Instruction Manual

DPharp

Model EJA115
Low Flow Transmitter
[Style: S2]

IM 1C22K1-01E

YOKOGAWA
Yokogawa Electric Corporation

IM 1C22K1-01E
9th Edition

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1. INTRODUCTION

Thank you for purchasing the DPharp electronic pressure transmitter.

The DPharp Pressure Transmitters are precisely calibrated at the factory before shipment. To ensure correct and efficient use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

■ Regarding This Manual

- This manual should be passed on to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instruments.
- Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.

NOTE

For FOUNDATION Fieldbus and HART protocol versions, please refer to IM 1C22T2-01E and IM 1C22T1-01E respectively, in addition to this IM.

■ Safety Precautions

- For the protection and safety of the operator and the instrument or the system including the instrument, please be sure to follow the instructions on safety described in this manual when handling this instrument. In case the instrument is handled in contradiction to these instructions, Yokogawa does not guarantee safety.
- For the intrinsically safe equipment and explosionproof equipment, in case the instrument is not restored to its original condition after any repair or modification undertaken by the customer, intrinsically safe construction or explosionproof construction is damaged and may cause dangerous condition. Please contact Yokogawa for any repair or modification required to the instrument.
- The following safety symbol marks are used in this Manual:

WARNING

Indicates a potentially hazardous situation which, if not avoided, *could* result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against *unsafe practices*.

IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

NOTE

Draws attention to information essential for understanding the operation and features.

WARRANTY

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurred during the warranty period shall basically be repaired free of charge.
- In case of problems, the customer should contact the Yokogawa representative from which the instrument was purchased, or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible party for repair cost for the problems shall be determined by Yokogawa based on our investigation.
- The Purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
  - Improper and/or inadequate maintenance by the purchaser.
  - Failure or damage due to improper handling, use or storage which is out of design conditions.
  - Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
  - Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
  - Malfunction or damage from improper relocation of the product in question after delivery.
  - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

⚠ WARNING

- Instrument installed in the process is under pressure. Never loosen or tighten the process connector bolts as it may cause dangerous spouting of process fluid.
- During draining condensate or venting gas in transmitter pressure-detector section, take appropriate care to avoid contact with the skin, eyes or body, or inhalation of vapors, if the accumulated process fluid may be toxic or otherwise harmful.
  Since draining condensate or bleeding off gas gives the pressure measurement disturbance, this should not be done when the loop is in operation.
- Since the accumulated process fluid may be toxic or otherwise harmful, take appropriate care to avoid contact with the body, or inhalation of vapors even after dismounting the instrument from the process line for maintenance.

⚠ CAUTION

This instrument is tested and certified as intrinsically safe type or explosionproof type. Please note that the construction of the instrument, installation, external wiring, maintenance or repair is strictly restricted, and non-observance or negligence of this restriction would result in dangerous condition.

2. HANDLING CAUTIONS

This chapter describes important cautions regarding how to handle the transmitter. Read carefully before using the transmitter.

The EJA Series pressure transmitters are thoroughly tested at the factory before shipment. When the transmitter is delivered, visually check them to make sure that no damage occurred during shipment.

Also check that all transmitter mounting hardware shown in Figure 2.1 is included. If the transmitter was ordered without the mounting bracket, the transmitter mounting hardware is not included. After checking the transmitter, repack it in the way it was delivered until installation.

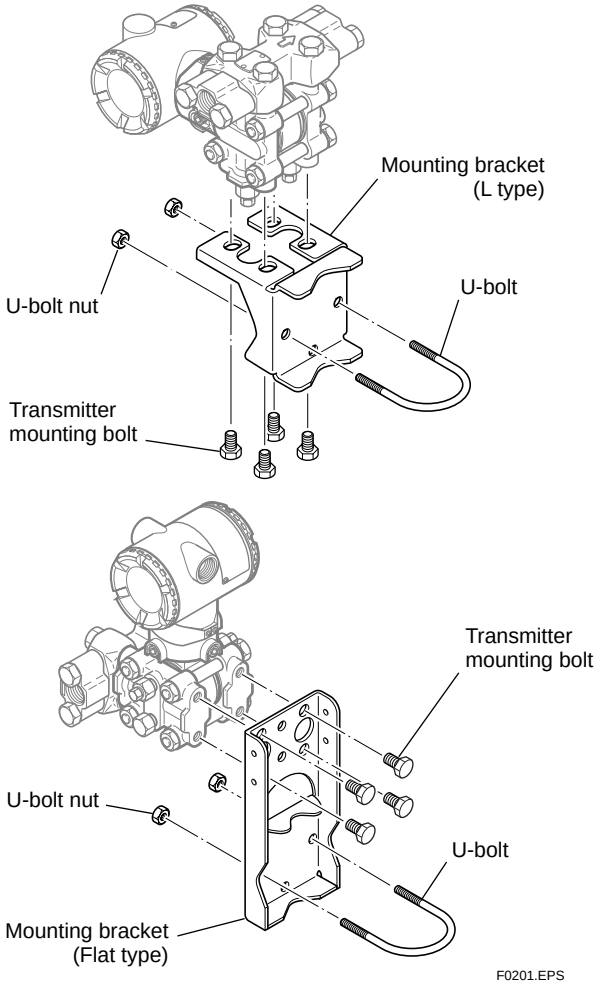


Figure 2.1 Transmitter Mounting Hardware

2.1 Model and Specifications Check

The model name and specifications are indicated on the name plate attached to the case. If the *reverse* operating mode was ordered (reverse signal), 'REVERSE' will be inscribed in field *1; if *square root* display mode was ordered, 'SQRT' is inscribed in field *2.

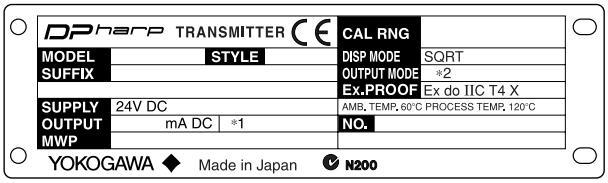


Figure 2.2 Name Plate Example of JIS Flameproof Type

2.2 Unpacking

When moving the transmitter to the installation site, keep it in its original packaging. Then, unpack the transmitter there to avoid damage on the way.

2.3 Storage

The following precautions must be observed when storing the instrument, especially for a long period.

(a) Select a storage area which meets the following conditions:
- It is not exposed to rain or water.
- It suffers minimum vibration and shock.
- It has an ambient temperature and relative humidity within the following ranges.

Ambient temperature:
–40 to 85°C without integral indicator
–30 to 80°C with integral indicator
Relative humidity:
5% to 100% R.H. (at 40°C)
Preferred temperature and humidity:
approx. 25°C and 65% R.H.

(b) When storing the transmitter, repack it as nearly as possible to the way it was packed when delivered from the factory.

(c) If storing a transmitter that has been used, thoroughly clean the chambers inside the cover flanges and integral flow orifice unit, so that no measured fluid remains in it. Also make sure before storing that the pressure-detector and transmitter section are securely mounted.

2.4 Selecting the Installation Location

The transmitter is designed to withstand severe environmental conditions. However, to ensure stable and accurate operation for years, observe the following precautions when selecting an installation location.

(a) Ambient Temperature
Avoid locations subject to wide temperature variations or a significant temperature gradient. If the location is exposed to radiant heat from plant equipments, provide adequate thermal insulation and/or ventilation.

(b) Ambient Atmosphere
Avoid installing the transmitter in a corrosive atmosphere. If the transmitter must be installed in a corrosive atmosphere, there must be adequate ventilation as well as measures to prevent intrusion or stagnation of rain water in conduits.

(c) Shock and Vibration
Select an installation site suffering minimum shock and vibration (although the transmitter is designed to be relatively resistant to shock and vibration).

(d) Installation of Explosion-protected Transmitters
Explosion-protected transmitters can be installed in hazardous areas according to the types of gases for which they are certified. See Subsection 2.9 "Installation of Explosion Protected Type Transmitters."

2.5 Pressure Connection

WARNING

- Instrument installed in the process is under pressure. Never loosen the process connector bolts to avoid the dangerous spouting of process fluid.
- During draining condensate from the pressure-detector section, take appropriate care to avoid contact with the skin, eyes or body, or inhalation of vapors, if the accumulated process fluid may be toxic or otherwise harmful.

The following precautions must be observed in order to safely operate the transmitter under pressure.

(a) Make sure that the four manifold bolts are tightened firmly.
(b) Make sure that there are no leaks in the impulse piping.
(c) Never apply a pressure higher than the specified maximum working pressure.

2.6 Waterproofing of Cable Conduit Connections

Apply a non-hardening sealant to the threads to waterproof the transmitter cable conduit connections. (See Figure 6.4.2a, 6.4.2b and 6.4.2d.)

2.7 Restrictions on Use of Radio Transceiver

IMPORTANT

Although the transmitter has been designed to resist high frequency electrical noise, if a radio transceiver is used near the transmitter or its external wiring, the transmitter may be affected by high frequency noise pickup. To test for such effects, bring the transceiver in use slowly from a distance of several meters from the transmitter, and observe the measurement loop for noise effects. Thereafter, always use the transceiver outside the area affected by noise.

2.8 Insulation Resistance and Dielectric Strength Test

Since the transmitter has undergone insulation resistance and dielectric strength tests at the factory before shipment, normally these tests are not required. However, if required, observe the following precautions in the test procedures.

(a) Do not perform such tests more frequently than is absolutely necessary. Even test voltages that do not cause visible damage to the insulation may degrade the insulation and reduce safety margins.
(b) Never apply a voltage exceeding 500 V DC (100 V DC with an internal lightning protector) for the insulation resistance test, nor a voltage exceeding 500 V AC (100 V AC with an internal lightning protector) for the dielectric strength test.

(c) Before conducting these tests, disconnect all signal lines from the transmitter terminals. Perform the tests in the following procedure:

• Insulation Resistance Test

1) Short-circuit the + and – SUPPLY terminals in the terminal box.
2) Turn OFF the insulation tester. Then connect the insulation tester plus (+) lead wire to the shorted SUPPLY terminals and the minus (–) leadwire to the grounding terminal.
3) Turn ON the insulation tester power and measure the insulation resistance. The voltage should be applied short as possible to verify that the insulation resistance is at least 20 MΩ.
4) After completing the test and being very careful not to touch exposed conductors disconnect the insulation tester and connect a 100 kΩ resistor between the grounding terminal and the short-circuiting SUPPLY terminals. Leave this resistor connected at least one second to discharge any static potential. Do not touch the terminals while it is discharging.

• Dielectric Strength Test

1) Short-circuit the + and – SUPPLY terminals in the terminal box.
2) Turn OFF the dielectric strength tester. Then connect the tester between the shorted SUPPLY terminals and the grounding terminal. Be sure to connect the grounding lead of the dielectric strength tester to the ground terminal.
3) Set the current limit on the dielectric strength tester to 10 mA, then turn ON the power and gradually increase the test voltage from '0' to the specified voltage.
4) When the specified voltage is reached, hold it for one minute.
5) After completing this test, slowly decrease the voltage to avoid any voltage surges.

2.9 Installation of Explosion Protected Type

NOTE

For FOUNDATION Fieldbus explosion protected type, please refer to IM 1C22T2-01E.

WARNING

To pressure the safety of explosionproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair activities. Please read the following sections very carefully.

2.9.1 FM Approval

a. FM Intrinsically Safe Type

Caution for FM intrinsically safe type. (Following contents refer "DOC. No. IFM012-A12 P.1 and 2.")

Note 1. Model EJA Series pressure transmitters with optional code /FS1 are applicable for use in hazardous locations.

- Intrinsically Safe for Class I, Division 1, Groups A, B, C & D. Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations.
- Nonincendive for Class I, Division 2, Groups A, B, C & D. Class II, Division 2, Groups E, F & G and Class III, Division 1 Hazardous Locations.
- Outdoor hazardous locations, NEMA 4X.
- Temperature Class: T4
- Ambient temperature: –40 to 60°C

Note 2. Entity Parameters

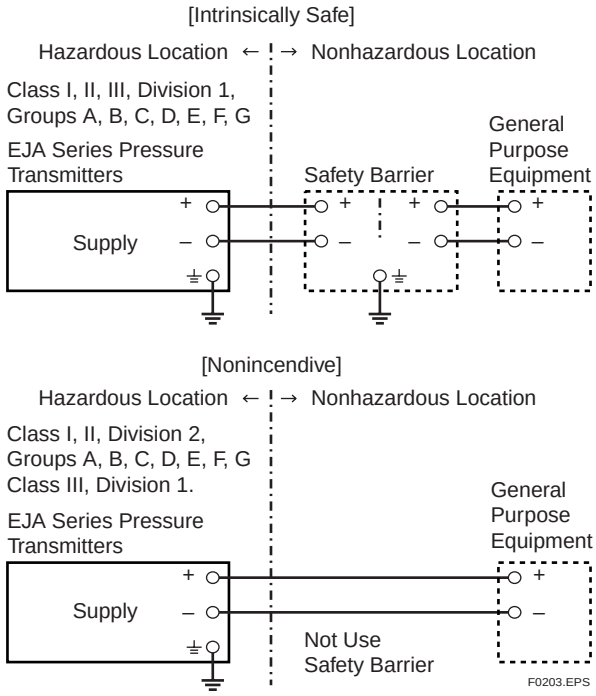
- Intrinsically Safe Apparatus Parameters
  [Groups A, B, C, D, E, F and G]
  Vmax = 30 V Ci = 22.5 nF
  Imax = 165 mA Li = 730 μH
  Pmax = 0.9 W
  * Associated Apparatus Parameters
  (FM approved barriers)
  Voc ≤ 30 V Ca > 22.5 nF
  Isc ≤ 165 mA La > 730 μH
  Pmax ≤ 0.9W
- Intrinsically Safe Apparatus Parameters
  [Groups C, D, E, F and G]
  Vmax = 30 V Ci = 22.5 nF
  Imax = 225 mA Li = 730 μH
  Pmax = 0.9 W
  * Associated Apparatus Parameters
  (FM approved barriers)
  Voc ≤ 30 V Ca > 22.5 nF
  Isc ≤ 225 mA La > 730 μH
  Pmax ≤ 0.9 W
- Entity Installation Requirements
  Vmax ≥ Voc or Vt, Imax ≥ Isc or It,
  Pmax (IS Apparatus) ≥ Pmax (Barrier)
  Ca ≥ Ci + Ccable, La ≥ Li + Lcable

Note 3. Installation

- Barrier must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.
- Control equipment connected to barrier must not use or generate more than 250 V rms or V dc.
- Installation should be in accordance with ANSI/ISA RP12.6 “Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations” and the National Electric Code (ANSI/NFPA 70).
- The configuration of associated apparatus must be FMRC Approved.
- Dust-tight conduit seal must be used when installed in a Class II, III, Group E, F and G environments.
- Associated apparatus manufacturer’s installation drawing must be followed when installing this apparatus.
- The maximum power delivered from the barrier must not exceed 0.9 W.
- Note a warning label worded “SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY,” and “INSTALL IN ACCORDANCE WITH DOC. No. IFM012-A12 P.1 and 2.”

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Intrinsically safe and Nonincendive Approval.



b. FM Explosionproof Type

Caution for FM explosionproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /FF1 are applicable for use in hazardous locations.

- Explosionproof for Class I, Division 1, Groups B, C and D.
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G.
- Outdoor hazardous locations, NEMA 4X.
- Temperature Class: T6
- Ambient Temperature: –40 to 60°C
- Supply Voltage: 42 V dc max.
- Output signal: 4 to 20 mA

Note 2. Wiring

- All wiring shall comply with National Electrical Code ANSI/NEPA70 and Local Electrical Codes.
- When installed in Division 1, “FACTORY SEALED, CONDUIT SEAL NOT REQUIRED.”

Note 3. Operation

- Keep the “CAUTION” nameplate attached to the transmitter.
  CAUTION: OPEN CIRCUIT BEFORE REMOVING COVER. FACTORY SEALED, CONDUIT SEAL NOT REQUIRED. INSTALL IN ACCORDANCE WITH THE INSTRUCTION MANUAL IM 1C22.
- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Explosionproof Approval.

c. FM Intrinsically Safe Type/FM Explosionproof Type

Model EJA Series pressure transmitters with optional code /FU1 can be selected the type of protection (FM Intrinsically Safe or FM Explosionproof) for use in hazardous locations.

Note 1. For the installation of this transmitter, once a particular type of protection is selected, any other type of protection cannot be used. The installation must be in accordance with the description about the type of protection in this instruction manual.

Note 2. In order to avoid confusion, unnecessary marking is crossed out on the label other than the selected type of protection when the transmitter is installed.

2.9.2 CSA Certification

a. CSA Intrinsically Safe Type

Caution for CSA Intrinsically safe type. (Following contents refer to "DOC No. ICS003-A12 P.1-1 and P.1-2.")

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /CS1 are applicable for use in hazardous locations

- Intrinsically Safe for Class I, Division 1, Groups A, B, C & D. Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations.
- Nonincendive for Class I, Division 2, Groups A, B, C & D, Class II, Division 2, Groups F & G, and Class III, Hazardous Locations. (not use Safety Barrier)
- Encl. "Type 4X"
- Temperature Class: T4
- Ambient temperature: –40 to 60°C
- Process Temperature: 120°C max.

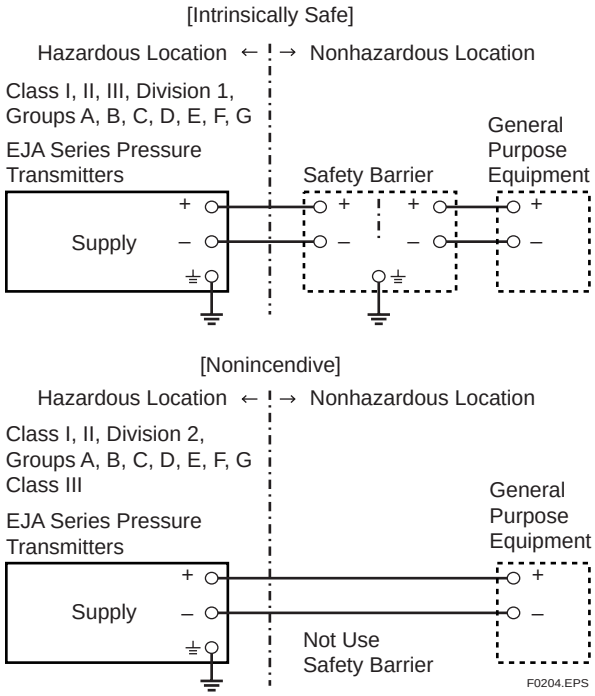
Note 2. Entity Parameters

- Intrinsically safe ratings are as follows:
  Maximum Input Voltage (Vmax) = 30 V
  Maximum Input Current (Imax) = 165 mA
  Maximum Input Power (Pmax) = 0.9 W
  Maximum Internal Capacitance (Ci) = 22.5 nF
  Maximum Internal Inductance (Li) = 730 μH

* Associated apparatus (CSA certified barriers)
Maximum output voltage (Voc) ≤ 30 V
Maximum output current (Isc) ≤ 165 mA
Maximum output power (Pmax) ≤ 0.9 W

Note 3. Installation

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation and Yokogawa Corporation of America is prohibited and will void Canadian Standards Intrinsically safe and nonincendive Certification.



b. CSA Explosionproof Type

Caution for CSA explosionproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /CF1 are applicable for use in hazardous locations:

- Explosionproof for Class I, Division 1, Groups B, C and D.
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G.
- Encl "Type 4X"
- Temperature Class: T6, T5, and T4
- Process Temperature: 85°C (T6), 100°C (T5), and 120°C (T4)
- Ambient Temperature: –40 to 80°C
- Supply Voltage: 42 V dc max.
- Output Signal: 4 to 20 mA

Note 2. Wiring

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in the figure.
  CAUTION: SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE.
  UN SCELLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 50 cm DU BÎTIER.
- When installed in Division 2, "SEALS NOT REQUIRED."

Note 3. Operation

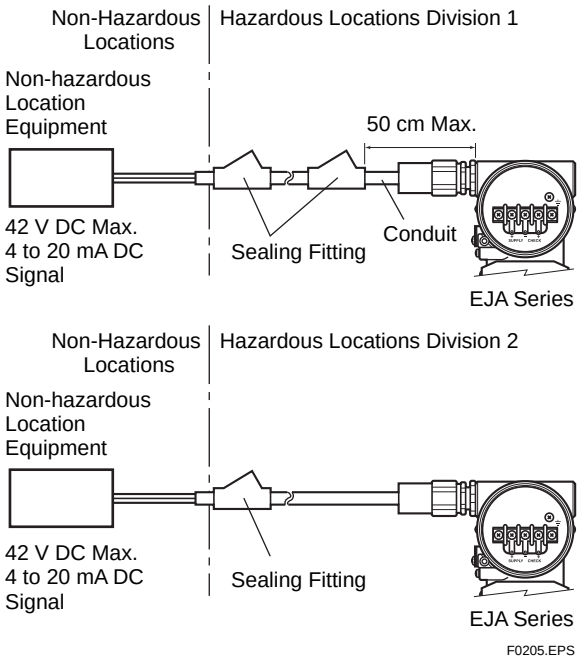
• Keep the “CAUTION” label attached to the transmitter.

CAUTION: OPEN CIRCUIT BEFORE REMOVING COVER.
OUVRIR LE CIRCUIT AVANT D´NLEVER LE COUVERCLE.

• Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

• The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation and Yokogawa Corporation of America is prohibited and will void Canadian Standards Explosionproof Certification.



c. CSA Intrinsically Safe Type/CSA Explosionproof Type

Model EJA Series pressure transmitters with optional code /CU1 can be selected the type of protection (CSA Intrinsically Safe or CSA Explosionproof) for use in hazardous locations.

Note 1. For the installation of this transmitter, once a particular type of protection is selected, any other type of protection cannot be used. The installation must be in accordance with the description about the type of protection in this instruction manual.

Note 2. In order to avoid confusion, unnecessary marking is crossed out on the label other than the selected type of protection when the transmitter is installed.

2.9.3 SAA Certification

a. SAA Intrinsically Safe Type

Caution for SAA Intrinsically safe type and Type n.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /SU1 are applicable for use in hazardous locations.

• Type of Protection and Marking Code:
Ex ia IIC T4 (Tamb = 60°C) IP67 Class I Zone 0

• Type of Protection and Marking Code:
Ex n IIC T4 (Tamb = 60°C) IP67 Class I Zone 2

• Ambient Temperature: –40 to 60°C

Note 2. Entity Parameters

• Intrinsically safe rating of the transmitters are as follows.

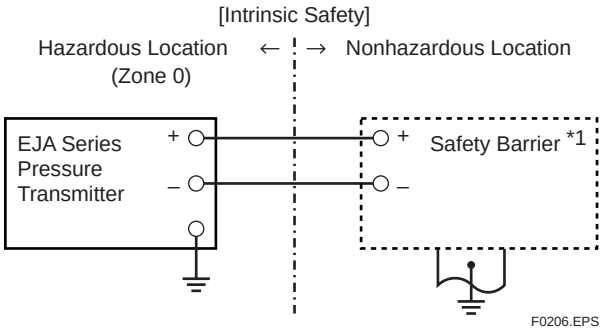
Maximum Input Voltage (Ui) = 30 V
Maximum Input Current (Ii) = 165 mA
Maximum Input Power (Pi) = 0.9 W
Maximum Internal Capacitance (Ci) = 0.02 μF
Maximum Internal Inductance (Li) = 0.73 mH

Note 3. Wiring

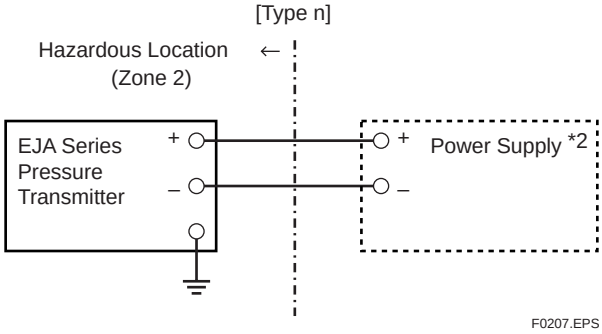
• All Wiring shall comply with the Australian Standard.

Note 4. Maintenance and Repair

• The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Standards Association of Australia Intrinsically safe and Type n Certification.



*1: Any safety barriers used for the output current must be limited by a resistor “R” such that Imaxout-Uz/R.



*2: The voltage of the power supply is not exceed 30V dc.

b. SAA Flameproof Type

Caution for SAA flameproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /SU1 are applicable for use in hazardous locations:

- Type of Protection and marking Code: Ex d II C T* IP67 Class I Zone 1 (T* see schedule)
- Temperature Class: T6, T5, and T4
- Process Temperature: 85°C (T6), 100°C (T5), and 120°C (T4)
- Supply voltage: 42 V dc max.
- Output Signal: 4 to 20 mA
- Ambient Temperature: –40 to 80°C

Note 2. Wiring

- All wiring shall comply with the Australian Standard.

Note 3. Operation

- Keep the "CAUTION" label attached to the transmitter.

  CAUTION: AMBIENT TEMPERATURE ABOVE 75 DEG C SELECT SUITABLE CABLE. DISCONNECT POWER AND WAIT 1 MINUTE BEFORE REMAKING COVER

- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Standards Association of Australia Flameproof Certification.

2.9.4 CENELEC (KEMA)/IEC (KEMA) Certification

a. CENELEC (KEMA) Intrinsically Safe Type

Caution for CENELEC (KEMA) intrinsically safe type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /KS1 for potentially explosive atmospheres:

- Type of Protection and Marking code: EEx ia IIC T4
- Temperature Class: T4
- Process Temperature: 120°C max.
- Ambient Temperature: –40 to 60°C

Note 2. Electrical Data

- In type of explosion protection intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit with following maximum values:

  Ui = 30 V
  Ii = 165 mA
  Pi = 0.9 W
  Effective internal capacitance; Ci = 22.5 nF
  Effective internal inductance; Li = 730 μH

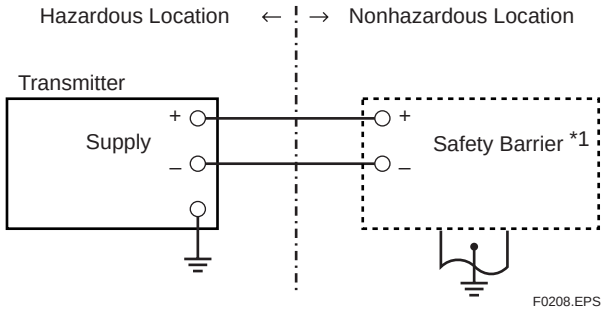
Note 3. Installation

- All wiring shall comply with local installation requirements. (Refer to the installation diagram)

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void KEMA Intrinsically safe Certification.

[Installation Diagram]



*1: In any safety barriers used the output current must be limited by a resistor "R" such that Imaxout-Uz/R.

b. CENELEC (KEMA) Flameproof Type

Caution for CENELEC (KEMA) flameproof type.

Note 1. Model EJA Series differential, gauge, and absolute pressure transmitters with optional code /KF1 for potentially explosive atmospheres:

- Type of Protection and Marking Code: EEx d IIC T6…T4
- Temperature Class: T6, T5, and T4
- Maximum Process Temperature: 85°C (T6), 100°C (T5), and 120°C
- Ambient Temperature: –40 to 80°C

Note 2. Electrical Data

- Supply voltage: 42 V dc max.
- Output signal: 4 to 20 mA

Note 3. Installation

- All wiring shall comply with local installation requirement.
- The cable entry devices shall be of a certified flameproof type, suitable for the conditions of use.

Note 4. Operation
- Keep the “CAUTION” label to the transmitter.
  CAUTION: WAIT 1 MIN. AFTER POWER-DISCONNECTION, BEFORE OPENING THE ENCLOSURE.
- Take care not to generate mechanical sparking when accessing to the instrument and peripheral devices in a hazardous location.

Note 5. Maintenance and Repair
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void KEMA Flameproof Certification.

c. IEC (KEMA) Type of Protection “n”

Caution for IEC (KEMA) Type of Protection “n.”

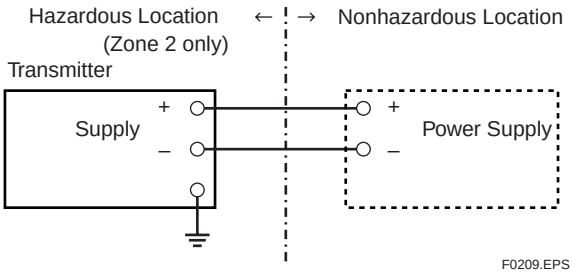
Note 1. Model EJA Series pressure transmitters with optional code /KU1 for potentially explosive atmospheres.
- Type of Protection and Marking Code: Ex nA IIC T4
- Temperature Class: T4
- Process Temperature: 120°C max.
- Ambient Temperature: –40 to 60°C

Note 2. Electrical Data
- Supply and output circuit ≤ 30 V dc, 165 mA (terminals + and –)

Note 3. Installation
- All wiring shall comply with local installation requirements. (refer to the installation diagram)

Note 4. Maintenance and Repair
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void KEMA Type of Protection “n” Certification.

