User's Manual

OpreX™ Pressure Transmitter

EJX S Series
Explosion Protection for US and CANADA (Approval Codes -FS1, -FF1, -FU1, -CS1, -CF1, -CU1, and -VU1)

IM 01C33A21-01EN

YOKOGAWA
Yokogawa Electric Corporation

IM 01C33A21-01EN
1st Edition

1. Introduction

This manual provides the guidelines for US and Canadian explosion protection type of EJX S series Differential Pressure and Pressure Transmitters.
For the items which are not covered in this manual, read the applicable user's manuals and general specifications as listed in IM 01C33A01-01Z1 (Read Me First).
These documents can be downloaded from the website of YOKOGAWA. To ensure correct use of the product, read these manuals thoroughly and fully understand how to operate the product before maintaining it.
For method of checking the model and specifications, read the applicable general specifications listed in IM 01C33A01-01Z1 (Read Me First).

■ 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.
- This manual is intended for the following personnel;
  Engineers responsible for installation and wiring of the product.
  Personnel responsible for normal daily operation and maintenance of the product.
- This manual is part of the product. Keep on safe place for future reference.

1.1 Warranty and Disclaimer

- Except as specified in the warranty terms, YOKOGAWA shall not provide any warranty for the product.
- YOKOGAWA shall not be liable for any indirect or consequential loss incurred by either using or not being able to use the product.

1.2 Trademarks

- 'DPharp' and 'FieldMate' are registered trademarks of Yokogawa Electric Corporation. Company names and product names used in this material are registered trademarks or trademarks of their respective owners.
- In this manual, trademarks or registered trademarks are not marked with ™ or ®.

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 or property damage. 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.

- There are some symbols on the instrument, and their meanings are as follows:

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

2. Handling Cautions

This chapter explains handling cautions of explosion protection type instruments in general. After reading all the contents of this chapter, please refer to Chapter 3 or 4 depending on the certification you have selected.

2.1 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.

WARNING

(a) General

- 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.

(b) 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 instrument.
- All installation shall comply with local installation requirement and local electrical code.

(c) Wiring

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about WIRING and INSTALLATION 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.
- All wiring shall comply with local installation requirement and local electrical code.

(d) Operation

- Operaion is limited according to the selected type of protection and installation.
  Please see Table A and Table B and follow it. For those operation prohibited in a hazardous location, operated it in a non-hazardous location.
- Do not open the cover in wet weather or humid environment. If the cover is opened, stated enclosure protection is not applicable.

(e) 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 nameplate. In case of its maintenance, use soft cloth.
- If you open the case cover for operation or maintenance, check the O-rings for scratches, cracks, shrinkage, and other deterioration, and replace them if any are found. For replacement, contact our service office. Even if there is no such deterioration, replace them after five years as a guideline.
- Check that the housing and cover do not have dents or cracks.

(f) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.
- Users are prohibited from modifying the construction of a explosion protection type transmitter. This would invalidate the approval for the use of the transmitter in a rated area. It follows that the user is prohibited from using a explosion protection type transmitter with its integral indicator removed, or from adding an integral indicator to a transmitter. If such modification is absolutely required, contact Yokogawa.

