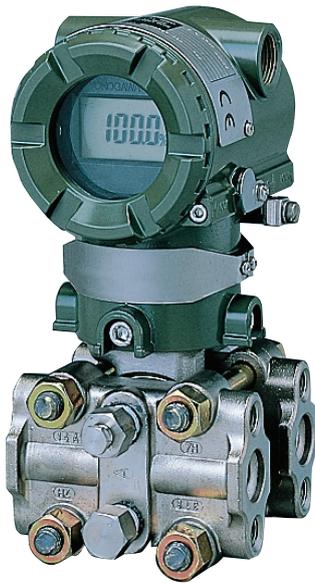


EJA Series Differential Pressure and Pressure Transmitters Installation Manual

IM 01C22A01-01E

vigilantplant.®



1. Introduction		1
1.1 For Safe Use of Product.....	2	
1.2 Warranty.....	3	2
1.3 ATEX Documentation.....	4	3
2. Handling Cautions		4
2.1 Model and Specifications Check.....	5	
2.2 Selecting the Installation Location.....	5	5
2.3 Pressure Connection.....	6	
2.4 Installation of Explosion Protected Type.....	6	6
2.5 EMC Conformity Standards.....	18	
2.6 PED (Pressure Equipment Directive).....	18	7
2.7 Safety Requirement Standards.....	19	
3. Installation		
3.1 Mounting.....	20	
3.2 Mounting the Diaphragm Seals.....	20	
3.3 Diaphragm Seals Installation Consideration.....	21	
3.4 Affixing the Teflon Film.....	22	
3.5 Rotating Transmitter Section.....	23	
3.6 Changing the Direction of Integral Indicator.....	23	
4. Installing Impulse Piping		
4.1 Impulse Piping Installation Precautions.....	24	
4.2 Impulse Piping Connection Examples.....	26	
4.3 Process Piping Installation Precautions.....	27	
5. Wiring		
5.1 Wiring Precautions.....	28	
5.2 Connections of External Wiring to Terminal Box.....	28	
5.3 Wiring.....	28	
5.4 Grounding.....	30	
5.5 Power Supply Voltage and Load Resistance.....	30	
6. Operation		
6.1 Preparation for Starting Operation.....	31	
6.2 Zero Point Adjustment.....	32	
7. Errors and Countermeasures		

1. Introduction

Thank you for purchasing the DPharp electronic pressure transmitter.

This manual provides the basic guidelines for installation and wiring procedures of the DPharp EJA and EJA-A Series with BRAIN and HART protocols. It does not provide the product specific functional specifications and explanations, maintenance, troubleshooting, and fieldbus communication operating procedures, both FOUNDATION Fieldbus™ and PROFIBUS PA. For the items which are not covered in this manual, see the applicable user's manuals as listed in Table 1.1.



WARNING

To ensure correct and safe use of the instrument, obtain the manuals applicable to designated models and specifications as listed Table 1.1, read them thoroughly and fully understand how to operate the instrument before operating it.

Users' manual for each product consists of a hardware manual describing installation, wiring, operation, based on BRAIN protocol, maintenance and specification including detailed model and suffix code information, and a communication manual describing information specific to each communication protocol type.

These manuals can be downloaded from the website of Yokogawa or purchased from the Yokogawa representatives.

Website address: <http://www.yokogawa.com/fld/>

Table 1.1 PDF Manual List and Applicable Style Code

Models	Document No.	Style
EJA110A, EJA120A, and EJA130A	IM 01C21B01-01E	S1
EJA210A and EJA220A	IM 01C21C01-01E	S1
EJA310A, EJA430A, and EJA440A	IM 01C21D01-01E	S1
EJA510A and EJA530A	IM 01C21F01-01E	S2
EJA118W, EJA118N, and EJA118Y	IM 01C22H01-01E	S2
EJA438W and EJA438N	IM 01C22J01-01E	S2
EJA115	IM 01C22K01-01E	S3
EJA Series HART Protocol	IM 01C22T01-01E	—
EJA Series FOUNDATION Fieldbus Communication Type	IM 01C22T02-01E	—
EJA Series PROFIBUS PA Communication Type	IM 01C22T03-00E	—

■ 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.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.



NOTE

For FOUNDATION Fieldbus, PROFIBUS PA and HART protocol versions, please refer to each communication manual in addition to this manual.

- 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.

--- Direct current

1.1 For Safe Use of Product

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. Please give your attention to the followings.

(a) Installation

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about INSTALLATION are not permitted for operators.
- In case of high process temperature, care should be taken not to burn yourself because the surface of body and case reaches a high temperature.
- The 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.
- When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the meter.
- All installation shall comply with local installation requirement and local electrical code.

(b) Wiring

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about WIRING are not permitted for operators.
- Please confirm that voltages between the power supply and the instrument before connecting the power cables and that the cables are not powered before connecting.

(c) Operation

- Wait 10 min. after power is turned off, before opening the covers.

(d) Maintenance

- Please do not carry out except being written to maintenance descriptions. When these procedures are needed, please contact nearest YOKOGAWA office.
- Care should be taken to prevent the build up of drift, dust or other material on the display glass and name plate. In case of its maintenance, soft and dry cloth is used.

(e) Explosion Protected Type Instrument

- Users of explosion proof instruments should refer first to section 2.4 (Installation of an Explosion Protected Instrument) of this manual.
- The use of this instrument is restricted to those who have received appropriate training in the device.
- Take care not to create sparks when accessing the instrument or peripheral devices in a hazardous location.

(f) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.

(g) Product Disposal

- The instrument should be disposed of in accordance with local and national legislation/regulations.

1.2 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.

1.3 ATEX Documentation

This is only applicable to the countries in European Union.

<p>GB All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.</p>	<p>SK Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.</p>
<p>DK Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.</p>	<p>CZ Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevybušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevybušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.</p>
<p>I Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.</p>	<p>LT Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokietieø ir prancøzø kalbomis. Norëdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës "Yokogawa" biuru arba atstovu.</p>
<p>E Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.</p>	<p>LV Visas ATEX Ex kategorijas izstrādājumu Lietošanas instrukcijas tiek piegādātas angļu, vācu un franču valodās. Ja vēlaties saņemt Ex ierīšu dokumentāciju citā valodā, Jums ir jāsazinās ar firmas Jokogava (Yokogawa) tuvāko ofisu vai pārstāvi.</p>
<p>NL Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.</p>	<p>EST Kõik ATEX Ex toodete kasutamisujuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima lokagava (Yokogawa) kontori või esindaja poole.</p>
<p>SF Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöohjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellänne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.</p>	<p>PL Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja obsługi w Państwa lokalnym języku, prosimy o kontakt z najbliższym biurem Yokogawy.</p>
<p>P Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.</p>	<p>SLO Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v angleščini, nemščini ter francoščini. Če so Ex sorodna navodila potrebna v vašem tukejnem jeziku, kontaktirajte vaš najbliži Yokogawa office ili predstavnika.</p>
<p>F Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.</p>	<p>H Az ATEX Ex műszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kéri az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviselőtet.</p>
<p>D Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.</p>	<p>BG Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.</p>
<p>S Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.</p>	<p>RO Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.</p>
<p>GR Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.</p>	<p>M Il-manwali kollha ta' l-istruzzjonijiet għal prodotti marbuta ma' ATEX Ex huma disponibbli bil-Ingliż, bil-Germaniż u bil-Franċiż. Jekk tkun tehtieg struzzjonijiet marbuta ma' Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentant jew ufficiju ta' Yokogawa.</p>

- (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 2.4 "Installation of Explosion Protected Type Transmitters."

2.3 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 process connector 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.



CAUTION

Maximum working pressure of the model EJA120A differential pressure transmitter is 50 kPa {0.5 kgf/cm²}.
Should the pressure exceed 50 kPa {0.5 kgf/cm²}, it is possible to break the sensor. Proceed with caution when applying pressure.

2.4 Installation of Explosion Protected Type

In this section, further requirements and differences and for explosionproof type instrument are described.

For explosionproof type instrument, the description in this chapter is prior to other description in this users manual.

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.



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.



WARNING

To preserve 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.

2.4.1 FM Approval

a. FM Intrinsically Safe Type for HART/BRAIN Type

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

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

- Applicable Standard: FM3600, FM3610, FM3611, FM3810, ANSI/NEMA250
- 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

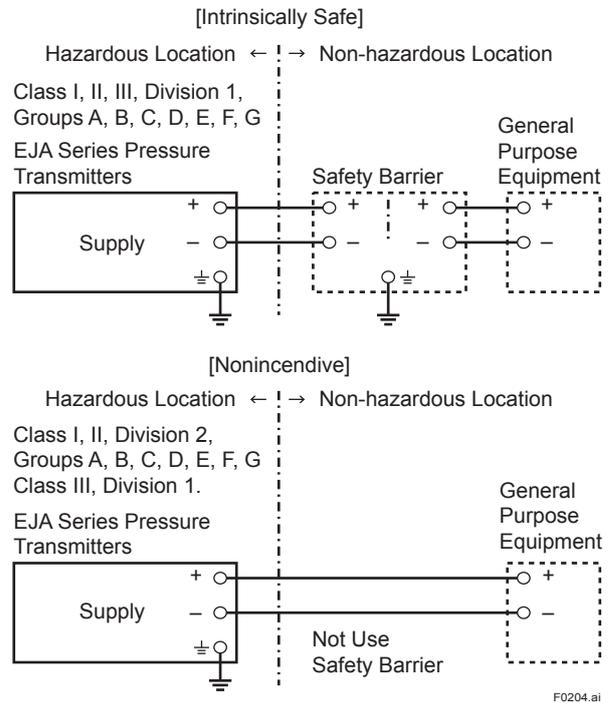
- Intrinsically Safe Apparatus Parameters [Groups A, B, C, D, E, F and G]
 $V_{max} = 30\text{ V}$, $C_i = 22.5\text{ nF}$, $I_{max} = 165\text{ mA}$,
 $L_i = 730\text{ }\mu\text{H}$, $P_{max} = 0.9\text{ W}$
- * Associated Apparatus Parameters (FM approved barriers)
 $V_{oc} \leq 30\text{ V}$, $C_a > 22.5\text{ nF}$, $I_{sc} \leq 165\text{ mA}$, $L_a > 730\text{ }\mu\text{H}$,
 $P_{max} \leq 0.9\text{ W}$
- Intrinsically Safe Apparatus Parameters [Groups C, D, E, F and G]
 $V_{max} = 30\text{ V}$, $C_i = 22.5\text{ nF}$, $I_{max} = 225\text{ mA}$,
 $L_i = 730\text{ }\mu\text{H}$, $P_{max} = 0.9\text{ W}$
- * Associated Apparatus Parameters (FM approved barriers)
 $V_{oc} \leq 30\text{ V}$, $C_a > 22.5\text{ nF}$, $I_{sc} \leq 225\text{ mA}$,
 $L_a > 730\text{ }\mu\text{H}$, $P_{max} \leq 0.9\text{ W}$
- Entity Installation Requirements
 $V_{max} \geq V_{oc}$ or V_t , $I_{max} \geq I_{sc}$ or I_t ,
 $P_{max} (\text{IS Apparatus}) \geq P_{max} (\text{Barrier})$,
 $C_a \geq C_i + C_{cable}$, $L_a \geq L_i + L_{cable}$

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 for HART/BRAIN Type

Caution for FM explosionproof type.

Note 1. EJA Series pressure transmitters with optional code /FF1 are applicable for use in hazardous locations.

- Applicable Standard: FM3600, FM3615, FM3810, ANSI/NEMA250
- 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 for HART/BRAIN Type

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.

d. FM Explosionproof Type for Fieldbus Type

Caution for FM explosionproof type.