[Installation Diagram]



Ratings of the Power Supply as follows;
Maximum Voltage: 30 V
Maximum Current: 165 mA

d. CENELEC (KEMA) Intrinsically Safe Type/ CENELEC (KEMA) Flameproof Type/IEC (KEMA) Type of Protection “n”

Model EJA Series pressure transmitters with optional code /KU1 can be selected the type of protection (CENELEC (KEMA) Intrinsically Safe or CENELEC (KEMA) Flameproof or IEC (KEMA) Type of Protection “n”) for use in hazardous locations.

Note 1. For the installation of this transmitter, once a particular type of protection is selected, any other type of protection cannot be used. The installation must be in accordance with the description about the type of protection in this instruction manual.

Note 2. In order to avoid confusion, unnecessary marking is crossed out on the label other than the selected type of protection when the transmitter is installed.

2.9.5 JIS Certification

JIS Flameproof and Intrinsically Safe Type

The model EJA Series pressure transmitters with optional code /JF1 and /JS1, which have obtained certification according to technical criteria for explosion-protected construction of electric machinery and equipment(Standards Notification No. 556 from the Japanese Ministry of Labor) conforming to IEC standards, are designed for hazardous areas where explosive gases and/or inflammable vapors may be present. [JIS Flameproof Type(optional code /JF1) allows installation in Division 1 and 2 areas, and JIS Intrinsically Safe Type(optional code /JS1) allows installation in Division 0, 1, and 2 areas.]

To observe the safety of flameproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair activities. Users absolutely must read “Installation and Operating Precautions for JIS Intrinsically Safe Equipment and Flameproof Equipment” at the end of this manual.

CAUTION

(For JIS flameproof type without integral indicator)

When the fill fluid near the sensor part moves from within, the instrument outputs a failure signal either high or low of the specific signal. In that case, generate the alarm to identify that the failure signal is output since the event may invalidate the flameproof approval.
If the optional integral indicator is equipped, the indicator identifies the alarm on its display. Therefore, no other alarm generation is necessary.

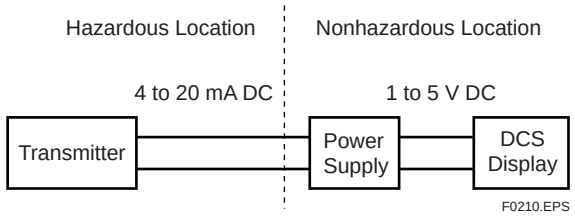


Figure 2.3 Example of using DCS (Distributed Control System)

CAUTION

When selecting cables for JIS flameproof type transmitters, determine the cables' maximum allowable heat resistance depending on the process and ambient temperature condition on the transmitter as illustrated in Figure 2.4. Use cables having a maximum allowable heat resistance of at least 60°C for the transmitter in Region A and that of 75°C in Region B.

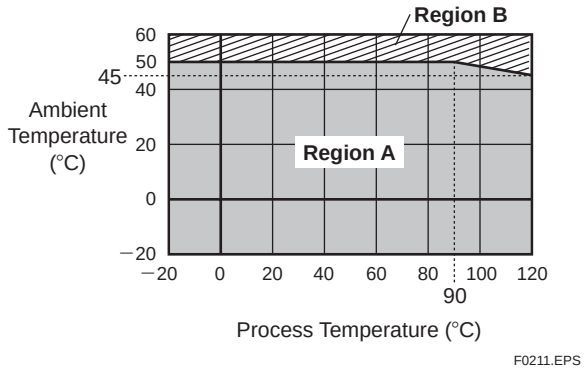


Figure 2.4 Selecting Cables

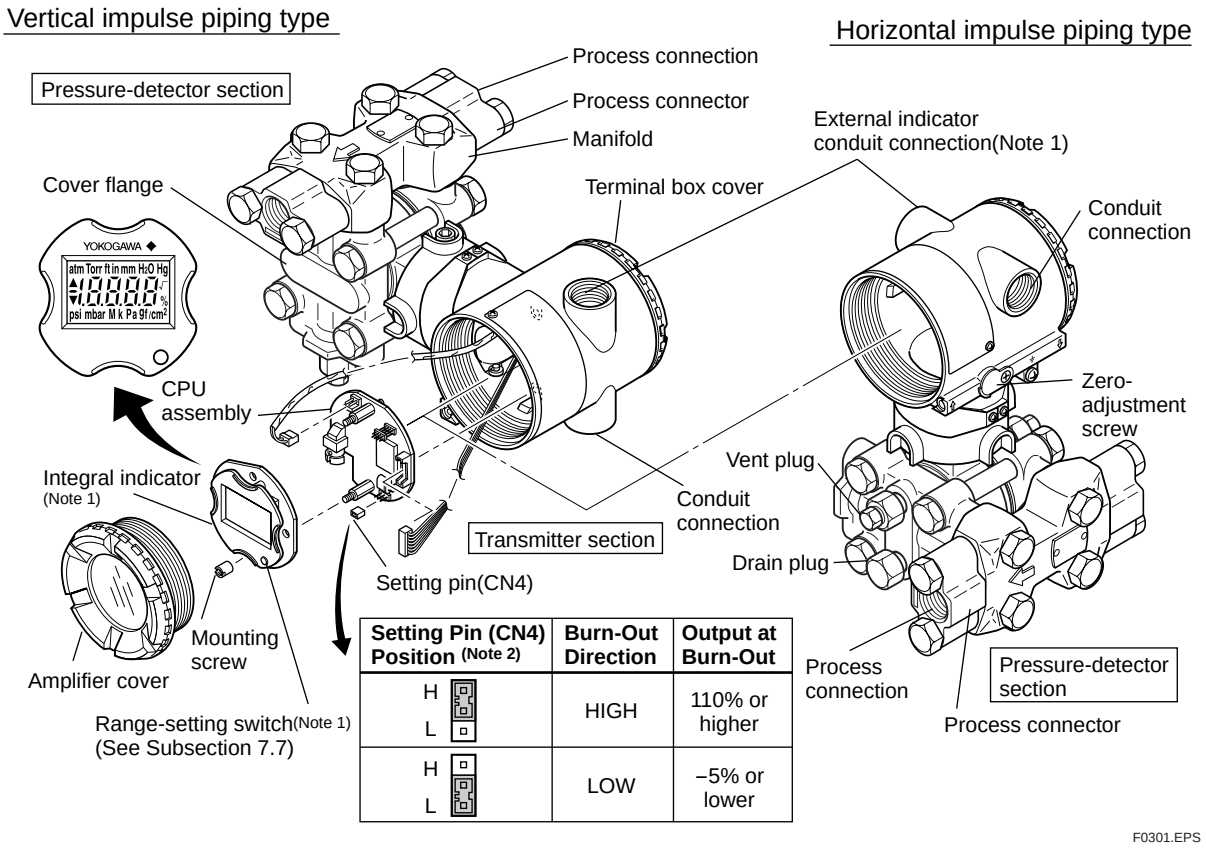
2.10 EMC Conformity Standards

For EMI (Emission): EN55011, AS/NZS 2064 1/2
For EMS (Immunity): EN50082–2

NOTE

YOKOGAWA recommends customer to apply the Metal Conduit Wiring or to use the twisted pair Shield Cable for signal wiring to conform the requirement of EMC Regulation, when customer installs the EJA Series Transmitters to the plant.

3. COMPONENT NAMES



Setting Pin (CN4) Position (Note 2)	Burn-Out Direction	Output at Burn-Out
H / L	HIGH	110% or higher
H / L	LOW	−5% or lower

Note 1: See Subsection 10.2, “Model and Suffix Codes,” for details.
Note 2: Insert the pin (CN4) as shown in the figure above to set the burn-out direction. The pin is set to the H side for delivery (unless option code /C1 is specified in the order).
The setting can be confirmed by calling up parameter D52 using the BRAIN TERMINAL. Refer to Subsection 8.3.3 (10).

Figure 3.1 Component Names

Table 3.1 Display Symbol

Display Symbol	Meaning of Display Symbol
$\sqrt{}$	Display mode is ‘square root’. (Display is not lit when ‘proportional’ mode.)
▲	The output signal being zero-adjusted is increasing.
▼	The output signal being zero-adjusted is decreasing.
%, Pa, hPa, kPa, MPa, kgf/cm^2, gf/cm^2, mbar, bar, atm, mmHg, mmH_2O, inH_2O, inHg, ftH_2O, psi, Torr	Select one of these seventeen available engineering units for the display.

T0301.EPS

4. INSTALLATION

4.1 Precautions

Before installing the transmitter, read the cautionary notes in Section 2.4, “Selecting the Installation Location.” For additional information on the ambient conditions allowed at the installation location, refer to Subsection 10.1 “Standard Specifications.”

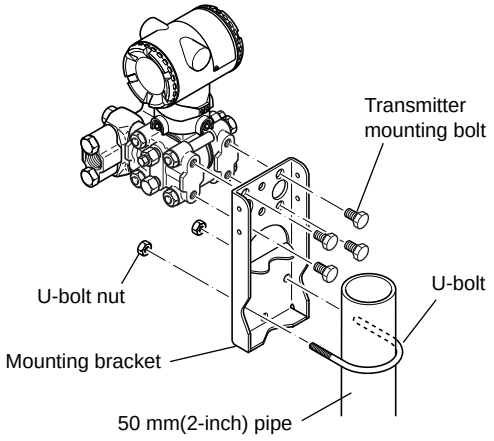
IMPORTANT

- When welding piping during construction, take care not to allow welding currents to flow through the transmitter.
- Do not step on this instrument after installation.

4.2 Mounting

- The transmitter can be mounted on a nominal 50 mm (2-inch) pipe using the mounting bracket supplied, as shown in Figure 4.2.1 and 4.2.2. The transmitter can be mounted on either a horizontal or a vertical pipe.
- When mounting the bracket on the transmitter, tighten the (four) bolts that hold the transmitter with a torque of approximately 39 N·m {4kgf·m}.
- The transmitter is shipped with the manifold set up as per the order specifications.
- For correct flow measurement, the flow path must always be filled with fluid; otherwise, measurement accuracy cannot be assured.
- For the vertical impulse piping type, it is recommended that the manifold be mounted facing up for liquid flow measurement; facing down for gas flow measurement, as shown in Figure 4.2.2.

Vertical pipe mounting



Horizontal pipe mounting

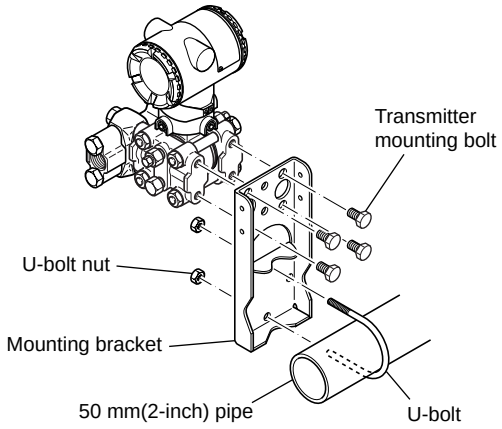
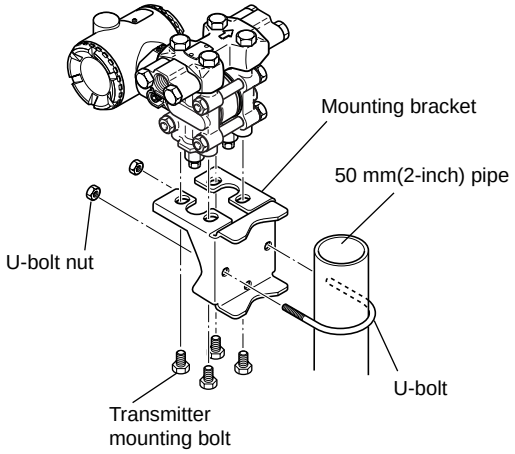


Figure 4.2.1 Transmitter Mounting (Horizontal Impulse Piping Type)

Vertical pipe mounting(Manifold upside)



Vertical pipe mounting(Manifold downside)

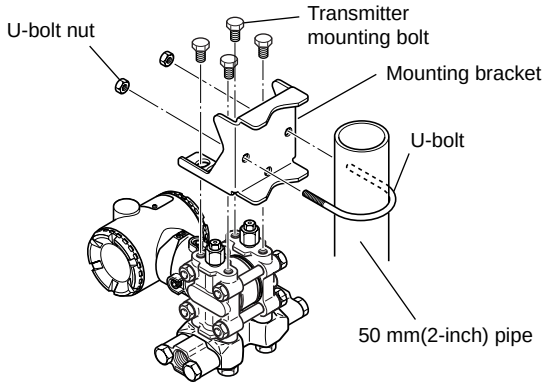


Figure 4.2.2 Transmitter Mounting (Vertical Impulse Piping Type)

4.3 Rotating Transmitter Section

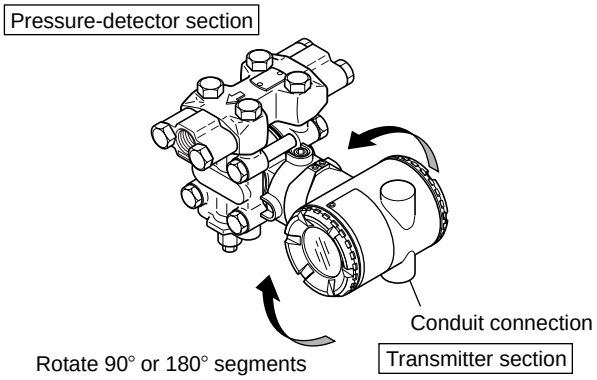
The DPharp transmitter section can be rotated in 90° segments.

1) Remove the two Allen screws that fasten the transmitter section and capsule assembly, using the Allen wrench.
2) Rotate the transmitter section slowly in 90° segments.
3) Tighten the two Allen screws to a torque of 5 N·m.

IMPORTANT

Do not rotate the transmitter section more than 180°.

Vertical impulse pipe



Horizontal impulse pipe

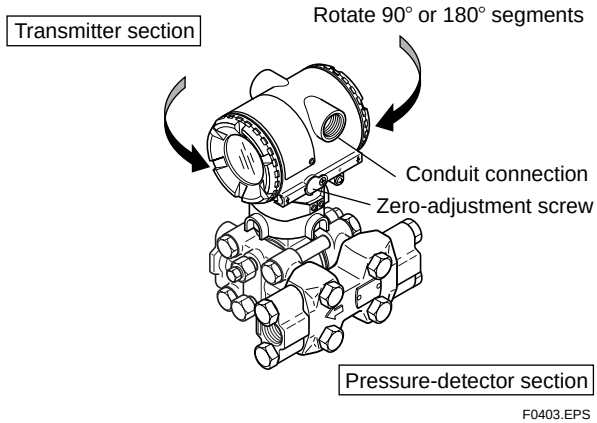


Figure 4.3 Rotating Transmitter Section

5. INSTALLING IMPULSE PIPING

5.1 Process Piping Installation Precautions

The manifold contains a small-bore orifice. For the transmitter of a high pressure connection right side, the orifice is placed facing such a direction as to enable normal flow measurement when fluid is flowed from right to left (as viewed from the front). If the orifice is removed from the manifold, it must be replaced facing the correct direction. (For disassembly and reassembly procedures, see Subsection 9.4.4)

Pay careful attention to the following points when routing the process piping and connection the process piping to the transmitter.

5.1.1 Connecting Process Piping to the Transmitter

(1) Confirming the Process Fluid Flow Direction (Figure 5.1.1)

The mark "⇦" on the manifold indicates the direction in which the process fluid is flowed (from right to left). When connecting the process piping to the process connector, confirm the process fluid flow direction.

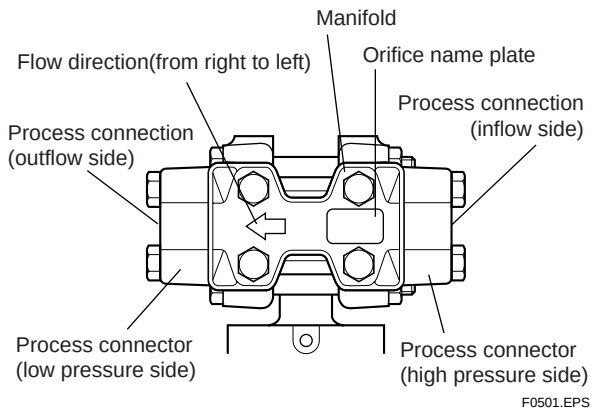


Figure 5.1.1 Manifold and Flow Direction Indication

(2) Tightening the Process Connector Mounting Bolts

The transmitter is shipped with the process connector mounting bolts only loosely tightened. After connecting the process piping, tighten these bolts uniformly to prevent leaks.

(3) Removing the Process Connector Port Dustproof Cap

The process connector port threads are covered with a plastic cap to exclude dust. This cap must be removed before connecting the piping. (Be careful not to damage the threads when removing this cap. Never insert a screwdriver or other tool between the cap and port threads to remove the cap.)

5.1.2 Routing the Process Piping

(1) Relationship between Process Fluid and Manifold Locations (For the vertical impulse piping type)

If condensate (or gas) generated in the process piping were allowed to accumulate, then it would be necessary to remove it periodically by opening the drain (or vent) plug. However, this would generate a transient disturbance in the pressure measurement. Therefore, the process piping must be routed so that any condensate (or gas) generated in the process piping will not accumulate in the pressure-sensing assembly of the transmitter.

NOTE

- If the process fluid is a gas, then as a rule the manifold must be located at the downside of the pressure-sensing assembly. (Figure 5.1.2)
- If the process fluid is a liquid, then as a rule the manifold must be located at the upside of the pressure-sensing assembly. (Figure 5.1.3)

(2) Pipe Size for Process Piping

Use a 15 mm (1/2-inch) pipe for process piping connection to the process connector.

(3) Preventing Freezing

If there is any risk that the process fluid in the transmitter pressure-sensing assembly could freeze, use a steam jacket or heater to maintain the temperature of the fluid.

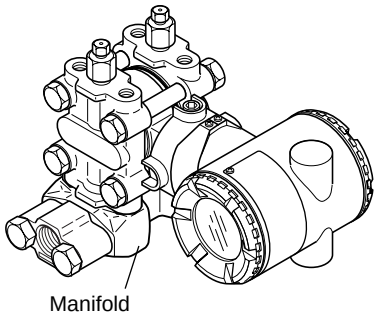


Figure 5.1.2 Manifold Location at the Downside (for Gas Flow Measurement)

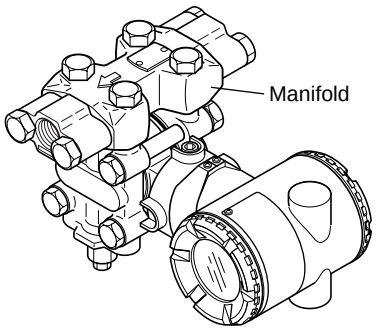


Figure 5.1.3 Manifold Location at the Upside (for Liquid Flow Measurement)

5.2 Process Piping Connection Examples

Figure 5.2 shows examples of typical process piping connections. Before connecting the transmitter to the process, study the transmitter installation location, the process piping layout, and the characteristics of the process fluid (corrosiveness, toxicity, flammability, etc.), in order to make appropriate changes and additions to the connection configurations.

Note the following points when referring to these piping examples.

- The high pressure connecting port on the transmitter is shown on the right (as viewed from the front).
- The transmitter process piping connection is shown for a vertical impulse piping connection configuration in which the direction of process flow is from right to left.
- The process piping material used must be compatible with the process pressure, temperature, and other conditions.
- A variety of process piping-mounted stop valves are available according to the type of connection (flanged, screwed, welded), construction (globe, gate, or ball valve), temperature and pressure. Select the type of valve most appropriate for the application.

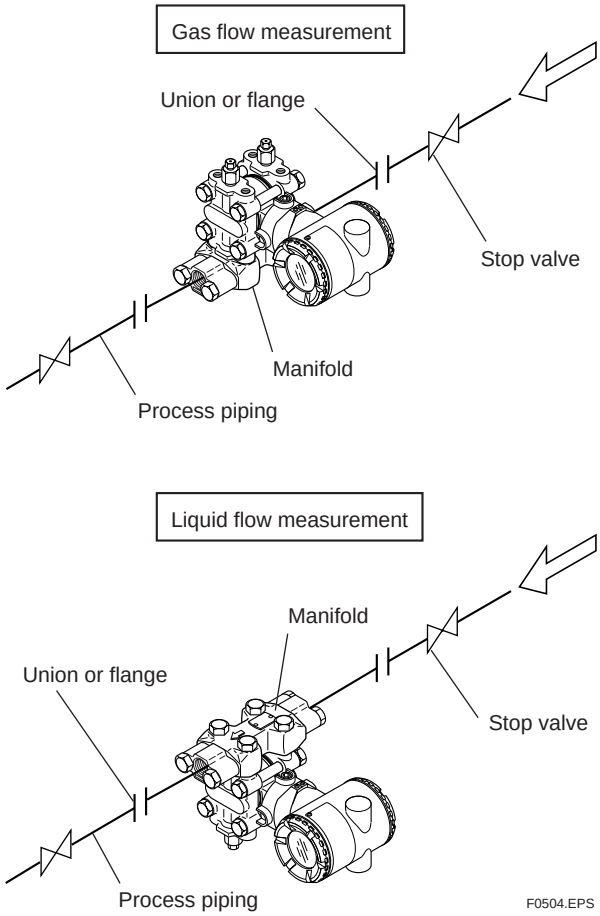


Figure 5.2 Process Piping Connection Examples

6. WIRING

6.1 Wiring Precautions

IMPORTANT

- Lay wiring as far as possible from electrical noise sources such as large capacity transformers, motors, and power supplies.
- Remove electrical connection dust cap before wiring.
- All threaded parts must be treated with waterproofing sealant. (A non-hardening silicone group sealant is recommended.)
- To prevent noise pickup, do not pass signal and power cables through the same ducts.
- Explosion-protected instruments must be wired in accordance with specific requirements (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion-protected features.
- The terminal box cover is locked by an Allen head bolt (a shrouding bolt) on CENELEC, SAA, and JIS flameproof type transmitters. When the shrouding bolt is driven clockwise by an Allen wrench, it is going in and cover lock is released, and then the cover can be opened. See Subsection 9.4 “Disassembly and Reassembly” for details.

Refer to The “Installation and Operating Precautions for JIS Flameproof Equipment” and “Installation and Operating Precautions for JIS Intrinsically Safe Equipment” at the end of this manual for correct wiring.

6.2 Selecting the Wiring Materials

(a) Use stranded leadwires or cables which are the same as or better than 600 V grade PVC insulated wire (JIS C3307) or equivalent.
(b) Use shielded wires in areas that are susceptible to electrical noise.
(c) In areas with higher or lower ambient temperatures, use appropriate wires or cables.

CAUTION

When selecting cables for JIS flameproof type transmitters, determine cables' maximum allowable heat resistance depending on the temperature condition on the transmitter. See Section 2.9.5 JIS Certification for details.

(d) In environment where oils, solvents, corrosive gases or liquids may be present, use wires or cables that are resistant to such substances.
(e) It is recommended that crimp-on solderless terminal lugs (for 4 mm screws) with insulating sleeves be used for leadwire ends.

6.3 Connections of External Wiring to Terminal Box

6.3.1 Power Supply Wiring Connection

Connect the power supply wiring to the SUPPLY + and – terminals.

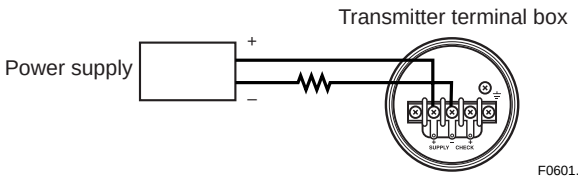


Figure 6.3.1 Power Supply Wiring Connection

6.3.2 External Indicator Connection

Connect wiring for external indicators to the CHECK + and – terminals.

(Note) Use a external indicator whose internal resistance is 10 Ω or less.

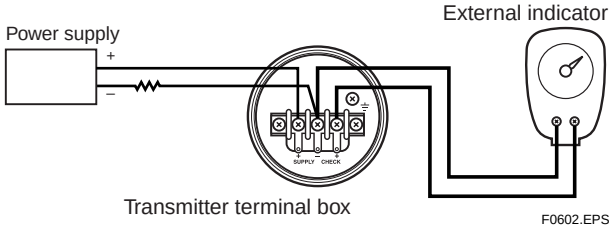


Figure 6.3.2 External Indicator Connection

6.3.3 BRAIN TERMINAL BT200 Connection

Connect the BT200 to the SUPPLY + and – terminals (Use hooks).

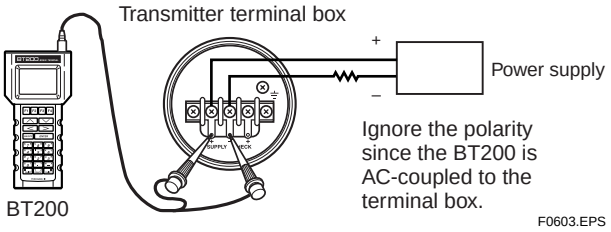


Figure 6.3.3 BT200 Connection

6.3.4 Check Meter Connection

Connect the check meter to the CHECK + and – terminals (use hooks).

• A 4 to 20 mA DC output signal from the CHECK + and – terminals.

(Note) Use a check meter whose internal resistance is 10 Ω or less.

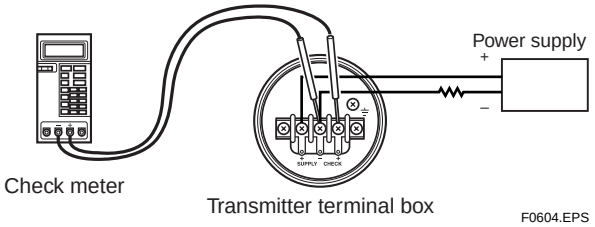


Figure 6.3.4 Check Meter Connection

6.4 Wiring

CAUTION

For the intrinsically safe equipment and flameproof equipment, wiring materials and wiring work for these equipment including peripherals are strictly restricted. Users absolutely must read “Installation and Operating Precautions for JIS Intrinsically Safe Equipment” and “Installation and Operating Precautions for JIS Flameproof Equipment” at the end of this manual prior to the work.

6.4.1 Loop Configuration

Since the DPharp uses a two-wire transmission system, signal wiring is also used as power wiring.

DC power is required for the transmitter loop. The transmitter and distributor are connected as shown below.

For details of the power supply voltage and load resistance, see Section 6.6; for communications line requirements, see Subsection 8.1.2.

(1) General-use Type and Flameproof Type

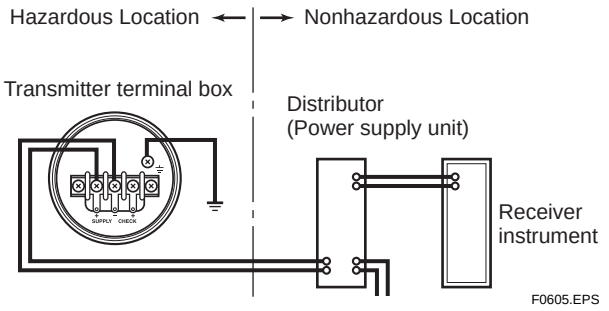


Figure 6.4.1a Connection between Transmitter and Distributor

(2) Intrinsically Safe Type

For intrinsically safe type, a safety barrier must be included in the loop.

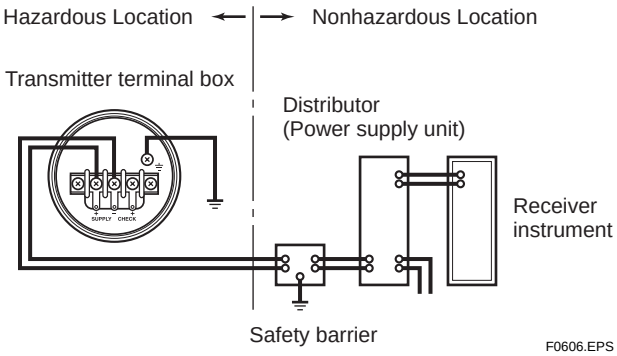


Figure 6.4.1b Connection between Transmitter and Distributor

6.4.2 Wiring Installation

(1) General-use Type and Intrinsically Safe Type

Make cable wiring using metallic conduit or waterproof glands.

- Apply a non-hardening sealant to the terminal box connection port and to the threads on the flexible metal conduit for waterproofing.

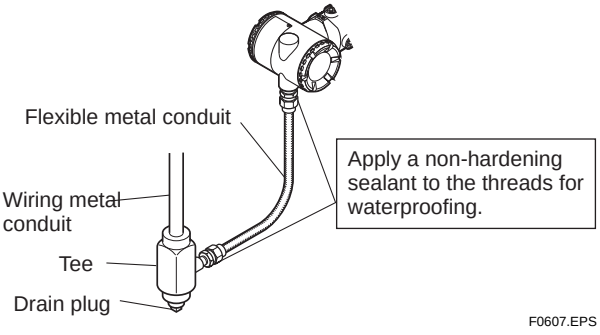


Figure 6.4.2a Typical Wiring Using Flexible Metal Conduit

(2) Flameproof Type (JIS)

Wire cables through a flameproof packing adapter, or using a flameproof metal conduit.