Table A. Operation in hazardous area for US and CANADA explosionproof model

		Zone		Division	
	General purpose model (Non-hazardous area) (*1)	Flameproof Enclosure	Dust ignition protection by enclosure (included in Flameproof Enclosure approval model)	Explosionproof	Dust-Ignitionproof (included in Explosionproof approval model)
Ex marking		US: Zone 1, AEx db IIC T6...T4 Gb Canada: Ex db IIC T6...T4 Gb	US: Zone 21, AEx tb IIIC T85°C Db Canada: Ex tb IIIC T85°C Db	US: Class I, Division 1, Groups B, C and D; Temperature Code: T6...T4 Canada: Class I, Groups B, C, and D; Temperature Code: T6...T4	US: Class II/III, Division 1, Groups E, F and G; Temperature Code: T6 Canada: Class II/III, Groups E, F, and G; Temperature Code: T6
Applicable Zone / Division	---	zone 1, zone 2	zone 21, zone 22	Division 1, Division 2	Division 1, Division 2
Opening the terminal cover	Possible	Wait at least 10 minutes after power off to open the terminal cover.	Wait at least 10 minutes after power off to open the terminal cover. Make sure there is no dust in the air before opening the terminal cover. Before closing, be sure to clean the inside and make sure there is no powder/ dust.	Wait at least 10 minutes after power off to open the terminal cover.	Wait at least 10 minutes after power off to open the terminal cover. Make sure there is no dust in the air before opening the terminal cover. Before closing, be sure to clean the inside and make sure there is no powder/ dust.
Opening the indicator cover during power on	Possible	Prohibited	Prohibited	Prohibited	Prohibited
Using a push button on the indicator	Possible	Prohibited	Prohibited	Prohibited	Prohibited
Rotating the transmitter section	Possible	Prohibited during power on. Wait at least 10 minutes after power off to rotating the transmitter section.	Prohibited during power on. Wait at least 10 minutes after power off to rotating the transmitter section.	Prohibited during power on. Wait at least 10 minutes after power off to rotating the transmitter section.	Prohibited during power on. Wait at least 10 minutes after power off to rotating the transmitter section.
Zero adjustment with uisng the external zero adjustment screw		Possible	Possible	Possible	Possible

*1: The following describes the conditions under which general purpose equipment is used in a non-hazardous area.

Table B. Operation in hazardous area for US and CANADA intrinsic safety model

	Zone		
	Intrinsic safety for HART	Intrinsic safety for PROFINET	Nonincendive for HART
Ex marking	US: CL I Zone 0, AEx ia IIC T5…T4 Ga Canada: Zone 0, Ex ia IIC T5…T4 Ga	US: CL I Zone 0, AEx ia IIC T5…T4 Ga Canada: Zone 0, Ex ia IIC T5…T4 Ga	US: CL I Zone 2, Group IIC T6...T4 Canada: Class I, Zone 2, Group IIC T6…T4
Applicable Zone / Division	zone 0, zone 1, zone 2	zone 0, zone 1, zone 2	zone 2
Opening the terminal cover	Possible	Possible	Possible
Opening the indicator cover during power on	Prohibited	Prohibited	Prohibited
Using a push button on the indicator	Prohibited	Prohibited	Prohibited
Rotating the transmitter section	Prohibited during power on. Turn off the power before rotating the transmitter section. Transmitter section should be kept connected to the capsule body while rotating. Do not pull it out from the capsule body.	Prohibited during power on. Turn off the power before rotating the transmitter section. Transmitter section should be kept connected to the capsule body while rotating. Do not pull it out from the capsule body.	Prohibited during power on. Turn off the power before rotating the transmitter section. Transmitter section should be kept connected to the capsule body while rotating. Do not pull it out from the capsule body.
Zero adjustment with uisng the external zero adjustment screw	Possible	Possible	Possible

	Division			
	Intrinsic safety for HART	Intrinsic safety for PROFINET	Nonincendive for HART	Intrinsic safety and Nonincendive for dust
Ex marking	US: IS Class I, Division 1, Groups A, B, C, D Canada: IS Class I, Division 1, Groups A, B, C, D	US: IS Class I, Division 1, Groups A, B, C, D Canada: IS Class I, Division 1, Groups A, B, C, D	US: NI Class I, Division 2, Groups A, B, C, D Canada: Class I, Division 2, Groups A, B, C, D	US: IS Class II, Division 1, Groups E, F, G;Class III, Division 1;Temperature Code: T5…T4 NI Class II,Division 2, Groups F, G;Class III, Division 1;Temperature Code: T6…T4 Canada: IS Class II, Division 1, Groups E, F, G;Class III, Division 1;Temperature Code: T5…T4 NI Class II,Division 2, Groups F, G;Class III, Division 1;Temperature Code: T6…T4
Applicable Zone / Division	Division 1, Division 2	Division 1, Division 2	Division 2	Division 1, Division 2
Opening the terminal cover	Possible	Possible	Possible	Prohibited during power-on. Turn off the power, and make sure that there is no dust in the air before opening the terminal cover. Before closing, be sure to clean the inside and make sure there is no powder/dust.
Opening the indicator cover during power on	Prohibited	Prohibited	Prohibited	Prohibited
Using a push button on the indicator	Prohibited	Prohibited	Prohibited	Prohibited
Rotating the transmitter section	Prohibited during power on. Turn off the power before rotating the transmitter section. Transmitter section should be kept connected to the capsule body while rotating. Do not pull it out from the capsule body.	Prohibited during power on. Turn off the power before rotating the transmitter section. Transmitter section should be kept connected to the capsule body while rotating. Do not pull it out from the capsule body.	Prohibited during power on. Turn off the power before rotating the transmitter section. Transmitter section should be kept connected to the capsule body while rotating. Do not pull it out from the capsule body.	Prohibited during power on. Turn off the power before rotating the transmitter section. Transmitter section should be kept connected to the capsule body while rotating. Do not pull it out from the capsule body.
Zero adjustment with uisng the external zero adjustment screw	Possible	Possible	Possible	Possible