Note 1. EJA Series pressure transmitters with optional code /FF15 are applicable for use in hazardous locations:

- Applicable Standard: FM3600, FM3615, FM3810, ANSI/NEMA250
- 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: 32 V dc max.
- Current Draw: 16.5 mA dc

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 strictly the “CAUTION” on the nameplate attached on 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 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.

e. FM Intrinsically Safe Type for Fieldbus Type

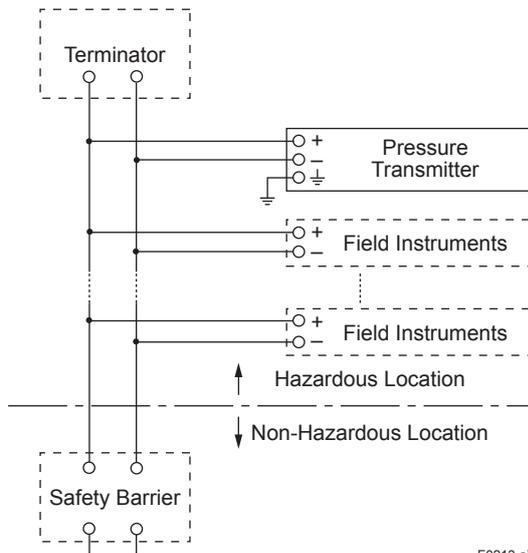
Caution for FM intrinsically safe type.

EJA Series pressure transmitters with optional code /FS15.

- Applicable standard: FM3600, FM3610, FM3611, FM3810, ANSI/NEMA250
- FM Intrinsically Safe Approval
[Entity Model]
Class I, II & III, Division 1, Groups A, B, C, D, E, F & G, Temperature Class T4 Ta=60°C, Type 4X and Class I, Zone 0, AEx ia IIC, Temperature Class T4 Ta=60°C, Type 4X
[FISCO Model]
Class I, II & III, Division 1, Groups A, B, C, D, E, F & G, Temperature Class T4 Ta=60°C, Type 4X and Class I, Zone 0, AEx ia IIC, Temperature Class T4 Ta=60°C, Type 4X
- Nonincendive Approval
Class I, Division 2, Groups A, B, C & D Temperature Class T4 Ta=60°C, Type 4X and Class II, Division 2, Groups F & G Temperature Class T4 Ta=60°C, Type 4X and Class I, Zone 2, Group IIC, Temperature Class T4 Ta=60°C, Type 4X and Class III, Division 2, Temperature Class T4 Ta=60°C, Type 4X
- Electrical Connection: 1/2 NPT female
- Caution for FM Intrinsically safe type. (Following contents refer to “DOC. No. IFM018-A12 p.1, p.2, p.3, and p.3-1.”)

■ IFM018-A12

● **Installation Diagram**
(Intrinsically safe, Division 1 Installation)



- *1: Dust-tight conduit seal must be used when installed in Class II and Class III environments.
- *2: Control equipment connected to the Associated Apparatus must not use or generate more than 250 Vrms or Vdc.
- *3: Installation should be in accordance with ANSI/ISA RP12/6 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code (ANSI/NFPA 70) Sections 504 and 505.
- *4: The configuration of Associated Apparatus must be Factory Mutual Research Approved under FISCO Concept.
- *5: Associated Apparatus manufacturer's installation drawing must be followed when installing this equipment.
- *6: The EJA100 Series are approved for Class I, Zone 0, applications. If connecting AEx (ib) associated Apparatus or AEx ib I.S. Apparatus to the Zone 2, and is not suitable for Class I, Zone 0 or Class I, Division 1, Hazardous (Classified) Locations.
- *7: No revision to drawing without prior Factory Mutual Research Approval.
- *8: Terminator must be FM Approved.

Electrical Data:

- Rating 1 (Entity)
 - For Groups A, B, C, D, E, F, and G or Group IIC
 - Maximum Input Voltage V_{max} : 24 V
 - Maximum Input Current I_{max} : 250 mA
 - Maximum Input Power P_{max} : 1.2 W
 - Maximum Internal Capacitance C_i : 3.52 nF
 - Maximum Internal Inductance L_i : 0 μ H

or

- Rating 2 (FISCO)
 - For Groups A, B, C, D, E, F, and G or Group IIC
 - Maximum Input Voltage V_{max} : 17.5 V
 - Maximum Input Current I_{max} : 360 mA
 - Maximum Input Power P_{max} : 2.52 W
 - Maximum Internal Capacitance C_i : 3.52 nF
 - Maximum Internal Inductance L_i : 0 μ H

or

- Rating 3 (FISCO)
 - For Groups C, D, E, F, and G or Group IIB
 - Maximum Input Voltage V_{max} : 17.5 V
 - Maximum Input Current I_{max} : 380 mA
 - Maximum Input Power P_{max} : 5.32 W
 - Maximum Internal Capacitance C_i : 3.52 nF
 - Maximum Internal Inductance L_i : 0 μ H

Note: In the rating 1, the output current of the barrier must be limited by a resistor "Ra" such that $I_o = U_o / R_a$. In the rating 2 or 3, the output characteristics of the barrier must be the type of trapezoid which are certified as the FISCO model (See "FISCO Rules"). The safety barrier may include a terminator. More than one field instruments may be connected to the power supply line.

● **FISCO Rules**

The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (U_i), the current (I_i) and the power (P_i) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (U_o , V_o , V_t), the current (I_o) and the power (P_o) which can be provided by the associated apparatus (supply unit).

$$P_o \leq P_i, U_o \leq U_i, I_o \leq I_i$$

In addition, the maximum unprotected residual capacitance (C_i) and inductance (L_i) of each apparatus (other than the terminators) connected to the fieldbus must be less than or equal to 5 nF and 10 μ H respectively.

$$C_i \leq 5\text{nF}, L_i \leq 10\mu\text{H}$$

In each I.S. fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the fieldbus system. The allowed voltage U_o of the associated apparatus used to supply the bus is limited to the range of 14 V dc to 24 V dc. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except to a leakage current of 50 μ A for each connected device.

Supply unit

Trapezoidal or rectangular output characteristic only

$$U_o = 14 \dots 17.5 \text{ V (I.S. maximum value)}$$

I_o according to spark test result or other assessment.

No specification of L_o and C_o is required on the certificate or label.

Cable

The cable used to interconnect the devices needs to comply with the following parameters:

- Loop resistance R_c : 15...150 Ω /km
- Inductance per unit length L_c : 0.4...1 mH/km
- Capacitance per unit length C_c : 80...200 nF/km
- Length of spur cable: max. 30 m (Group IIC and IIB)
- Length of trunk cable: max. 1 km (Group IIC) or 5 km (Group IIB)

Terminators

At each end of the trunk cable an approved line terminator with the following parameters is suitable:

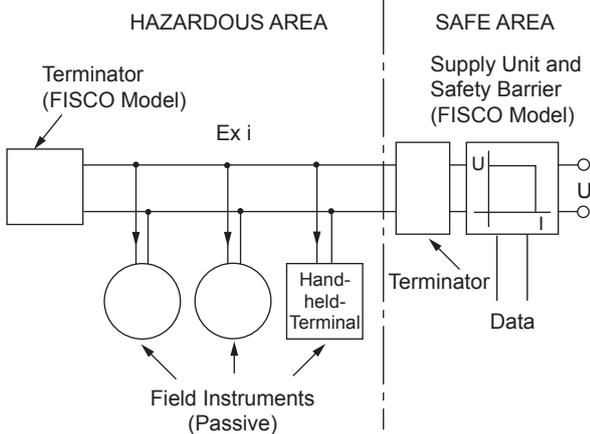
$$R = 90 \dots 102 \ \Omega$$

$$C = 0 \dots 2.2 \ \mu\text{F} \text{ (} 0.8 \dots 1.2 \ \mu\text{F is required in operation)}$$

The resistor must be infallible according to IEC 60079- 11.

System evaluations

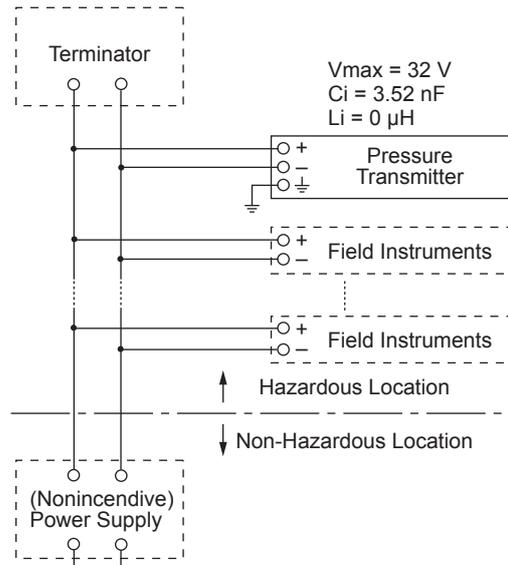
The number of passive device like transmitters, actuators, hand held terminals connected to a single bus segment is not limited due to I.S. reasons. Furthermore, if the above rules are respected, the inductance and capacitance of the cable need not to be considered and will not impair the intrinsic safety of the installation.



F0214.ai

I.S. fieldbus system complying with FISCO model

● Installation Diagram (Nonincendive, Division 2 Installation)



FM Approved Associated Nonincendive Field Wiring Apparatus
 V_t or V_{oc}
 I_t or I_{sc}
 C_a
 L_a

F0215.ai

- *1: Dust-tight conduit seal must be used when installed in Class II and Class III environments.
- *2: Installation should be in accordance with the National Electrical Code (ANSI/NFPA 70) Sections 504 and 505.
- *3: The configuration of Associated Nonincendive Field Wiring Apparatus must be Factory Mutual Research Approved under FISCO Concept.
- *4: Associated Nonincendive Field Wiring Apparatus manufacturer's installation drawing must be followed when installing this equipment.
- *5: No revision to drawing without prior Factory Mutual Research Approval.
- *6: Terminator and supply unit must be FM Approved.
- *7: If use ordinary wirings, the general purpose equipment must have nonincendive field wiring terminal approved by FM Approvals.
- *8: The nonincendive field wiring circuit concept allows interconnection of nonincendive field wiring apparatus with associated nonincendive field wiring apparatus, using any of the wiring methods permitted for unclassified locations.
- *9: Installation requirements;
 - $V_{max} \geq V_{oc}$ or V_t
 - I_{max} = see note 10.
 - $C_a \geq C_i + C_{cable}$
 - $L_a \geq L_i + L_{cable}$
- *10: For this current controlled circuit, the parameter (I_{max}) is not required and need not be aligned with parameter (I_{sc} or I_t) of the barrier or associated nonincendive field wiring apparatus.

Electrical Data:

Maximum Input Voltage V_{max} : 32 V
 Maximum Internal Capacitance C_i : 3.52 nF
 Maximum Internal Inductance L_i : 0 μ H

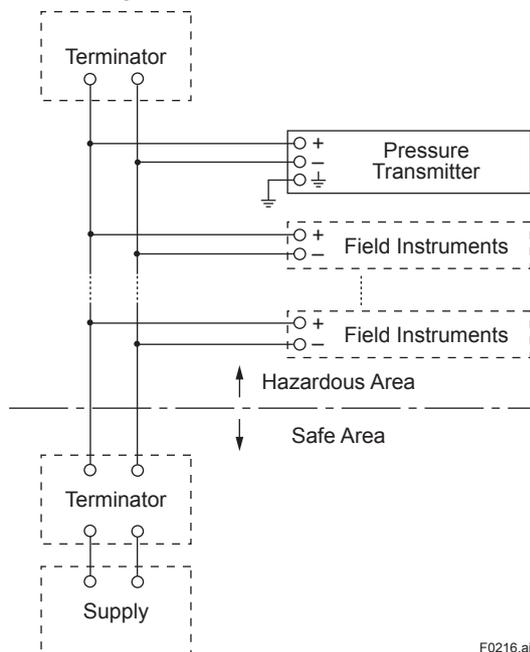
f. FM Nonincendive approval for Fieldbus Type

EJA Series pressure transmitters with optional code /FN15.