■ Wiring cable through flameproof packing adapter for only JIS flameproof type (see Figure 6.4.2b).

- Use only flameproof packing adapters approved by Yokogawa.
- Apply a nonhardening sealant to the terminal box connection port and to the threads on the flameproof packing adapter for waterproofing.

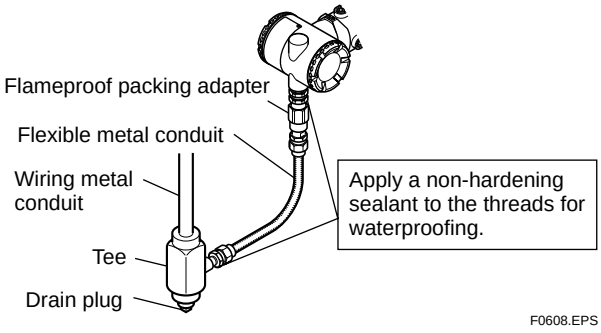


Figure 6.4.2b Typical Cable Wiring Using Flameproof Packing Adapter

- Measure the cable outer diameter in two directions to within 1 mm.
- Calculate the average of the two diameters, and use packing with an internal diameter nearest to this value (see Table 6.4.2).

Table 6.4.2 Flameproof Packings and Applicable Cable Outer Diameters

Optional Code	Wiring Port Thread Diameter	Applicable Cable OD (mm)	Identifying Mark	Part Number
G11	G 1/2	8 to 10	16 8-10	G9601AM
G12		10.1 to 12	16 10-12	

T0601.EPS

- Mounting flameproof packing adapter body to conduit connection (see Figure 6.4.2c)

1) Screw the flameproof packing adapter into the terminal box until the O-ring touches the wiring port (at least 6 full turns), and firmly tighten the lock nut.
2) Insert the cable through the union cover, the union coupling, the clamp nut, the clamp ring, the gland, the washer, the rubber packing, and the packing box, in that order.
3) Insert the end of the cable into the terminal box.
4) Tighten the union cover to grip the cable. When tightening the union cover, tighten approximately one turn past the point where the cable will no longer move up and down.
   Proper tightening is important. If it is too tight, a circuit break in the cable may occur; if not tight enough, the flameproof effectiveness will be compromised.
5) Fasten the cable by tightening the clamp nut.
6) Tighten the lock nut on the union cover.
7) Connect the cable wires to each terminal.

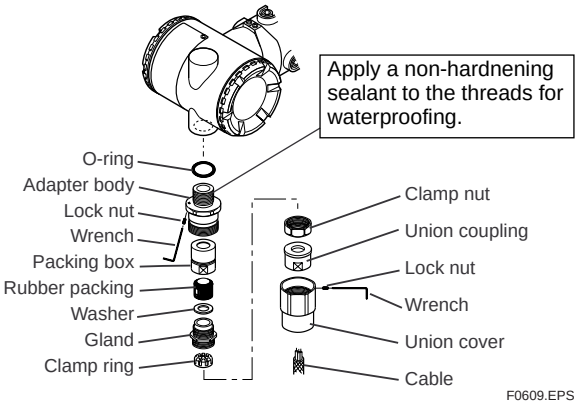


Figure 6.4.2c Installing Flameproof Packing Adapter

■ Flameproof metal conduit wiring

- A seal fitting must be installed near the terminal box connection port for a sealed construction.
- Apply a non-hardening sealant to the threads of the terminal box connection port, flexible metal conduit and seal fitting for waterproofing.

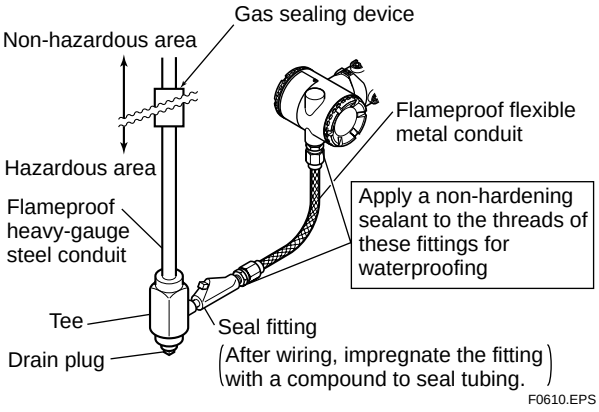


Figure 6.4.2d Typical Wiring Using Flameproof Metal Conduit

6.5 Grounding

(a) Grounding should satisfy JIS Class 3 requirements (grounding resistance, 100 Ω or less). Grounding is required for JIS flameproof type and intrinsically safe type.

(Note) If equipped with built-in Lightning Protector, grounding should satisfy Special JIS class 3 requirements (grounding resistance, 10 Ω or less).

(b) There are ground terminals on the inside and outside of the terminal box. Either of these terminals may be used.

(c) Use 600 V grade PVC insulated wires for grounding.

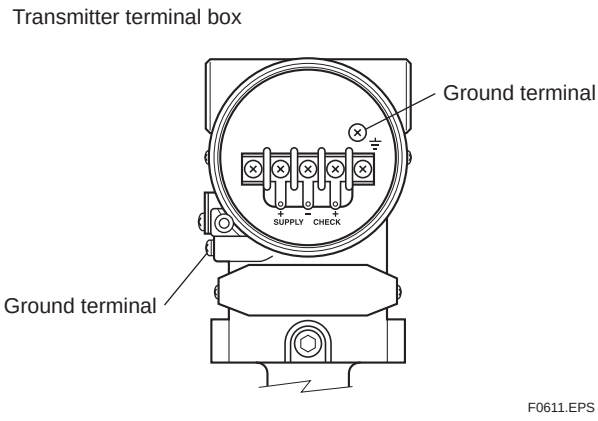


Figure 6.5 Ground Terminals

6.6 Power Supply Voltage and Load Resistance

When configuring the loop, make sure that the external load resistance is within the range in the figure below.

(Note) In case of an intrinsically safe transmitter, external load resistance includes safety barrier resistance.

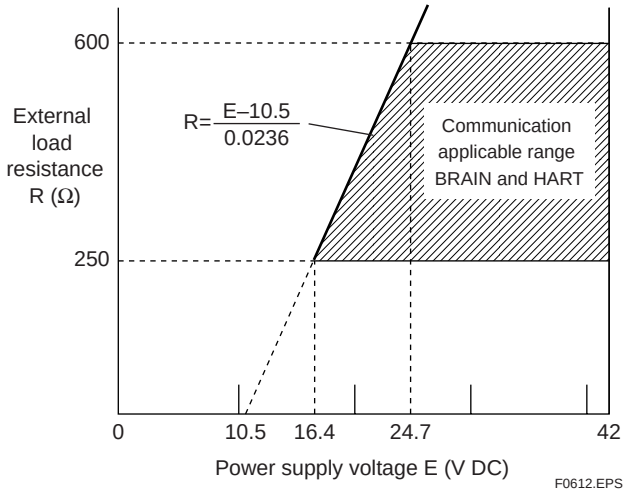


Figure 6.6 Relationship between Power Supply Voltage and External Load Resistance

7. OPERATION

7.1 Preparation for Starting Operation

The Model EJA115 low flow transmitter measures the flow rates of liquids and gases. This section describes the operation procedure for the EJA115 as shown in Figure 7.1 (vertical impulse piping type, high-pressure connection: right side) when measuring a liquid flow rate.

(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.

Venting Gas from the Transmitter Pressure-detector Section

- 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 Subsection 7.6 for instructions.

(b) Turn ON power and connect the BT200.
   Open the terminal box cover, and connect the BT200 to the SUPPLY + and – terminals.

(c) Using the BT200, confirm that the transmitter is operating properly. Check parameter values or change the setpoints as necessary. See Chapter 8 for BT200 operation.
   If the transmitter is equipped with an integral indicator, its indication can be used to confirm that the transmitter is operating properly.

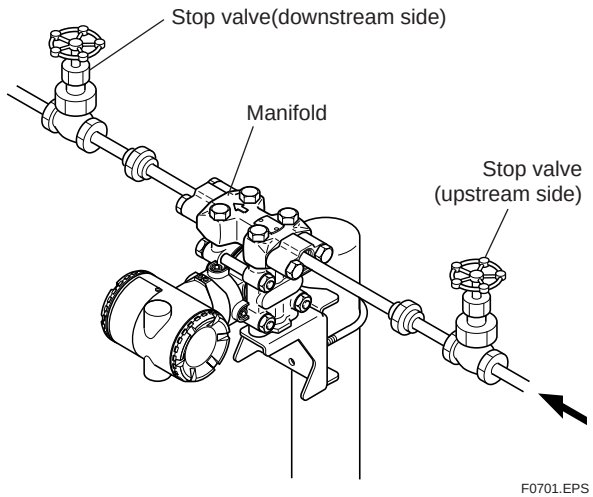
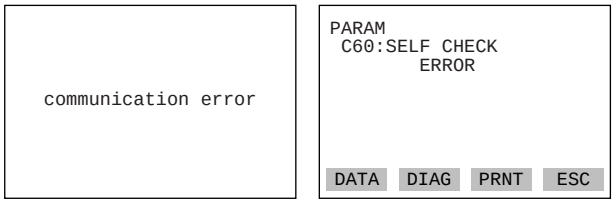


Figure 7.1 Liquid Flow Measurement

■ Confirming that Transmitter is Operating Properly

Using the BT200

- If the wiring system is faulty, ‘communication error’ appears on the display.
- If the transmitter is faulty, ‘SELF CHECK ERROR’ appears on the display.

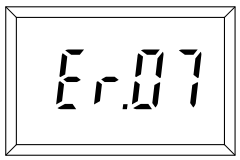


Communication error
(Faulty wiring)

Self-diagnostic error
(Faulty transmitter)

Using the integral indicator

- If the wiring system is faulty, the display stays blank.
- If the transmitter is faulty, an error code will appear on the display according to the nature of the error.



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

F0703.EPS

NOTE

If any of the error indications above appears on the display of the integral indicator or BT200, refer to Subsection 8.5.2 for corrective action.

■ Verify and Change Transmitter Parameter Setting and Values

The following parameters are the minimum settings required for operation. The transmitter has been shipped with these parameters. To confirm or change the values, see Subsection 8.3.3.

- Measuring range ..... See Subsection 8.3.3 (2)
- Output/integral indicator mode ..... See Subsection 8.3.3 (4)
- Operation mode ..... See Subsection 8.3.3 (9)

7.2 Zero Point Adjustment

Adjust the zero point after operating preparation is completed. Make sure to close the stop valves on the upstream and downstream sides before the adjustment.

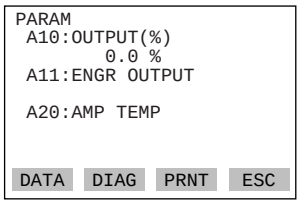
IMPORTANT

Do not turn off the power to the transmitter immediately after a zero adjustment. Powering off within 30 seconds after a zero adjustment will return the adjustment back to the previous settings.

The zero point adjustment can be made in either way: using the zero-adjustment screw of the transmitter or the BT200 operation.

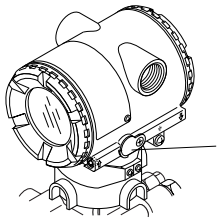
For output signal checking, display the parameter **A10: OUTPUT (%)** in the BT200.

●BT200



Output signal (%) display

●Zero-adjustment Screw



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■ Using the Transmitter Zero-adjustment Screw

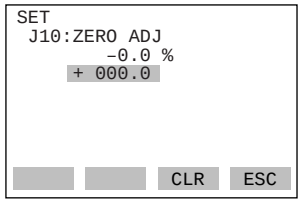
Before adjusting a screw, check that the parameter **J20: EXT ZERO ADJ** displays **ENABLE**. See Subsection 8.3.3 (13) for the setting procedure.

Use a slotted screwdriver to turn the zero-adjustment screw. Turn the screw clockwise to increase the output or counterclockwise to decrease the output. The zero point adjustment can be made with a resolution of 0.01% of the setting range. Since the degree of zero adjustments varies with the screw turning speed, turn the screw slowly for fine adjustment and quickly for coarse adjustment.

■ Using the BT200

Zero point can be adjusted by simple key operation of the BT200.

Select parameter **J10: ZERO ADJ**, and press the ENTER key twice. The zero point will be adjusted automatically to the output signal 0% (4 mA DC). Confirm that the setting value displayed for the parameter is '0.0%' before pressing the ENTER key. See Subsection 8.3.3 (13) for BT200 operating procedures.



A display when parameter J10 is selected.
Press ENTER key twice for 0% output 4 mA DC.

F0705.EPS

7.3 Starting Operation

After completing the zero point adjustment, follow the procedure below to start operation.

1) Open the stop valve on the upstream side.
2) Gradually open the stop valve on the downstream side. This places the transmitter in an operational condition.
3) Confirm the operating status. If the output signal exhibits wide fluctuations (hunting) due to periodic variation in the process pressure, use BT200 to dampen the transmitter output signal. Confirm the hunting using a receiving instrument or the integral indicator, and set the optimum damping time constant. See Subsection 8.3.3 (3), "Damping Time Constant Setup."
4) After confirming the operating status, perform the following.

IMPORTANT

- Remove the BT200 from the terminal box, and confirm that none of the terminal screws are loosened.
- Close the terminal box cover and the amplifier cover. Screw each cover in tightly until it will not turn further.
- Two covers are required to be locked on the CENELEC, SAA, and JIS Flameproof type transmitters. An Allen head bolts (shrouding bolts) are provided under edge of the each cover for locking. When a shrouding bolts are driven counterclockwise by an Allen wrench, it is coming out and locks up a cover. (See page 9-3) After locking, the covers should be confirmed not to be opened.
- Tighten the zero-adjustment cover mounting screw to fix the cover in position.

7.4 Shutting Down Operation

Shut down the transmitter operation as follows.
1) Turn off the power.
2) Close the stop valves on the up and downstream sides.

NOTE

Whenever shutting down the transmitter for a long period, remove any process fluid from the transmitter pressure-detector section.

7.5 Transmitter Measurement Range (Determining Differential Pressure Range)

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

1.03323 kgf/cm^2=1.01325×10^2 kPa

7.5.1 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**

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

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, $pkgf/cm^2G$)

γf: Specific liquid weight (kgf/m^3) at operating conditions (t°C, $pkgf/cm^2G$)

■ Equivalent Air Flow Calculation

$$Q_o = 0.05409 \cdot Qn \sqrt{\gamma n \cdot \frac{273.15 + t}{1.0332 + p} \cdot \frac{Zf}{Zn}} \quad \cdots\cdots (2)$$

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)
γn: Specific gas weight at 0°C, 1 atm (kgf/Nm^3)
Zn: Compression factor of gas at 0°C, 1 atm
Zf: Compression factor of gas at operations conditions (t°C, $pkgf/cm^2G$)

(b) Obtain a differential pressure from the above equivalent water or air flow using the nomograph shown in Figure 7.5.1 or 7.5.2. In this procedure, multiply Qw or Qo by 1000/60 to convert the flow unit into litre/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 (kgf/h) (Note)
D: Orifice bore (mm)
μ: Viscosity (cP)

Note: Determination of W
· For liquid, W=Qf·γf
· For gas, W=Qn·γn

■ 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 7.5.3

For details concerning determination of differential pressure correction using Reynolds number, pressure loss, etc., refer to TI 6P1E2-01E.

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7.5.2 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 weight:	1.251 kgf/Nm^3 (specific weight at 0°C, 1 atm)
Temperature:	30°C
Pressure:	1 kgf/cm^2
Viscosity:	0.018 cP

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

$$Q_o = 0.05409 \times 25 \sqrt{1.251 \times \frac{273.15 + 30}{1.0332 + 1}}$$

$$= 18.5\ Nm^3/h = 308.3\ Nl/min$$

A differential pressure range of 0 to 2400 mmH_2O is obtained from Figure 7.5.2 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.

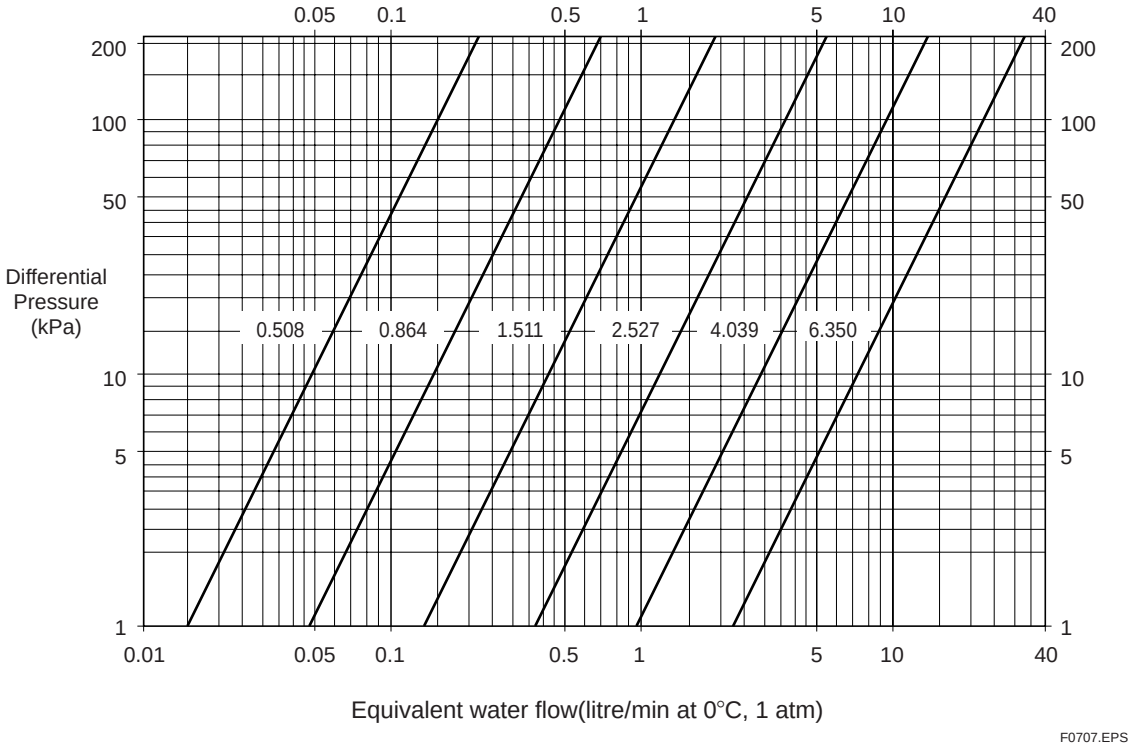


Figure 7.5.1 Relationship between Equivalent Water Flow and Differential Pressure

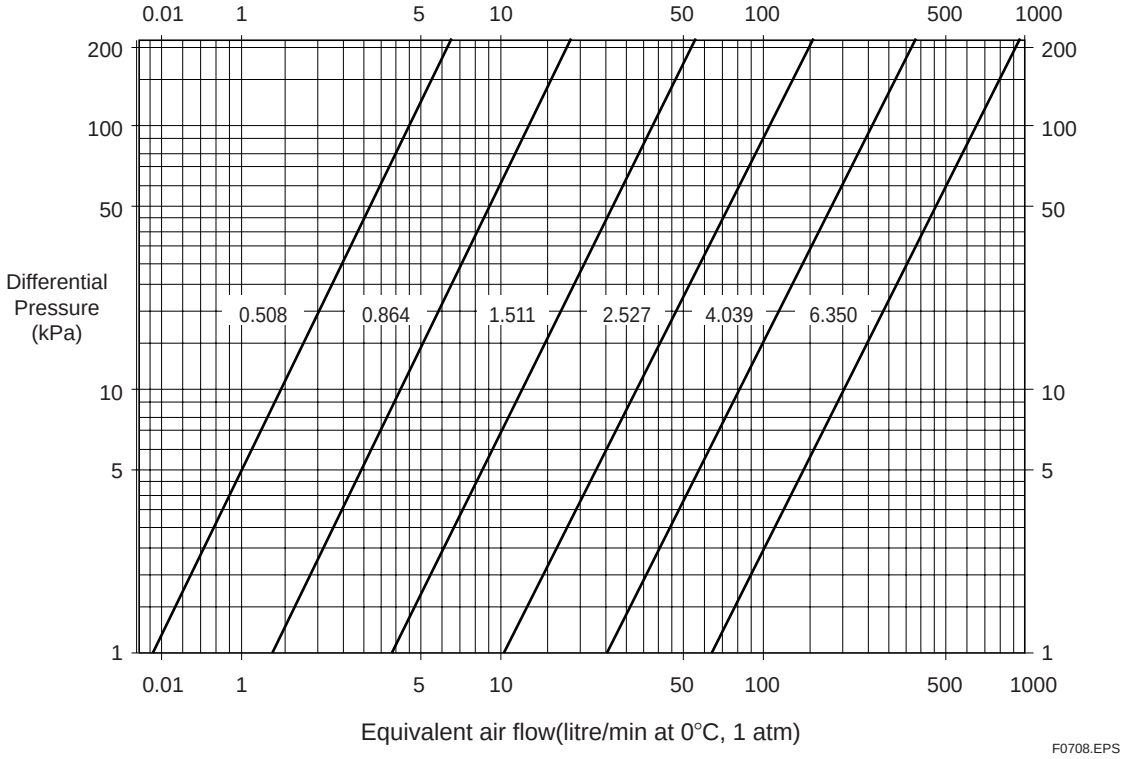
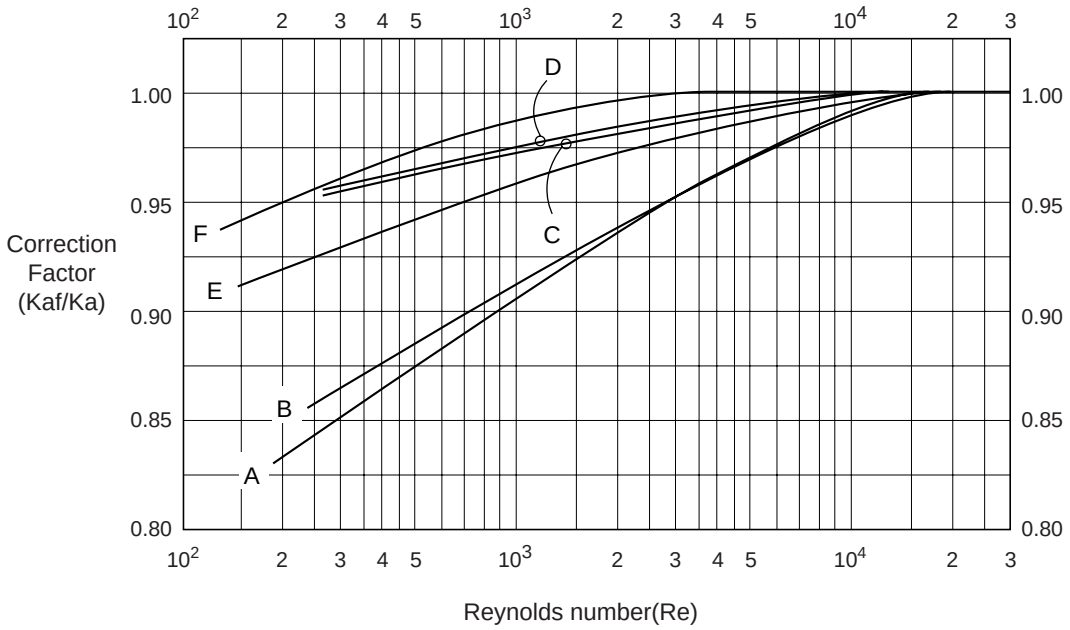


Figure 7.5.2 Relationship between Equivalent Air Flow and Differential Pressure



Characteristic curve	Orifice bore(mm)
A	0.508
B	0.864
C	1.511
D	2.527
E	4.039
F	6.350

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Figure 7.5.3 Relationship between Reynolds Number and Correction Factor

7.6 Venting or Draining Transmitter Pressure-detector Section

Since this transmitter is designed to be self-draining and self-venting with vertical impulse piping connections, neither draining nor venting will be required if the impulse piping is configured appropriately for self-draining or self-venting operation.

If condensate (or gas) collects in the transmitter pressure-detector section, the measured pressure may be in error. If it is not possible to configure the piping for self-draining (or self-venting) operation, you will need to loosen the drain (vent) screw on the transmitter to completely drain (vent) any stagnated liquid (gas).

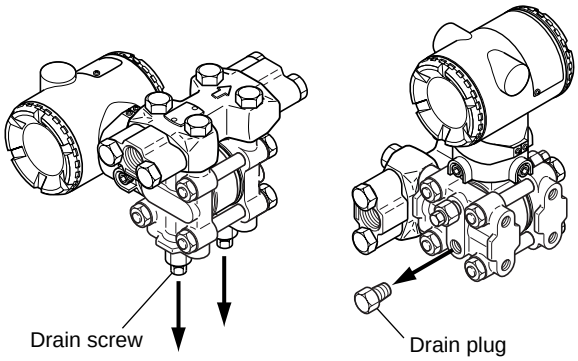
However, since draining condensate or bleeding off gas gives the pressure measurement disturbance, this should not be done when the loop is in operation.

⚠ WARNING

Since the accumulated liquid (or gas) may be toxic or otherwise harmful, take appropriate care to avoid contact with the body, or inhalation of vapors.

7.6.1 Draining Condensate

1) Gradually open the drain screw or drain plug and drain the transmitter pressure-detector section. (See Figure 7.6.1.)
2) When all accumulated liquid is completely removed, close the drain screw or drain plug.
3) Tighten the drain screw to a torque of 10 N·m, and the drain plug to a torque of 34 to 39 N·m.



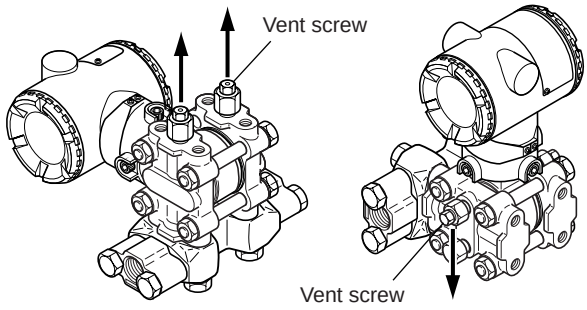
When you loosen the drain screw or drain plug, the accumulated loquid will be expelled in the direction on th earrow.

F0710.EPS

Figure 7.6.1 Draining the Transmitter

7.6.2 Venting Gas

1) Gradually open the vent screw to vent gas from the transmitter pressur-detector section. (See Figure 7.6.2.)
2) When the transmitter is completely vented, close the vent screw.
3) Tighen the vent screw to a torque of 10 N·m.



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

F0711.EPS

Figure 7.6.2 Venting the Transmitter

7.7 Setting the Range Using the Range-setting Switch

With actual pressure being applied to the transmitter, the range-setting switch (push-button) located on the optional integral indicator plate and the external zero-adjustment screw allow users to change (re-range) the low- and high-limit values for the measurement range (LRV and HRV) without using BT200. However, other changes in the display settings (scale range and engineering unit) for the integral indicator requires BT200.

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

[Example]

Rerange LRV to 0 and HRV to 20 kPa.

1) Connect the transmitter and apparatus as shown in Figure 9.3.1 and warm up for at least five minutes.
2) Press the range-setting push-button.
   The integral indicator then displays “LSET.”
3) Apply a pressure of 0 kPa (atmospheric pressure) to the transmitter. (Note 1)
4) Turn the external zero-adjustment screw in the desired direction. The integral indicator displays the output signal in %. (Note 2)
5) Adjust the output signal to 0% (1 V DC) by rotating the external zero-adjustment screw. Doing so completes the LRV setting.

6) Press the range-setting push-button. The integral indicator then displays “HSET.”
7) Apply a pressure of 20 kPa to the transmitter. (Note 1)
8) Turn the external zero-adjustment screw in the desired direction. The integral indicator displays the output signal in %. (Note 2)
9) Adjust the output signal to 100% (5 V DC) by rotating the external zero-adjustment screw. Doing so completes the HRV setting.
10) Press the range-setting push-button. The transmitter then switches back to the normal operation mode with the measurement range of 0 to 20 kPa.

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 HRV), the integral indicator may display error number “Er.07” (In this case, the output signal percent and “Er.07” are displayed alternately every two seconds). Although “Er.07” is displayed, you may proceed to the next step. However, should any other error number be displayed, take the appropriate measure in reference to Subsection 8.5.2, “Errors and Countermeasures.”

IMPORTANT

- Do not turn off the power to the transmitter immediately after completion of the change in the LRV and/or HRV setting(s). Note that powering off within thirty seconds after setting will cause a return to the previous settings.
- Changing LRV automatically changes HRV to the following value.

HRV = previous HRV + (new LRV – previous LRV)

- If the range-setting push-button and external zero-adjustment screw are not touched during a range-change operation, the transmitter automatically switches back to the normal operation mode.