2.2 Installation of an Explosion Protection Type Instrument

If a customer makes a repair or modification to an explosion protection type instrument and the instrument is not restored to its original condition, its explosion protection construction may be compromised and the instrument may be hazardous to operate. Please contact YOKOGAWA before making any repair or modification to an instrument.

WARNING

Maintaining the safety of explosion protection type instruments requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair. Please read the following sections very carefully.

CAUTION

This instrument has been tested and certified as being explosion protection type. Please note that severe restrictions (e.g. IEC 60079-14) apply to this instrument's construction, installation, external wiring, maintenance and repair. A failure to abide by these restrictions could make the instrument a hazard to operate.

CAUTION

For multiple approval types
Once a device of multiple approval type is installed, it should not be re-installed using any other approval types. Apply a permanent mark in the check box of the selected approval type on the nameplate on the transmitter to distinguish it from unused approval types.

IMPORTANT

All the blind plugs which accompany the EJX S series transmitters upon shipment from the factory are certified by each certification body in combination with those transmitters. The plugs which are marked with the symbols "◊ Ex" on their surfaces are certified only in combination with the EJX S series transmitters, and cannot be used with other instruments in hazardous area.

3. US Certification

Certificate: FM25US0031X

3.1 Explosionproof (Approval Code: -FF1, -FU1, -VU1)

3.1.1 Technical Data

- Applicable Standard
  FM 3600
  FM 3615
  FM 3616
  FM 3810
  ANSI/UL 50E
  ANSI/UL 60079-0
  ANSI/UL 60079-1
  ANSI/UL 60079-31
  ANSI/UL 61010-1-12
  ANSI/UL 122701
- Specific Ex marking
  Flameproof for
  Zone 1, AEx db IIC T6...T4 Gb
  Dust-Ignitionproof for
  Zone 21, AEx tb IIIC T85°C Db
  Explosionproof for
  Class I, Division 1, Groups B, C and D;
  Temperature Code: T6...T4
  Dust-Ignitionproof for
  Class II/III, Division 1, Groups E, F and G;
  Temperature Code: T6
- Ambient Temperature
  See "3.1.6 Specific conditions of use."
- Process Temperature
  See "3.1.6 Specific conditions of use."
- Power Supply
  HART: 10.5 to 42 Vd.c., 21.6 mA(max)
- Maximum working pressure
  85 MPa (MWP varies depending on the model codes. Refer to the General Specifications or the nameplate of each product.)
- Enclosure
  For Division system of area classification: Type 4X

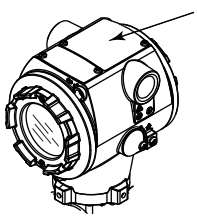
3.1.2 Process Seal

Dual seal without annunciation (up to 50 MPa).

3.1.3 Installation

- For Zone
  When Ta is ≥ 49°C, heat-resisting cables and cable glands with rated temperature of ≥ 90°C must be used.

- When installing the equipment, the selected Type of Protection should be ticked as follows.
  ☑ CL I ZN 1 AEx db IIC T6…T4 Gb
  ☐ ZN 21 AEx tb IIIC T85°C Db
  ☐ XP CL I DIV 1 GP BCD T6…T4
  ☐ DIP CL II/III DIV 1 GP EFG T6
- Cable glands, adapters and/or blanking elements with a suitable IP rating shall be of Ex db IIC / Ex tb IIIC certified by certification body and shall be installed so as to maintain the specific degree of protection (IP Code or Type) of the equipment.
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the nameplate.