- Applicable standard: FM3600, FM3611, FM3810
- Nonincendive Approval
 Class I, Division 2, Groups A, B, C and D
 Class II, Division 2, Groups F and G
 Class III, Division 1 and
 Class I, Zone 2, Group IIC in Hazardous (Classified) Locations.
 Temperature Class: T4
 Ambient Temperature: -40 to 60°C
 Ambient Humidity: 0 to 100%R.H. (No condensation)
 Enclosure: NEMA Type4X
- Electrical Parameters:
 $V_{max} = 32$ Vdc
 $C_i = 3.52$ nF
 $L_i = 0$ μ H
- Caution for FM Nonincendive type. (Following contents refer to "DOC. No. NFM012-A08 p.1 and p.2")

■ NFM012-A08

Installation Diagram:



F0216.ai

Note:

- 1: Dust-tight conduit seal must be used when installed in Class II and Class III environments.
- 2: Installation should be in accordance with National Electrical Code (ANSI/NFPA 70) Sections 504, 505 and Local Electrical Code.

- 3: The configuration of Associated Apparatus must be Factory Mutual Research Approved.
- 4: Associated Apparatus manufacturer's installation drawing must be followed when installing this equipment.
- 5: No revision to drawing without prior Factory Mutual Research Approval.
- 6: Terminator and supply unit must be FM approved.
- 7: Installation requirements;
 $V_{max} \geq V_{oc}$ or V_t
 $C_a \geq C_i + C_{cable}$
 $L_a \geq L_i + L_{cable}$

2.4.2 CSA Certification

a. CSA Intrinsically Safe Type for HART/BRAIN Type

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

Note 1. EJA Series pressure transmitters with optional code /CS1 are applicable for use in hazardous locations

Certificate: 1053843

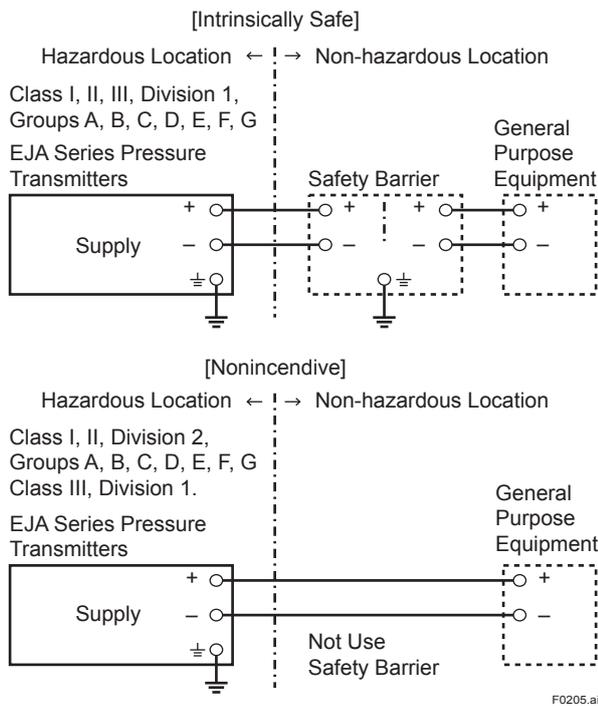
- Applicable Standard: C22.2 No.0, No.0.4, No.25, No.30, No.94, No.142, No.157, No.213
- Intrinsically Safe for Class I, Division 1, Groups A, B, C & D. Class II, Division 1, Groups E, F & G and Class III, Division 1 Hazardous Locations.
- Nonincendive for Class I, Division 2, Groups A, B, C & D, Class 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 (V_{max}) = 30 V
 Maximum Input Current (I_{max}) = 165 mA
 Maximum Input Power (P_{max}) = 0.9 W
 Maximum Internal Capacitance (C_i) = 22.5 nF
 Maximum Internal Inductance (L_i) = 730 μ H
- * Associated apparatus (CSA certified barriers)
 Maximum output voltage (V_{oc}) \leq 30 V
 Maximum output current (I_{sc}) \leq 165 mA
 Maximum output power (P_{max}) \leq 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 for HART/BRAIN Type

Caution for CSA explosionproof type.

Note 1. EJA Series pressure transmitters with optional code /CF1 are applicable for use in hazardous locations:

Certificate: 1089598

- Applicable Standard: C22.2 No.0, No.0.4, No.25, No.30, No.94, No.142
- 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 SCÉLLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 50 cm DU BÂTIER.

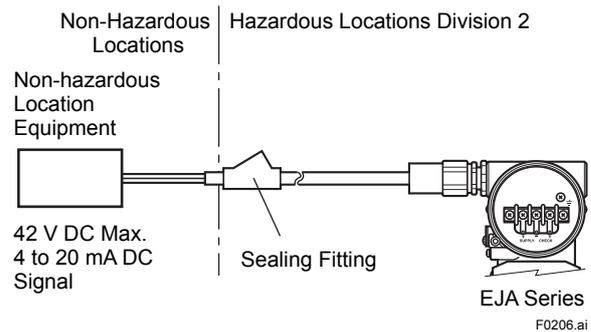
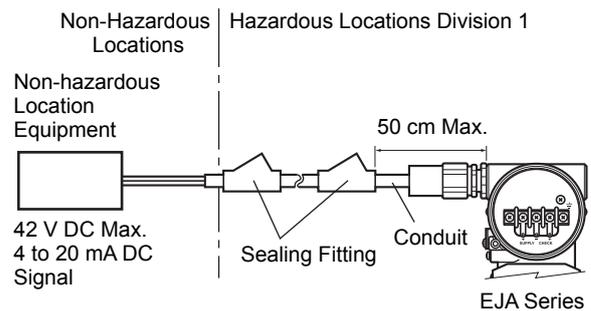
- When installed in Division 2, "SEALS NOT REQUIRED."

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 for HART/BRAIN Type

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.

d. CSA Explosionproof Type for Fieldbus Type

Caution for CSA Explosionproof type.

Note 1. EJA Series pressure transmitter with optional code /CF15 are applicable for use in hazardous locations:

- Applicable standard: C22.2 No.0, No.0.4, No.25, No.30, No.94, No.142, No.1010.1
- Certificate: 1010820
- 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 T4
- Process Temperature: 85°C 100°C 120°C
- Ambient Temperature: -40 to 80°C
- Supply Voltage: 32 V dc max.
- Current Draw: 16.5 mA dc

Note 2. Wiring

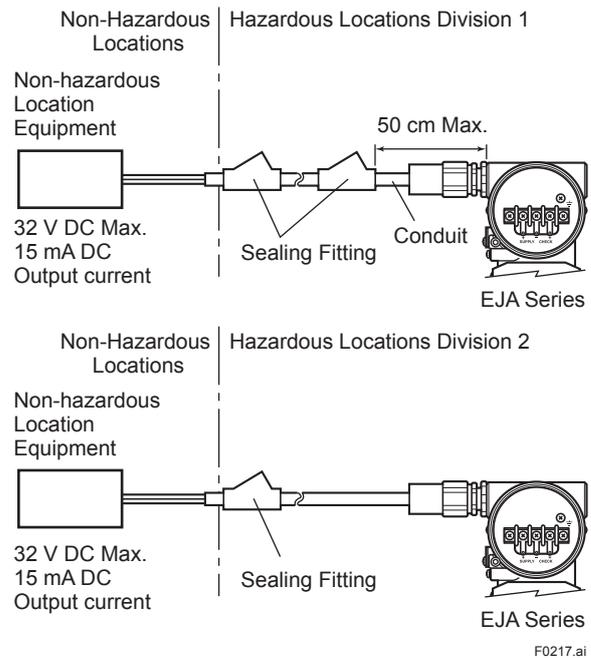
- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In hazardous location, wiring shall be in conduit as shown in the figure.
- CAUTION:
SEAL ALL CONDUITS WITHIN 50 cm OF THE ENCLOSURE.
UN SCÉLLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 50 cm DU BÂTIER.
- When installed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

Note 3. Operation

- Keep strictly the "CAUTION" on the label attached on the transmitter.
CAUTION: OPEN CIRCUIT BEFORE REMOVING COVER.
OUVRIR LE CIRCUIT AVANT D'NLEVER LE COUVERCLE.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in 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.



2.4.3 IECEx Certification

EJA Series pressure transmitters with optional code /SU2 can be selected the type of protection (IECEx Intrinsically Safe/type n or flameproof) 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.

a. IECEx Intrinsically Safe Type / type n for HART/BRAIN Type

Caution for IECEx Intrinsically safe and type n.

Note 1. EJA Series pressure transmitters with optional code /SU2 are applicable for use in hazardous locations.

- No. IECEx KEM 06.0007X
- Applicable Standard: IEC 60079-0:2004, IEC 60079-11:1999, IEC 60079-15:2005, IEC 60079-26:2004
- Type of Protection and Marking Code: Ex ia IIC T4, Ex nL IIC T4
- Ambient Temperature: -40 to 60°C
- Max. Process Temp.: 120°C
- Enclosure: IP67

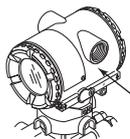
Note 2. Entity Parameters

- Intrinsically safe ratings 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) = 22.5 nF
 - Maximum Internal Inductance (Li) = 730 μH
- Type "n" ratings are as follows:
 - Maximum Input Voltage (Ui) = 30 V
 - Maximum Internal Capacitance (Ci) = 22.5 nF
 - Maximum Internal Inductance (Li) = 730 μH
- Installation Requirements
 - $U_o \leq U_i$, $I_o \leq I_i$, $P_o \leq P_i$, $C_o \geq C_i + C_{cable}$,
 $L_o \geq L_i + L_{cable}$, U_o , I_o , P_o , C_o , and
 L_o are parameters of barrier.

Note 3. Installation

- In any safety barrier used output current must be limited by a resistor 'R' such that $I_o = U_o/R$.
- The safety barrier must be IECEx certified.
- Input voltage of the safety barrier must be less than 250 Vrms/Vdc.
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation and will void IECEx Intrinsically safe and type n certification.
- The cable entry devices and blanking elements for type n shall be of a certified type providing a level of ingress protection of at least IP54, suitable for the conditions of use and correctly installed.
- Electrical Connection:
 The type of electrical connection is stamped near the electrical connection port according to the following marking.

Screw Size	Marking
ISO M20 × 1.5 female	△ M
ANSI 1/2 NPT female	△ A



Location of the marking

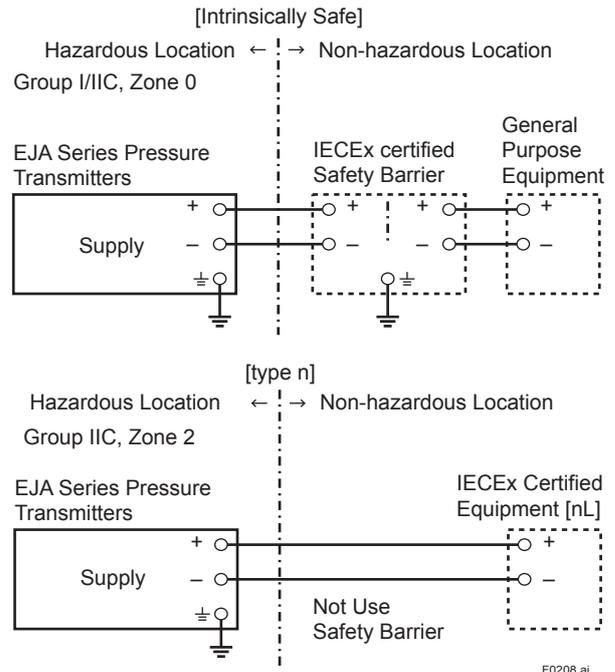
F0207.ai

Note 4. Operation

- WARNING:
 WHEN AMBIENT TEMPERATURE $\geq 55^\circ\text{C}$,
 USE THE HEAT-RESISTING CABLES $\geq 90^\circ\text{C}$.