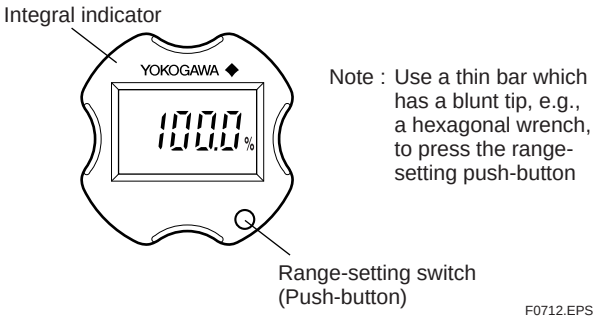


Figure 7.7 Range-setting Switch

8. BRAIN TERMINAL BT200 OPERATION

The DPharp is equipped with BRAIN communications capabilities, so that range changes, Tag No. setup, monitoring of self-diagnostic results, and zero point adjustment can be handled by remote control via BT200 BRAIN TERMINAL or CENTUM CS console. This section describes procedures for setting parameters using the BT200. For details concerning the BT200, see IM 1C0A10-E, "BT200 User's Manual."

8.1 BT200 Operation Precautions

8.1.1 Connecting the BT200

Connection to the transmitter with the BT200 can be made by either connecting to the BT200 connection hooks in the transmitter terminal box or by connecting to a relaying terminal board.

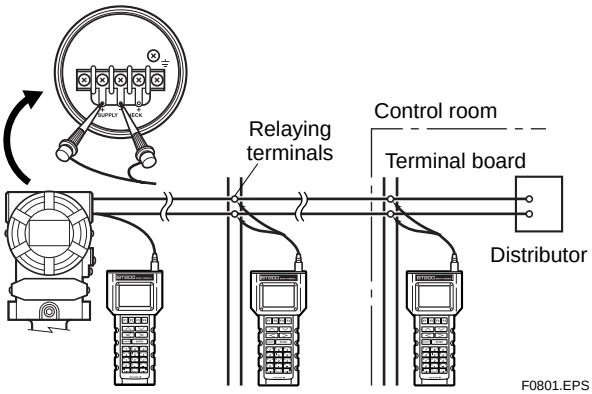


Figure 8.1.1 Connecting the BT200

8.1.2 Conditions of Communication Line

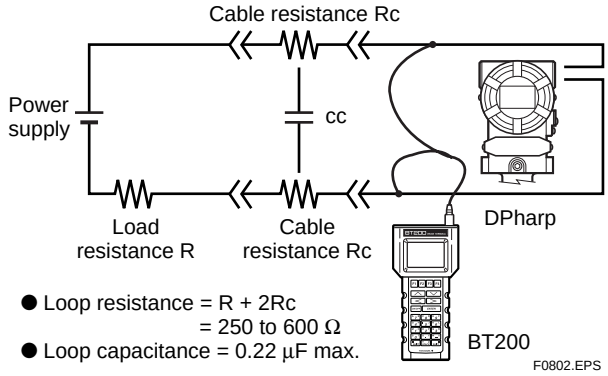


Figure 8.1.2 Conditions of Communication Line

8.2 BT200 Operating Procedures

8.2.1 Key Layout and Screen Display

Figure 8.2.1a shows the arrangement of the operating keys on the BT200 keypad, and Figure 8.2.1b shows the BT200 screen component.

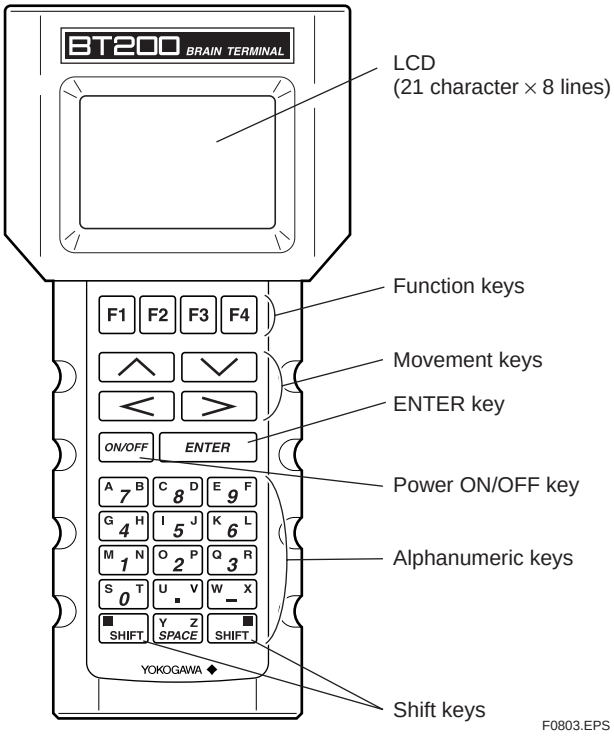


Figure 8.2.1a BT200 Key Layout

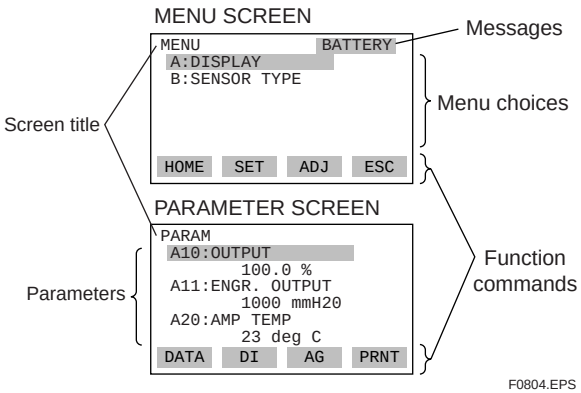
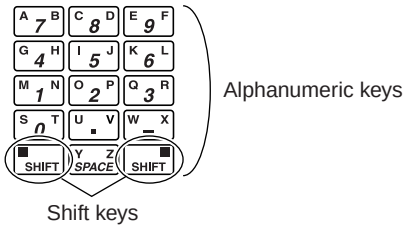


Figure 8.2.1b BT200 Screen Component

8.2.2 Operating Key Functions

(1) Alphanumeric Keys and Shift Keys

You can use the alphanumeric keys in conjunction with the shift keys to enter symbols, as well as alphanumeric keys.



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a. Entering Digits, Symbols, and Spaces

Simply press the alphanumeric keys.

Entry	Key-in Sequence
–4	[–] [4]
0.3	[0] [.] [3]
1 ␣ –9	[1] [SPACE] [–] [9]

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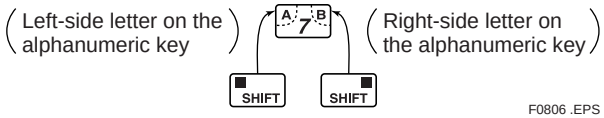
b. Entering Letters (A through Z)

Press an alphanumeric key following a shift key to enter the letter shown on that side which the shift key represents. You must press the shift key before entering each letter.



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Entry	Key-in Sequence
W	[SHIFT] [–]
IC	[SHIFT] [5] [SHIFT] [8]
J. B	[SHIFT] [5] [.] [SHIFT] [7]

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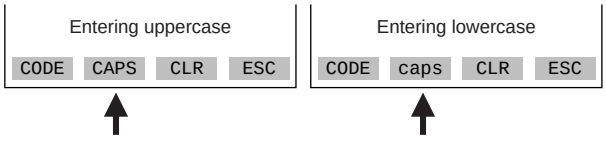
Use the function key [F2] CAPS to select between uppercase and lowercase (for letters only). The case toggles between uppercase and lowercase each time you press [F2] CAPS.



Entry	Key-in Sequence
Boy	[SHIFT] [7] [F2] [SHIFT] [2] [SHIFT] [SPACE] (to lower case) (B) (o) (y)

F0807.EPS

Use the function key [F1] CODE to enter symbols. The following symbols will appear in sequence, one at a time, at the cursor each time you press [F1] CODE:

/ . – , + *) (' & % $ # " !

To enter characters next to these symbols, press [>] to move the cursor.

Entry	Key-in Sequence
l/m	[F2] [SHIFT] [6] [F1] [>] [SHIFT] [1] (symbol command) (l) (/) (m)

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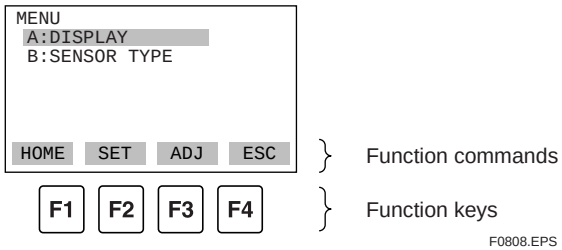
(2) Function Keys

The functions of the function keys depend on the function commands on display.



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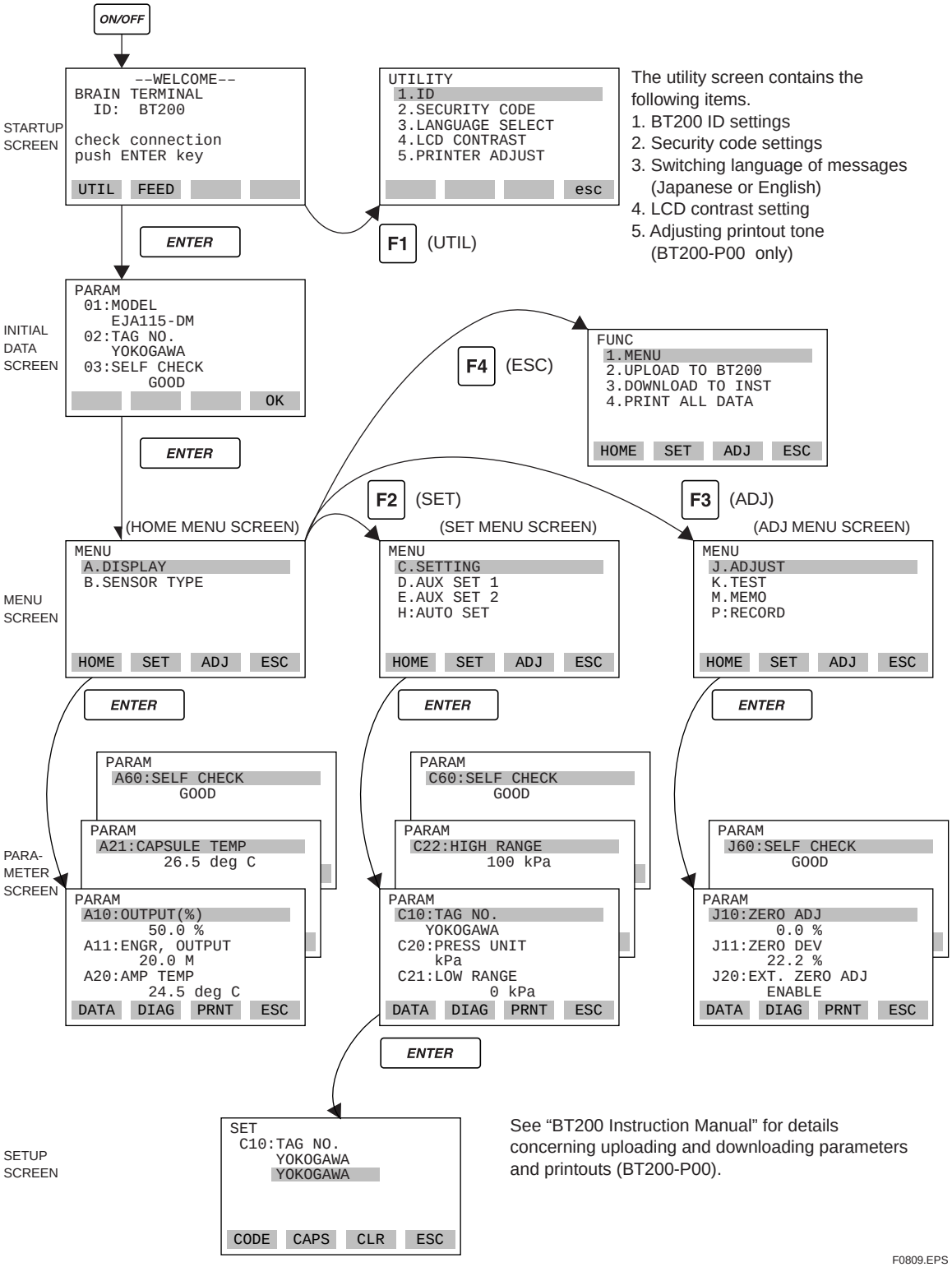
Function Command List

Command	Function
ADJ	Displays the ADJ menu
CAPS/caps	Selects uppercase or lowercase
CODE	Selects symbols
CLR	Erases input data or deletes all data
DATA	Updates parameter data
DEL	Deletes one character
DIAG	Calls the self-check panel
ESC	Returns to the most recent display
HOME	Displays the menu panel
NO	Quits setup and returns to the previous display
OK	Proceeds to the next panel
PARM	Enters the parameter number setup mode
SET	Displays the SET menu
SLOT	Returns to the slot selection panel
UTIL	Calls the utility panel
*COPY	Prints out parameters on display
*FEED	Paper feed
*LIST	Lists all parameters in the menu
*PON/POFF	Automatic printout mode on or off
*PRNT	Changes to the print mode
*GO	Starts printing
*STOP	Cancels printing

* Available on BT200-P00 (with printer).

T0804.EPS

8.2.3 Calling Up Menu Addresses Using the Operating Keys



8.3 Setting Parameters Using the BT200

8.3.1 Parameter Summary

Instruments to which applicable:
F: Differential pressure transmitters EJA110, EJA120, EJA118W, EJA118N, EJA118Y, and EJA115
P: Pressure transmitters EJA310, EJA430, EJA438W, and EJA438N
L: Liquid level transmitters EJA210 and EJA220

No.	Item	Description	Rewritability	Remarks	Default Value	Applicability		
						F	P	L
01	MODEL	Model+capsule type	–			○	○	○
02	TAG NO.	Tag number	–	16 alphanumerics		○	○	○
03	SELF CHECK	Self-diagnostic result	–	GOOD/ERROR		○	○	○
A	DISPLAY	Measured data display	–	Menu name		○	○	○
A10	OUTPUT (%)	Output (in %)	–	–5 to 110%		○	○	○
A11	ENGR. OUTPUT	Output (in engineering units)	–	–19999 to 19999		○	○	○
A20	AMP TEMP	Amplifier temperature	–	Unit specified in D30		○	○	○
A21	CAPSULE TEMP	Capsule temperature	–	Unit specified in D30		○	○	○
A30	STATIC PRESS	Static pressure	–	Unit specified in D31*		○	–	○
A40	INPUT	Input (indicated in engineering DP unit)	–	–32000 to 32000		○	○	○
A60	SELF CHECK	Self-diagnostic messages	–	GOOD/ERROR, CAP MODULE FAULT, AMP MODULE FAULT, OUT OF RANGE, OUT OF SP RANGE*, OVER TEMP (CAP), OVER TEMP (AMP), OVER OUTPUT, OVER DISPLAY, ILLEGAL LRV, ILLEGAL HRV, ILLEGAL SPAN, and ZERO ADJ OVER		○	○	○
B	SENSOR TYPE	Sensor type	–	Menu name		○	○	○
B10	MODEL	Model+span	–	16 uppercase alphanumerics		○	○	○
B11	STYLE NO.	Style number	–			○	○	○
B20	LRL	Lower range-limit	–	–32000 to 32000		○	○	○
B21	URL	Upper range-limit	–	–32000 to 32000		○	○	○
B30	MIN SPAN	Minimum span	–	–32000 to 32000		○	○	○
B40	MAX STAT.P.	Maximum atatic pressure	–			○	–	○
B60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
C	SETTING	Setting data	–	Menu name		○	○	○
C10	TAG. NO.	Tag number	○	16 alphanumerics	As specified when ordered.	○	○	○
C20	PRESS UNIT	Measurement range units	○	Selected from mmH_2O, mmAq, mmWG, mmHg, Torr, Pa, hPa, kPa, MPa, mbar, bar, gf/cm^2, kgf/cm^2, inH_2O, inHg, ftH_2O, psi, or atm	As specified when ordered.	○	○	○
C21	LOW RANGE	Measurement range, lower range value	○	–32000 to 32000(but within measurement range)	As specified when ordered.	○	○	○
C22	HIGH RANGE	Measurement range, higher range value	○	–32000 to 32000(but within measurement range)	As specified when ordered.	○	○	○
C30	AMP DAMPING	Damping time constant	○	Selected from 0.2, 0.5, 1.0, 2.0, 4.0, 8.0, 16.0, 32.0, or 64.0 sec.	2 s	○	○	○
C40	OUTPUT MODE	Output mode and integral indicator mode	○	Selected from OUT:LIN; DSP:LIN, OUT:LIN; DSP:SQR, OUT:SQR; DSP:SQR	As specified when ordered. If not specified, OUT: LIN; DSP: LIN.	○	–	–
C60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
D	AUX SET 1	Auxiliary setting data 1	–	Menu name		○	○	○
D10	LOW CUT	Low cut	○	0.0 to 20.0%		○	○	○
D11	LOW CUT MODE	Low cut mode	○	LINEAR/ZERO		○	○	○
D20	DISP SELECT	Display selection	○	NORMAL %/USER SET, USER & %/INP PRES, PRES & %		○	○	○

* In case of Model EJA120, static pressure cannot be measured. The display is always 0 MPa, but this is not a measured value.

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No.	Item	Description	Rewritability	Remarks	Default Value	Applicability		
						F	P	L
D	AUX SET 1	Auxiliary setting data 1	–	Menu name		○	○	○
D21	DISP UNIT	Engineering unit for display	○	8 uppercase alphanumerics		○	○	○
D22	DISP LRV	Engineering range, lower range value	○	–19999 to 19999	As specified when ordered.	○	○	○
D23	DISP HRV	Engineering range, higher range value	○	–19999 to 19999	As specified when ordered.	○	○	○
D30	TEMP UNIT	Temperature setting units	○	deg C/deg F	deg C	○	○	○
D31	STAT. P. UNIT	Static pressure setting units	○	Selected from mmH_2O, mmAq, mmWG, mmHg, Torr, Pa, hPa, kPa, MPa, mbar, bar, gf/cm^2, kgf/cm^2, inH_2O, inHg, ftH_2O, psi, or atm	As specified when ordered. If not specified, MPa.	○	–	○
D40	REV OUTPUT	Output reversal	○	NORMAL/REVERSE	If not specified, NORMAL.	○	○	○
D45	H/L SWAP	Impulse piping accessing direction	○	NORMAL/REVERSE**	NORMAL	○	–	–
D52	BURN OUT	CPU error	–	HIGH/LOW	HIGH	○	○	○
D53	ERROR OUT	Hardware error	○	HOLD/HIGH/LOW	HIGH	○	○	○
D60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
E	AUX SET 2	Auxiliary setting data 2	–	Menu name		○	○	○
E30	BI DIRE MODE	Bidirectional mode	○	OFF/ON	OFF	○	–	–
E60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
H	AUTO SET	Automatic setup	–	Menu name		○	○	○
H10	AUTO LRV	Automatic measurement range lower range value setup	○	–32000 to 32000	Displays the same data as C21.	○	○	○
H11	AUTO HRV	Automatic measurement range higher range value setup	○	–32000 to 32000	Displays the same data as C22.	○	○	○
H60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
J	ADJUST	Adjustment data	–	Menu name		○	○	○
J10	ZERO ADJ	Automatic zero adjustment	○	–5 to 110.0%		○	○	○
J11	ZERO DEV.	Manual zero adjustment	○			○	○	○
J20	EXT. ZERO ADJ	External zero-adjustment screw permission	○	ENABLE/INHIBIT		○	○	○
J60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
K	TEST	Tests	–	Menu name		○	○	○
K10	OUTPUT in %	Test output % setting	○	–5 to 110.0% Displays 'ACTIVE' while executing		○	○	○
K60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
M	MEMO	Memo	–	Menu name		○	○	○
M10	MEMO 1	Memo	○	8 uppercase alphanumerics		○	○	○
M20	MEMO 2	Memo	○	8 uppercase alphanumerics		○	○	○
M30	MEMO 3	Memo	○	8 uppercase alphanumerics		○	○	○
M40	MEMO 4	Memo	○	8 uppercase alphanumerics		○	○	○
M50	MEMO 5	Memo	○	8 uppercase alphanumerics		○	○	○
M60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○
P	RECORD	History of the errors	–			○	○	○
P10	ERROR REC 1	Last error	○	Display the error		○	○	○
P11	ERROR REC 2	One time before	○	Display the error		○	○	○
P12	ERROR REC 3	Two time before	○	Display the error		○	○	○
P13	ERROR REC 4	Three time before	○	Display the error		○	○	○
P60	SELF CHECK	Self-diagnostic messages	–	Same as A60		○	○	○

** Not applicable for Model EJA115.

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8.3.2 Parameter Usage and Selection

Before describing the procedure for setting parameters, we present the following table showing how the parameters are used and in what case.

IMPORTANT

If the transmitter is turned off within 30 seconds after parameters have been set, the set data will not be stored and the terminal returns to previous settings.

Table 8.3.1 Parameter Usage and Selection

Setup Item	Description
Tag No. setup ► P.8-7	Sets the Tag No. (using 16 alphanumeric characters). Note: Up to 8 alphanumerics (upper case letters) can be used in the BT100.
Calibration range setup ► P.8-7	Sets the calibration range for 4 to 20 mA DC. Sets three data items: range unit, input value at 4 mA DC (LRV), and input value at 20 mA DC (HRV). Note: LRV and HRV can be specified with range value specifications up to 5 digits (excluding any decimal point) within the range of –32000 to 32000.
Damping time constant setup ► P.8-8	Adjusts the output response speed for 4 to 20 mA DC. Can be set in 9 increments from 0.2 to 64 s.
Output and integral indicator display mode setup ► P.8-9	Sets modes for output signal and integral indicator to “Linear mode” (proportional to input differential pressure) or to “Square root mode” (proportional to flow).
Output signal low cut mode setup ► P.8-9	Used mainly to stabilize output near 0% if output signal is the square root mode. Two modes are available: forcing output to 0% for input below a specific value, or changing to proportional output for input below a specific value.
Integral indicator scale range and unit setup ► P.8-10	Sets the following 5 types of integral indicator scale ranges and units: % scale indicator, user set scale indicator, alternate indication of user set scale and % scale, input pressure display, alternate indication of input pressure and % scale When using the user set scale, 4 types of data can be set: user set scale setting, unit (BT200 only), display value at 4 mA DC (LRV), and display value at 20 mA DC (HRV). Note: LRV and HRV can be specified with range value specifications up to 5 digits (excluding any decimal point) within the range of –19999 to 19999.
Unit setup for displayed temperature ► P.8-11	Sets a unit for temperatures displayed on the BT200.
Unit setup for displayed static pressure ► P.8-12	Sets a unit for static pressure displayed on the BT200.
Operation mode (normal/reverse signal) setup ► P.8-12	Reverses the direction for 4 to 20 mA DC output relative to input. Reverse mode is used for applications in which safety requires that output be driven toward 20 mA if input is lost.
Output status display/setup when a CPU failure ► P.8-12	Displays the status of 4 to 20 mA DC output when a CPU failure. The parameter of the standard unit is fixed to the high limit value.
Output status setup when a hardware error occurs ► P.8-12	Sets the status of the 4 to 20 mA DC output when an abnormal status is detected with the capsule or the amplifier as the result of self-diagnosis. One of the following statuses; last held, high limit, and low limit values, can be selected.
Range change (while applying actual inputs) ► P.8-13	Range for 4 to 20 mA DC signal is set with actual input applied. Sets 20 mA DC output precisely with respect to user’s reference instrument output. Note that DPharp is calibrated with high accuracy before shipment, so span should be set using the normal range setup.
Zero point adjustment ► P.8-13	Adjusts zero point. This can be done either using the external zero-adjustment screw on the transmitteror using the BT200.
Test output (fixed current output) setup ► P.8-14	Used for loop checks. Output can be set freely from –5% to 110% in 1% steps.
User memo fields ► P.8-14	Allows user to enter up to 5 items of any desired text in up to 8 uppercase alphanumeric characters per item.

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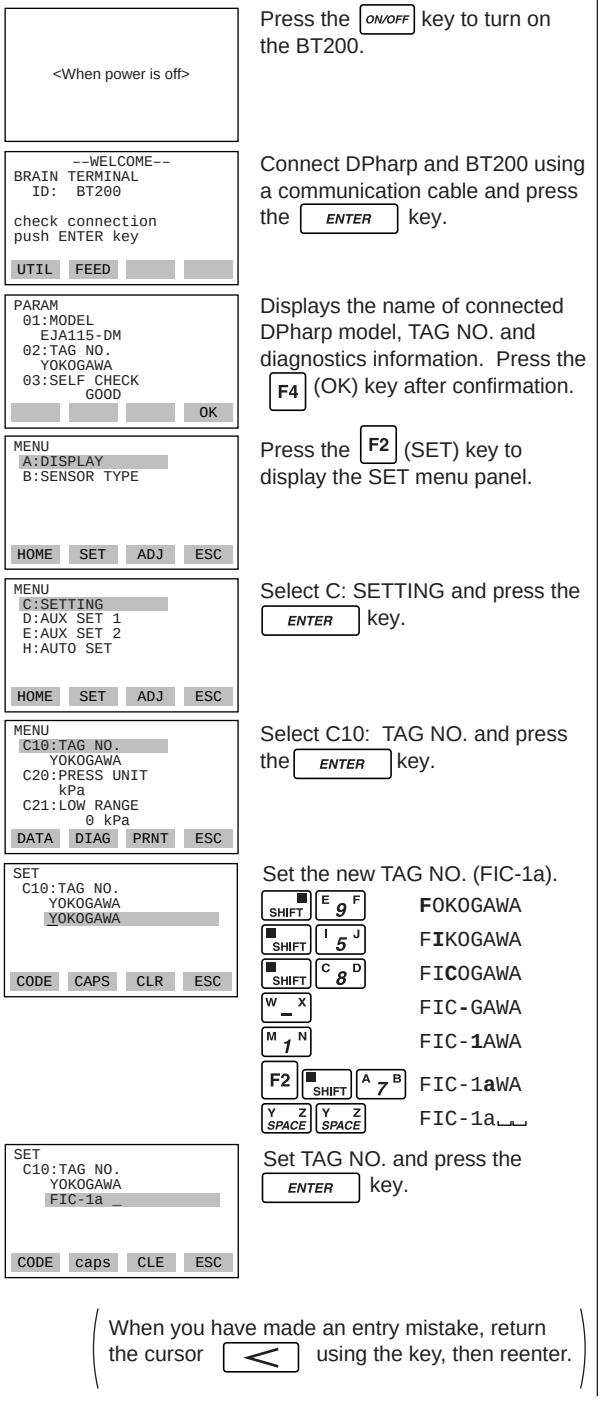
8.3.3 Setting Parameters

Set or change the parameters as necessary. After completing these, do not fail to use the "DIAG" key to confirm that "GOOD" is displayed for the self-diagnostic result at **_60: SELF CHECK**.

(1) Tag No. Setup (C10: TAG NO)

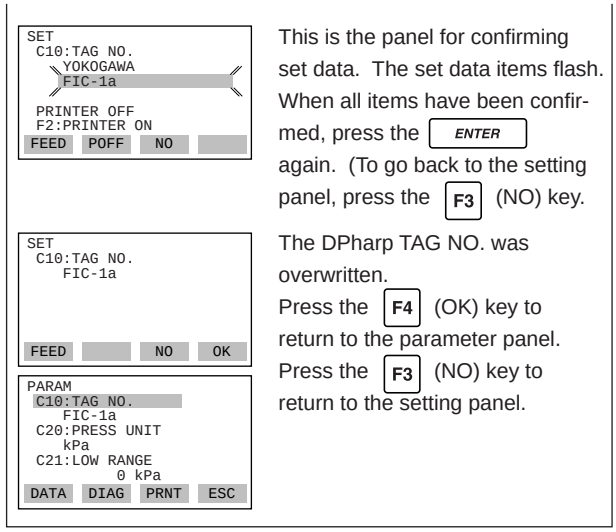
Use the procedure below to change the Tag No. Up to 16 alphanumeric characters can be entered.

• Example: Set a Tag No. to FIC-1a



When you have made an entry mistake, return the cursor < using the key, then reenter.

F0810.EPS



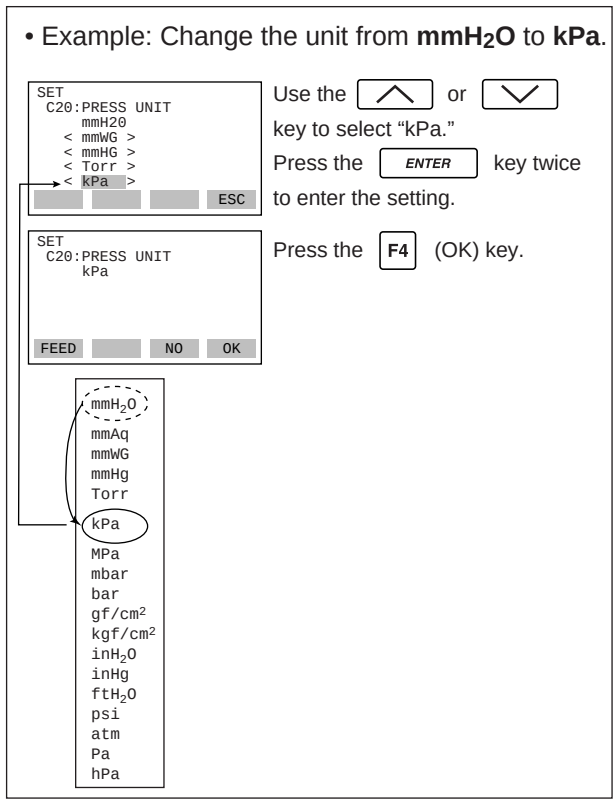
F0811.EPS

(2) Calibration Range Setup

a. Setting Calibration Range Unit (C20: PRESS UNIT)

The unit is set at the factory before shipment if specified at the time of order. Follow the procedure below to change the unit.