Nameplate

Marking	Screw form / size
M20	ISO M20 × 1.5
1/2NPT	ANSI 1/2NPT

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- For Division
  Conduit Seal not Required

3.1.4 Operation

WARNING

- POTENTIAL ELECTROSTATIC CHARGING HAZARD
  Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.
- AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING

3.1.5 Maintenance and Repair

WARNING

- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.
- The transmitter can be recalibrated. The process connectors and bug screen can be disassembled from the transmitter and restored by the users for cleaning and replacement purpose. Refer to IM 01C33B01-01EN for procedures.

3.1.6 Specific Conditions of Use

- Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.
- Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.
- The fasteners used to fasten the shaft onto the enclosure shall only be replaced with Yokogawa fastener, Part number: F9900RH and B1054BB.
- For transmitters with a membrane made of titanium, ignition hazard due to impact and friction on the membranes shall be avoided.
- When the Electrical connection model code is 2 or 4, installation of equipment shall be installed using both field wiring entries with suitable conduit or cable gland.
- For Zone system of area classification
  Refer to the following table for details of ambient temperature and process temperature ratings.

Ex db

Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas	–	T6	-50°C≤Ta≤+75°C	-60°C≤Tp≤+80°C
		T5	-50°C≤Ta≤+80°C	-60°C≤Tp≤+95°C
		T4	-50°C≤Ta≤+75°C	-60°C≤Tp≤+120°C

Ex tb

Type	Output signal code	Maximum surface temperature	Ambient temperature	Process temperature
Dust	–	T85°C	-40°C≤Ta≤+75°C	-40°C≤Tp≤+80°C

- For Division system of area classification
  Refer to the following table for details of ambient temperature and process temperature ratings.

Ex db

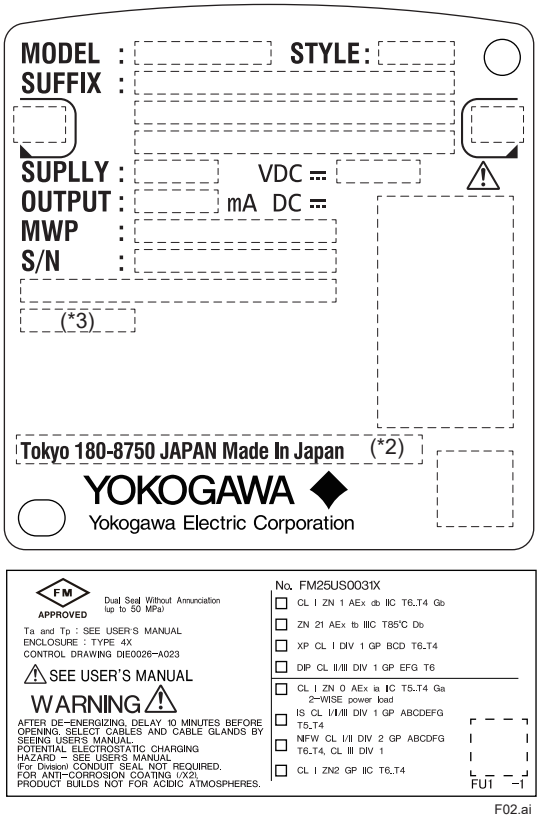
Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas	–	T6	-40°C≤Ta≤+75°C	-40°C≤Tp≤+80°C
		T5	-40°C≤Ta≤+80°C	-40°C≤Tp≤+95°C
		T4		-40°C≤Tp≤+130°C

Ex tb

Type	Output signal code	Maximum surface temperature	Ambient temperature	Process temperature
Dust	–	T6	-40°C≤Ta≤+75°C	-40°C≤Tp≤+80°C

3.1.7 Nameplate

Example for the nameplate in case of approval code -FU1, US explosionproof and intrinsic safety type.



