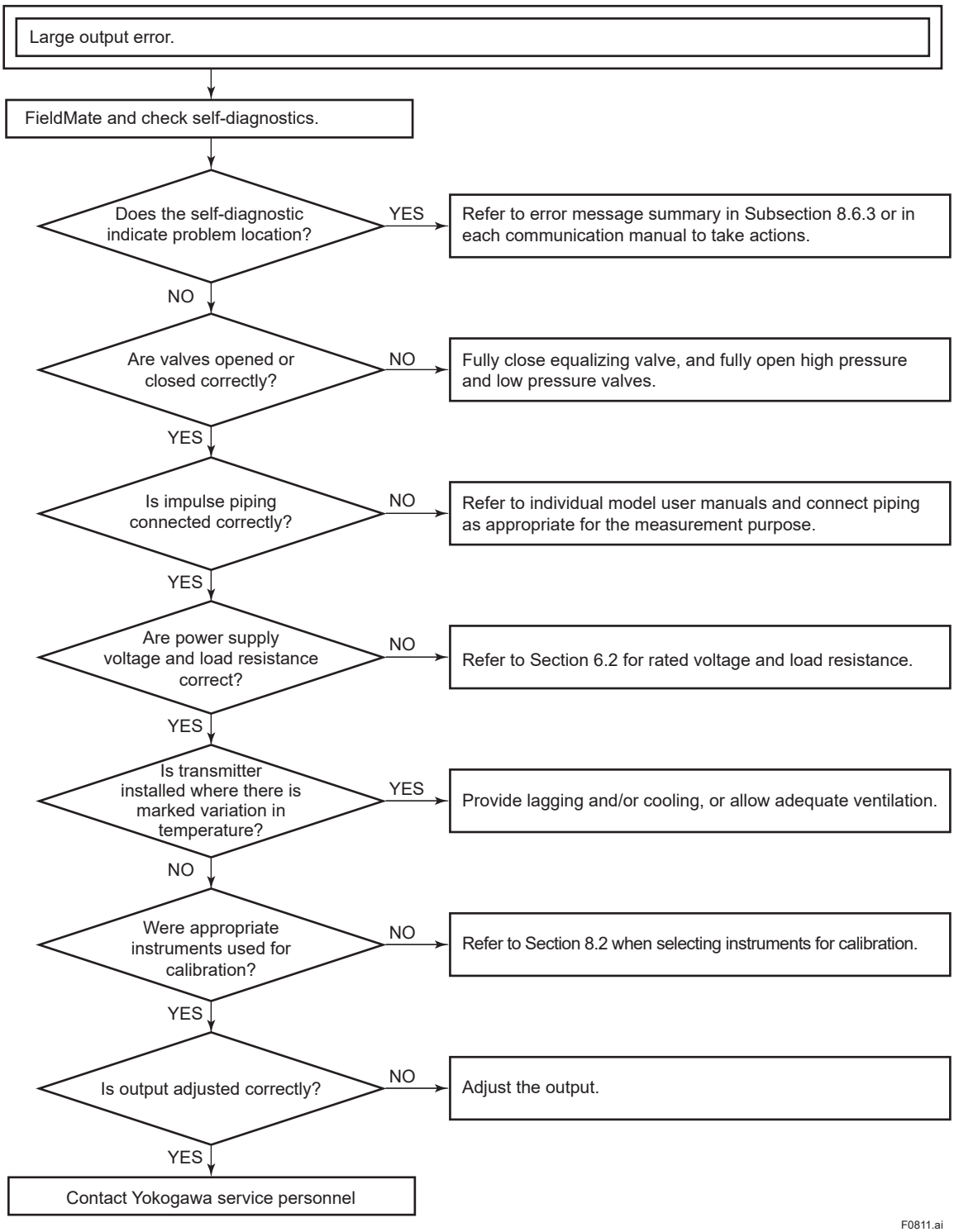

Output travels beyond 0% or 100%.
FieldMate and check self-diagnostics.
Does the self-diagnostic indicate problem location?
YES
Refer to error message summary in Subsection 8.6.3 or in each communication manual to take actions.
NO
Is power supply polarity correct?
NO
Refer to Section 6.4 to check/correct polarity at each terminal from power supply to the terminal box.
YES
Are valves opened or closed correctly?
NO
Fully close equalizing valve, and fully open high pressure and low pressure valves.
YES
Is there any pressure leak?
YES
Fix pressure leaks, paying particular attention to connections for impulse piping, pressure-detector section, etc.
NO
Is impulse piping to high pressure and low pressure side correct?
NO
Refer to individual model user manuals and connect piping as appropriate for the measurement purpose.
YES
Is zero point adjusted correctly?
NO
Adjust the zero point.
YES
Contact Yokogawa service personnel.