• Example: Change the unit from **mmH$_2$O** to **kPa**.



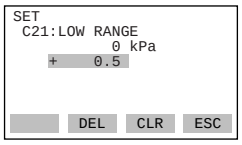
F0812.EPS

b. Setting Calibration Range Lower Range Value and Higher Range Value (C21: LOW RANGE, C22: HIGH RANGE)

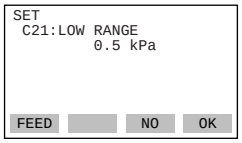
These range values are set as specified in the order before the instrument is shipped. Follow the procedure below to change the range.

- The measurement span is determined by the high and low range limit values. In this instrument, changing the low range value also automatically changes the high range value, keeping the span constant.

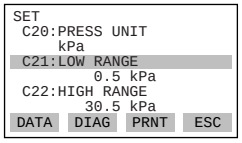
• Example 1: With present settings of 0 to 30 kPa, set the lower range value to 0.5 kPa.



Set **0.5**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



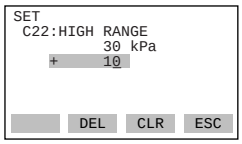
The higher range value is changed while the span remains constant.

(Span = Higher range value – Lower range value)

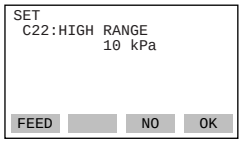
F0813.EPS

- Note, however, that changing the higher range value does not cause the lower range value to change. Thus, changing the higher range value also changes the span.
- Calibration range can be specified with range value specifications up to 5 digits (excluding any decimal point) for low or high range limits within the range of –32000 to 32000.

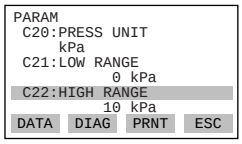
• Example 2: With present settings of 0 to 30 kPa, set the Higher range value to10 kPa.



Set **10**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



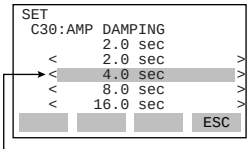
The low range value is not changed, so the span changes.

F0814.EPS

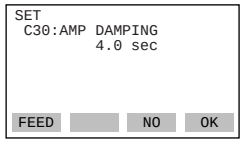
(3) Damping Time Constant Setup (C30: AMP DAMPING)

When the instrument is shipped, the damping time constant is set at 2.0 seconds. Follow the procedure below to change the time constant.

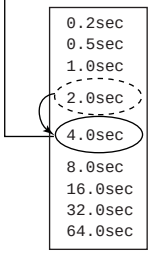
• Example: Change from 2.0 sec to 4.0 sec.



Use the ^ or v key to select **4.0 sec**.
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



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Note: The damping time constant set here is the damping time constant for the amplifier assembly. The damping time constant for the entire transmitter is the sum of the values for the amplifier assembly and for the capsule assembly. For the capsule assembly damping time constant (fixed), see the "General Specifications" found at the end of this manual. (See Chapter 10.)

(4) Output Mode and Integral Indicator Display Mode Setup (C40: OUTPUT MODE)

The mode setting for the output signal and the integral indicator coordinate as shown in the table below.

BT200 Display	Output Mode	Integral Indicator Display Mode
OUT: LIN DSP: LIN	Linear	Linear
OUT: LIN DSP: SQR	Linear	Square root
OUT: SQR DSP: SQR	Square root	Square root

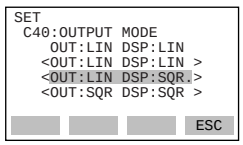
T0808.EPS

This mode is set as specified in the order when the instrument is shipped. Follow the procedure below to change the mode.

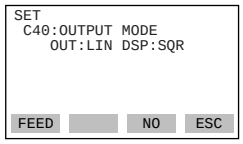
If the instrument is equipped with an integral indicator and the display mode is "square root", "$\sqrt{\ }$" is displayed on the integral indicator.

For details, see Chapter 3.

• Example: Set output mode to **Linear** and display mode to **Square root**.



Use the ^ or v key to select "OUT: LIN, DSP: SQR."
Press the ENTER key twice to enter the setting.



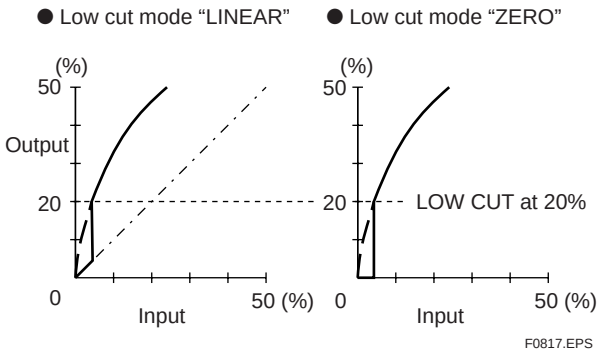
Press the F4 (OK) key.

F0816.EPS

(5) Output Signal Low Cut Mode Setup (D10: LOW CUT, D11: LOW CUT MODE)

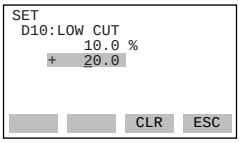
Low cut mode can be used to stabilize the output signal near the zero point. The low cut point can be set in a range from 0 to 20% of output. (Hysteresis of cut point: ±1%)

Either "LINEAR" or "ZERO" can be selected as the low cut mode.

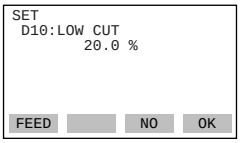


F0817.EPS

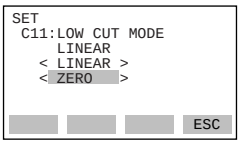
• Example: Change the low cut setting range from 10% to 20%, and the low cut mode from **LINEAR** to **ZERO**.



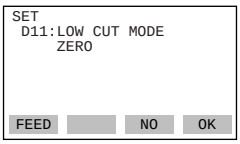
Set "20."
Press the ENTER key twice to enter the setting.



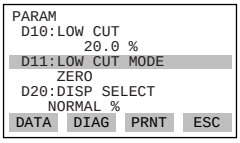
Press the F4 (OK) key.
Next, the [D11: LOW CUT MODE] setting panel is displayed.



Use the ^ or v key to select "ZERO."
Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.



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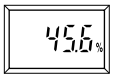
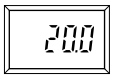
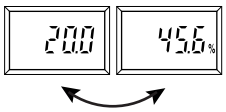
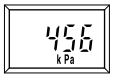
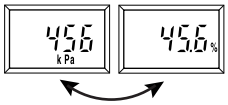
(6) Integral Indicator Scale Setup

The following 5 displays are available for integral indicators.

D20: DISP SELECT and Display	Description and Related parameters
NORMAL % 	Indicates –5 to 110% range depending on the Measurement range (C21, C22). A10:OUTPUT (%) 45.6 %
USER SET 	Indicates values depending on the Engineering range (D22, D23).(Note 1) Units set using Engineering unit (D21) are not indicated. A11:ENGR.OUTPUT 20.0 M
USER & % 	Indicates user set and % alternately in 3 second intervals. A10:OUTPUT (%) 45.6 % A11:ENGR. OUTPUT 20.0 M
INP PRES 	Indicates input pressure. Indication limits –19999 to 19999. A40:INPUT 456 kPa
PRES & % 	Indicates input pressure and % alternately in 3 second intervals. A10:OUTPUT (%) 45.6 % A40:INPUT 456 kPa

(Note 1) Scale range can be specified with range limit specifications up to 5 digits (excluding any decimal point) for low or high range limits within the range of –19999 to 19999.

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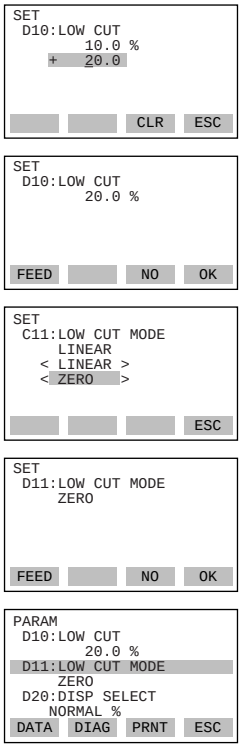
See (a.) through (c.) for each setting procedure.

• Example: Change the low cut setting range from 10% to 20%, and the low cut mode from **LINEAR** to **ZERO**.



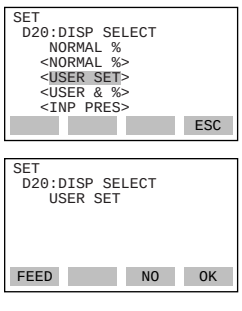
F0818.EPS

a. Display Selection (D20: DISP SELECT)

Follow the instructions given to the below to change the range of integral indication scales.

When **USER SET** is selected, the user set values of integral indication and **A11: ENGR. OUTPUT** parameter are indicated.

• Example: Set the integral indicator scale to engineering units display.



(The “%” disappears from the integral indicator display.)

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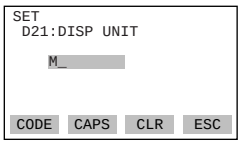
b. Setting User-set Engineering Unit (D21: DISP UNIT)

This parameter allows entry of the engineering units to be displayed on the BT200. When the instrument is shipped, this is set as specified in the order.

Follow the procedure below to change this setting.

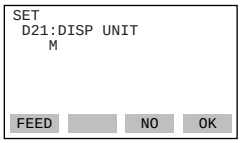
Since these units are not displayed on the integral indicator, use the adhesive labels provided. This parameter need not be set for % display.

• Example: Set an engineering unit **M**.



Set "M."

Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

F0821.EPS

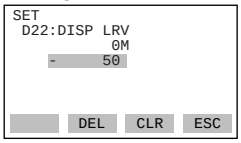
c. Lower and Higher Range Value Setup in Engineering Unit (D22: DISP LRV, D23: DISP HRV)

These parameter items are used to set the lower and higher range values for the engineering unit display.

When the instrument is shipped, these are set as specified in the order. Follow the procedure below to change these settings. Note that these parameters need not be set for % display.

• Example: Set lower range value (LRV) to **–50** and higher range value (HRV) to **50**.

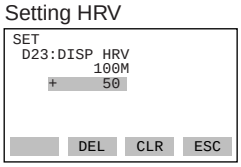
Setting LRV



Set "–50."

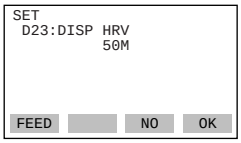
Press the ENTER key twice to enter the setting.

Setting HRV

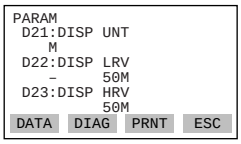


Set "50."

Press the ENTER key twice to enter the setting.



Press the F4 (OK) key.

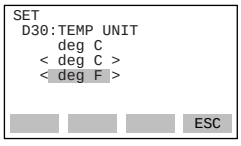


F0822.EPS

(7) Unit Setup for Displayed Temperature (D30: TEMP UNIT)

When the instrument is shipped, the temperature units are set to **degC**. Follow the procedure below to change this setting. Note that changing the unit here changes the unit for **A20: AMP TEMP** (amplifier temperature) and **A21: CAPSULE TEMP** (capsule temperature).

• Example: Change the unit for the temperature display.



Use the ^ or v key to select "deg F."

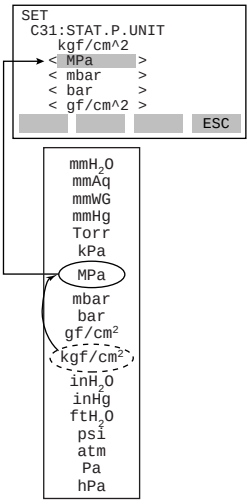
Press the ENTER key twice to enter the setting.

F0823.EPS

(8) Unit Setup for Displayed Static Pressure (D31: STAT.P.UNIT)

Follow the procedure below to change the static pressure units.
Changing this parameter changes the unit for the A30: STATIC PRESS (static pressure) display.

• Example: Change the static pressure unit from **kgf/cm^2** to **MPa**.



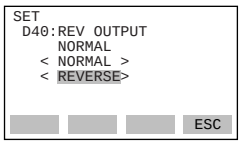
Use the ^ or v key to select "MPa."
Press the ENTER key twice to enter the setting.

F0824.EPS

(9) Operation Mode Setup (D40: REV OUTPUT)

This parameter allows the direction of the 4 to 20 mA output to be reversed with respect to input. Follow the procedure below to make this change.

• Example: Change 4 to 20 mA output to 20 to 4 mA output.



Use the ^ or v key to select REVERSE.
Press the ENTER key twice to enter the setting.

F0825.EPS

(10) Output Status Display/Setup when a CPU Failure (D52: BURN OUT)

This parameter displays the status of 4 to 20 mA DC output if a CPU failure occurs. In case of a failure, communication is disabled.

Setting of HIGH or LOW is enabled. This is done with the pin (CN4) on the CPU assembly. See Chapter 3 for details.

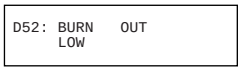
Standard specifications
The parameter is set to HIGH. If a failure, the transmitter outputs the signal of 110% or higher. The parameter **D53: ERROR OUT** is set to HIGH from the factory.

Optional code/C1
The parameter is set to LOW. If a failure, output which is –5% or lower is generated. The parameter **D53: ERROR OUT** is set to LOW from the factory.

• Example: Standard specifications

pin (CN4) position: H

• Example: Optional code/C1



pin (CN4) position: L

F0826.EPS

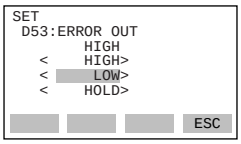
(11) Output Status Setup when a Hardware Error Occurs (D53: ERROR OUT)

This parameter allows the setting of the output status when a hardware error occurs. The following three selections are available.

(a) HOLD; Outputs the last value held before the error occurred.
(b) HIGH; Outputs an output of 110% when an error has occurred.
(c) LOW; Outputs an output of –5% when an error has occurred.

Note: A hardware error means CAP MODULE FAULT of Er.01 or AMP MODULE FAULT of Er. 02 which are shown in 8.5.2 "Errors and Countermeasures.")

• Example: Set the output status to LOW when a hardware error occurs.



Use the ^ or v key to select "LOW."
Press the ENTER key twice to enter the setting.

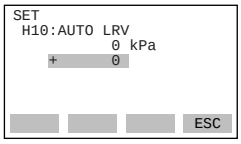
F0827.EPS

(12) Range Change while Applying Actual Inputs (H10: AUTO LRV, H11: AUTO HRV)

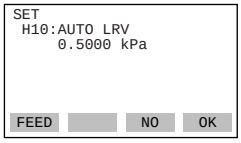
This feature allows the lower and higher range values to be set up automatically with the actual input applied. If the lower and higher range values are set, **C21: LOW RANGE** and **C22: HIGH RANGE** are changed at this same time.

Follow the procedure in the figure below.
The measurement span is determined by the higher and lower range values. Changing the lower range value results in the higher range value changing automatically, keeping the span constant.

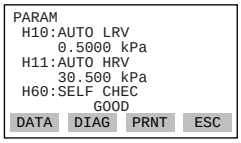
• Example 1: When changing the lower range value to 0.5 kPa for the present setting of 0 to 30 kPa, take the following action with input pressure of 0.5 kPa applied.



Press the ENTER key twice.
The lower range value is changed to 0.5 kPa.



Press the F4 (OK) key.

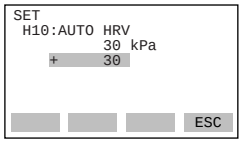


The higher range value is changed keeping the span constant.
Parameters **C21** and **C22** are changed at the same time.

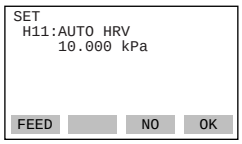
F0828.EPS

Note that changing the higher range value does not cause the lower range value to change but does change the span.

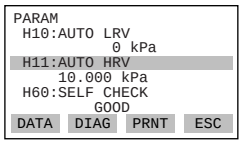
• Example 2: When the higher range value is to be changed to 10 kPa with the present setting of 0 to 30 kPa, take the following action with an input pressure of 10 kPa applied.



Press the ENTER key twice.
The higher range value is changed to 10 kPa.



Press the F4 (OK) key.



The lower range value is not changed, so the span changes.
Parameter **C22** is changed at the same time.

F0829.EPS

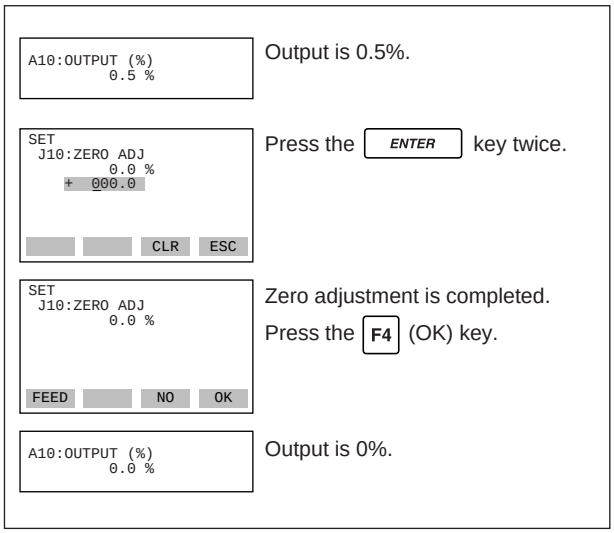
(13) Zero Point Adjustment (J10: ZERO ADJ, J11: ZERO DEV, J20: EXT ZERO ADJ)

The DPharp supports several adjustment methods. Select the method best suited for the conditions of your application.
Note that output signal can be checked by displaying parameter **A10:OUTPUT (%)** on the BT200.

Adjustment Method	Description
Using the BT200	**Set the present input to 0%.** Adjust for 0% output at input level of 0%.
	Adjust output to the reference value obtained using other means. If the input level cannot easily be made 0% (because of tank level, etc.), adjust output to the reference value obtained using other means, such as a sight glass.
Using the external zero-adjustment screw	Adjust zero point using the zero-adjustment screw on the transmitter. This permits zero adjustment without using the BT200. Accurately adjust the output current to 4 mA DC or other target output value using an ammeter that accurately reads output currents.

T0810.EPS

(a) Follow the procedure below when setting the present output to 0% (4 mA).



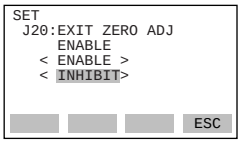
F0830.EPS

(b) Zero Point Adjustment Using the External Zero Adjustment Screw

• Enabling/inhibiting of zero point adjustment using the external zero-adjustment screw on the transmitter (J20: EXT ZERO ADJ)

Follow the procedure below to enable or inhibit zero point adjustment from the zero-adjustment screw on the transmitter.
This is set to "ENABLE" when the instrument is shipped.

• Example: Inhibiting zero adjustment by the external zero-adjustment screw



Use the ^ or v key to select "INHIBIT."
Press the ENTER key twice to enter the setting.

F0831.EPS

• Zero point adjustment using external zero-adjustment screw on the transmitter

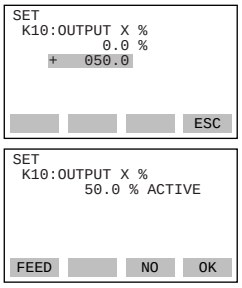
Turn the zero-adjustment screw on the outside of the transmitter case using a slotted screwdriver. Turn the screw to the right to increase the zero point or to the left to decrease the zero output; the zero adjusts in increments of 0.01% of the range setting.
Note that the amount of adjustment to the zero point changes according to the speed at which the screw is turned. To make fine adjustments, turn the screw slowly; to make coarse adjustments, turn the screw quickly.

Note: When a zero point adjustment has been made, do not turn off the transmitter less than 30 seconds after adjustment.

(14) Test Output Setup (K10: OUTPUT X%)

This feature can be used to output a fixed current from 3.2 mA (–5%) to 21.6 mA (110%) for loop checks.

• Example: Output 12 mA (50%) fixed current.



F0832.EPS

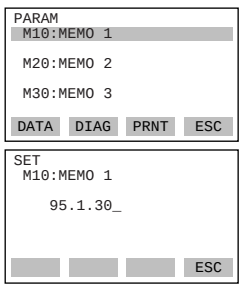
IMPORTANT

1. Test output is held for approximately 10 minutes, and then released automatically after the time has elapsed. Even if the BT200 power supply is turned off or the communication cable is disconnected during test output, it is held for approximately 10 minutes.
2. Press the F4 (OK) key to release test output immediately.

(15) User Memo Fields (M: MEMO)

This feature provides 5 user memo fields, each holding up to 8 alphanumeric characters. Up to 5 items such as inspection date, inspector, and other information can be saved in these fields.

• Example: Save an inspection date of January 30, 1995.



F0833.EPS

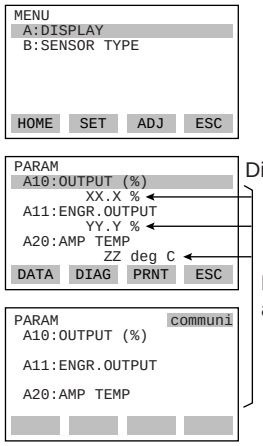
8.4 Displaying Data Using the BT200

8.4.1 Displaying Measured Data

The BT200 can be used to display measured data.

The measured data is updated automatically every 7 seconds. In addition, the display can be updated to the present data value at any time by pressing the F1 (DATA) key. For parameters associated with the display of measured data, see Subsection 8.3.1, "Parameter Summary."

• Example: Display output.



Display "A10: OUTPUT (%)."

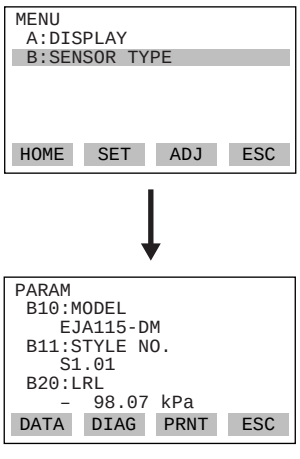
Data is updated automatically at 7-second intervals.

F0834.EPS

8.4.2 Display Transmitter Model and Specifications

The BT200 can be used to display the model and specifications of the transmitter.

• Example: View transmitter model name.



Press ENTER.

For the associated parameters, see Subsection 8.3.1, Parameter Summary.

F0835.EPS

8.5 Self-Diagnostics

8.5.1 Checking for Problems

(1) Identifying Problems with BT200

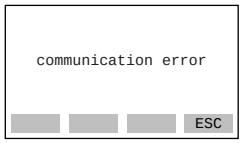
The following four areas can be checked.

(a) Whether connections are good.
(b) Whether BT200 was properly operated.
(c) Whether settings were properly entered.
(d) History of the errors.

See examples below.

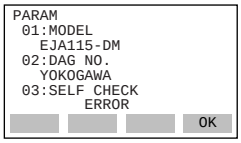
• Example 1: Connection errors

Press the ON/OFF key.
When the panel shown on the left appears, press the ENTER key.

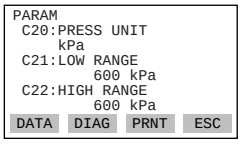


Since communications will be unsuccessful if there is a problem in the connection to the BT200, the display at the left will appear.
Recheck the connection.
Press the F4 (OK) key.

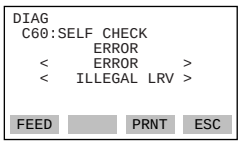
• Example 2: Setting entry errors



The initial data panel shows the result of current transmitter diagnostics.



Press the F2 (DIAG) key in the parameter panel to go to the diagnostics panel (C60: SELF CHECK).



An error message is displayed when an error occurs in the diagnostics panel.

F0836.EPS

• Example 3: Checking the history of the errors

```
MENU
 J:ADJUST
 K:TEST
 M:MEMO
 P:RECORD

HOME  SET  ADJ  ESC
```

Connect the BT200 to the transmitter, and call item “P.”

```
PARAM
 P10:ERROR REC 1
        ERROR
 P11:ERROR REC 2
        ERROR
 P12:ERROR REC 3
        GOOD
DATA  DIAG  PRNT  ESC
```

P10: “ERROR REC 1” displays the last error.
P11: “ERROR REC 2” displays the error one time before the last error occurred.
P12: “ERROR REC 3” displays the error two times before the last error occurred.
P13: “ERROR REC 4” displays the error three times before the last error occurred.

The history of up to four errors can be stored. When the 5th error has occurred, it is stored in “P10”. The error stored in “P13” will be deleted, and then, the error in “P12” will be copied to “P13”. In this sequence, the history of the most previously occurred error will be removed from memory. “GOOD” will be displayed if there was no previous error.

```
SET
 P10:ERROR REC 1
        ERROR
   <     ERROR     >
   <   ILLEGAL LRV >
   <   ILLEGAL HRV >

                ESC
```

Select P10: ERROR REC1 and press the ENTER key to display the error message.

<(a) SETUP PANEL>

For the details of the messages listed below, see Table 8.5.1 Error Message Summary.

CAP MODULE FAULT	OVER TEMP (CAP)	ILLEGAL LRV
AMP MODULE FAULT	OVER TEMP (AMP)	ILLEGAL HRV
OUT OF RANGE	OVER OUTPUT	ILLEGAL SPAN
OUT OF SP RANGE	OVER DISPLAY	ZERO ADJ OVER

Note 1: Press the ENTER key twice in the setting panel (panel 1) to clear all error message (P10 to P13) information.
Note 2: After two hours from when an error occurs, the error message of that error will be recorded. Therefore, if you switch off the transmitter within two hours from when the error occurs, there is no history of that error stored in the transmitter, and this function is meaningless.

F0837.EPS

(2) Checking with Integral Indicator

NOTE

If an error is detected in the self-diagnostic, an error number is displayed on the integral indicator. If there is more than one error, the error number changes at two-second intervals. See Table 8.5.1 regarding the error numbers.

F0838.EPS

Figure 8.5.1 Identifying Problems Using the Integral Indicator

8.5.2 Errors and Countermeasures

The table below shows a summary of error messages.

Table 8.5.1 Error Message Summary

Integral Indicator Display	BT200 Display	Cause	Output Operation during Error	Countermeasure
None	GOOD			
----	ERROR			
Er. 01	CAP MODULE FAULT	Capsule problem.	Outputs the signal (Hold, High, or Low) set with parameter D53.	Replace capsule.
Er. 02	AMP MODULE FAULT	Amplifier problem.	Outputs the signal (Hold, High, or Low) set with parameter D53.	Replace amplifier.
Er. 03	OUT OF RANGE	Input is outside measurement range limit of capsule.	Outputs high range limit value or low range limit value.	Check input.
Er. 04	OUT OF SP RANGE	Static pressure exceeds specified range.*1	Displays present output.	Check line pressure (static pressure).
Er. 05	OVER TEMP (CAP)	Capsule temperature is outside range (–50 to 130°C).	Displays present output.	Use heat insulation or make lagging to keep temperature within range.
Er. 06	OVER TEMP (AMP)	Amplifier temperature is outside range (–50 to 95°C).	Displays present output.	Use heat insulation or make lagging to keep temperature within range.
Er. 07	OVER OUTPUT	Output is outside high or low range limit value.	Outputs high or low range limit value.	Check input and range setting, and change them as needed.
Er. 08	OVER DISPLAY	Displayed value is outside high or low range limit value.	Displays high or low range limit value.	Check input and display conditions and modify them as needed.
Er. 09	ILLEGAL LRV	LRV is outside setting range.	Holds output immediately before error occurrence.	Check LRV and modify as needed.
Er. 10	ILLEGAL HRV	HRV is outside setting range.	Holds output immediately before error occurrence.	Check HRV and modify as needed.
Er. 11	ILLEGAL SPAN	SPAN is outside setting range.	Holds output immediately before error occurrence.	Check SPAN and change as needed.
Er. 12	ZERO ADJ OVER	Zero adjustment is too large.	Displays present output.	Readjust zero point.

*1: For Model EJA120, static pressure cannot be measured. The display is always 0 MPa, but this is not a measured value.

T0811 .EPS

9. MAINTENANCE

9.1 Overview

WARNING

Since the accumulated process fluid may be toxic or otherwise harmful, take appropriate care to avoid contact with the body, or inhalation of vapors during draining condensate or venting gas in transmitter pressure-detector section and even after dismounting the instrument from the process line for maintenance.

Maintenance of the transmitter is easy due to its modular construction. This chapter describes the procedures for calibration, adjustment, and the disassembly and reassembly procedures required for component replacement.

Since the transmitters are precision instruments, carefully and thoroughly read the following sections for proper handling during maintenance.