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- MODEL: Specified model code
- SUFFIX: Suffix codes of the model code
- STYLE: Specified style code
- SUPPLY: Power supply voltage of apparatus
- OUTPUT: Output signal of apparatus
- MWP: Maximum working pressure of apparatus
- S/N.: Manufacturing serial number
- Cable Entry: Screw form / size
- YOKOGAWA ◆: Name of manufacturer
- Tokyo 180-8750 JAPAN: address of manufacturer (*1)
- TYPE 4X: Enclosure protection code
- WARNING: Warning to apparatus
- No. FM25US0031X: Certification number

*1: "180-8750" is a zip code which represents the following address: 2-9-32 Nakacho, Musashino-shi, Tokyo Japan
*2: Country of origin
*3: Year and month of manufacturing

3.2 Intrinsic safety (Certification Code: -FS1, -FU1, -VU1)

3.2.1 Technical Data

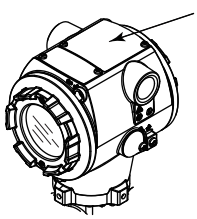
- Applicable Standard
  FM 3600
  FM 3610
  FM 3611
  FM 3810
  ANSI/UL 60079-0
  ANSI/UL 60079-11
  ANSI/UL 61010-1
  ANSI/UL 121201
  ANSI/UL 122701
  ANSI/UL 50E
  UL 60079-47
- Specific Ex Marking
  Intrinsic safety for
  IS Class I, Division 1, Groups A, B, C, D;
  Class II, Division 1, Groups E, F, G;
  Class III, Division 1;
  Temperature Code: T5…T4
  CL I Zone 0, AEx ia IIC T5…T4 Ga
  Nonincendive for
  NI Class I, Division 2, Groups A, B, C, D;
  Class II,Division 2, Groups F, G;
  Class III, Division 1;
  Temperature Code: T6…T4
  CL I Zone 2, Group IIC T6...T4
- Ambient Temperature
  See "3.2.6 Specific conditions of use."
- Process Temperature
  See "3.2.6 Specific conditions of use."
- Power Supply
  HART: 10.5 to 30 Vd.c., 21.6 mA(max)
  PROFINET(APL): 9 to 15 Vd.c., 55.56 mA(max), 0.54W(max)
  Nonincendive: 10.5 to 42 Vd.c., 21.6 mA(max)
- Enclosure
  For Division system of area classification: Type 4X
- Maximum Working Pressure
  85 MPa (MWP varies depending on the model codes. Refer to the General Specifications or the nameplate of each product.)

3.2.2 Process Seal

Dual seal without annunciation (up to 50 MPa).

3.2.3 Installation

- When installing the equipment, the selected Type of Protection should be ticked as follows.
  ☑ CL I ZN 0 AEx ia IIC T5…T4 Ga
  ☐ IS CL I/II/III DIV 1 GP ABCDEFG T5…T4
  ☐ NIFW CL I/II DIV 2 GP ABCDFG T6…T4, CL III DIV 1
  ☐ CL I ZN2 GP IIC T6…T4
- The equipment shall be installed in accordance with NFPA70 and relevant local codes and requirements.
- See the control drawing DIE0026-A023. (3.2.8 Control Drawing.)
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the nameplate.



Nameplate

Marking	Screw form / size
M20	ISO M20 × 1.5
1/2NPT	ANSI 1/2NPT

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3.2.4 Operation

WARNING

- POTENTIAL ELECTROSTATIC CHARGING HAZARD
  Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.

3.2.5 Maintenance and Repair

WARNING

- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.
- The transmitter can be recalibrated. The process connectors and bug screen can be disassembled from the transmitter and restored by the users for cleaning and replacement purpose. Refer to IM 01C33B01-01EN for procedures.

3.2.6 Specific Conditions of Use

- Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.
- When the enclosure of the equipment is made of aluminum alloy, if it is mounted in Zone 0, it must be installed such that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.
- For nonincendive, the installer must ensure the process temperature does not increase the ambient temperature above the maximum ambient temperature value allowed for the temperature code marked on the product.
- Refer to the following table for details of ambient temperature and process temperature ratings.

Ex ia

Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas	-J	T5	-55°C≤Ta≤+40°C	Tp≤+95°C
		T4	-55°C≤Ta≤+60°C	Tp≤+120°C
	-T	T5	-40°C≤Ta≤+40°C	Tp≤+95°C
		T4	-40°C≤Ta≤+60°C	Tp≤+120°C

Type	Output signal code	Maximum surface temperature	Ambient temperature	Process temperature
Dust	–	T85°C	-40°C≤Ta≤+60°C	Tp≤+80°C
		T100°C		Tp≤+95°C
		T120°C		Tp≤+115°C