F0810.ai


Large output error.
FieldMate and check self-diagnostics.
Does the self-diagnostic indicate problem location?
YES
Refer to error message summary in Subsection 8.6.3 or in each communication manual to take actions.
NO
Are valves opened or closed correctly?
NO
Fully close equalizing valve, and fully open high pressure and low pressure valves.
YES
Is impulse piping connected correctly?
NO
Refer to individual model user manuals and connect piping as appropriate for the measurement purpose.
YES
Are power supply voltage and load resistance correct?
NO
Refer to Section 6.2 for rated voltage and load resistance.
YES
Is transmitter installed where there is marked variation in temperature?
YES
Provide lagging and/or cooling, or allow adequate ventilation.
NO
Were appropriate instruments used for calibration?
NO
Refer to Section 8.2 when selecting instruments for calibration.
YES
Is output adjusted correctly?
NO
Adjust the output.
YES
Contact Yokogawa service personnel

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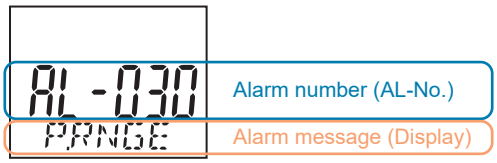
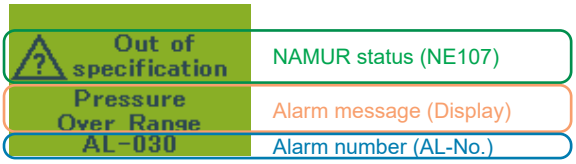
8.6.3 Errors and Countermeasures

• LCD Display Error Message



• Graphic Display Error Message



F0812.ai

Table 8.4 Alarm Message Summary

HART	PROFINET	NE107	AL-No. Display	Graphic Display	Alarm name	Cause	Error handling
O	O	F	AL-001 SENSOR	Pressure Sensor Module Error	Pressure Sensor Module Error	Pressure Sensor Module problem.	Contact the nearest sales office or service center.
O	O	F	AL-002 MAIN	Main Module Error	Main Module Error	Main Module problem.	Replace the main module. Or contact sales office or service center.
O	O	F	AL-010 SNS.COM.	Sensor Comm. Error	Sensor Comm Error	Sensor Module communication problem.	Take measures to reduce communication noise. Contact the nearest sales office or service center.
O	O	F	AL-011 INT.COM.	Main Internal Comm. Error	Main Internal Comm Error	Main Module internal communication problem.	Take measures to reduce communication noise. Replace the main module. Or contact sales office or service center.
O	O	–	AL-012 IND.COM.	Indicator Comm. Error	Indicator Comm Error	Indicator communication problem.	Take measures to reduce communication noise. Replace the main module. Or contact sales office or service center.
O	O	S	AL-020 PRESS.	Pressure Outside Limit	Pressure Outside Limit	Differential pressure/ pressure exceeds limit.	Check input or replace capsule when necessary.
O	O	S	AL-021 ST.PRES.	Static Pressure Outside Limit	Static Pressrue Outside Limit	Static pressure exceeds limit.	Check input or replace capsule when necessary.
O	O	S	AL-022 SNSR.T.	Sensor Temp. Outside Limit	Sensor Temp Outside Limit	Sensor temperature is outside range.	Use heat insulation or make lagging to keep temperature within range.
O	O	S	AL-023 DEV.T.	Device Temp. Outside Limit	Device Temp Outside Limit	Device temperature is outside range.	Use heat insulation or make lagging to keep temperature within range.
O	–	S	AL-030 P.RNGE	Pressure Over Range	Pressure Over Range	Differential pressure/ pressure exceeds specified range.	Check input and range setting, and change them as needed.
O	–	S	AL-031 SP.RNGE	Static Pressure Over Range	Static Pressure Over Range	Static pressure exceeds specified range.	Check input and range setting, and change them as needed.
O	–	N	AL-040 P.HI.	Pressure High Alarm	Pressure High Alarm	Differential pressure/ pressure exceeds specified threshold.	Check input.
O	–	N	AL-041 P.LO.	Pressure Low Alarm	Pressure Low Alarm	Differential pressure/ pressure exceeds specified threshold.	Check input.
O	–	N	AL-042 SP.HI.	Static Pressure High Alarm	Static Pressure High Alarm	Static pressure exceeds specified threshold.	Check input.
O	–	N	AL-043 SP.LO.	Static Pressure Low Alarm	Static Pressure Low Alarm	Static pressure exceeds specified threshold.	Check input.