Note 5. Special Conditions for Safe Use

- WARNING:
 IN THE CASE WHERE THE ENCLOSURE OF THE PRESSURE TRANSMITTER IS MADE OF ALUMINUM, IF IT IS MOUNTED IN AN AREA WHERE THE USE OF ZONE 0 IS REQUIRED, IT MUST BE INSTALLED SUCH, THAT, EVEN IN THE EVENT OF RARE INCIDENTS, IGNITION SOURCES DUE TO IMPACT AND FRICTION SPARKS ARE EXCLUDED.



b. IECEx Flameproof Type for HART/BRAIN Type

Caution for IECEx flameproof type.

Note 1. EJA Series pressure transmitters with optional code /SU2 are applicable for use in hazardous locations:

- No. IECEx KEM 06.0005
- Applicable Standard: IEC 60079-0:2004, IEC 60079-1:2003
- Type of Protection and Marking Code: Ex d IIC T6...T4
- Enclosure: IP67
- Maximum Process Temperature: 120°C (T4), 100°C (T5), 85°C (T6)
- Ambient Temperature: -40 to 75°C (T4), -40 to 80°C (T5), -40 to 75°C (T6)
- Supply Voltage: 42 V dc max.
- Output Signal: 4 to 20 mA dc

Note 2. Wiring

- In hazardous locations, the cable entry devices shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is certificated as the flame proof IP67 as a part of this apparatus.)
- In case of ANSI 1/2 NPT plug, ANSI hexagonal wrench should be applied to screw in.

Note 3. Operation

- WARNING:
 AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING.

- **WARNING:**
WHEN AMBIENT TEMPERATURE $\geq 70^{\circ}\text{C}$,
USE THE HEAT-RESISTING CABLES $\geq 90^{\circ}\text{C}$.
- 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 IECEx Certification.

c. IECEx Flameproof Type for Fieldbus Type

Caution for IECEx flameproof type.

Note 1. EJA Series pressure transmitters with optional code /SF25 are applicable for use in hazardous locations:

- No. IECEx KEM 06.0005
- Applicable Standard: IEC 60079-0:2004, IEC 60079-1:2003
- Type of Protection and Marking Code: Ex d IIC T6...T4
- Enclosure: IP67
- Maximum Process Temperature: 120°C (T4), 100°C (T5), 85°C (T6)
- Ambient Temperature: -40 to 75°C (T4), -40 to 80°C (T5), -40 to 75°C (T6)
- Supply Voltage: 42 V dc max.
- Output Signal: 4 to 20 mA dc

Note 2. Wiring

- In hazardous locations, the cable entry devices shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is certificated as the flame proof IP67 as a part of this apparatus.)
- In case of ANSI 1/2 NPT plug, ANSI hexagonal wrench should be applied to screw in.

Note 3. Operation

- **WARNING:**
AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING.
- **WARNING:**
WHEN AMBIENT TEMPERATURE $\geq 70^{\circ}\text{C}$,
USE THE HEAT-RESISTING CABLES $\geq 90^{\circ}\text{C}$.
- 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 IECEx Certification.

2.4.4 ATEX Certification

(1) Technical Data

a. ATEX Intrinsically Safe Type for HART/BRAIN Type

Caution for ATEX Intrinsically safe type.

Note 1. EJA Series pressure transmitters with optional code /KS2 for potentially explosive atmospheres:

- No. KEMA 02ATEX1030 X
- Applicable Standard: EN 50014:1997, EN 50020:1994, EN 50284:1999, EN 50281-1-1:1998
- Type of Protection and Marking code: EEx ia IIC T4
- Temperature Class: T4
- Enclosure: IP67
- 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:

$U_i = 30\text{ V}$
 $I_i = 165\text{ mA}$
 $P_i = 0.9\text{ W}$
 Effective internal capacitance; $C_i = 22.5\text{ nF}$
 Effective internal inductance; $L_i = 730\text{ }\mu\text{H}$

Note 3. Installation

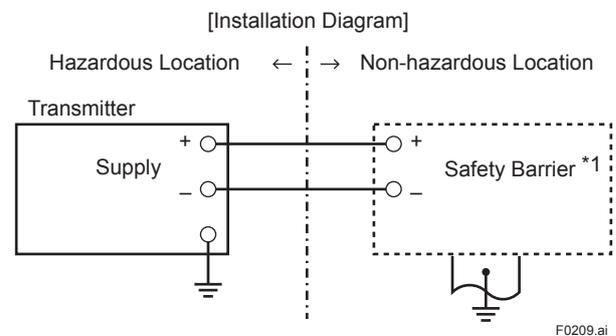
- All wiring shall comply with local installation requirements. (Refer to the installation diagram)

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 DEKRA Intrinsically safe Certification.

Note 5. Special Conditions for Safe Use

- In the case where the enclosure of the Pressure Transmitter is made of aluminium, if it is mounted in an area where the use of category 1 G apparatus is required, it must be installed such, that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.



*1: In any safety barriers used the output current must be limited by a resistor "R" such that $I_{\text{maxout}} \leq U_z/R$.

b. ATEX Flameproof Type

Caution for ATEX flameproof type.

Note 1. EJA Series pressure transmitters with optional code /KF21 for potentially explosive atmospheres:

- No. KEMA 02ATEX2148
- Applicable Standard:
EN 60079-0:2006, EN 60079-1:2004,
EN 61241-0:2006, EN 61241-1:2004
- Type of Protection and Marking Code:
Ex d IIC T6...T4
- Temperature Class: T6, T5, and T4
- Enclosure: IP67
- Maximum Process Temperature:
85°C (T6), 100°C (T5), and 120°C (T4)
- Ambient Temperature:
T4 and T6; -40* to 75°C, T5; -40* to 80°C
* -15°C when /HE is specified.

Note 2. Electrical Data

- Supply voltage: 42 V dc max. / 32 V dc max. for
Fieldbus type
- Output signal: 4 to 20 mA / 15 mA for Fieldbus type

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: AFTER DE-ENERGIZING, DELAY
10 MINUTES BEFORE OPENING. WHEN
THE AMBIENT TEMP. ≥ 70°C, USE HEAT-
RESISTING CABLES ≥ 90°C.
- 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 DEKRA
Flameproof Certification.

c. ATEX Intrinsically Safe Type for Fieldbus Type

Caution for ATEX Intrinsically safe Type.

Note 1. EJA Series pressure transmitters with optional code /KS25 for potentially explosive atmospheres:

- No. KEMA 02ATEX1344 X
- Applicable standard:
EN 50014:1997, EN 50020:1994, EN 50284:1999

- Type of Protection and Marking Code: EEx ia IIC T4
- Temperature Class: T4
- Enclosure: IP67
- Process Temperature: 120°C max.
- Ambient Temperature: -40 to 60°C

Note 2. Installation

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

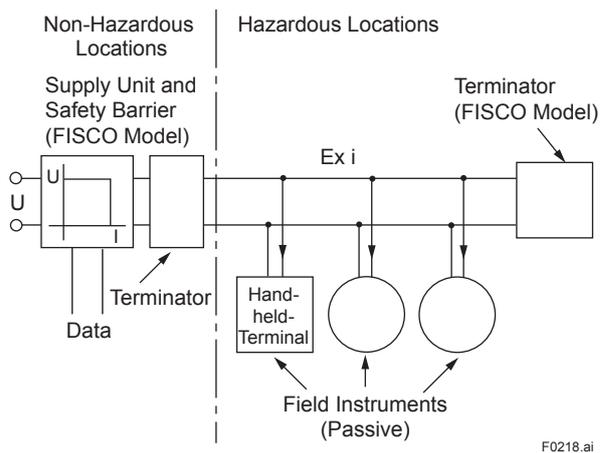
Note 3. Maintenance and Repair

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

Note 4. Special Conditions for Safe Use

- In the case where the enclosure of the Pressure
Transmitter is made of aluminium, if it is mounted in
an area where the use of category 1 G apparatus is
required, it must be installed such, that even in the
event of rare incidents, ignition sources due to impact
and friction sparks are excluded.

● **FISCO Model**



I.S. fieldbus system complying with FISCO

The criterion for such interconnection is that the voltage (U_i), the current (I_i) and the power (P_i), which intrinsically safe apparatus can receive, must be equal or greater than the voltage (U_o), the current (I_o) and the power (P_o) which can be provided by the associated apparatus (supply unit).

$$P_o \leq P_i, U_o \leq U_i, I_o \leq I_i$$

In addition, the maximum unprotected residual capacitance (C_i) and inductance (L_i) of each apparatus (other than the terminators) connected to the fieldbus line must be equal or less than 5 nF and 10 μH respectively.

$$C_i \leq 5\text{nF}, L_i \leq 10\mu\text{H}$$

Supply unit

The supply unit must be certified by a notify body as FISCO model and following trapezoidal or rectangular output characteristic is used.

$$U_0 = 14 \dots 17.5 \text{ V (I.S. maximum value)}$$

Io based on spark test result or other assessment. No specification of Lo and Co is required on the certificate or label.

Cable

The cable used to interconnect the devices needs to comply with the following parameters:

- Loop resistance Rc: 15...150 Ω/km
- Inductance per unit length Lc: 0.4...1 mH/km
- Capacitance per unit length Cc: 80...200 nF/km
- Length of spur cable: max. 30 m (IIC and IIB)
- Length of trunk cable: max. 1 km (IIC) or 5 km (EEx ia IIB T4)

Terminators

The terminator must be certified by a Notified body as FISCO model and at each end of the trunk cable an approved line terminator with the following parameters is suitable:

$$R = 90 \dots 102 \Omega$$

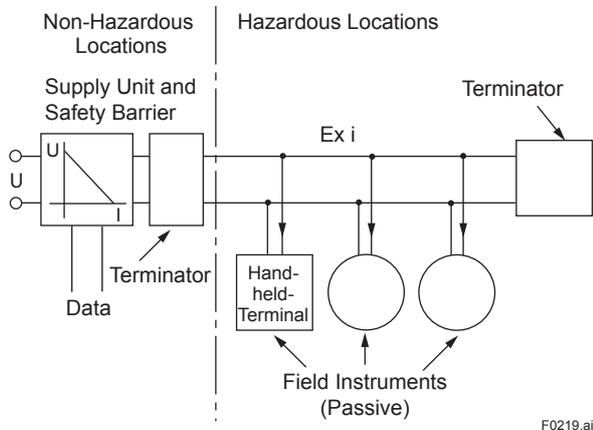
$$C = 0 \dots 2.2 \mu\text{F} \text{ (0.8...1.2 } \mu\text{F is required in operation)}$$

The resistor must be infallible according to IEC 60079-11. One of the two allowed terminators might already be integrated in the associated apparatus (bus supply unit).

Number of Devices

The number of devices (max. 32) possible on a fieldbus link depends on factors such as the power consumption of each device, the type of cable used, use of repeaters, etc.