Nonincendive

Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas Dust	-J	T6	-40°C≤Ta≤+53°C	-40°C≤Tp≤+80°C
		T5	-40°C≤Ta≤+66°C	-40°C≤Tp≤+95°C
		T4	-40°C≤Ta≤+80°C	-40°C≤Tp≤+130°C

3.2.7 Nameplate

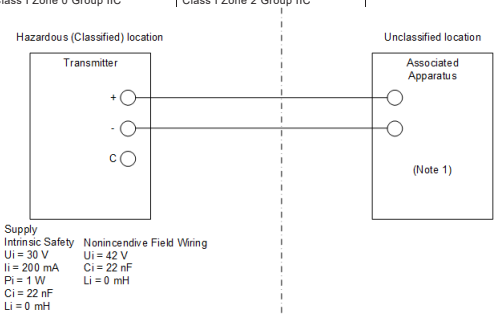
Please see an example in 3.1.7 “Nameplate.”

3.2.8 Control Drawing

Yokogawa Electric Corporation		Model		TRANSMITTER Series			
Title	Control drawing (US) Intrinsic Safety						
No.	DIE0026-A023	Page	1	Revision	0	Date	2023-10-31
Revised pages	–						

Certification: -FS1, -FU1, -VU1
Communication and I/O: -J

Intrinsic Safety	Nonincendive
Class I Division 1 Group ABCD	Class I Division 2 Group ABCD
Class II Division 1 Group EFG	Class II Division 2 Group FG
Class III Division 1	Class III Division 1
Class I Zone 0 Group IIC	Class I Zone 2 Group IIC

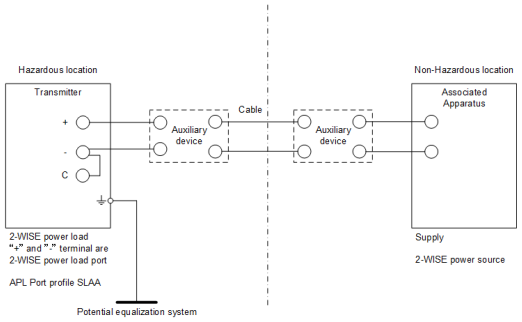


Notes:
1. Except Associated Nonincendive Field Wiring Apparatus, the Associated Apparatus must be a linear power source whose output current is resistively limited.
2. The Associated Apparatus must be FM-approved.
3. The following conditions must be satisfied for each circuit. When more than one intrinsically safe apparatus are connected in an intrinsically safe circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Io (or Isc) ≤ Ii
   Po ≤ Pi
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable
4. Control equipment connected to the Associated Apparatus must not use or generate a voltage more than Um of the Associated Apparatus.
5. The control drawing of the Associated Apparatus must be followed when installing the equipment.
6. In case Nonincendive Field Wiring Concept is used for the interconnection, FM-approved Associated Nonincendive Field Wiring Apparatus, which meets the following conditions, must be used as the Power Supply / Control Equipment. When more than one Nonincendive Field Wiring Apparatus are connected in a Nonincendive Field Wiring circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

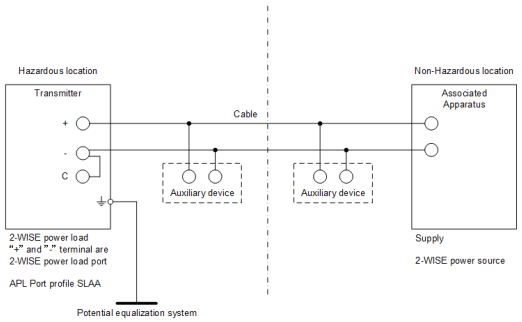
   Transmitter provides nonincendive field wiring outputs and hazardous location suitability of the output: Class I/II Division 2 Group ABCDFG and Class III Division 1.