HART	PROFINET	NE107	AL-No. Display	Graphic Display	Alarm name	Cause	Error handling
O	–	N	AL-044 TMP.HI.	Sensor Temp. High Alarm	Sensor Temperature High Alarm	Sensor temperature exceeds specified threshold.	Check input.
O	–	N	AL-045 TMP.LO.	Sensor Temp. Low Alarm	Sensor Temperature Low Alarm	Sensor temperature exceeds specified threshold.	Check input.
O	–	C	AL-050 P.LRV	Abnormal Pressure LRV	Illegal Pressure LRV	Specified value is outside of setting range.	Check settings and change them as needed.
O	–	C	AL-051 P.URV	Abnormal Pressure URV	Illegal Pressure URV	Specified value is outside of setting range.	Check settings and change them as needed.
O	–	C	AL-052 P.SPN	Abnormal Pressure SPAN	Illegal Pressure SPAN	Specified value is outside of setting range.	Check settings and change them as needed.
O	–	C	AL-053 SP.LRV	Abnormal Static Pressure LRV	Illegal Static Pressure LRV	Specified value is outside of setting range.	Check settings and change them as needed.
O	–	C	AL-054 SP.URV	Abnormal Static Pressure URV	Illegal Static Pressure URV	Specified value is outside of setting range.	Check settings and change them as needed.
O	–	C	AL-055 SP.SPN	Abnormal Static Pressure SPAN	Illegal Static Pressure SPAN	Specified value is outside of setting range.	Check settings and change them as needed.
O	–	C	AL-059 BO.CFG	Burnout Config Error	Burnout Configuration Error	The burnout setting value (Lower AO Alarm Current Value, Upper AO Alarm Current Value) is set within the the normal output range (Lower/ Upper limit of current output).	Set the burnout value outside the normal output range.
O	O	C	AL-060 P.ADJ.	Pressure SPAN Trim Error	Pressure SPAN Trim Error	Specified value is outside of Span Trim.	Adjust settings and change them as needed.
O	O	C	AL-061 P.ADJ.	Pressure ZERO Trim Error	Pressure ZERO Trim Error	Specified value is outside of Zero Trim.	Adjust settings and change them as needed.
O	O	C	AL-062 SP.ADJ.	St. Pressure SPAN Trim Error	Static Pressure SPAN Trim Error	Specified value is outside of Span Trim.	Adjust settings and change them as needed.
O	O	C	AL-063 SP.ADJ.	St. Pressure ZERO Trim Error	Static Pressure ZERO Trim Error	Specified value is outside of Zero Trim.	Adjust settings and change them as needed.
O	O	C	AL-070 SC.CFG	Signal Charac. Config. Error	Signal Characterizer Config Error	Set points of signal characterization do not increase monotonically.	Check settings and change them.
O	O	M	AL-071 FLG.HI.	Flange Temp. High Alarm	Flange Temp High Alarm	Flange temperature exceeds specified threshold.	Check the heater failure. Check the capsule temp. and amplifier temp. Adjust flange temperature coefficient(Flg temp coef).
O	O	M	AL-072 FLG.LO.	Flange Temp. Low Alarm	Flange Temp Low Alarm	Flange temperature exceeds specified threshold.	Check the heater failure. Check the capsule temp. and amplifier temp. Adjust flange temperature coefficient(Flg temp coef).
O	O	C	AL-073 REF.FDP	Invalid Ref. fDP	Invalid Ref fDP	Differential pressure fluctuation does not reach the reference level required to blockage detection so that no blockage detection is carried out.	Check process condition. Obtain the reference fluctuation values again.
O	O	C	AL-074 REF.SPL	Invalid Ref. fSPl	Invalid Ref fSPl	Low-pressure-side fluctuation does not reach the reference level required to blockage detection.	Check process condition. Obtain the reference fluctuation values again.
O	O	C	AL-075 REF.SPH	Invalid Ref. fSPh	Invalid Ref fSPh	High-pressure-side fluctuation does not reach the reference level required to blockage detection.	Check process condition. Obtain the reference fluctuation values again.