IMPORTANT

- As a rule, maintenance of this transmitter should be implemented in a maintenance service shop where the necessary tools are provided.
- The CPU assembly contains sensitive parts that may be damaged by static electricity. Exercise care so as not to directly touch the electronic parts or circuit patterns on the board, for example, by preventing static electrification by using grounded wrist straps when handling the assembly. Also take precautions such as placing a removed CPU assembly into a bag with an antistatic coating.

9.2 Calibration Instruments Selection

Table 9.2.1 shows the instruments required for calibration. Select instruments that will enable the transmitter to be calibrated or adjusted to the required accuracy.

The calibration instruments should be handled carefully so as to maintain the specified accuracy.

9.3 Calibration

Use the procedure below to check instrument operation and accuracy during periodic maintenance or troubleshooting.

1) Connect the instruments as shown in Figure 9.3.1 and warm up the instruments for at least five minutes.

IMPORTANT

- To adjust the transmitter for highest accuracy, make adjustments with the power supply voltage and load resistance including leadwire resistances set close to the conditions under which the transmitter is installed.
- Dismount the manifold assembly(see Subsection 9.4.4) and apply reference pressure on the high pressure side. (The low pressure side should be open to atmosphere.)

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: When the output mode is set to SQRT, apply reference pressures of 0, 6.25, 25, 56.25, and 100%, instead.

Table 9.2.1 Instruments Required for Calibration

Name	Yokogawa-recommended Instrument	Remarks
Power supply	Model SDBT or SDBS distributor	4 to 20 mA DC signal
Load resistor	Model 2792 standard resistor [250 Ω ±0.005%, 3 W]	
	Load adjustment resistor [100 Ω ±1%, 1 W]	
Voltmeter	Model 2501 A digital multimeter Accuracy (10V DC range): ±(0.002% of rdg + 1 dgt)	
Digital manometer	Model MT110, MT120 precision digital manometer 1) For 10 kPa class Accuracy: ±(0.015% of rdg + 0.015% of F.S.) ..... for 0 to 10 kPa ±(0.2% of rdg + 0.1% of F.S.) ..... for -10 to 0 kPa 2) For 130 kPa class Accuracy: ±0.02% of rdg ..... for 25 to 130 kPa ±5digits ..... for 0 to 25 kPa ±(0.2% of rdg + 0.1% of F.S.) ..... for -80 to 0 kPa 3) For 700 kPa class Accuracy: ±(0.02% of rdg + 3digits) ..... for 100 to 700 kPa ±5 digits ..... for 0 to 100 kPa ±(0.2% of rdg + 0.1% of F.S.) ..... for -80 to 0 kPa 4) For 3000 kPa class Accuracy: ±(0.02% of rdg + 10 digits) ..... for 0 to 3000 kPa ±(0.2% of rdg + 0.1% of F.S.) ..... for -80 to 0 kPa 5) For 130 kPa abs class Accuracy: ±(0.03% of rdg + 6 digits) ..... for 0 to 130 kPa abs	Select a manometer having a pressure range close to that of the transmitter.
Pressure generator	Model 2657 pneumatic pressure standard for 200 kPa {2 kgf/cm^2}, 25 kPa {2500 mmH_2O} Accuracy: ±0.05% of F.S. or ±0.1% setting (whichever is greater)	Requires air pressure supply.
	Dead weight gauge tester 25 kPa {2500mmH_2O} Accuracy: ±0.03% of setting	Select the one having a pressure range close to that of the transmitter.
Pressure source	Model 6919 pressure regulator (pressure pump) Pressure range: 0 to 133 kPa {1000 mmHg}	Prepare the vacuum pump for negative pressure ranges.

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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% level, there are 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.

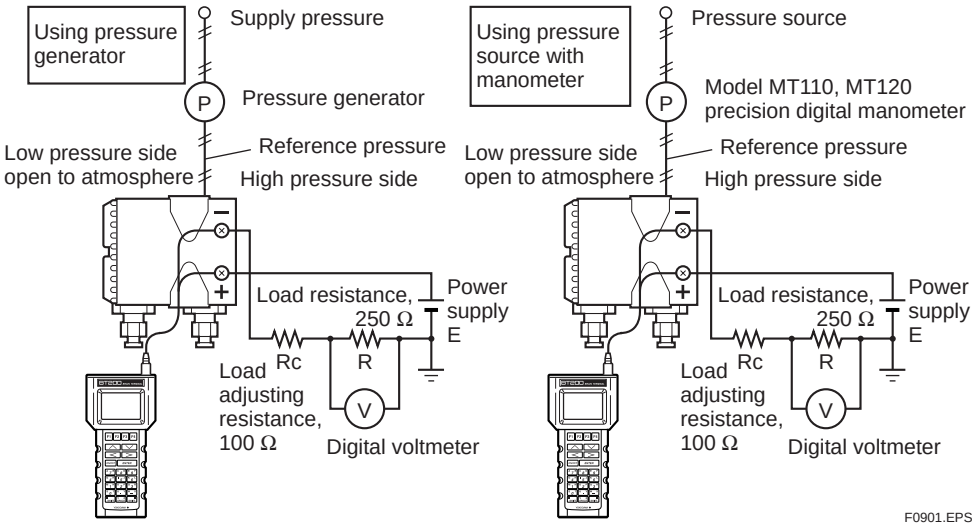

Figure 9.3.1 Instrument Connections

9.4 Disassembly and Reassembly

This section describes procedures for disassembly and reassembly for maintenance and component replacement.

Always turn OFF power and shut off and release pressures before disassembly. Use proper tools for all operations. Table 9.4.1 shows the tools required.

Table 9.4.1 Tools for Disassembly and Reassembly

Tool	Quantity	Remarks
Phillips screwdriver	1	JIS B4633, No. 2
Slotted screwdriver	1	
Allen wrenches	2	JIS B4648 One each, nominal 3 and 5 mm Allen wrenches
Wrench	1	Width across flats, 17 mm
Torque wrench	1	
Adjustable wrench	1	
Socket wrench	1	Width across flats, 16 mm
Socket driver	1	Width across flats, 5.5 mm
Tweezers	1	

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CAUTION

Precautions for CENELEC, SAA, and JIS Flameproof Type Transmitters

- Flameproof type transmitters must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state. For details, see "Installation and Operating Precautions for JIS Flameproof Equipment" later in this manual.
- On the flameproof type transmitters the two covers are locked, each by an Allen head bolt (shrouding bolt). When a shrouding bolt is driven clockwise by an Allen wrench, it is going in and cover lock is released, and then the cover can be opened.

When a cover is closed it should be locked by a shrouding bolt without fail. Tighten the shrouding bolt to a torque of 0.7 N·m.

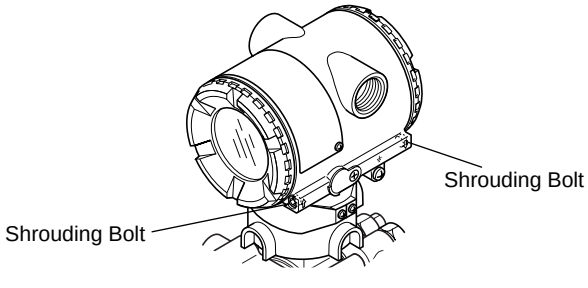

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Figure 9.4 Shrouding Bolts

9.4.1 Replacing the Integral Indicator

CAUTION

Cautions for JIS Flameproof Type Transmitters

Users are prohibited by law from modifying the construction of a flameproof type transmitter. This would invalidate the agency approval and the transmitter's use in such rated area.
Thus the user is prohibited from using a flameproof type transmitter with its integral indicator removed, or from adding an integral indicator to a transmitter. If such modification is absolutely required, contact Yokogawa.

This subsection describes the procedure for replacing an integral indicator. (See Figure 9.4.1)

■ Removing the Integral Indicator

1) Remove the cover.
2) Supporting the integral indicator by hand, loosen its two mounting screws.
3) Dismount the LCD board assembly from the CPU assembly.
   When doing this, carefully pull the LCD board assembly straight forward so as not to damage the connector pins between it and the CPU assembly.

■ Attaching the Integral Indicator

1) Align both the LCD board assembly and CPU assembly connectors and engage them.
2) Insert and tighten the two mounting screws.
3) Replace the cover.

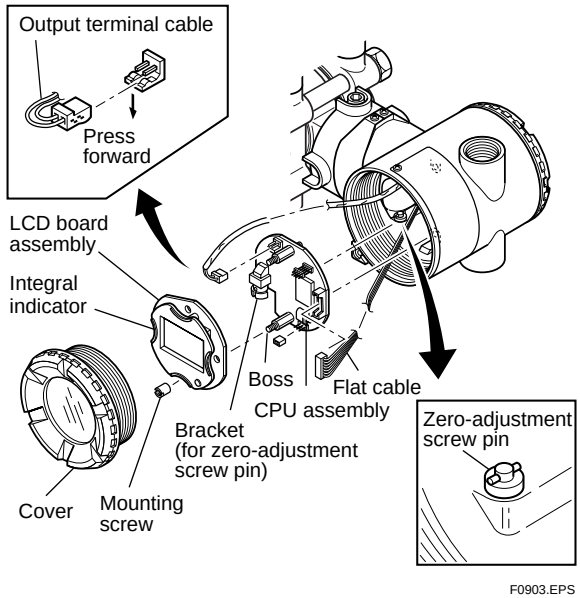

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Figure 9.4.1 Removing and Attaching LCD Board Assembly and CPU Assembly

9.4.2 Replacing the CPU Board Assembly

This subsection describes the procedure for replacing the CPU assembly. (See Figure 9.4.1)

■ Removing the CPU Assembly

1) Remove the cover. If an integral indicator is mounted, refer to Subsection 9.4.1 and remove the indicator.
2) Turn the zero-adjustment screw to the position (where the screw head slot is horizontal) as shown in Figure 9.4.1.
3) Disconnect the output terminal cable (cable with brown connector at the end). When doing this, lightly press the side of the CPU assembly connector and pull the cable connector to disengage.
4) Use a socket driver (width across flats, 5.5mm) to loosen the two bosses.
5) Carefully pull the CPU assembly straight forward to remove it.
6) Disconnect the flat cable (cable with black connector at the end) that connects the CPU assembly and the capsule.

NOTE

Be careful not to apply excessive force to the CPU assembly when removing it.

■ Mounting the CPU Assembly

1) Connect the flat cable (with black connector) between the CPU assembly and the capsule.
2) Connect the output terminal cable (with brown connector).

NOTE

Make certain that the cables are free of pinching between the case and the CPU assembly edge.

3) Align and engage the zero-adjustment screw pin with the groove on the bracket on the CPU assembly. Then insert the CPU board assembly straight onto the post in the amplifier case.
4) Tighten the two bosses. If the transmitter is equipped with an integral indicator, refer to Subsection 9.4.1 to mount the indicator.

NOTE

Confirm that the zero-adjustment screw pin is placed properly in the groove on the bracket prior to tightening the two bosses. If it is not, the zero-adjustment mechanism will be damaged.

5) Replace the cover.

9.4.3 Replacing the Process Connector Gaskets

This subsection describes process connector gasket replacement. (See Figure 9.4.2.)

(a) Loosen the two bolts, and remove the process connectors.
(b) Replace the process connector gaskets.
(c) Remount the process connectors. Tighten the bolts securely and uniformly, and verify that there are no pressure leaks.

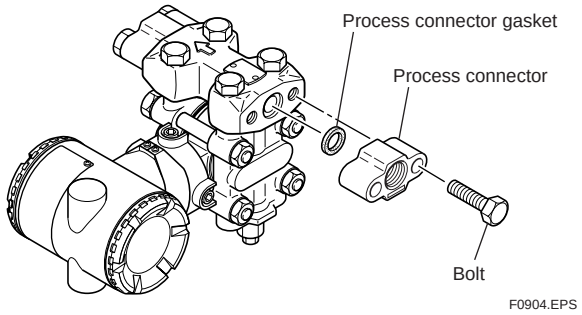


Figure 9.4.2 Removing and Mounting the Process Connector

9.4.4 Cleaning Manifold Assembly and Replacing Orifice

This subsection describes the procedures for cleaning the manifold assembly and replacing the orifice to change flow rate. (See Figure 9.4.3.)

■ Removing the Manifold Asssembly

1) Remove the process connector as shown in Subsection 9.4.3.
2) Remove the four bolts that connect the cover flange with the manifold.
3) Remove the spacer, orifice, and orifice gasket from inside the manifold.
4) Clean the manifold, spacer, and orifice, or replace them as necessary.

IMPORTANT

Exercise care as follows when cleaning the manifold assembly.

- Handle the manifold assembly with care, and be careful not to damage the inner part of the manifold, spacer, and orifice. Be especially careful not to damage or distort the orifice edge (orifice bore).
- Do not use a chlorinated or acidic solution for cleaning.
- Rinse thoroughly with clean water after cleaning.

■ Reassembling the Manifold Assembly

1) Reassemble the orifice gasket, orifice, and spacer into the manifold in that order.
   When reassembling, refer to Figure 9.4.3 to ensure that they are placed in the correct direction.
   Replace the orifice gasket with a new gasket.
2) Mount the process connector as shown in Subsection 9.4.3.
3) Mount the manifold on the cover flange with the four bolts. Tighten the four bolts uniformly to a torque of 39 to 49 N·m.
   Replace the manifold gaskets with new gaskets.
4) After completing reassembly, a leak test must be performed to verify that there are no pressure leaks.

NOTE

Exercise care as follows when reassembling the manifold assembly. (See Figure 9.4.3.)

- Be careful not to reassemble the orifice in the wrong direction. Note that the spacer is configured so that it cannot be placed in the reverse direction.
- When mounting the manifold on the cover flange, confirm the indication “flow direction” shown on the manifold surface and the high and low pressure sides of the pressure-detector section.
  Mount the manifold so that the upstream side of process fluid flow is located at the high pressure side of the pressure-detection section.

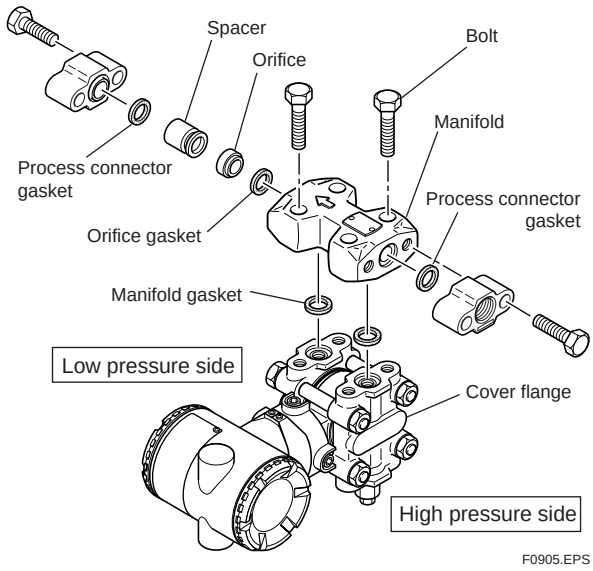


Figure 9.4.3 Manifold Assembly

9.4.5 Cleaning and Replacing the Capsule Assembly

This subsection describes the procedures for cleaning and replacing the capsule assembly. (See Figure 9.4.4.)

CAUTION

Cautions for JIS Flameproof Type Transmitters

Users are prohibited by law from modifying the construction of a flameproof type transmitter. If you wish to replace the capsule assembly with one of a different measurement range, contact Yokogawa.

The user is permitted, however, to replace a capsule assembly with another of the same measurement range. When doing so, be sure to observe the following.

- The replacement capsule assembly must have the same part number as the one being replaced.
- The section connecting the transmitter and capsule assembly is a critical element in preservation of flameproof performance, and must be checked to verify that it is free of dents, scratches, and other defects.
- After completing maintenance, be sure to securely tighten the Allen screws that fasten the transmitter section and pressure-detector section together.

■ Removing the Capsule Assembly

IMPORTANT

Exercise care as follows when cleaning the capsule assembly.

- Handle the capsule assembly with care, and be especially careful not to damage or distort the diaphragms that contact the process fluid.
- Do not use a chlorinated or acidic solution for cleaning.
- Rinse thoroughly with clean water after cleaning.

1) Remove the CPU assembly as shown in Subsection 9.4.2.
2) Remove the two Allen screws that connect the transmitter section and pressure-detector section.
3) Separate the transmitter section and pressure-detector section.
4) Remove the nuts from the four flange bolts.
5) Hold the capsule assembly by hand and remove the cover flange.
6) Remove the capsule assembly.
7) Clean the capsule assembly or replace with a new one.

■ Reassembling the Capsule Assembly

1) Insert the capsule assembly between the flange bolts, paying close attention to the relative positions of the H (high pressure side) and L (low pressure side) marks on the capsule assembly.
   Replace the two capsule gaskets with new gaskets.
2) Install the cover flange on the high pressure side, and use a torque wrench to tighten the four nuts uniformly to a torque of 39 N·m.
3) After the pressure-detector section has been reassembled, a leak test must be performed to verify that there are no pressure leaks.
4) Reattach the transmitter section to the pressure-detector section.
5) Tighten the two Allen screws. (Tighten the screws to a torque of 5 N·m)
6) Install the CPU assembly according to Subsection 9.4.2.
7) After completing reassembly, adjust the zero point and recheck the parameters.

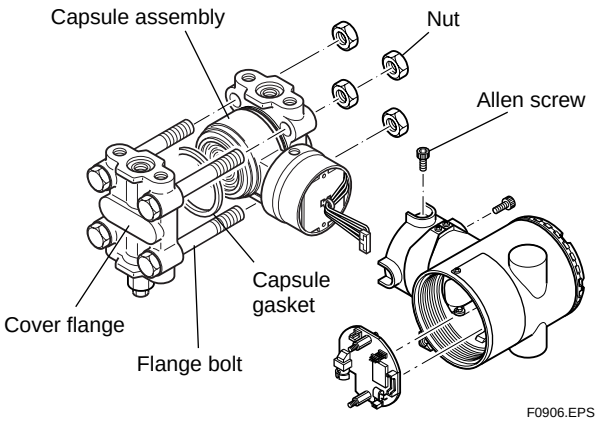


Figure 9.4.4 Removing and Mounting the Pressure-detector Section

9.5 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.

9.5.1 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; see Section 8.5 for information on using this function.

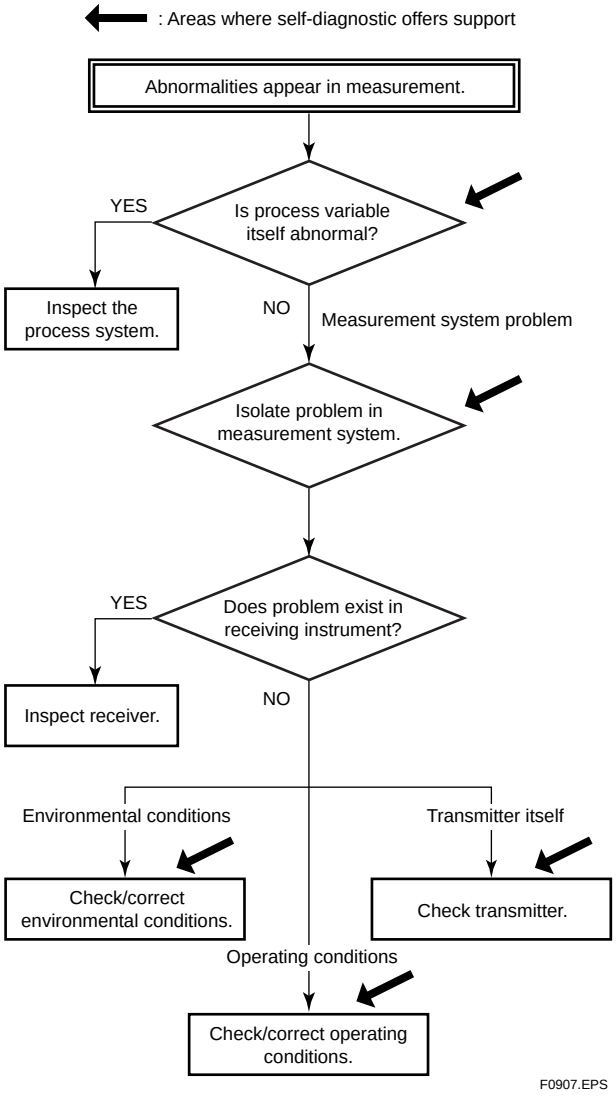
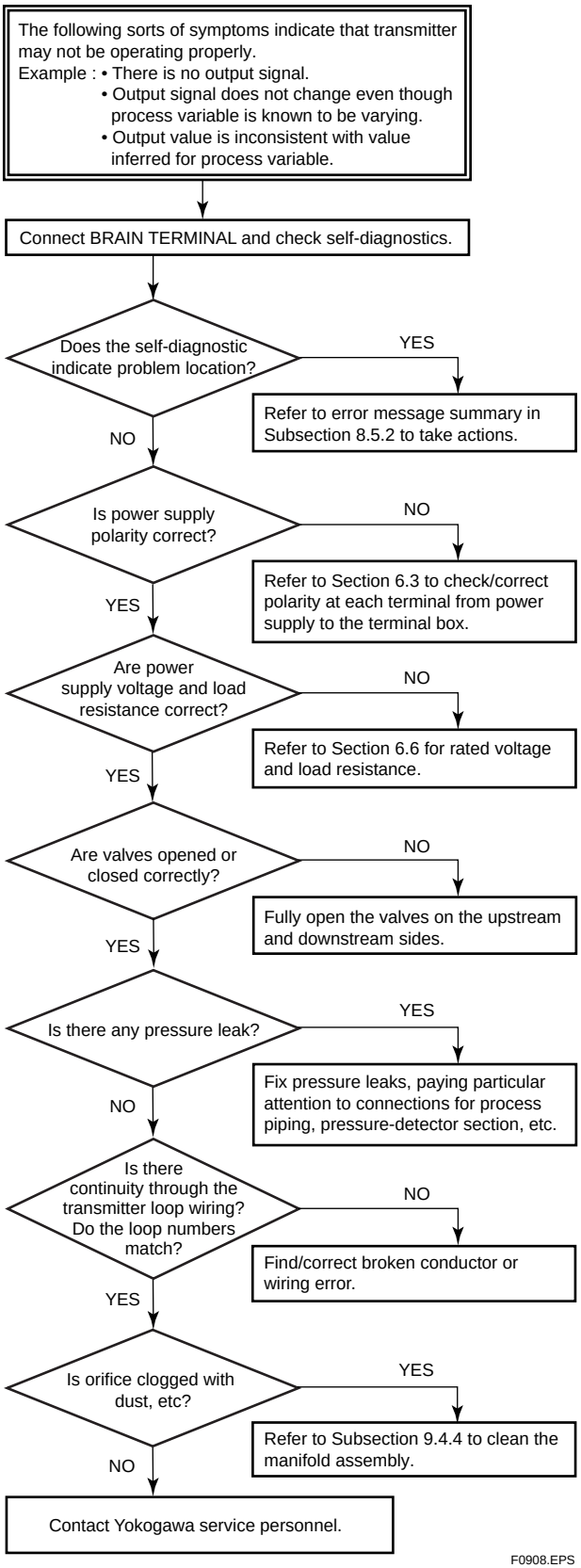
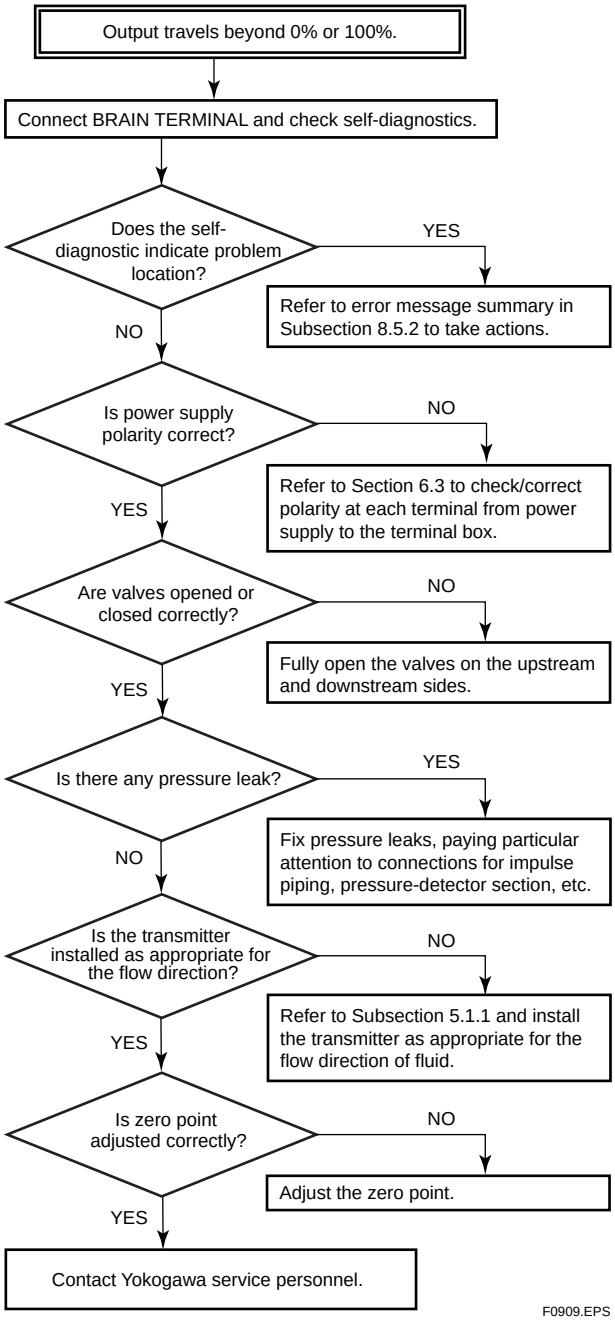


Figure 9.5.1 Basic Flow and Self-Diagnostics

9.5.2 Troubleshooting Flow Charts





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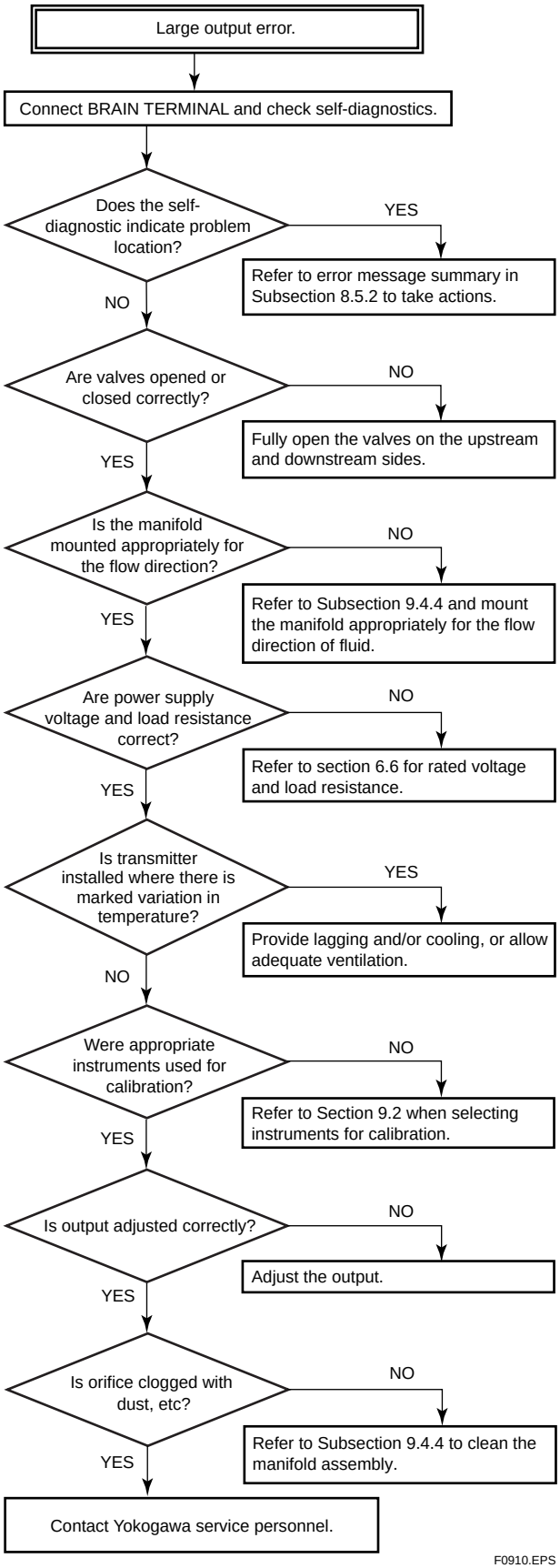

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10. GENERAL SPECIFICATIONS

10.1 Standard Specifications

Refer to GS 1C22T2-E for Fieldbus communication type marked with "◇".

● Performance Specifications

See General Specifications sheet, GS 1C22K1-E.

● Functional Specifications

Span & Range Limits

Differential Pressure Span	kPa	inH_2O (/D1)	mbar (/D3)	mmH_2O (/D4)
L Capsule	1 to 10	4 to 40	10 to 100	100 to 1000
M Capsule	2 to 100	8 to 400	20 to 1000	200 to 10000
H Capsule	20 to 210	80 to 830	200 to 2100	0.05 to 5 kgf/cm^2

Measurement Range	Water Equivalent Flow l/min	Air Equivalent Flow Nl/min
L Capsule	0.016 to 7.2	0.44 to 198
M Capsule	0.022 to 23.0	0.63 to 635
H Capsule	0.07 to 33.0	2.0 to 910

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Zero Adjustment Limits:
Zero can be fully elevated or suppressed, within the Lower and Upper Range Limits of the capsule.