Yokogawa Electric Corporation		Model		TRANSMITTER Series	
Title	Control drawing (US) Intrinsic Safety				
No.	DIE0026-A023	Page	2	Revision	0

Certification: -FS1, -FU1, -VU1
Communication and I/O: -T



c) 2-WISE auxiliary device ports connected with short wires (stub) in the cable



b) 2-WISE auxiliary device ports connected via a series connection in the cable

Yokogawa Electric Corporation		Model		TRANSMITTER Series			
Title	Control drawing (US) Intrinsic Safety						
No.	DIE0026-A023	Page	3	Revision	0		

Notes:
2-WISE Concept allows interconnection of intrinsically safe apparatus and associated apparatus not specially assessed for such a combination. For the acceptance of the interconnection of the different intrinsically safe circuits of these apparatus, the comparison of the voltage Ui (Vmax) with Uo (Voc), the current Ii (Imax) with Io (Ioc), and the power PI (Pmax) with Po (Pmax) are equal to or greater than Uo (Voc), Io (Isc) and Po (Pmax) of the connected circuits. In addition, the maximum internal capacitance (Ci) and maximum internal inductance (Li) of each apparatus (other than those from auxiliary devices) connected to a 2-WISE system must not exceed 5 nF and 10 µH respectively.
In a powered 2-WISE system only 2ports (power source and power load) are allowed to be connected at the opposite ends of a cable, with maximum of two auxiliary devices connected in between. The power source port supplies DC power to the system, and the power load port consumes DC power from the system. Auxiliary device ports may also consume DC power from the system.
The voltage Uo (Voc) of a power source port must be in the range of 14 V to 17,5 V. Any other device connected to the cable shall be passive, meaning that it is not allowed to provide energy to the system, with the exception of a leakage current of 1 mA for a power load port and a leakage current of 50 µA for each auxiliary device port. The intrinsically safe circuit of a 2-WISE port shall be galvanically isolated from non-intrinsically safe circuits.
The parameters of cable used to interconnect 2-WISE must be as follows:

cable resistance Rc: 15…150 Ohm/km
cable inductance Lc: 0,4…1 mH/km
cable capacitance Cc: 45…200 nF/km
Cc = Cc line/line + 0.5 Cc line/screen, if both lines are floating, or
Cc = Cc line/line + Cc line/screen, if the screen is connected to one line
Length of cable (not including cable stubs) ≤ 200m
Length of cable stubs: ≤ 1m

If the above rules are respected, the inductance and capacitance of the cable will not impair the intrinsic safety of the installation.

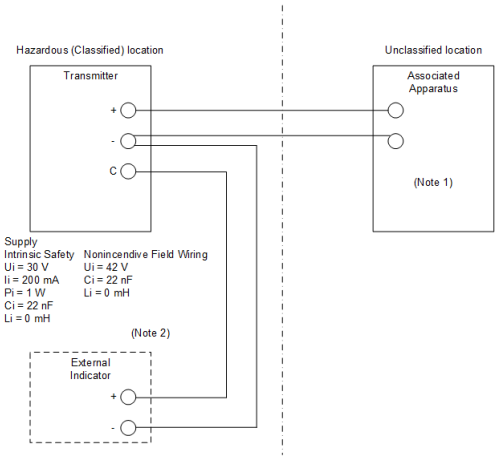
Simple Apparatus meet following conditions can be connected 2-WISE system.
internal inductance Li and internal capacitance Ci less than 1uH and 1nF

Yokogawa Electric Corporation		Model		TRANSMITTER Series			
Title	Control drawing (US) Intrinsic Safety						
No.	DIE0026-A023	Page	4	Revision	0		

Circuit connection with an external indicator

Certification: -FS1, -FU1, -VU1
Communication and I/O: -J

Intrinsic Safety	Nonincendive
Class I Division 1 Group ABCD	Class I Division 2 Group ABCD
Class II Division 1 Group EFG	Class II Division 2 Group FG
Class III Division 1	Class III Division 1
Class I Zone 0 Group IIC	Class I Zone 2 Group IIC



Yokogawa Electric Corporation		Model		TRANSMITTER Series	
Title	Control drawing (US) Intrinsic Safety				
No.	DIE0026-A023	Page	5	Revision	0

Notes:
1. Except Associated Nonincendive Field Wiring Apparatus, the Associated Apparatus must be a linear power source whose output current is resistively limited.
2. Maximum voltage, current, and power applied to External Indicator are equal to Uo, Io, and Po of Associated Apparatus (Transmitter does not convert the voltage, current, or power).
3. The Associated Apparatus must be FM-approved.
4. The following conditions must be satisfied for each circuit. When more than one intrinsically safe apparatus are connected in an intrinsically safe circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Io (or Isc) ≤ Ii
   Po ≤ Pi
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable
5. Control equipment connected to the Associated Apparatus must not use or generate a voltage more than Um of the Associated Apparatus.
6. The control drawing of the Associated Apparatus must be followed when installing the equipment.
7. In case Nonincendive Field Wiring Concept is used for the interconnection, FM-approved Associated Nonincendive Field Wiring Apparatus, which meets the following conditions, must be used as the Power Supply / Control Equipment. When more than one Nonincendive Field Wiring Apparatus are connected in a Nonincendive Field Wiring circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