HART	PROFINET	NE107	AL-No. Display	Graphic Display	Alarm name	Cause	Error handling
O	O	C	AL-076 REF.F	Invalid Ref. BlkF	Invalid Ref BlkF	Blocking factor can not be used for blockage detection.	Check process condition. Obtain the reference fluctuation values again.
O	O	N	AL-077 ILBD.OV	ILBD Over Range	ILBD Over Range	Appointed the diagnosis range outside.	Check process condition.
O	O	M	AL-078 B.BLOCK	B Blocking	B Blocking	B blocking (both-side blockage) is detected.	Check process and impulse line condition(both-side blockage). If there are large flow change or the change of fluid under the measured process conditions, obtain the reference value again.
O	O	M	AL-079 H.BLOCK	High Side Blockage	High Side Blocking	High-pressure-side blockage is detected.	Check process and impulse line condition(high-pressure-side). If there are large flow change or the change of fluid under the measured process conditions, obtain the reference value again.
O	O	M	AL-080 L.BLOCK	Low Side Blockage	Low Side Blocking	Low-pressure-side blockage is detected.	Check process and impulse line condition(low-pressure-side). If there are large flow change or the change of fluid under the measured process conditions, obtain the reference value again.
O	O	M	AL-081 H.LARGE	Large Fluctuat. of High Side	Large Fluctuation of High Side	High-pressure-side fluctuation amplitude is large.	Check process condition. If there are large flow change or the change of fluid under the measured process conditions, obtain the reference value again.
O	O	M	AL-082 L.LARGE	Large Fluctuat. of Low Side	Large Fluctuation of Low Side	Low-pressure-side fluctuation amplitude is large.	Check process condition. If there are large flow change or the change of fluid under the measured process conditions, obtain the reference value again.
O	O	M	AL-083 A.BLOCK	A Blocking	A Blocking	A blocking (single-side blockage) is detected.	Check process and impulse line condition(single-side blockage). If there are large flow change or the change of fluid under the measured process conditions, obtain the reference value again.
O	O	C	AL-090 P.SIM.	Press. Simulate Mode Active	Pressure Simulate Mode Active	Under simulation mode for device variable.	Check simulation mode.
O	O	C	AL-091 SP.SIM.	St. Press. Sim. Mode Active	Static Pressure Simulate Mode Active	Under simulation mode for device variable.	Check simulation mode.
O	O	C	AL-092 T.SIM.	Sens.Temp.Sim. Mode Active	Sensor Temp Simulate Mode Active	Under simulation mode for device variable.	Check simulation mode.

HART	PROFINET	NE107	AL-No. Display	Graphic Display	Alarm name	Cause	Error handling
○	–	C	AL-093 AO.SIM.	Analog Output Sim. Mode Active	Analog Output Simulate Mode Active	Under simulation mode for device variable.	Check simulation mode.
○	–	N	AL-094 STS.SIM.	Status Simulate Mode Active	Status Simulate Mode Active	Under simulation mode for status.	Check simulation mode.
–	○	C	AL-100 AI1.SIM.	AI1 Simulate Active	AI1 Simulation Active	Under simulation mode for AI1.	Check simulation mode.
–	○	C	AL-101 AI2.SIM.	AI2 Simulate Active	AI2 Simulation Active	Under simulation mode for AI2.	Check simulation mode.
–	○	C	AL-102 AI3.SIM.	AI3 Simulate Active	AI3 Simulation Active	Under simulation mode for AI3.	Check simulation mode.
–	○	C	AL-103 TOT.SIM.	TOT Simulate Active	TOT Simulation Active	Under simulation mode for TOT.	Check simulation mode.
–	○	C	AL-104 PTB.SIM.	PTB Simulate Active	PTB Simulation Active	Under simulation mode for PTB.	Check simulation mode.
–	○	Follow the Simulation value	AL-105 PB.SIM.	PB Simulate Active	PB Simulation Active	Under simulation mode for PB.	Check simulation mode.
–	○	C	AL-110 PB.O/S	PB is out of service	PB is O/S mode	PB is O/S mode.	Check block mode.
○	○	–	All lights on	EEPROM Error	Indicator CPU Error	Indicator or device problem.	Contact the nearest sales office or service center.