Entity Model



F0219.ai

I.S. fieldbus system complying with Entity model

I.S. values Power supply-field device:

$$P_o \leq P_i, U_o \leq U_i, I_o \leq I_i$$

Calculation of max. allowed cable length:

$$C_{\text{cable}} \leq C_o - \sum C_i - \sum C_i \text{ (Terminator)}$$

$$L_{\text{cable}} \leq L_o - \sum L_i$$

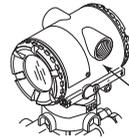
Number of Devices

The number of devices (max. 32) possible on a fieldbus link depends on factors such as the power consumption of each device, the type of cable used, use of repeaters, etc.

(2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following marking.

Screw Size	Marking
ISO M20 × 1.5 female	△ M
ANSI 1/2 NPT female	△ A



Location of the marking

F0211.ai

(3) Installation



WARNING

- All wiring shall comply with local installation requirement and local electrical code.
- There is no need of the conduit seal for both of Division 1 and Division 2 hazardous locations because this product is sealed at factory.
- In case of ANSI 1/2 NPT plug, ANSI hexagonal wrench should be applied to screw in.

(4) Operation



WARNING

- OPEN CIRCUIT BEFORE REMOVING COVER. INSTALL IN ACCORDANCE WITH THIS USER'S MANUAL
- Take care not to generate mechanical sparking when access to the instrument and peripheral devices in hazardous locations.

(5) Maintenance and Repair

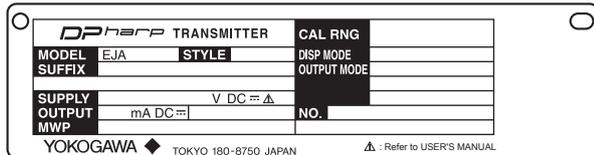


WARNING

The instrument modification or parts replacement by other than authorized Representative of Yokogawa Electric Corporation is prohibited and will void the certification.

(6) Name Plate

- Name plate



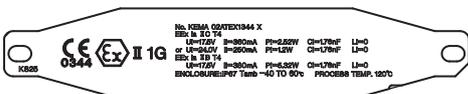
- Tag plate for flameproof type



- Tag plate for intrinsically safe type for HART/BRAIN



- Tag plate for intrinsically safe type for Fieldbus



F0212.ai

MODEL: Specified model code.

STYLE: Style code.

SUFFIX: Specified suffix code.

SUPPLY: Supply voltage.

OUTPUT: Output signal.

MWP: Maximum working pressure.

CAL RNG: Specified calibration range.

DISP MODE: Specified display mode.

OUTPUT MODE: Specified output mode.

NO.: Serial number and year of production*1.

YOKOGAWA ◆ TOKYO 180-8750 JAPAN:

The manufacturer name and the address*2.

*1: The third figure from the last shows the last one figure of the year of production. For example, the production year of the product engraved in "NO." column on the name plate as follows is 2001.

12A819857 132
 ↑
 The year 2001

*2: "180-8750" is a zip code which represents the following address.

2-9-32 Nakacho, Musashino-shi, Tokyo Japan

2.5 EMC Conformity Standards

EN 61326-1 Class A, Table 2 (For use in industrial locations)

EN 61326-2-3

EN 61326-2-5 (for Fieldbus)



CAUTION

This instrument is a Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.



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.

2.6 PED (Pressure Equipment Directive)

(1) General

- EJA series of pressure transmitters are categorized as pressure accessories under the vessel section of this directive 97/23/EC, which corresponds to Article 3, Paragraph 3 of PED, denoted as Sound Engineering Practice (SEP).
- EJA130A, EJA440A, EJA510A, and EJA530A can be used above 200 bar and therefore considered as a part of a pressure retaining vessel where category III, Module H applies. These models with option code /PE3 conform to that category.

(2) Technical Data

- Models without /PE3
 Article 3, Paragraph 3 of PED, denoted as Sound Engineering Practice (SEP) .
- Models with /PE3
 Module: H
 Type of Equipment: Pressure Accessory - Vessel
 Type of Fluid: Liquid and Gas
 Group of Fluid: 1 and 2

Model	PS*1 (bar)	V(L)	PS-V (bar-L)	Category*2
EJA110A	160	0.01	1.6	Article 3, paragraph 3 (SEP)
EJA120A	0.5	0.01	0.005	Article 3, paragraph 3 (SEP)
EJA130A	420	0.01	4.2	Article 3, paragraph 3 (SEP)
EJA130A With code /PE3	420	0.01	4.2	III
EJA310A	160	0.01	1.6	Article 3, paragraph 3 (SEP)
EJA430A	160	0.01	1.6	Article 3, paragraph 3 (SEP)
EJA440A	500	0.01	50	Article 3, paragraph 3 (SEP)
EJA440A With code /PE3	500	0.01	50	III
EJA510A	500	0.01	50	Article 3, paragraph 3 (SEP)
EJA510A With code /PE3	500	0.01	50	III
EJA530A	500	0.01	50	Article 3, paragraph 3 (SEP)
EJA530A With code /PE3	500	0.01	50	III

*1: PS is maximum allowable pressure for vessel itself.

*2: Referred to Table 1 covered by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC.

(3) Operation



CAUTION

- The temperature and pressure of fluid should be applied under the normal operating condition.
- The ambient temperature should be applied under the normal operating condition.
- Please pay attention to prevent the excessive pressure like water hammer, etc. When water hammer is to be occurred, please take measures to prevent the pressure from exceeding PS by setting the safety valve, etc. at the system and the like.
- When external fire is to be occurred, please take safety measures at the device or system not to influence the transmitters.

2.7 Safety Requirement Standards

Applicable standard : EN 61010-1

(1) Pollution Degree 2

"Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. " 2 " applies to normal indoor atmosphere. Normally, only non-conductive pollution occurs. Occasionally, however, temporary conductivity caused by condensation must be expected.

(2) Installation Category I

"Overvoltage category(Installation category)" describes a number which defines a transient overvoltage condition. It implies the regulation for impulse withstand voltage. " I " applies to electrical equipment which is supplied from the circuit when appropriate transient overvoltage control means (interfaces) are provided.

(3) Altitude of installation site:

Max. 2,000 m above sea level

(4) Indoor/Outdoor use

3.2.1 EJA210A and EJA220A

The transmitter is mounted on a process using its high pressure side flange as shown in Figure 3.5. The customer should prepare the mating flange, gasket, stud bolts and nuts.

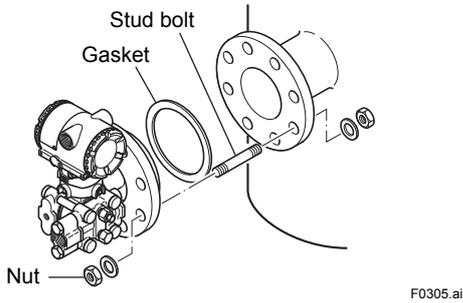


Figure 3.5 EJA210A and EJA220A Mounting

3.2.2 EJA118□ and EJA438□

Mount the diaphragm seals using the flanges as shown in Figure 3.6. The customer should prepare the mating flange, gasket, bolts and nuts.

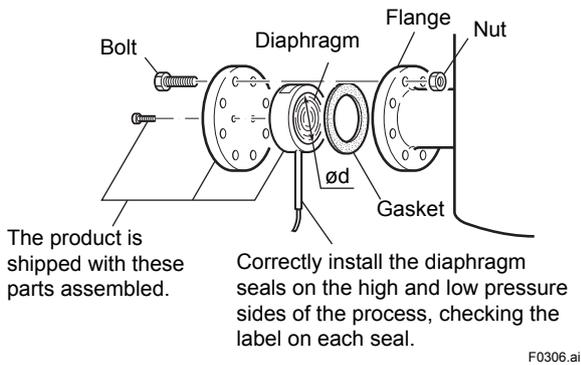


Figure 3.6 Mounting the Diaphragm Seals

3.3 Diaphragm Seals Installation Consideration



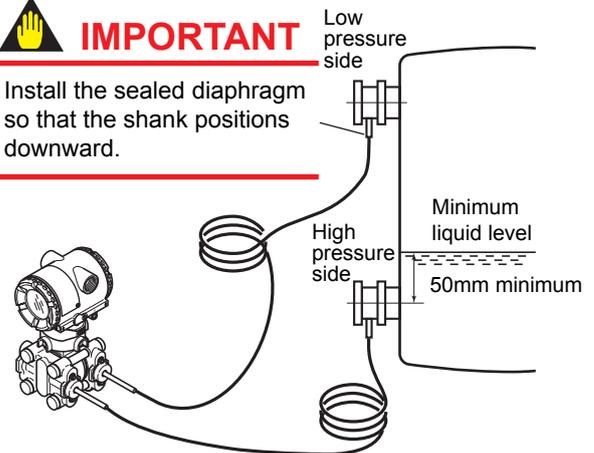
IMPORTANT

- When measuring the liquid level of the tank, the minimum liquid level (zero point) must be set to a level at least 50 mm above the center of the high pressure side diaphragm seal (see Figure 3.7).
- Correctly install the diaphragm seals on the high and low pressure sides of the process, checking the label on each seal.
- To avoid measuring error duets temperature difference between the two diaphragm seals, capillary tube must be bound together. The capillary tube must be securely fixed to the tank wall to prevent movement by wind or vibration. If the capillary tube is too long, loosely coil the excess and secure using suitable clamps.



IMPORTANT

Install the sealed diaphragm so that the shank positions downward.



The transmitter should be installed as low as possible below the position where the high pressure side diaphragm seal is installed.

F0307.ai

Figure 3.7 Installing the Diaphragm Seals to a Tank



IMPORTANT

The transmitter should be installed below the high pressure (HP) process connection to ensure a positive head pressure of fill fluid. The recommended height between the HP process connection and the transmitter is show in the following table. Pay special attention to vacuum applications.

Model	Height (h)
EJA118□	600 mm
EJA438W Wetted parts material code S, T, U, EJA438N	700 mm
EJA438W Wetted parts material code H	1,300 mm

Wetted parts material code
EJA438W - □□■□□□□□-□□□□-□□□□

If it can not be installed below the HP process connection with the recommended height above, please use the equation below:

$$h = \frac{(P - P_0) \times dHg}{ds} \times 7.5 \times 10^{-3} \text{ [mm]}$$

h: Vertical height between the HP process connection and the transmitter (mm)

h ≤ 0: Install the transmitter at least h (mm) below the HP process connection

h > 0: Install the transmitter at most h (mm) above the HP process connection

P: Pressure in the tank (Pa abs)

P₀: Minimum working pressure limit of the transmitter (ambient temperature range: -10 to 50°C)

EJA118□

Wetted parts material code	S	T	H	U
P ₀ : Minimum working pressure limit	3178	3596	6074	4711

EJA438□

Wetted parts material code	S	T, U	H
P ₀ : Minimum working pressure limit	5254	6980	13019

ds: Specific gravity of fill fluid (at 25°C)

Fill fluid code	A	B	C, E	D
ds: Specific gravity	1.07	0.94	1.09	1.90 to 1.92

dHg: Specific gravity of the Mercury 13.6 (at 25°C)

Wetted parts material code
EJA□□□□-□□■□□□□□-□□□□-□□□□
Fill fluid code

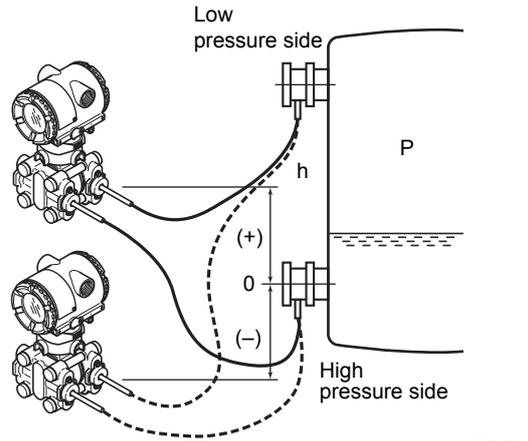


Figure 3.8 Example of Installation to Tank (Caution on Installation)

3.4 Affixing the Teflon Film



IMPORTANT

The FEP Teflon option includes a teflon film and fluorinated oil. Before mounting the transmitter to the process flange, affix the teflon film as follows:

- Position the diaphragm so that the diaphragm is in an upward position.
- Pour the fluorinated oil on the diaphragm and gasket area covering it completely and evenly. Be careful not to scratch the diaphragm or change the its shape.
- Affix the teflon film over the diaphragm and gasket area.
- Next, carefully inspect the cover and try to identify any entrapped air between the diaphragm and the teflon film. The air must be removed to ensure accuracy. If air pockets are present, use your fingers to remove the air by starting at the center of the diaphragm and work your way out.
- Place the gasket with the teflon film and affix to the process flange.