External Zero Adjustment "◇":
External zero is continuously adjustable with 0.01% incremental resolution of span. Span may be adjusted locally using the digital indicator with range switch.

Output "◇":
Two wire 4 to 20 mA DC output with digital communications, linear or square root programmable. BRAIN or HART FSK protocol are superimposed on the 4 to 20 mA signal.

Failure Alarm:
Output status at CPU failure and hardware error;
Up-scale: 110%, 21.6 mA DC or more (standard)
Down-scale: –5%, 3.2 mA DC
Note: Applicable for Output signal code D and E

Damping Time Constant (1st order):
The sum of the amplifier and capsule damping time constant must be used for the overall time constant. Amp damping time constant is adjustable from 0.2 to 64 seconds.

Capsule (Silicone Oil)	L	M	H
Time Constant (approx. sec)	0.8	0.6	0.3

T1002.EPS

Ambient Temperature Limits:
* Safety approval codes may affect limits.
–40 to 85°C (–40 to 185°F)
–30 to 80°C (–22 to 176°F) with LCD Display

Process Temperature Limits:
* Safety approval codes may affect limits.
–40 to 120°C (–40 to 248°F)

Working Pressure Limits (Silicone Oil)
2.7 kPa abs {20 mmHg abs} to maximum working pressure. See 'Model and Suffix Codes.'

● Installation

Supply & Load Requirements "◇":
* Safety approvals can affect electrical requirements. See Section 6.6, 'Power Supply Voltage and Load Resistance.'

EMC Conformity Standards: CE , N200
For EMI (Emission): EN55011, AS/NZS 2064 1/2
For EMS (Immunity): EN50082-2

Communication Requirements "◇":
BRAIN
Communication Distance;
Up to 2 km (1.25 miles) when using CEV polyethylene-insulated PVC-sheathed cables.
Communication distance varies depending on type of cable used.
Load Capacitance;
0.22 μF or less (see note)
Load Inductance;
3.3 mH or less (see note)
Input Impedance of communicating device;
10 kΩ or more at 2.4 kHz.
Note: For general-use and Flameproof type.
For Intrinsically safe type, please refer to 'Optional Specifications.'

HART
Communication Distance;
Up to 1.5 km (1 mile) when using multiple twisted pair cables. Communication distance varies depending on type of cable used.
Use the following formula to determine cable length for specific applications:

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10{,}000)}{C}$$

Where:
L = length in meters or feet
R = resistance in Ω (including barrier resistance)
C = cable capacitance in pF/m or pF/ft
C_f = maximum shunt capacitance of receiving devices in pF/m or pF/ft

● Physical Specifications

Wetted Parts Materials:

Diaphragm, Cover flange, Process connector, Manifold, Orifice, and Drain/Vent Plug;
See 'Model and Suffix Codes'

Capsule Gasket;
Teflon-coated SUS316L

Process Connector Gasket;
PTFE Teflon

Non-wetted Parts Materials:

Bolting;
SCM435 or SUS630

Housing;
Low copper cast-aluminum alloy with polyurethane paint (Munsell 0.6GY3.1/2.0)

Enclosure Classification;
JIS C0920 immersion proof (equivalent to NEMA 4X and IEC IP67)

Cover O-rings;
Buna-N

Data plate and tag;
SUS304

Fill Fluid;
Silicone or Fluorinated oil (optional)

Weight:
5.6 kg (12.3 lb) without mounting bracket

Connections:
Refer to the 'Model and Suffix Codes' to specify the process and electrical connection type.

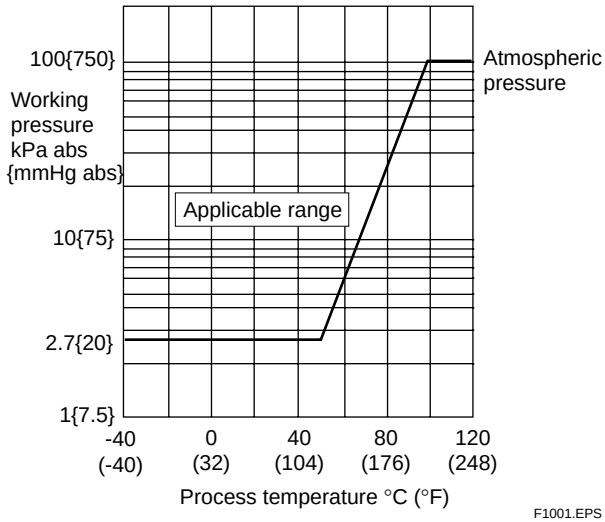


Figure 1. Working Pressure and Process Temperature

<Settings When Shipped "◇">

Tag Number	As specified in order *1
Output Mode	'Linear' unless otherwise specified in order
Display Mode	'Square root'
Operation Mode	'Normal' unless otherwise specified in order
Damping Time Constant	'2 sec.'

Calibration Range Lower Range Value	As specified in order
Calibration Range Higher Range Value	As specified in order
Calibration Range Units	Selected from mmH_2O, mmAq, mmWG, mmHg, Pa, hPa, kPa, MPa, mbar, bar, gf/cm^2, kgf/cm^2, inH_2O, inHg, ftH_2O, or psi. (Only one unit can be specified)

T1003.EPS

Note 1: If Tag No. is no more than 16 alphanumeric characters (including - and ·), it will be written into the tag plate and amplifier memory settings.

10.2 Model and Suffix Codes

● Model EJA115

[Style: S2]

Model	Suffix Codes	Description
EJA115	·····	Low Flow transmitter
Output Signal	**-D** ·····	4 to 20 mA DC with digital communication (BRAIN protocol)
	-E ·····	4 to 20 mA DC with digital communication (HART protocol) (Note 1)
	-F ·····	Digital communication (FOUNDATION Fieldbus protocol) (Note 4)
Measurement span (capsule)	**L** ·····	1 to 10 kPa {100 to 1000 mmH_2O}
	M ·····	2 to 100 kPa {200 to 10000 mmH_2O}
	H ·····	20 to 210 kPa {2000 to 21000 mmH_2O}
Wetted parts material		[Body](Note 3) [Capsule] [Orifice]
	S ·····	JIS SCS14A JIS SUS316L (Note 2) JIS SUS316
Process flange rating	**2** ·····	Rc1/2 female
	4 ·····	1/2 NPT female
–	**00** ·····	Always 00
Bolts and nuts material		[Maximum working pressure] (L capsule) (M, H capsule)
	A ·····	JIS SCM435 3.5 MPa {35 kgf/cm²} 14 MPa {140 kgf/cm²}
	B ·····	JIS SUS630 3.5 MPa {35 kgf/cm²} 14 MPa {140 kgf/cm²}
Installation	**-2** ·····	Vertical impulse piping type, right side high pressure, manifold upside
	-3 ·····	Vertical impulse piping type, right side high pressure, manifold downside
	-6 ·····	Vertical impulse piping type, left side high pressure, manifold upside
	-7 ·····	Vertical impulse piping type, left side high pressure, manifold downside
	-8 ·····	Horizontal impulse piping type, right side high pressure
	-9 ·····	Horizontal impulse piping type, left side high pressure
Electrical connection	**0** ·····	G1/2 female, one electrical connection
	2 ·····	1/2 NPT female, two electrical connections without blind plug
	3 ·····	Pg 13.5 female, two electrical connections without blind plug
	4 ·····	M20 female, two electrical connections without blind plug
	5 ·····	G1/2 female, two electrical connections and a blind plug
	7 ·····	1/2 NPT female, two electrical connections and a blind plug
	8 ·····	Pg 13.5 female, two electrical connections and a blind plug
	9 ·····	M20 female, two electrical connections and a blind plug
Integral indicator	**D** ·····	Digital indicator
	E ·····	Digital indicator with the range setting switch
	N ·····	(None)
Mounting bracket	**A** ·····	JIS SECC 2-inch pipe mounting (flat type)
	B ·····	JIS SUS304 2-inch pipe mounting (flat type)
	C ·····	JIS SECC 2-inch pipe mounting (L type)
	D ·····	JIS SUS304 2-inch pipe mounting (L type)
	N ·····	(None)
Optional codes		/□ Optional specification

T1004.EPS

Example: EJA115-DMS400A-92NN/□

Note 1: Refer to GS 1C22T1-E for HART Protocol version.

Note 2: Indicates other wetted parts materials. Diaphragm material is Hastelloy C-276.

Note 3: Indicates material of cover flanges and process connectors. Manifold and vent plugs material are JIS SUS316.

Note 4: Refer to GS 1C22T2-E for Fieldbus communication.

10.3 Optional Specifications

Item	Description		Code
Factory Mutual (FM)	FM Explosionproof Approval Explosionproof for Class I, Division 1, Groups B, C and D Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G Hazardous (classified) locations, indoors and outdoors (NEMA 4X) Temperature class: T6 Amb. Temp.:–40 to 60 °C (–40 to 140 °F) Electrical connection: 1/2 NPT female		**FF1**
	FM Intrinsically safe Approval Intrinsically Safe for Class I, Division 1, Groups A, B, C & D, Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations. Nonincendive for Class I, Division 2, Groups A, B, C & D, Class II, Division. 2, Groups E, F & G, and Class III, Division 1 Hazardous Locations. Enclosure: "NEMA 4X", Temp. Class: T4, Amb. Temp.: –40 to 60 °C (–40 to 140 °F) Intrinsically Safe Apparatus Parameters [Groups A, B, C, D, E, F and G] Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH [Groups C, D, E, F and G] Vmax=30 V, Imax=225 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH Electrical connection: 1/2 NPT female		**FS1**
	Combined FF1 and FS1 Electrical connection: 1/2 NPT female		**FU1**
CENELEC (KEMA)	CENELEC (KEMA) Flameproof Approval EExd IIC T4, T5, T6, Amb. Temp.: –40 to 80 °C (–40 to 176 °F) Max. process Temp.: T4; 120 °C (248 °F), T5; 100 °C (212 °F), T6; 85 °C (185 °F) Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female		**KF1**
	CENELEC (KEMA) Intrinsically safe Approval EEx ia IIC T4, Amb. Temp.: –40 to 60 °C(–40 to 140 °F) Ui=30 V, Ii=165 mA, Pi=0.9 W, Ci=22.5 nF, Li=730 μH Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female		**KS1**
	Combined KF1, KS1 and Type N Approval KEMA Type N Approval Ex nA IIC T4, Amb. Temp.: –40 to 60 °C(–40 to 140 °F) U=30 V, I=165 mA Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female		**KU1**
Canadian Standards Association (CSA)	CSA Explosionproof Approval Explosionproof for Class I, Division 1, Groups B, C and D Dustignitionproof for Class II/III, Division 1, Groups E, F and G Division2 'SEALS NOT REQUIRED' , Temp. Class : T4, T5, T6 Encl Type 4x Max. Process Temp.: T4; 120 °C (248 °F), T5; 100 °C (212 °F), T6; 85 °C (185 °F) Amb. Temp.:–40 to 80 °C (–40 to 176 °F) Electrical connection: 1/2 NPT female		**CF1**
	CSA Intrinsically safe Approval Class I, Groups A, B, C and D Class II and III, Groups E, F and G Encl Type 4x, Temp. Class: T4, Amb. Temp.: –40 to 60 °C (–40 to 140 °F) Vmax=30 V, Imax=165 mA, Pmax=0.9 W, Ci=22.5 nF, Li=730 μH Electrical connection: 1/2 NPT female		**CS1**
	Combined CF1 and CS1 Electrical connection: 1/2 NPT female		**CU1**
Standards Association of Australia (SAA)	SAA Flameproof, Intrinsically safe and Non-sparking Approval Ex d IIC T4/T5/T6, IP67 class I, Zone 1, Amb. Temp. : –40 to 80 °C (–40 to 176 °F) Max. Process Temp.: T4; 120 °C (248 °F), T5; 100 °C (212 °F), T6; 85 °C (185 °F) Ex ia IIC T4, IP67 class I, Zone 0 Ex n IIC T4, IP67 class I, Zone 2 Ui=30 V DC, Ii=165 mA DC, Wi=0.9 W, Amb. Temp.: –40 to 60 °C (–40 to 140 °F) Electrical connection: 1/2 NPT female, Pg 13.5 female and M20 female		**SU1**
Japanese Industrial Standards (JIS)	JIS Flameproof Approval, Ex do IIC T4X Amb. Temp. –20 to 60 °C, Process Temp. –20 to 120 °C		**JF3**
	JIS Intrinsically safe Approval, Ex ia IIC T4 Amb. Temp. –20 to 60 °C, Process Temp. –20 to 120 °C		**JS1**
Attached flameproof packing adapter	Electrical connection: G1/2 female Applicable cable O.D.: 8 to 12 mm	1 pc.	**G11**
		2 pcs.	**G12**

T1005.EPS

Item		Description		Code
Painting	Color change	Amplifier cover only		**P□**
	Coating change	Epoxy resin-baked coating		**X1**
Lightning protector		Transmitter power supply voltag: 10.5 to 32 V DC (10.5 to 30 V DC for intrinsically safe type, 9 to 32 V DC for Fieldbus communication type.) Allowable current: Max. 6000 A (1×40 μs), Repeating 1000 A (1×40 μs) 100 times		**A**
Oil-prohibited use		Degrease cleansing treatment		**K1**
		Degrease cleansing treatment and with fluorinated oilfilled capsule. Operating temperature –20 to 80 °C		**K2**
Oil-prohibited use with dehydrating treatment		Degrease cleansing treatment and dehydrating treatment		**K5**
		Degrease cleansing treatment and dehydrating treatment with fluorinated oilfilled capsule. Operating temperature –20 to 80 °C		**K6**
Calibration units		P calibration (psi unit)	(See Table for Span and Range Limits.)	**D1**
		bar calibration (bar unit)		**D3**
		M calibration (kgf/cm^2 unit)		**D4**
Sealing treatment to SUS630 nuts		Sealant (liquid silicone rubber) is coated on surfaces of SUS630 nuts used for cover flange mounting.		**Y**
Long vent (Note 1)		Total vent plug Length: 112 mm (standard, 32 mm)		**U**
Fast response		Update time: 0.125 sec or less, see GS for the response time		**F1**
Failure alarm down-scale (Note 2)		Output status at CPU failure and hardware error: –5%, 3.2 mA DC or less. When combining with Optional code F1, output signal is –2.5%, 3.6 mA DC or less.		**C1**
Stainless steel amplifier housing (Note 3)		Amplifier housing material: SCS14A stainless steel (equivalent to SUS316 cast stainless steel or ASTM CF-8M)		**E1**
Gold-plate		Gold-plated diaphragm		**A1**
Mill Certificate		Cover flange, Process connector, Manifold, Orifice, and Spacer		**M12**
Pressure test/Leak test Certificate		Test Pressure: 3.5 MPa{35 kgf/cm^2}	Nitrogen(N_2) Gas (Note 5) Retention time: 10 minutes	**T01**
		Test Pressure: 14 MPa{140 kgf/cm^2}		**T02**

T1006.EPS

Note 1: Applicable only for vertical impulse piping types (Installation Code 2, 3, 6 or 7). Long vent material is SUS316.
Note 2: The hardware error indicates faulty amplifier or capsule. Standard output status (without /C1) is up-scale of 110%, 21.6 mA DC or more.
Note 3: Applicable only for electrical Connection code 2, 3 and 4. Not applicable for optional Code P□ and X1.
Note 4: Applicable for Process Connections Code 0 and 5.
Note 5: Pure nitrogen gas is used for Oil-prohibited use (Optional Code K1, K2, K5 and K6).

Table 1. Measurement Range (Approximate value)

	Orifice Bore (mm)	L Capsule	M Capsule	H Capsule
Water Equivalent Maximum Flow Range l/min	0.508	0.016 to 0.049	0.022 to 0.157	0.07 to 0.225
	0.864	0.046 to 0.145	0.066 to 0.46	0.21 to 0.67
	1.511	0.134 to 0.42	0.19 to 1.35	0.60 to 1.93
	2.527	0.36 to 1.15	0.52 to 3.6	1.65 to 5.2
	4.039	0.92 to 2.9	1.3 to 9.2	4.1 to 13.0
	6.350	2.3 to 7.2	3.3 to 23	10 to 33
Air Equivalent Maximum Flow Range Nl/min	0.508	0.44 to 1.40	0.63 to 4.4	1.98 to 6.4
	0.864	1.30 to 4.10	1.85 to 12.9	5.8 to 18.5
	1.511	3.7 to 11.7	5.3 to 37	16.7 to 54
	2.527	10.3 to 32	14.6 to 105	47 to 150
	4.039	25 to 79	36 to 255	113 to 370
	6.350	63 to 198	89 to 630	280 to 910

T1007.EPS

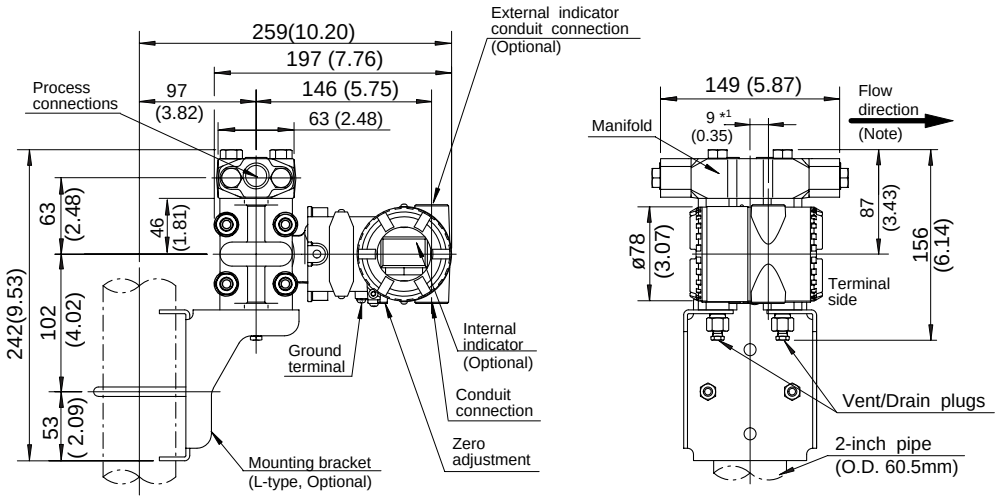
Note: For details, refer to TI 6P1E2-E.

10.4 Dimensions

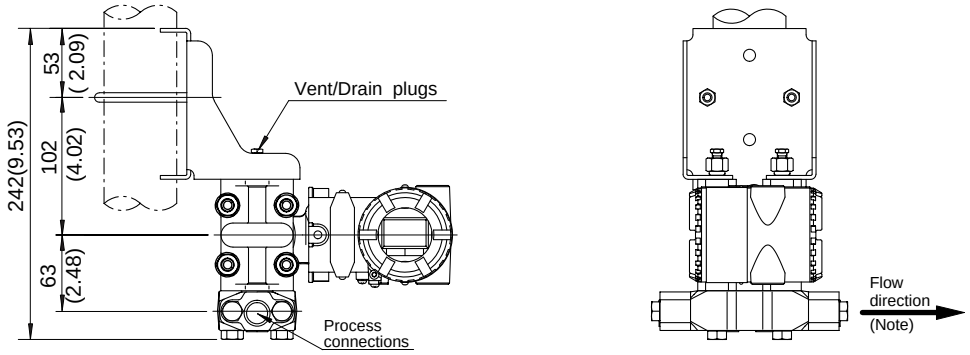
● Model EJA115 [Style: S2]

Unit: mm(approx. inch)

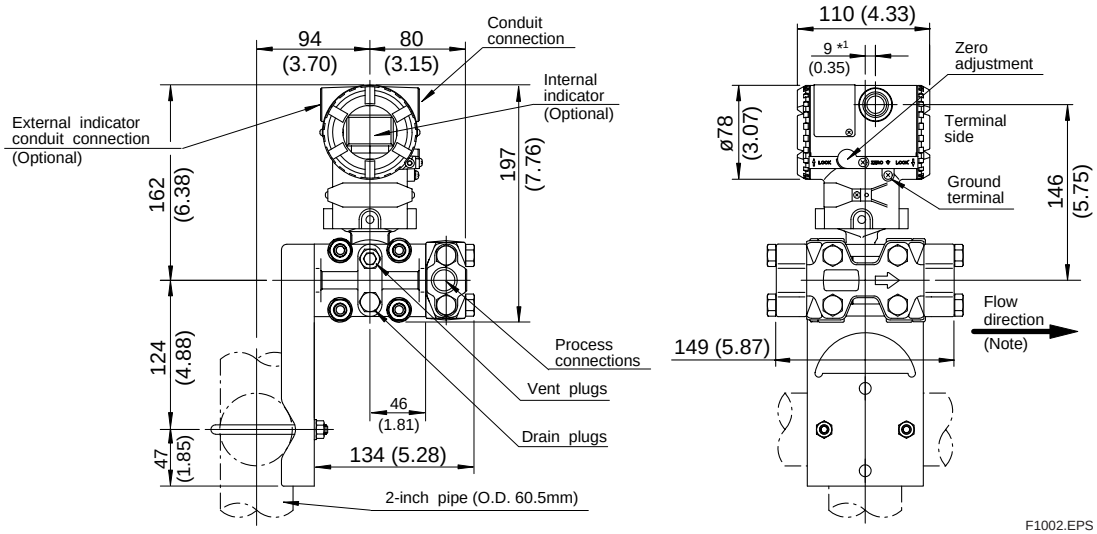
Vertical Impulse Piping Type, Manifold upside(INSTALLATION CODE '6')



Vertical Impulse Piping Type, Manifold downside(INSTALLATION CODE '7')



Horizontal Impulse Piping Type(INSTALLATION CODE '9')



Note: When INSTALLATION CODE ‘2’, ‘3’ or ‘8’ is selected, flow direction arrow mark on above figure are reversed.
(i. e. Arrow head faces toward left.)

*1: 15 mm (0.59 inch) for right side high pressure. (INSTALLATION CODE ‘2’, ‘3’ or ‘8’)

INSTALLATION AND OPERATING PRECAUTIONS FOR JIS INTRINSICALLY SAFE EQUIPMENT

Apparatus Certified Under Technical Criteria (IEC-compatible Standards) and from "RECOMMENDED PRACTICES for Explosion-Protected Electrical Installations in General Industries," published in 1979

1. General

The following describes precautions on electrical apparatus of intrinsically safe construction (hereinafter referred to as intrinsically safe apparatus).

Following the Labor Safety and Health Laws of Japan, an intrinsically safe apparatus must undergo type tests in order to be certified by the Technical Institute of Industrial Safety, Inc. These tests are required to satisfy either the technical criteria for electrical machinery and equipment in compliance with explosionproof standards involving inflammable gases or vapors and for machinery and equipment having explosionproof performance (standards notification no. 556 from the Japanese Ministry of Labor) (hereinafter referred to as technical criteria), in conformity with IEC Standards, or the "Recommended Practice for Explosion-Protected Electrical Installations in General Industries," published in 1979. Such a certified apparatus can be used in hazardous locations where inflammable gases or vapors may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements.

For electrical wiring and maintenance servicing, please refer to "Internal Wiring Rules" in the Electrical Installation Technical Standards as well as "USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry," published in 1994.

To meet intrinsically safe requirements, equipment that can be termed an "intrinsically safe apparatus" must:

(1) be certified by the Technical Institute of Industrial Safety, Inc. in accordance with the Labor Safety and Health Laws of Japan and have the appropriate mark of certification labeled on its case, and
(2) be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

Note: Intrinsically safe apparatus satisfy their performance under specific conditions. They are not always absolutely safe under every operational and environmental condition. In other words, they are not safe products involved with factors such as chemical reactions, geographical changes or the like other than affected by electric energy from the equipment itself.

2. Electrical Apparatus of Intrinsic Safety Type of Explosion-Protected Construction

The intrinsic safety type of explosion-protected construction is a method of protection applicable to a circuit or part of a circuit in which, under prescribed test conditions, no spark or thermal effect, whether produced normally or accidentally, is capable of causing a prescribed explosive gas to ignite. In other words, electrical apparatus of this construction is intended to suppress electrical energy thereby preventing ignition of a given explosive gas atmosphere even though spark or high thermal effect occurs in the electric circuitry.

Intrinsically safe electrical apparatus generally comprise intrinsically safe apparatus installed in a hazardous location and a safety barrier (associated apparatus), installed in a non-hazardous location, aimed at preventing electrical energy from flowing into the electric circuitry of intrinsically safe apparatus.

However, battery-operated, portable intrinsically safe apparatus or the like may be used alone.

3. Terminology

(1) Intrinsically safe apparatus: Electrical apparatus in which all the circuits are intrinsically safe circuits.
(2) Associated apparatus: Electrical apparatus in which there are both intrinsically safe circuits and non-intrinsically safe circuits that can affect the safety of intrinsically safe circuits.
(3) Safety barrier: A specific type of associated apparatus, which consists mainly of safety barrier elements, and serves to limit the flow of excessive electrical energy, which is capable of causing ignition of a given explosive gas or vapour of a non-intrinsically safe circuit into concerned intrinsically safe circuits.
(4) Apparatus of category "ia": Intrinsically safe electrical apparatus and associated apparatus which are incapable of causing ignition of a given explosive gas or vapour with the appropriate safety factors such as:

— when up to two countable faults are applied and, in addition,
— when non-countable faults produce an onerous condition.

(5) Apparatus of category “ib”: Intrinsically safe electrical apparatus and associated apparatus which are incapable of causing ignition of a given explosive gas or vapour, with the appropriate safety factors such as:
— when up to one countable fault is applied and, in addition,
— when non-countable faults produce an onerous condition.

(6) Safety rating: A rating to be designated to intrinsically safe apparatus as well as associated apparatus and is the maximum rating allowable for maintaining intrinsic safety of concerned intrinsically safe circuits.

4. Caution on Combining Intrinsically Safe Apparatus and Safety Barriers

(1) A combination of certified intrinsically safe apparatus and safety barriers needs to satisfy combination requirements. If intrinsically safe apparatus specify safety barriers for combination, safety barriers other than specified cannot be used (see Note 1 for more details).

(2) Certified intrinsically safe systems specify specific safety barriers in combination with intrinsically safe apparatus. So safety barriers other than specified cannot be used (see Note 2 for more details).

(3) Other than limitations of combining intrinsically safe apparatus and safety barriers as given in (1) and (2) above, two or more pieces of apparatus certified under different standards cannot be combined with each other (see Note 3 for more details). In addition, bear in mind that classifications of explosion protection such as “IIA,” “IIB” and “IIC” and category “ia” and “ib” limit a combination of intrinsically safe apparatus and safety barriers.
For more details, see the “Type Certificate Guide for Explosion-Protected Constructionfor Electrical Machinery and Equipment,” issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safety.

Note 1: Testing Apparatus
Intrinsically safe apparatus and safety barriers are assessed individually to ensure that their safety requirements are satisfied. Tested and certified intrinsically safe apparatus and safety barriers incorporate individual certification numbers. A combination of intrinsically safe apparatus and safety barriers involves the following two limitations:
(1) A safety barrier which meets the combination requirements by referring to its safety rating and combination parameters shall be selected.
(2) For pressure transmitters, pH transmitters, temperature detectors and the like, safety barriers that can be combined are already specified. Other safety barriers cannot be used.

Note 2: Testing Intrinsically Safe System
An assembly (as a system) in which intrinsically safe apparatus and safety barriers are combined is assessed to ensure that its safety requirements are satisfied. A tested and certified system incorporates a certification number (intrinsically safe apparatus and safety barriers have the same certification number).

Note 3: Impossible Combinations of Apparatus Certified Under Different Standards
Intrinsically safe apparatus certified under technical criteria and safety barriers certified under the “Recommended Practice for Explosion-Protected Electrical Installations in General Industries” (1979) and vice versa cannot be combined even if their combination requirements are satisfied.

5. Installation of Intrinsically Safe Apparatus and Safety Barriers

(1) Classification of installation location

Intrinsically safe apparatus may be installed, depending upon applicable gases, in a hazardous area in Zone 0, 1 or 2 (Note 4 below), where the specified gases are present. However, note that apparatus certified under Technical Criteria, in category “ib” shall be installed only in Zone 1 or 2. Safety barriers (associated apparatus) that are combined with these intrinsically safe apparatus shall be installed only in a non-hazardous area. In cases where safety barriers are installed in a hazardous area, they shall be enclosed, for example, in a flameproof enclosure.

Note 4: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

(2) Ambient temperature limits for intrinsically safe apparatus

Intrinsically safe apparatus shall be installed in a location where the ambient temperature ranges from –20° to +40°C (for those certified under Technical Criteria) or –10° to +40°C (for those certified under the “Recommended Practice for Explosion-Protected Electrical Installations in General Industries” (1979). However, some field-mounted

intrinsically safe apparatus may be used at an ambient temperature up to 60°C. So, specifications should be checked before installing intrinsically safe apparatus.