Appendix 1. EJX110S Determination of Differential Pressure Range with Orifice for Low Flow Measurement

The following describes the procedure for calculating the differential pressure range and the calculation example in low flow measurement.

Conversion factor in pressure unit:
1 Pa = 1.01972×10^{-1} mmH_2O
1 mmH_2O = 9.80665 Pa
1 atm = 1.01325×10^{2} kPa

A1.1 Determining the Differential Pressure Range

Use the following procedures to determine a differential pressure range according to the fluid conditions being measured.

(a) Calculate a water or air equivalent flow from the flow of the fluid being measured (100% flow).

■ **Equivalent Water Flow Calculation**

$$Q_w = 0.03162 \cdot Qf \cdot \sqrt{\rho f} \quad \cdots\cdots (1)$$

Where,
Qw: Water equivalent volumetric flow (m^3/h) at 4°C, 1 atm
Qf: Volumetric liquid flow (m^3/h) at operating conditions (t°C, p kPa)
ρf: Specific liquid density (kg/m^3) at operating conditions (t°C, p kPa)

■ **Equivalent Air Flow Calculation**

$$Q_o = 0.5356 \cdot Qn \sqrt{\rho n \cdot \frac{273.15 + t}{101.325 + p} \cdot \frac{Zf}{Zn}} \quad \cdots\cdots (2)$$

Where,
Qo: Air equivalent volumetric flow at 0°C, 1 atm (Nm^3/h)
Qn: Volumetric gas flow at 0°C, 1 atm (Nm^3/h)
ρn: Specific gas density at 0°C, 1 atm (kg/Nm^3)
Zn: Compression factor of gas at 0°C, 1 atm
Zf: Compression factor of gas at operations conditions (t°C, p kPa)

(b) Obtain a differential pressure from the above equivalent water or air flow using the nomograph shown in Figure A1.1 or A1.2. In this procedure, multiply Qw or Qo by 1000/60 to convert the flow unit into liter/min.

(c) Select an orifice bore, taking into considerations pressure loss, etc.

(d) As necessary, calculate Reynolds number at normal flow rate and correct the differential pressure obtained from the procedure (b).

■ **Reynolds Number Calculation**

$$Re = 354 \frac{W}{D \cdot \mu} \quad \cdots\cdots (3)$$

Where,
Re: Reynolds number at normal flow rate
W: Weight flow at normal flow rate (kg/h) (Note)
D: Orifice bore (mm)
μ: Viscosity (mPa·s)

Note: Determination of W
- For liquid, W = Qf·ρf
- For gas, W = Qn·ρn

■ **Differential Pressure Correction using Reynolds Number**

$$\Delta P = \left(\frac{1}{Kaf/Ka}\right)^2 \cdot \Delta P_0$$

Where,
ΔP: Corrected differential pressure
ΔP_0: Differential pressure obtained from procedure (b)
Kaf/ka: Correction factor obtained from Figure A1.3

NOTE

For details concerning determination of differential pressure correction using Reynolds number, pressure loss, etc., refer to TI 01C33A02-01EN.

A1.2 Example of Calculation

Fluid: N_2 gas (Nitrogen gas)
Flow range: 0 to 25 Nm^3/h (flow rate at 0°C, 1 atm)
Normal flow rate: 18 Nm^3/h
Specific density: 1.251 kg/Nm^3 (specific density at 0°C, 1 atm)
Temperature: 30°C
Pressure: 100 kPa
Viscosity: 0.018 mPa·s

From Equation (2), air equivalent volumetric flow Qo is:

$$Q_o = 0.5356 \times 25 \sqrt{1.251 \times \frac{273.15 + 30}{101.325 + 100}} = 18.38\ Nm^3/h = 306.3\ Nl/min$$

A differential pressure range of 0 to 2400 mmH_2O is obtained from Figure A1.2 applying an orifice bore of 6.350 mm (where, Zf/Zn=1 is assumed).