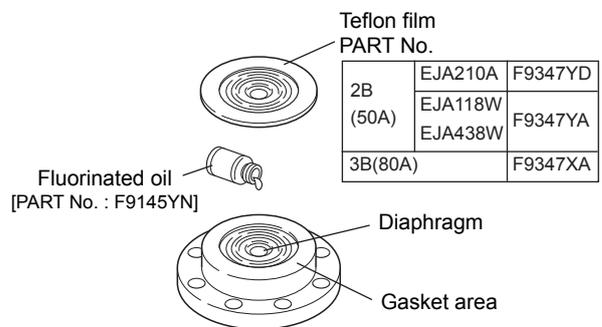


Figure 3.9 Affixing the Teflon Film

3.5 Rotating Transmitter Section

The transmitter section can be rotated in 90° segments.

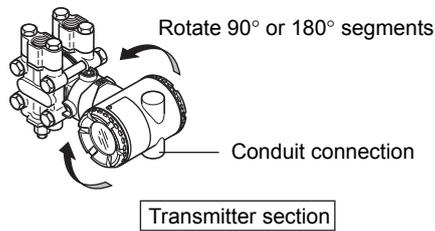
- 1) Remove the two Allen screws that fasten the transmitter section and capsule assembly, using the Allen wrench. Also, remove the pipe for EJA530A with Measurement span code A, B, and C, using the slotted screwdriver.
- 2) Rotate the transmitter section slowly in 90° segments.
- 3) Tighten the two Allen screws to a torque of 5 N·m.



IMPORTANT

Do not rotate the transmitter section more than 180°.

Pressure-detector section



F0310.ai

Figure 3.10 Rotating Transmitter Section

3.6 Changing the Direction of Integral Indicator

An integral indicator can be rotated as shown in Figure 3.11.



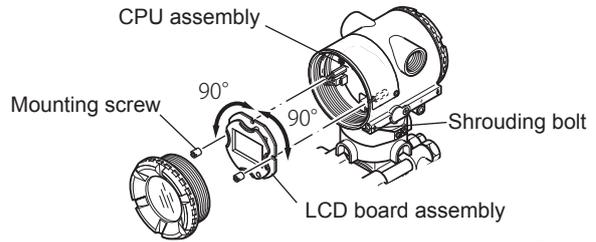
IMPORTANT

The terminal box cover is locked by an Allen head bolt (a shrouding bolt) on CENELEC and IECEx 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 by hand.

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.

- 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.

- 4) After rotating the LCD, align both the LCD board assembly and CPU assembly connectors and engage them.
- 5) Insert and tighten the two mounting screws.
- 6) Replace the cover.



F0311.ai

Figure 3.11 Rotating Integral Indicator

4. Installing Impulse Piping

4.1 Impulse Piping Installation Precautions

The impulse piping that connects the process outputs to the transmitter must convey the process pressure accurately. If, for example, gas collects in a liquid filled impulse piping, or the drain of a gas-filled impulse piping becomes plugged, the impulse piping will not convey the pressure accurately. Since this will cause errors in the measurement output, select the proper piping method for the process fluid (gas, liquid, or steam). Pay careful attention to the following points when routing the impulse piping and connecting the impulse piping to the transmitter.

4.1.1 Connecting Impulse Piping to the Transmitter

(1) Check the High and Low Pressure Connections on the Transmitter (Figure 4.1)

Symbols “H” and “L” are shown on a capsule assembly to indicate high and low pressure side. Connect the impulse piping to the “H” side, and the low impulse piping to the “L” side.

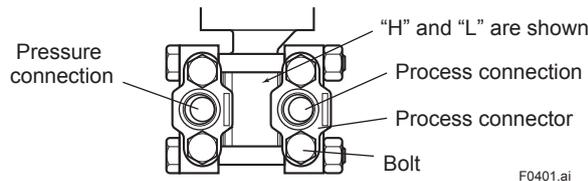


Figure 4.1 “H” and “L” Symbols on a Capsule Assembly

(2) Changing the Process Connector Piping Connections

The impulse piping connection distances can be changed between 51 mm, 54 mm and 57 mm by changing the orientation of the process connectors.

This is convenient for aligning the impulse piping with the process connectors when connecting the piping.

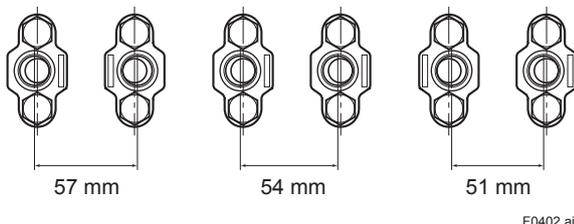


Figure 4.2 Process Connector Impulse Piping Connection Distances

(3) Tightening the Process Connector Mounting Bolts

After connecting the impulse piping, tighten the process connector mounting bolts uniformly.

(4) Connecting the Transmitter and 3-Valve Manifold (EJA110A)

A 3-valve manifold consists of two stop valves to block process pressure and an equalizing valve to equalize the pressures on the high and low pressure sides of the transmitter. Such a manifold makes it easier to disconnect the transmitter from the impulse piping, and is convenient when adjusting the transmitter zero point.

There are two types of 3-valve manifold: the pipe mounting type and the direct-mounting type; care should be taken with respect to the following points when connecting the manifold to the transmitter.

■ Pipe-Mounting Type 3-Valve Manifold

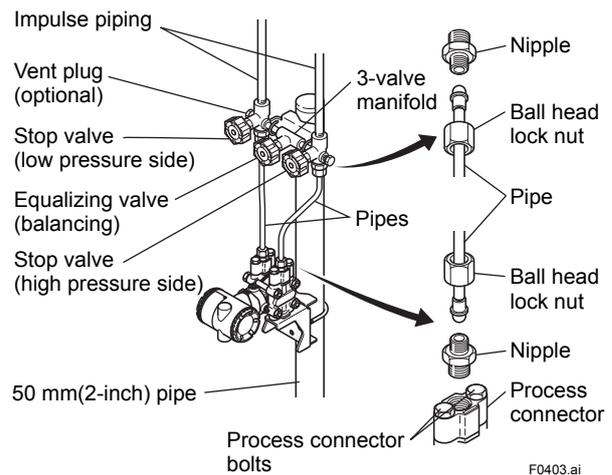


Figure 4.3 3-Valve Manifold (Pipe-Mounting Type)

- 1) Screw nipples into the connection ports on the transmitter side of the 3-valve manifold, and into the impulse piping connecting ports on the process connectors. (To maintain proper sealing, wind sealing tape around the nipple threads.)
- 2) Mount the 3-valve manifold on the 50 mm (2-inch) pipe by fastening a U-bolt to its mounting bracket. Tighten the U-bolt nuts only lightly at this time.
- 3) Install the pipe assemblies between the 3-valve manifold and the process connectors and lightly tighten the ball head lock nuts. (The ball-shaped ends of the pipes must be handled carefully, since they will not seal properly if the ball surface is scratched or otherwise damaged.)

- Now tighten the nuts and bolts securely in the following sequence:
 Process connector bolts → transmitter-end ball head lock nuts → 3-valve manifold ball head lock nuts → 3-valve manifold mounting bracket U-bolt nuts

■ **Direct-Mounting Type 3-Valve Manifold**

- Mount the 3-valve manifold on the transmitter. (When mounting, use the two gaskets and the four bolts provided with the 3-valve manifold. Tighten the bolts evenly.)
- Mount the process connectors and gaskets on the top of the 3-valve manifold (the side on which the impulse piping will be connected.)

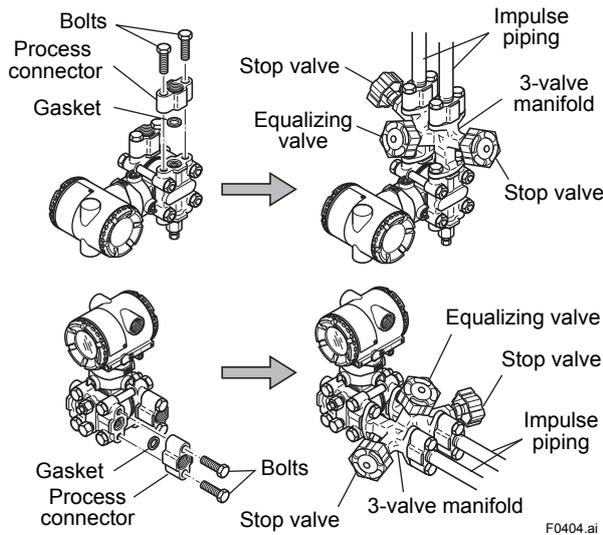


Figure 4.4 3-Valve Manifold (Direct-Mounting Type)

4.1.2 Routing the Impulse Piping

(1) Process Pressure Tap Angles

If condensate, gas, sediment or other extraneous material in the process piping gets into the impulse piping, pressure measurement errors may result. To prevent such problems, the process pressure taps must be angled as shown in Figure 4.5 according to the kind of fluid being measured.



NOTE

- If the process fluid is a gas, the taps must be vertical or within 45° either side of vertical.
- If the process fluid is a liquid, the taps must be horizontal or below horizontal, but not more than 45° below horizontal.
- If the process fluid is steam or other condensing vapor, the taps must be horizontal or above horizontal, but not more than 45° above horizontal.

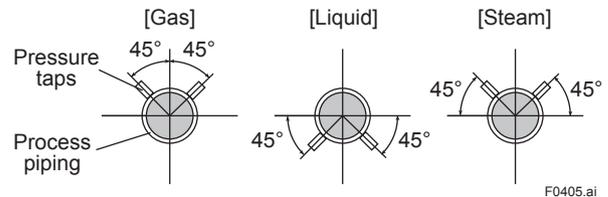


Figure 4.5 Process Pressure Tap Angle (For Horizontal Piping)

(2) Position of Process Pressure Taps and Transmitter

If condensate (or gas) accumulates in the impulse piping, it should be removed periodically by opening the drain (or vent) plugs. However, this will generate a transient disturbance in the pressure measurement, and therefore it is necessary to position the taps and route the impulse piping so that any extraneous liquid or gas generated in the leadlines returns naturally to the process piping.

- If the process fluid is a gas, then as a rule the transmitter must be located higher than the process pressure taps.
- If the process fluid is a liquid or steam, then as a rule the transmitter must be located lower than the process pressure taps.

(3) Impulse Piping Slope

The impulse piping must be routed with only an upward or downward slope. Even for horizontal routing, the impulse piping should have a slope of at least 1/10 to prevent condensate (or gases) from accumulating in the pipes.

(4) Temperature Difference Between Impulse Piping

If there is a temperature difference between the high and low impulse piping, the density difference of the fluids in the two lines will cause an error in the measurement pressure. When measuring flow, impulse piping must be routed together so that there is no temperature difference between them.