If the intrinsically safe apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

6. Wiring for Intrinsically Safe Circuits

In intrinsically safe construction, safety shall be maintained as an intrinsically safe system involving intrinsically safe apparatus and safety barriers connected thereto, and electrical wiring (through intrinsically safe circuits) interconnected between them. In other words, even when safety requirements are maintained individually by intrinsically safe apparatus and safety barriers, they shall not be affected by electrical or magnetic energy caused by electrical wiring.

To make electrical wiring for intrinsically safe circuits, you must:

(a) refer to the equipment configuration diagram and make electrical wiring properly;
(b) prevent intrinsically safe wiring from being contacted with non-intrinsically safe wiring, and separate the intrinsically safe circuit from other electrical circuits;
(c) prevent intrinsically safe wiring from being electrostatically and magnetically affected by non-intrinsically safe wiring;
(d) reduce wiring inductance and capacitance produced between the intrinsically safe apparatus and safety barrier where possible, and use a shorter cable between the intrinsically safe apparatus and safety barrier than specified if the maximum permissible inductance of the cable is specified as operating conditions;
(e) conform to conditions of installation such as wiring method, earthing or the like, if any; and
(f) protect the outer sheath of cables from damage with appropriate measures.

7. Maintenance and Inspection of Intrinsically Safe Apparatus and Safety Barriers

Maintenance and inspection of intrinsically safe apparatus and safety barriers shall be limited to within the instructions described in applicable instruction manuals. If other than this is required, contact the manufacturers. For more information, refer to the “USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry” issued in 1994 by the Japanese Ministry of Labour, the Research Institute of Industrial Safety.

(1) Requirements for maintenance personnel

Maintenance and inspection of intrinsically safe apparatus and safety barriers shall be conducted by maintenance personnel skilled in intrinsically safe construction and installation of electrical devices as well as capable of applying associated rules.

(2) Maintenance and Inspection

(a) Visual inspection
Visually inspect the external connections of intrinsically safe apparatus and safety barriers, and cables for damage or corrosion as well as other mechanical and structural defects.

(b) Adjustments
Zero, span and sensitivity adjustments shall be made with applicable adjusting potentiometers and mechanical adjustment screws.
These maintenance adjustments shall be made in a non-hazardous location.

⚠ CAUTION

If intrinsically safe apparatus and safety barriers require maintenance service and checking, a gas detector shall be used to ensure that there is no explosive gas in the location (maintenance servicing shall be conducted in a non-hazardous location).

(3) Repair

Intrinsically safe apparatus and safety barriers shall be repaired by manufacturers.

(4) Prohibition of modifications and specification changes

Do not attempt to make modifications or change specifications which may affect safety.

INSTALLATION AND OPERATING PRECAUTIONS FOR JIS FLAMEPROOF EQUIPMENT

Apparatus Certified Under Technical Criteria
(IEC-compatible Standards)

1. General

The following describes precautions on electrical apparatus of flameproof construction (hereinafter referred to as flameproof apparatus) in explosion-protected apparatus.

Following the Labour Safety and Health Laws of Japan, flameproof apparatus is subjected to type tests to meet either the technical criteria for explosionproof electrical machinery and equipment (standards notification no. 556 from the Japanese Ministry of Labour) (hereinafter referred to as technical criteria), in conformity with the IEC Standards, or the “Recommended Practice for Explosion-Protected Electrical Installations in General Industries,” published in 1979. These certified apparatus can be used in hazardous locations where explosive or inflammable gases or vapours may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements.

For electrical wiring and maintenance servicing, please refer to “Internal Wiring Rules” in the Electrical Installation Technical Standards as well as “USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry,” published in 1994.

To meet flameproof requirements, equipment that can be termed “flameproof” must:

(1) Be certified by a Japanese public authority in accordance with the Labour Safety and Health Laws of Japan and have a certification label in an appropriate location on its case, and
(2) Be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

2. Electrical Apparatus of Flameproof Type of Explosion-Protected Construction

Electrical apparatus which is of flameproof construction is subjected to a type test and certified by the Japanese Ministry of Labour aiming at preventing explosion caused by electrical apparatus in a factory or any location where inflammable gases or vapours may be present. The flameproof construction is of completely enclosed type and its enclosure shall endure explosive pressures in cases where explosive gases or vapours entering the enclosure cause explosion. In addition, the enclosure construction shall be such that flame caused by explosion does not ignite gases or vapours outside the enclosure.

In this manual, the word "flameproof" is applied to the flameproof equipment combined with the types of protection "e", "o", "i", and "d" as well as flameproof equipment.

3. Terminology

(1) Enclosure

An outer shell of an electrical apparatus, which encloses live parts and thus is needed to configure explosion-protected construction.

(2) Shroud

A component part which is so designed that the fastening of joint surfaces cannot be loosened unless a special tool is used.

(3) Enclosure internal volume

This is indicated by:— the total internal volume of the flameproof enclosure minus the volume of the internal components essential to equipment functions.

(4) Path length of joint surface

On a joint surface, the length of the shortest path through which flame flows from the inside to outside of the flameproof enclosure. This definition cannot be applied to threaded joints.

(5) Gaps between joint surfaces

The physical distance between two mating surfaces, or differences in diameters if the mating surfaces are cylindrical.

Note: The permissible sizes of gaps between joint surfaces, the path length of a joint surface and the number of joint threads are determined by such factors as the enclosure’s internal volume, joint and mating surface construction, and the explosion classification of the specified gases and vapours.

4. Installation of Flameproof Apparatus

(1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

(2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from –20°C to +40°C (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to +60°C as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring or flameproof metal conduits for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. For metal conduits, attach sealing fittings as close to wiring connections as possible and completely seal the apparatus. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the “USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry,” published in 1994.

(1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the “USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry,” published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated form Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables, or cable connections with insulated cables inside the conduit pipes are made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

(2) Flameproof Metal Conduit Wiring

- For the flameproof metal conduit wiring or insulated wires shall be used as recommended by the USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry, published in 1994.
- For conduit pipes, heavy-gauge steel conduits conforming to JIS C 8305 Standard shall be used.
- Flameproof sealing fittings shall be used in the vicinity of the wiring connections, and those fittings shall be filled with sealing compounds to complete sealing of the apparatus. In addition, to prevent explosive gases, moisture, or flame caused by explosion form being propagated through the conduit, always provide sealing fittings to complete sealing of the conduit in the following locations:
  (a) In the boundaries between the hazardous and non-hazardous locations.
  (b) In the boundaries where there is a different classification of hazardous location.
- For the connections of the apparatus with a conduit pipe or its associated accessories, G-type parallel pipe threads (JIS B 0202) shall be used to provide a minimum of five-thread engagement to complete tightness. In addition, since these parallel threads do not have sealing property, nonhardening sealant such as liquid gaskets shall thus be applied to those threads for ensuring waterproofness.
- If metal conduits need flexibility, use flameproof flexible fittings.

6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 “MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION” in the USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

(1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

(a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.

(b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

(2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

(a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.

(b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.

CAUTION

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

(c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.

(d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

(3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

7. Selection of Cable Entry Devices for Flameproof Type

IMPORTANT

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

References:

(1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan

(2) USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

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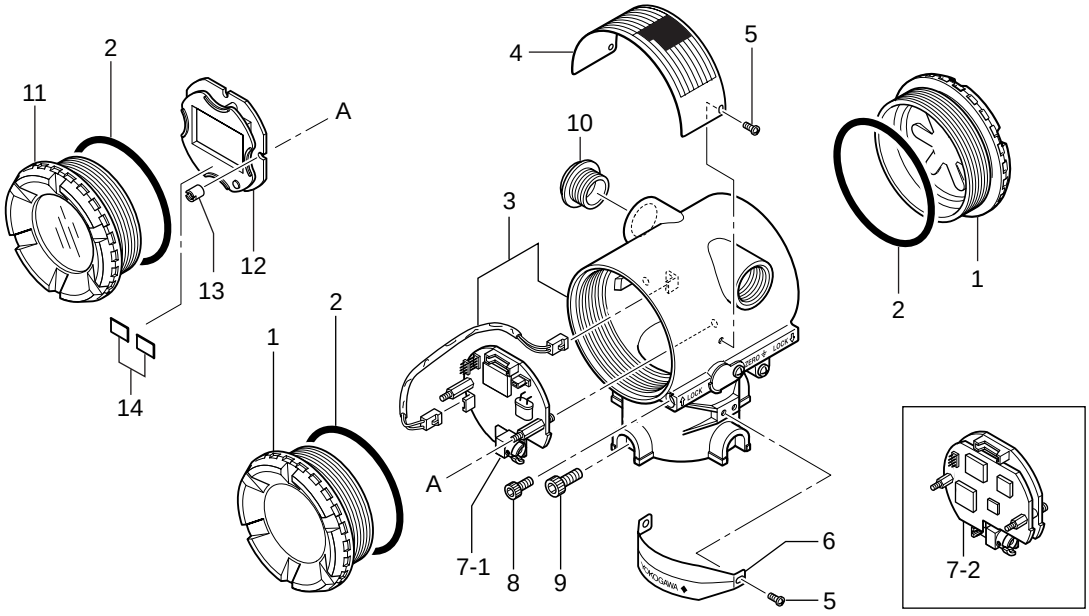
Customer Maintenance Parts List

DPharp EJA Series
Transmitter Section

DPharp



Item	Part No.	Qty	Description	
1	Bellow	2	Cover	
	F9341RA		Cast-aluminum alloy	
	F9341RJ		SCS14A stainless steel	
2	F9341JP	2	O-ring	
3	Below	1	Case Assembly	
	F9341AA		Cast-aluminum alloy for G1/2	
	F9341AC		Cast-aluminum alloy for G1/2 (two electrical connections)	
	F9341AE		Cast-aluminum alloy for 1/2 NPT (two electrical connections)	
	F9341AH		Cast-aluminum alloy for M20 (two electrical connections)	
	F9341AJ		Cast-aluminum alloy for Pg13.5 (two electrical connections)	
	F9341AR		SCS14A stainless steel for 1/2 NPT (two electrical connections)	
4	F9341KA	1	Name Plate	
5	Bellow	4	Screw	
	F9300AG		For cast-aluminum alloy case assembly	
	F9303JU		For SCS14A stainless steel case assembly	
6	F9341KL	1	Tag Plate	
7-1	Below	1	CPU Assembly	
	F9342BB		For BRAIN protocol version (Except JIS Intrinsically safe type)	
	F9342BH		For HART protocol version (Except JIS Intrinsically safe type)	
	F9342BJ		For BRAIN protocol version JIS Intrinsically safe type (Optional code /JS1)	
	F9342AF		For BRAIN protocol version (Optional code /F1)	
	F9342AM		For HART protocol version with write protection switch (Optional code /F1)	
7-2	F9342BF		For FOUNDATION Fieldbus protocol	
8	Y9406ZU	2	Cap Screw	
9	Y9612YU	2	Screw	
10	Below	1	Plug	
	F9340NW		For Pg13.5	
	F9340NX		For M20	
	G9330DP		For G1/2	
	G9612EB		For 1/2 NPT	
11	Bellow	1	Cover Assembly	For integral indicator
	F9341FM		Cast-aluminum alloy	
	F9341FJ		SCS14A stainless steel	
12	Below	1	LCD Board Assembly	
	F9342BL		Without range-setting switch	
	F9342BM		With range-setting switch	
13	F9342MK	2	Mounting Screw	
14	F9300PB	2	Label	

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CMPL 1C22A1-02E
6th Edition: Feb. 2000(YK)

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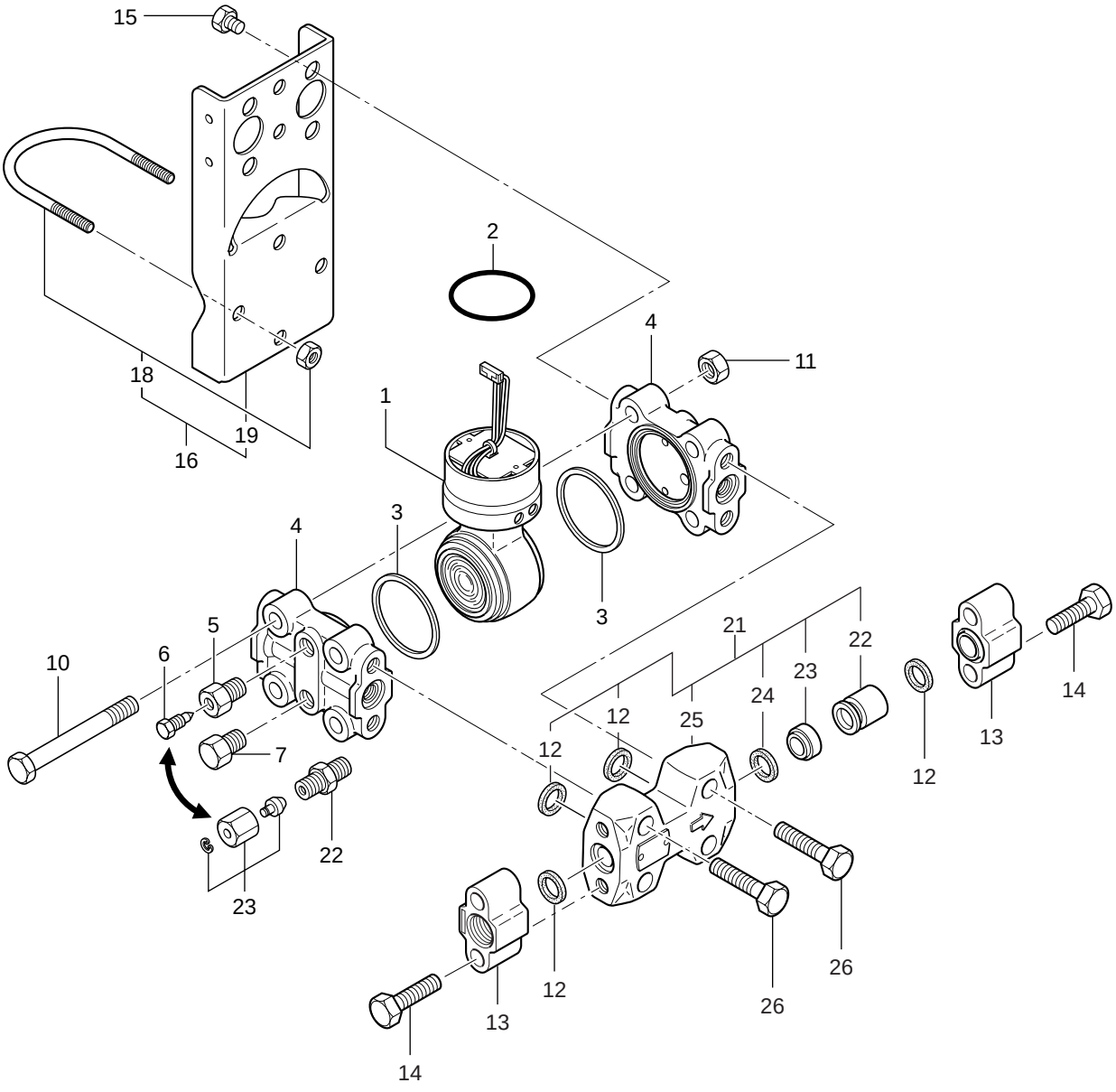
Customer Maintenance Parts List

Model EJA115
Low Flow Transmitter
(Pressure-detector Section)

DPharp

Horizontal Impulse Piping Type



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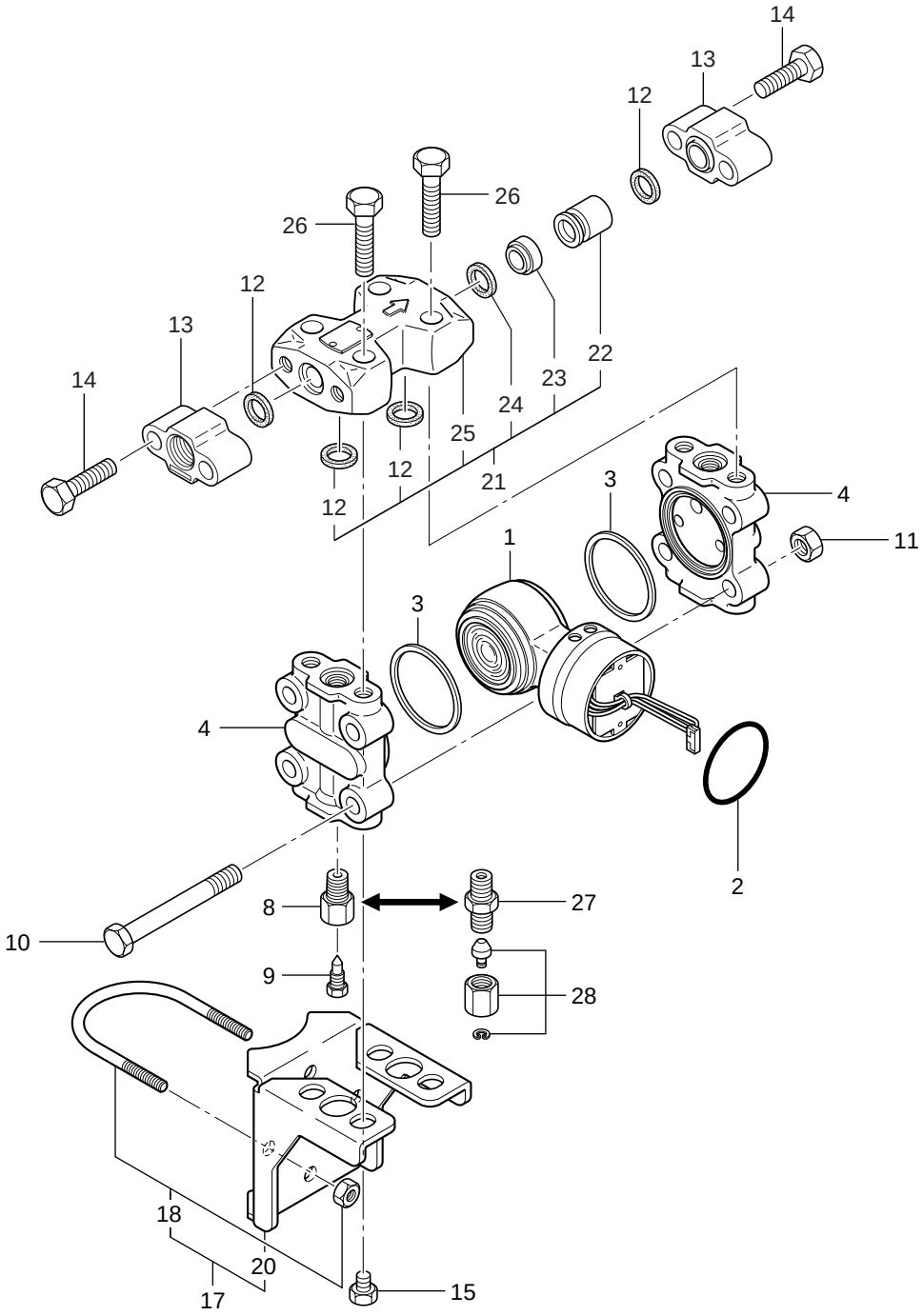
Vertical Impulse Piping Type



Item	Part No.	Qty	Description
1	—	1	Capsule Assembly (see table 1.and table 2. page 4) (Note 1)
2	F9300AJ	1	O-Ring
3	Below	2	Gasket
	F9340GA		Teflon-coated SUS316L Stainless Steel
	F9340GC		Teflon-coated SUS316L Stainless Steel (degreased)
4	Below	2	Cover Flange, SCS14A Stainless Steel (Note 2)
	F9340VA		Rc 1/4 } For Horizontal Impulse Piping Type (Note 3)
	F9340VB		1/4 NPT } For Horizontal Impulse Piping Type (Note 3)
	F9340VC		Rc 1/4 } For Vertical Impulse Piping Type (Note 3)
	F9340VD		1/4 NPT } For Vertical Impulse Piping Type (Note 3)
5	Below	2	Vent Plug, SUS316 Stainless Steel
	F9340SA		R 1/4
	F9340SB		1/4 NPT
6	D0114PB	2	Vent Screw, SUS316 Stainless Steel
7	Below	2	Drain Plug, SUS316 Stainless Steel (Note 2)
	F9200CS		R 1/4
	D0114RZ		1/4 NPT
8	Below	2	Drain/Vent Plug, SUS316 Stainless Steel
	F9340SC		R 1/4
	F9340SD		1/4 NPT
9	F9270HE	2	Drain/Vent Screw, SUS316 Stainless Steel
10	Below	4	Bolt
	F9340AB		SCM435 Chrome Molybdenum Steel
	F9340AC		SUS630 Stainless Steel
11	Below	4	Nut
	F9275KL		SCM435 Chrome Molybdenum Steel
	F9275KH		SUS630 Stainless Steel
12	Below	4	Gasket
	D0114RB		PTFE Teflon
	U0102XC		PTFE Teflon (degreased)
13	Below	2	Process Connector, SCS14A Stainless Steel (Note 2)
	F9340XW		Rc 1/2
	F9340XX		1/2 NPT
14	Below	4	Bolt
	X0100MN		SCM435 Chrome Molyboleom Steel
	F9273DZ		SUS630 Stainless Steel
15	Below	4	Bolt
	F9270AY		S15C Carbon Steel
	F9273CZ		SUS XM7 Stainless Steel
16	Below	1	Bracket Assembly (Flat type)
	F9270AW		SECC Carbon Steel
	F9300TJ		SECC Carbon Steel (for Epoxy resin-baked coating)
	F9300TA		SUS304 Stainless Steel
17	Below	1	Bracket Assembly (L type)
	F9340EA		SECC Carbon Steel
	F9340EB		SECC Carbon Steel (for Epoxy resin-baked coating)
	F9340EC		SUS304 Stainless Steel
18	D0117XL-A	1	U-Bolt/Nut Assembly, SUS304 Stainless Steel
19	Below	1	Bracket (Flat type)
	F9270AX		SECC Carbon Steel
	F9300TN		SECC Carbon Steel (for Epoxy resin-baked coating)
	F9300TE		SUS304 Stainless Steel
20	Below	1	Bracket (L type)
	F9340EF		SECC Carbon Steel
	F9340EG		SECC Carbon Steel (for Epoxy resin-baked coating)
	F9340EM		SUS304 Stainless Steel
21	Below	1	Manifold Assembly
	F9304VA		Orifice Bore : 0.508 mm
	F9304VB		Orifice Bore : 0.864 mm
	F9304VC		Orifice Bore : 1.511 mm
	F9304VD		Orifice Bore : 2.527 mm

Item	Part No.	Qty	Description
21	F9304VE		Orifice Bore : 4.039 mm
	F9304VF		Orifice Bore : 6.350 mm
22	F9275ZT	1	Spacer, SUS316 Stainless Steel (Note 2)
23	Below	1	Orifice, SUS316 Stainless Steel (Note 2)
	D0117BW		Orifice Bore : 0.508 mm
	D0117BX		Orifice Bore : 0.864 mm
	D0117BY		Orifice Bore : 1.511 mm
	D0117BZ		Orifice Bore : 2.527 mm
	D0117CA		Orifice Bore : 4.039 mm
	D0117CB		Orifice Bore : 6.350 mm
24	F9273HC	1	Gasket, PTFE Teflon (Note 2)
25	F9275ZR	1	Manifold, SUS316 Stainless Steel (Note 2)
26	Below	4	Bolt
	F9147AF		Chrome Molybdenum Steel
	A0116WT		SUS630 Stainless Steel
27	Below	2	Vent Plug (degreased), SUS316 Stainless Steel
	F9275EC		R 1/4
	F9275ED		1/4 NPT
28	F9275EE	2	Needle Assebmly (degreased), SUS316 Stainless Steel

(Note 1) In case of Degrease cleansing treatment (Optional Code/K1 or K5), consult YOKOGAWA local office.
(However, see Table 1 and 2 in case of Optional Code/K2 or K6)
(Note 2) In case of Degrease cleansing treatment (Optional Code/K1, K2, K5 or K6), consult YOKOGAWA local office.
(Note 3) These Cover Flanges shall be applied to the model with the Style Code "S2" which was supplied from Aug. 16, 1996.

Table 1. Capsule Assembly Part Number (Item 1)
For General-use type, Flameproof type and Intrinsically safe type (Except JIS Intrinsically safe type)

Installation of Transmitter	High Pressure Side	Capsule Code	Part No. (*1)	Part No. (*2)
Horizontal Impulse Piping Type	Right	L	F9349AA	F9352AA
		M	F9349BA	F9352BA
		H	F9349CA	F9352CA
	Left	L	F9349AB	F9352AB
		M	F9349BB	F9352BB
		H	F9349CB	F9352CB
Vertical Impulse Piping Type	Right	L	F9349AC	F9352AC
		M	F9349BC	F9352BC
		H	F9349CC	F9352CC
	Left	L	F9349AD	F9352AD
		M	F9349BD	F9352BD
		H	F9349CD	F9352CD

*1. Silicone oil filled capsule (Standard)
*2. Fluorinated oil filled capsule (for oil-prohibited-use : Optional Code /K2 or K6)

Table 2. Capsule Assembly Part Number (Item 1) For JIS Intrinsically safe type

Installation of Transmitter	High Pressure Side	Capsule Code	Part No. (*1)	Part No. (*2)
Horizontal Impulse Piping Type	Right	L	F9349NA	F9352NA
		M	F9349PA	F9352PA
		H	F9349QA	F9352QA
	Left	L	F9349NB	F9352NB
		M	F9349PB	F9352PB
		H	F9349QB	F9352QB
Vertical Impulse Piping Type	Right	L	F9349NC	F9352NC
		M	F9349PC	F9352PC
		H	F9349QC	F9352QC
	Left	L	F9349ND	F9352ND
		M	F9349PD	F9352PD
		H	F9349QD	F9352QD

*1. Silicone oil filled capsule (Standard)
*2. Fluorinated oil filled capsule (for oil-prohibited-use : Optional Code /K2 or K6)

REVISION RECORD

Title: Model EJA115 Low Flow Transmitter
Manual No.: IM 1C22K1-01E

Edition	Date	Page	Revised Item
7th	Mar. 1998	1-1	1 • Add FOUNDATION Fieldbus protcol version to 'NOTE' notice.
		6-1	6.1 • Add Item 6 to the Wiring Precautions.
		11-1	11.1.1 • Add FOUNDATOIN Fieldbus protocol.
		11-2	11.1.2 • Add Output signal code F.
		11-3	11.1.3 • Add Optional code A1.
		2-9+	• Change the figure of terminal configuration.
		CMPL	CMPL 1C22A1-02E 3rd ⇒ 4th
			Page 2 • Add Item 7-2.
		CMPL	CMPL 1C22K1-01E 4th ⇒ 5th
			Page 4 • Add Optional code K5 and K6.
8th	Sep. 1998	2-14	2.10 • Delete EMC Conformity Standards Tables and move the section to Page 2-14.
		2-15	2.10 • Remove Page 2-15.
		8-20	8.3.2(10) • Correction made in BURN OUT figure.
		11-2	11.1.2 • Add Electrical connection code 7, 8, and 9.
		CMPL	CMPL 1C22A1-02E 4th ⇒ 5th
			Page 2 • Add Part No. to Item 3 (For PG13.5 and M20).
			• Add Part No. to Item 10 (For 1/2NPT, PG13.5, and M20).
9th	Feb. 2000	–	Changed to Electronic File Format Revised a book in a new format. (The location of contents and the associated page numbers may not coincide with the one in old editions.) Major Revised Items: 1. Explosion class and option code of JIS flameproof approval. Explosion class: Ex ds IIC T4(old) to Ex do IIC T4X(new). Option code: /JF1(old) to /JF3(new) 2. Option code for flameproof packing adapter for JIS flameproof approval. Option code: /G1 and /G2(old) to /G11 and /G12(new) 3. Add "Pa" and "hPa" as the unit for calibration range. 4. Part number change for CPU Board Assembly.
		2-9	2.9 • Add Figure 2.3 Example of using DCS. • Add Figure 2.4 Selecting Cables.
			2.10 • Add AS/NZS 2064 1/2 to EMI, EMC Conformity Standards.
		6-1	6.2 • Add selection in the case of JIS flameproof type.
		6-3	6.4.2 • Change option code for flame packing adapter. Option code: G1 and G2 ⇒ G11 and G12 Change Applicable cable O.D. and Identifying mark. Part number: G9601AH ⇒ G9601AM Change the figure of flame proof packing adapter in Figure 6.4.2c.
		8-4	8.3.1 • Add Pa and hPa to C20 and D31.
		–	– • Installation and Operating Precautions for JIS Intrinsically Safe and Explosionproof Equipment: EX-A01E ⇒ EX-A03E, EX-B01E ⇒ EX-B03E
		10-5	10.3 • Add Optional code F1.
		CMPL	CMPL 1C22A1-02E 5th ⇒ 6th • Change a format. • Change and add Part No. of Item 7-1, CPU assembly: Change; F9342BC ⇒ F9342BB, F9342BK ⇒ F9342BJ Add; F9342AF, F9342AM • Change Part No. of Item 10, Plug: G9330DK ⇒ G9330DP CMPL 1C22K1-01E 6th • Change a format.

REVISION RECORD.EPS

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