From Equation (3), Reynolds number at normal flow rate Re is:

$$Re = 354 \times \frac{18 \times 1.251}{6.35 \times 0.018} = 6.97 \times 10^4$$

Since the correction factor (1.00) is constant at this Reynolds number, no differential pressure correction is required. Consequently, the differential pressure range is determined as 0 to 2400 mmH_2O.

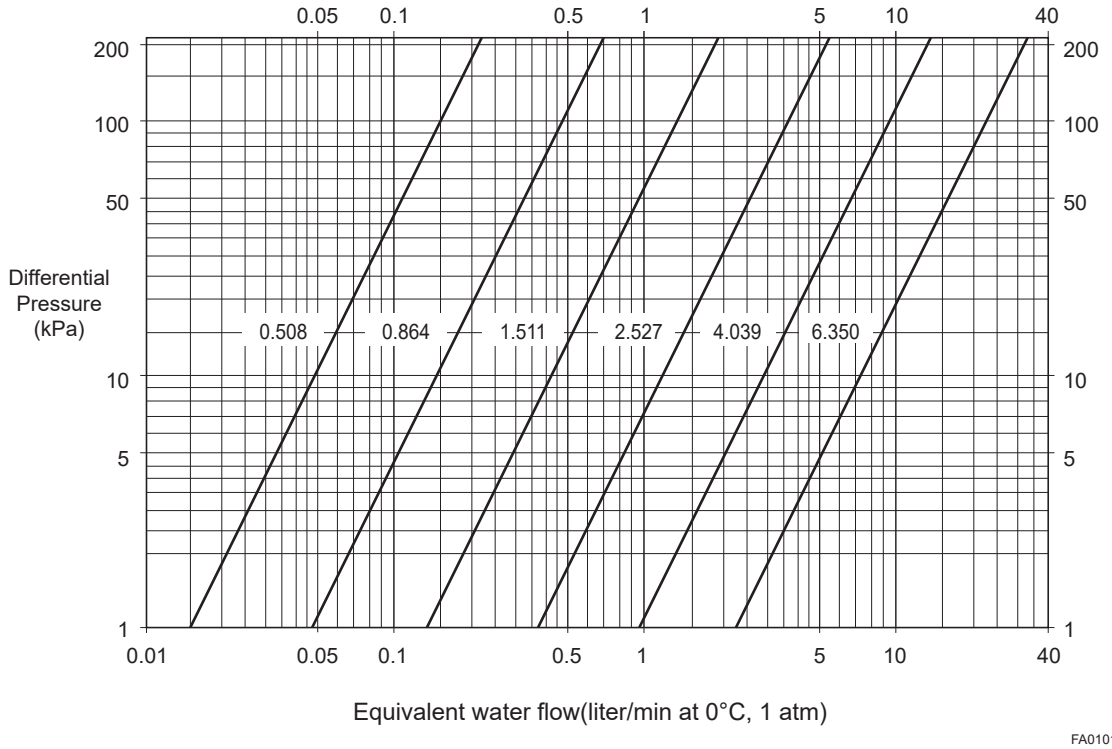


Figure A1.1 Relationship between Equivalent Water Flow and Differential Pressure