(5) Condensate Pots for Steam Flow Measurement

If the liquid in the impulse piping repeatedly condenses or vaporizes as a result of changes in the ambient or process temperature, this will cause a difference in the fluid head between the high pressure and low pressure sides. To prevent measurement errors due to these head differences, condensate pots are used when measuring steam flow.

(6) Preventing Wind Speed Effects in Very Low Differential Pressure Measurement



IMPORTANT

When using a differential pressure transmitter to measure very low pressures (draft pressure), the low pressure connection port is left open to atmospheric pressure (the reference pressure). Any wind around the differential pressure transmitter will therefore cause errors in the measurement. To prevent this, it will be necessary either to enclose the transmitter in a box, or to connect a impulse piping to the low pressure side and insert its end into a wind excluding pot (cylindrical with a base plate).

(7) Preventing Freezing

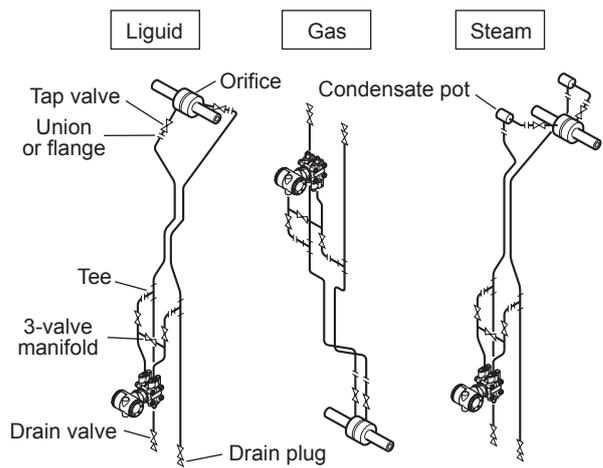
If there is any risk that the process fluid in the impulse piping or transmitter could freeze, use a steam jacket or heater to maintain the temperature of the fluid.

4.2 Impulse Piping Connection Examples

Figure 4.6, 4.7, and 4.8 shows examples of typical impulse 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.

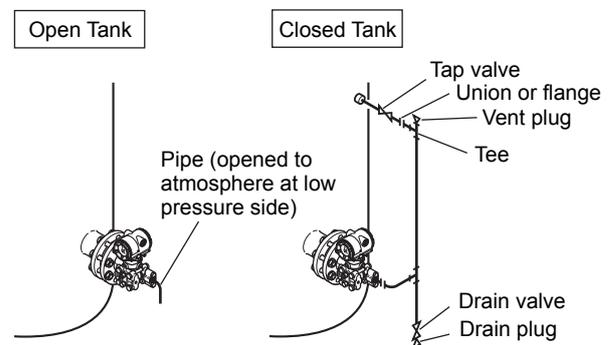
Note the following points when referring to these piping examples.

- If the impulse piping is long, bracing or supports should be provided to prevent vibration.
- The impulse piping material used must be compatible with the process pressure, temperature, and other conditions.
- A variety of process pressure tap valves (main 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.



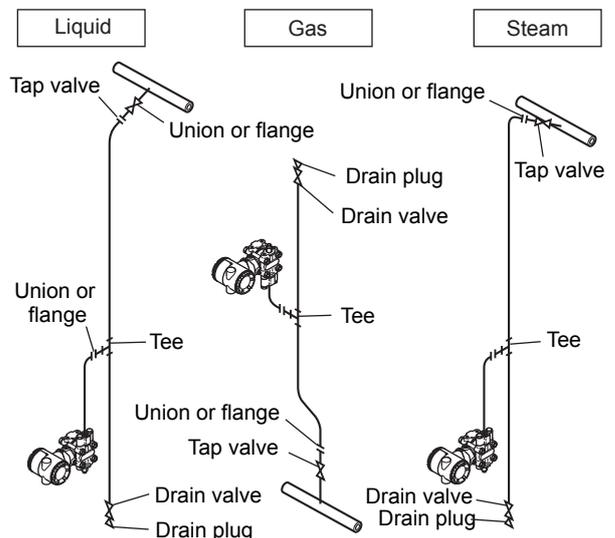
F0406.ai

Figure 4.6 Impulse Piping Connection Examples (EJA110A)



F0407.ai

Figure 4.7 Impulse Piping Connection Examples (EJA210A and EJA220A)



F0408.ai

Figure 4.8 Impulse Piping Connection Examples (EJA310A, EJA430A, and EJA440A)

4.3 Process Piping Installation Precautions

4.3.1 Connecting Process Piping to the Transmitter

(1) Confirming the Process Fluid Flow Direction

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.

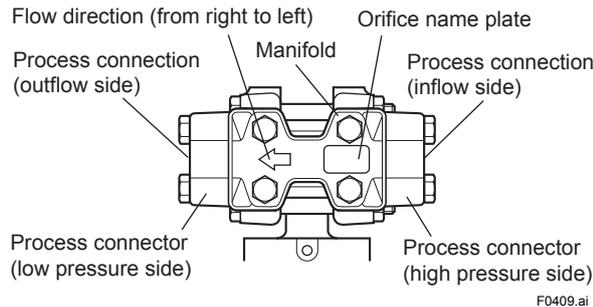


Figure 4.9 Manifold and Flow Direction Indication

(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 with a torque of 39 to 49 N·m {4 to 5 kgf·m}.

(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.)

4.3.2 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.
- If the process fluid is a liquid, then as a rule the manifold must be located at the upside of the pressure-sensing assembly.

(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.

(4) Process Piping Connection Examples

Figure 4.10 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 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.

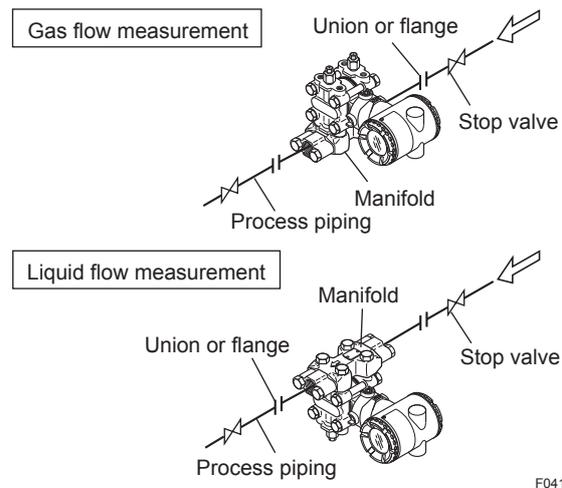


Figure 4.10 Process Piping Connection Examples (EJA115)

5. Wiring



NOTE

For FOUNDATION Fieldbus and PROFIBUS PA communication types, please refer to manuals for each communication type.

5.1 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 GENELEC and IECEx 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 by hand.
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.

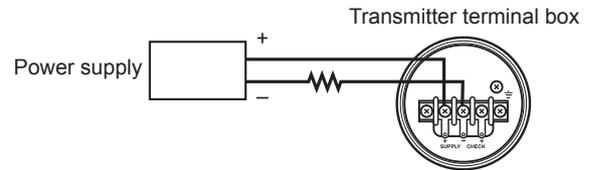


F0501.ai

5.2 Connections of External Wiring to Terminal Box

5.2.1 Power Supply Wiring Connection

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

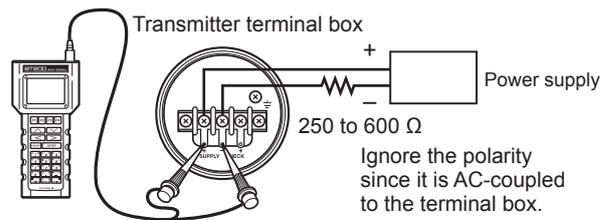


F0502.ai

Figure 5.1 Power Supply Wiring Connection

5.2.2 Handheld Terminal Connection

Connect the handheld terminal to the SUPPLY + and – terminals (Use hooks). Communication line requires a reception resistor of 250 to 600Ω in series.



BT200 etc.

F0503.ai

Figure 5.2 Handheld Terminal Connection

5.3 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 TIIS Intrinsically Safe Equipment” and “Installation and Operating Precautions for TIIS Flameproof Equipment” at the end of this manual prior to the work.

5.3.1 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 5.6.

(1) General-use Type and Flameproof Type

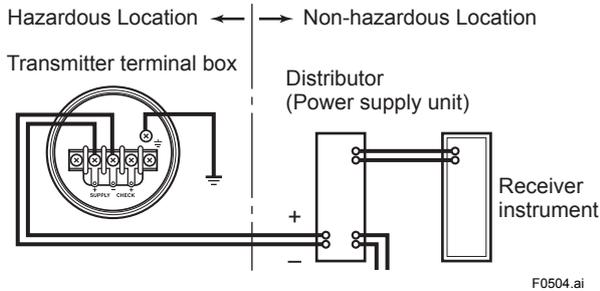


Figure 5.3 Connection between Transmitter and Distributor

(2) Intrinsically Safe Type

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

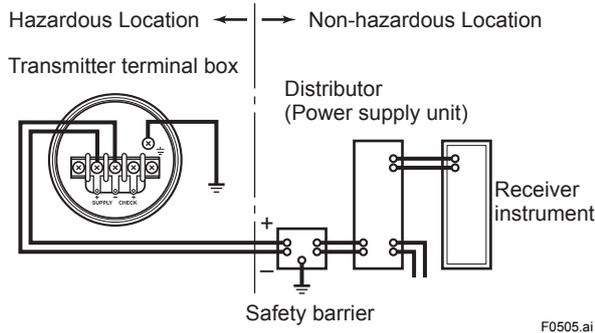


Figure 5.4 Connection between Transmitter and Distributor

5.3.2 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.

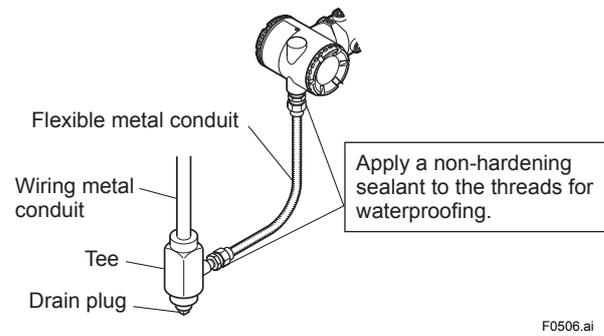


Figure 5.5 Typical Wiring Using Flexible Metal Conduit

(2) Flameproof Type

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

- Wiring cable through flameproof packing adapter.
 - Apply a non-hardening sealant to the terminal box connection port and to the threads on the flameproof packing adapter for waterproofing.

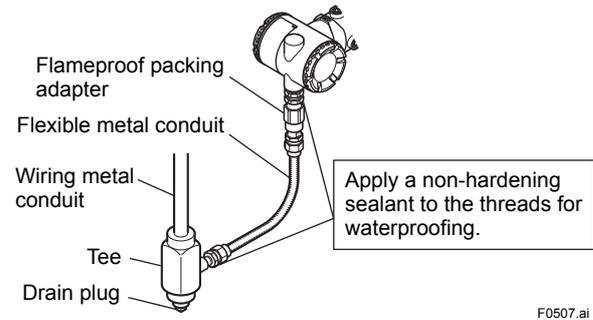


Figure 5.6 Typical Cable Wiring Using Flameproof Packing Adapter

- 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 5.1).

Table 5.1 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	

- Mounting flameproof packing adapter body to conduit connection (see Figure 5.7)
 - 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.

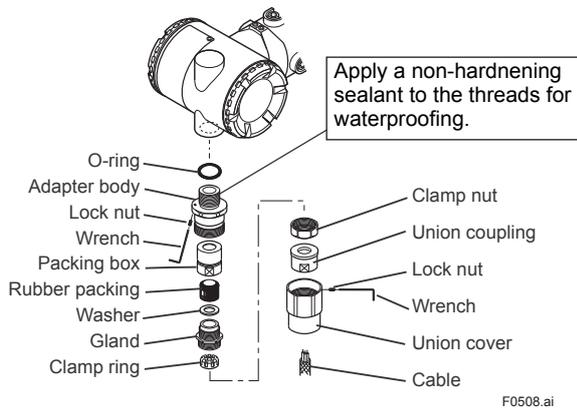


Figure 5.7 Installing Flameproof Packing Adapter

- 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.

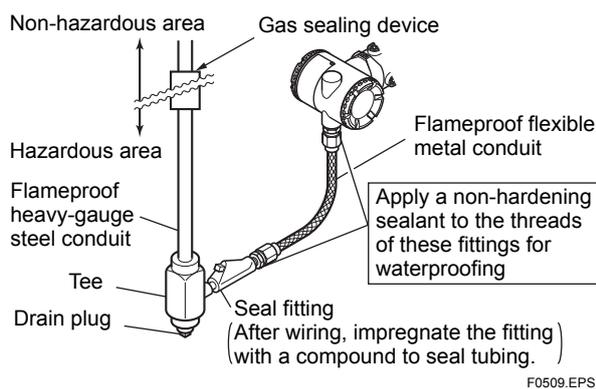


Figure 5.8 Typical Wiring Using Flameproof Metal Conduit

5.4 Grounding

Grounding is always required for the proper operation of transmitters. Follow the domestic electrical requirements as regulated in each country. For a transmitter with builtin lightning protector, grounding should satisfy ground resistance of 10Ω or less.

Ground terminals are located on the inside and outside of the terminal box. Either of these terminals may be used.



For TIIIS flameproof type and intrinsically safe, grounding should satisfy Class D requirements (grounding resistance, 100Ω or less).

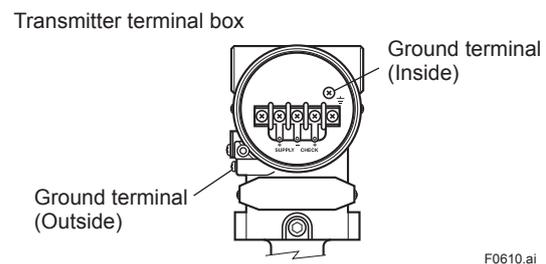


Figure 5.9 Ground Terminals

5.5 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.

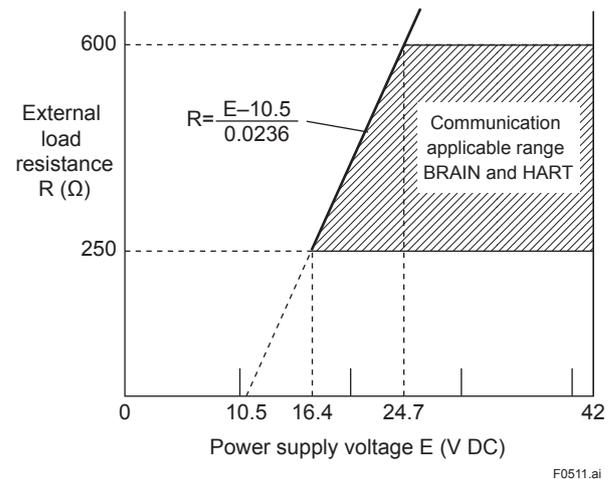


Figure 5.10 Relationship between Power Supply Voltage and External Load Resistance

6. Operation



NOTE

For FOUNDATION Fieldbus and PROFIBUS PA communication types and for the transmitter operating confirmation and zeroing by any communication method, refer to each communication manuals for further information.

6.1 Preparation for Starting Operation

■ Confirming that Transmitter is Operating Properly

On 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)

F0601.ai



NOTE

If any of the error indications above appears on the display of the integral indicator, refer to Chapter 7 for corrective action.

■ Verify and Change Transmitter Parameter Setting and Values

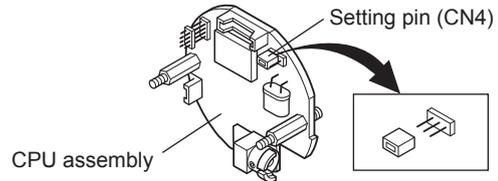
The following parameters are the minimum settings required for operation.

- Measuring range
- Output/integral indicator mode
- Operation mode

■ Output Status Setting at CPU Failure

Set the burn-out direction as shown in the figures below. The direction is set to the H side for delivery unless option code /C1 is specified in the order. For option code /F1, the output signal for down-scale is -2.5%, 3.6 mA DC or less.

● BRAIN and HART except option code /F1

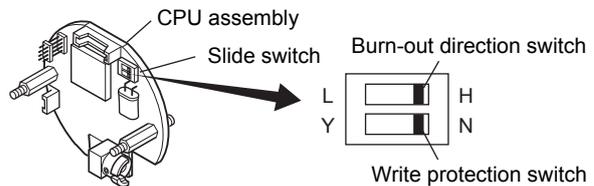


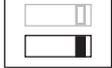
Setting Pin (CN4) Position	Burn-Out Direction	Output at Burn-Out
 H L	HIGH	110% or higher
 L H	LOW	-5% or lower

F0602.ai

Figure 6.1 Burn-out Direction Setting Pin

● HART with option code /F1



Burn-out direction switch			
Burnout Direction Switch Position	L  H	L  H	
	Y  N	Y  N	
Burn-out Direction	HIGH	LOW	
Hardware write protection switch			
Write Protection Switch Position	L  H	L  H	
	Y  N	Y  N	
Write Protection	NO	YES	

F0603.ai

Figure 6.2 Burn-out Direction Slide Switch

6.2 Zero Point Adjustment

Adjust the zero point after operating preparation is completed.



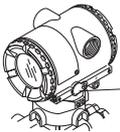
IMPORTANT

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.

■ Using the Transmitter Zero-adjustment Screw

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.

- Zero-adjustment Screw



Zero-adjustment screw

F0604.ai

7. Errors and Countermeasures



NOTE

For FOUNDATION Fieldbus and PROFIBUS PA communication types, please refer to each communication manuals.

The table below shows a summary of error messages for BRAIN and HART protocols.

Table 7.1 Error Message Summary

Integral Indicator Display	Description	Cause	Output Operation during Error	Countermeasure
None	GOOD			
---	ERROR			
Er. 01	CAP MODULE FAULT	Capsule problem.*1	Outputs the signal according to status of a burnout direction pin or switch (the signal can be set as "hold" for BRAIN protocol).	Replace the capsule when error keeps appearing even after restart.*2
Er. 02	AMP MODULE FAULT	Amplifier problem.	Outputs the signal (Hold, Outputs the signal according to status of a burnout direction pin or switch (the signal can be set as "hold" for BRAIN protocol).	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.*3	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 URV	URV is outside setting range.	Holds output immediately before error occurrence.	Check URV 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: This error code appears at a capsule problem or when an illegal overpressure is applied to the pressure sensor.
 *2: If the normal pressure is regained, the Er.01 will disappear according to the setting of the parameter of E50: AUTO RECOVER. When the E50 : AUTO RECOVER is set to ON, the Er.01 will disappear automatically. The default setting for this parameter is ON. When the E50: AUTO RECOVER is set to OFF, restart the transmitter to cancel Er.01. If no error code appears then, perform necessary adjustments such as zero-adjustment to continue the operation. If the error code still appears, replace the capsule assembly.
 *3: For Model EJA120A, static pressure cannot be measured. The display is always 0 MPa, but this is not a measured value.

Installation and Operating Precautions for TIIS 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 Construction for 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 TIS 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 $+40^{\circ}\text{C}$ (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to $+60^{\circ}\text{C}$ 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 non-hardening 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 from 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 from 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, non-hardening 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 Safety.

Revision Information

- Title : EJA Series Differential Pressure and Pressure Transmitters Installation Manual
- Manual No. : IM 01C22A01-01E

Edition	Date	Page	Revised Item
1st	Jan. 2008		New publication
2nd	Oct.2008	12 13 28 29	2.4.4 Change explosion protection marking for type n from EEx to Ex. 2.5 Update EMC conformity standards. 7. Modify descriptions and notes for Er.01. 8. Add new parameters.
3rd	July 2015	— 1 2 6 6 to 18 18 19 28, 31, 33 —	Remove CD-ROM 1. Modify descriptions. Replace CD-ROM information by the downloading information. Modify note about communication 1.1 Add (g). 2.4 Delete NOTE for CD-ROM. 2.4 Add Fieldbus explosion protected type. (2.4.1 c and d, 2.4.2 d, 2.4.3 c, and 2.4.4 (1) c.) Modify 2.4.4 (1) b and (6) 2.5 Add information. 2.7 Modify title. Add (3) and (4). 5, 6 and 7 Modify note for CD-ROM. Delete chapter 8.



YOKOGAWA ELECTRIC CORPORATION

Headquarters

2-9-32, Nakacho, Musashino-shi, Tokyo, 180-8750 JAPAN
Phone : 81-422-52-5555

Branch Sales Offices

Osaka, Nagoya, Hiroshima, Kurashiki, Fukuoka, Kitakyusyu

YOKOGAWA CORPORATION OF AMERICA

Head Office

12530 West Airport Blvd, Sugar Land, Texas 77478, USA
Phone : 1-281-340-3800 Fax : 1-281-340-3838

Georgia Office

2 Dart Road, Newnan, Georgia 30265, USA
Phone : 1-800-888-6400/ 1-770-253-7000 Fax : 1-770-254-0928

YOKOGAWA AMERICA DO SUL LTDA.

Praca Acapulco, 31 - Santo Amaro, São Paulo/SP, BRAZIL, CEP-04675-190
Phone : 55-11-5681-2400 Fax : 55-11-5681-4434

YOKOGAWA EUROPE B. V.

Euroweg 2, 3825 HD Amersfoort, THE NETHERLANDS
Phone : 31-88-4641000 Fax : 31-88-4641111

YOKOGAWA ELECTRIC CIS LTD.

Grokholskiy per 13 Building 2, 4th Floor 129090, Moscow, RUSSIA
Phone : 7-495-737-7868 Fax : 7-495-737-7869

YOKOGAWA CHINA CO., LTD.

3F Tower D Cartelo Crocodile Building, No.568 West Tianshan Road,
Shanghai 200335, CHINA
Phone : 86-21-62396262 Fax : 86-21-62387866

YOKOGAWA ELECTRIC KOREA CO., LTD.

(Yokogawa B/D, Yangpyeong-dong 4-Ga), 21, Seonyu-ro 45-gil, Yeongdeungpo-gu,
Seoul, 150-866, KOREA
Phone : 82-2-2628-6000 Fax : 82-2-2628-6400

YOKOGAWA ENGINEERING ASIA PTE. LTD.

5 Bedok South Road, Singapore 469270, SINGAPORE
Phone : 65-6241-9933 Fax : 65-6241-2606

YOKOGAWA INDIA LTD.

Plot No.96, Electronic City Complex, Hosur Road, Bangalore - 560 100, INDIA
Phone : 91-80-4158-6000 Fax : 91-80-2852-1442

YOKOGAWA AUSTRALIA PTY. LTD.

Tower A, 112-118 Talavera Road, Macquarie Park NSW 2113, AUSTRALIA
Phone : 61-2-8870-1100 Fax : 61-2-8870-1111

YOKOGAWA MIDDLE EAST & AFRICA B.S.C.(C)

P.O. Box 10070, Manama, Building 577, Road 2516, Busaiteen 225, Muharraq,
Kingdom of SAUDI ARABIA
Phone : 973-17358100 Fax : 973-17336100

Apr. '15