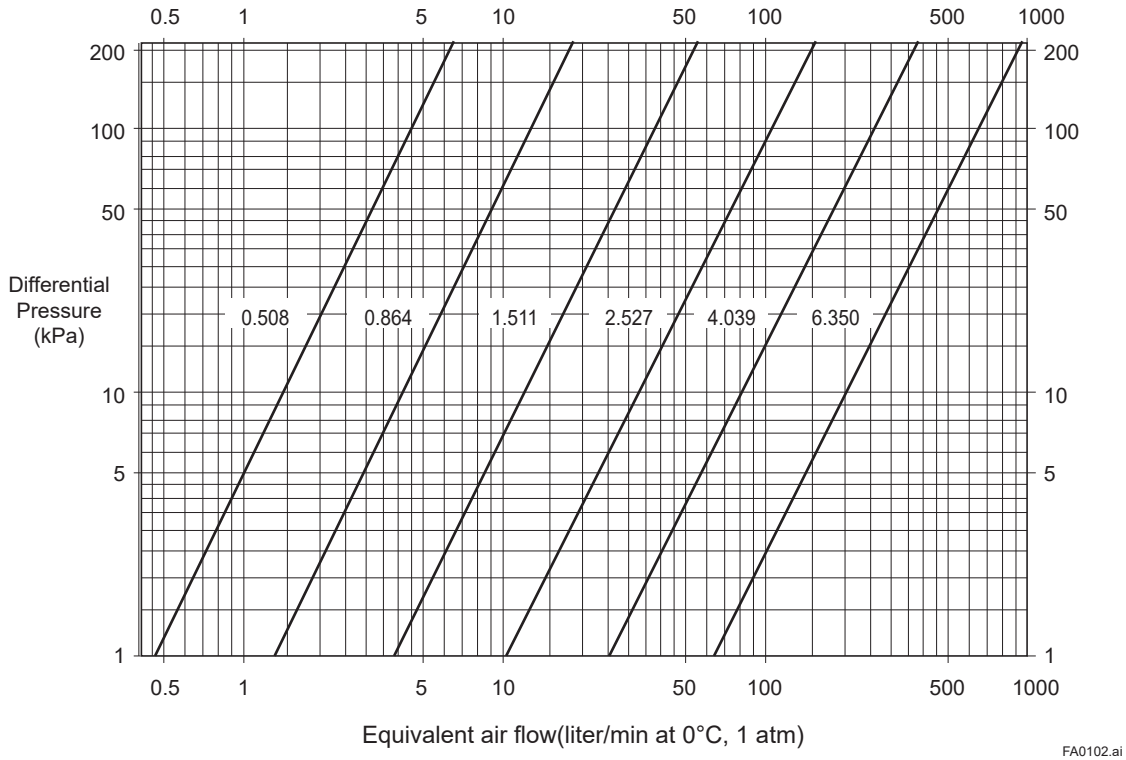


Figure A1.2 Relationship between Equivalent Air Flow and Differential Pressure

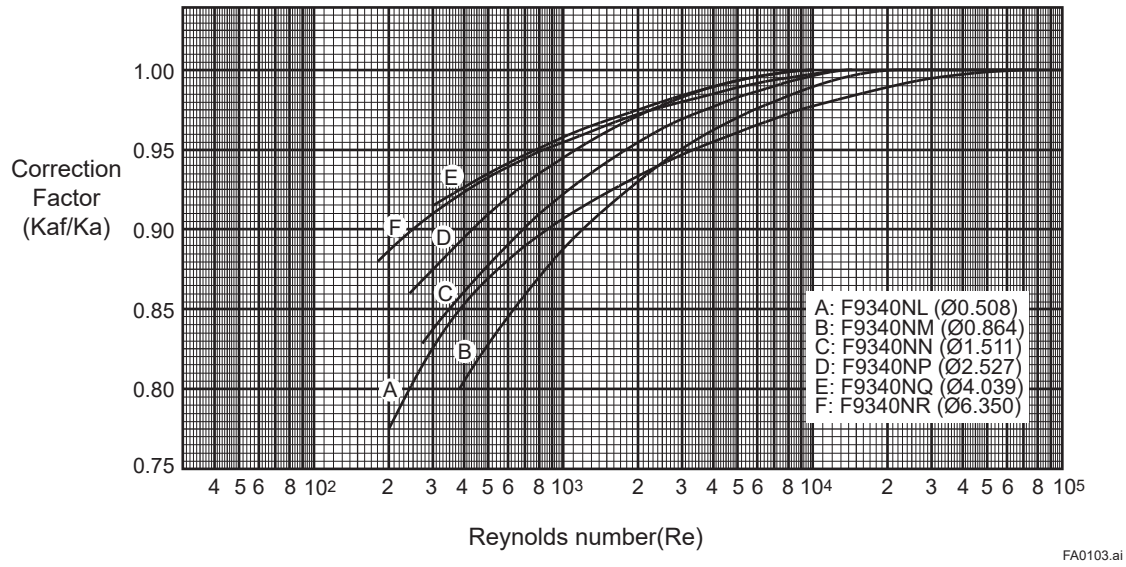


Figure A1.3 Relationship between Reynolds Number and Correction Factor

Revision Information

- Title : OpreX Pressure Transmitter
  EJX110S, EJX310S, EJX430S, EJX510S and EJX530S
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