Transmitter provides nonincendive field wiring outputs and hazardous location suitability of the output: Class I/II Division 2 Group ABCDFG and Class III Division 1.

4. Canadian Certification

Certificate: FM25CA0015X

4.1 Explosionproof (Approval Code: -CF1, -CU1, -VU1)

4.1.1 Technical Data

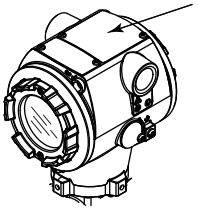
- Applicable Standard
  CSA C22.2 No. 25
  CSA C22.2 No. 30
  CSA C22.2 No. 94.2
  CSA C22.2 No. 60079-0
  CSA C22.2 No. 60079-1
  CSA C22.2 No. 60079-31
  CSA C22.2 No. 61010-1-12
  CSA C22.2 No. 60079-40
- Specific Ex Marking
  Flameproof for
  Ex db IIC T6...T4 Gb
  Dust-Ignitionproof for
  Ex tb IIIC T85°C Db
  Explosion-proof for
  Class I, Groups B, C, and D;
  Temperature Code: T6...T4
  Dust-Ignitionproof for
  Class II/III, Groups E, F, and G;
  Temperature Code: T6
- Ambient Temperature
  See “4.1.6 Specific conditions of use.”
- Process Temperature
  See “4.1.6 Specific conditions of use.”
- Power Supply
  HART: 10.5 to 42 Vd.c., 21.6 mA(max)
- Maximum Working Pressure
  50 MPa (MWP varies depending on the model codes. Refer to the General Specifications or the nameplate of each product.)
- Enclosure
  For Division system of area classification: Type 4X

4.1.2 Process Seal

Dual seal without annunciation (up to 50 MPa).

4.1.3 Installation

- For Zone
  When Ta is ≥ 49°C, heat-resisting cables and cable glands with rated temperature of ≥ 90°C must be used.
  LORSQUE LA TEMPÉRATURE AMBIANTE ≥ 49°C, UTILISER LE CÂBLE RÉSISTANT À LA CHALEUR ET LA GLANDE DE CÂBLE ≥ 90 °C.
- When installing the equipment, the selected Type of Protection should be ticked as follows.
  ☑ Ex db IIC T6…T4 Gb
  ☐ Ex tb IIIC T85°C Db
- Cable glands, adapters and/or blanking elements with a suitable IP rating shall be of Ex db IIC / Ex tb IIIC certified by certification body and shall be installed so as to maintain the specific degree of protection (IP Code or Type) of the equipment.
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the nameplate.



Marking	Screw form / size
M20	ISO M20 × 1.5
1/2NPT	ANSI 1/2NPT

F01.ai

- For Division
  Conduit Seal not Required.

4.1.4 Operation

WARNING

- POTENTIAL ELECTROSTATIC CHARGING HAZARD
  DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES
  Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.
- AFTER DE-ENERGIZING, DELAY 10 MINUTES BEFORE OPENING
  APRÈS MISE HORS TENSION, ATTENDRE 10 MINUTES AVANT L’OUVERTURE.

4.1.5 Maintenance and Repair

WARNING

- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.
- The transmitter can be recalibrated. The process connectors and bug screen can be disassembled from the transmitter and restored by the users for cleaning and replacement purpose. Refer to IM 01C33B01-01EN for procedures.

4.1.6 Specific Conditions of Use

- For Zone system of area classification
  Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.

  Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.

  The fasteners used to fasten the shaft onto the enclosure shall only be replaced with Yokogawa fastener, Part number: F9900RH and B1054BB.

  For transmitters with a membrane made of titanium, ignition hazard due to impact and friction on the membranes shall be avoided.

  When the Electrical connection model code is 2 or 4, installation of equipment shall be installed using both field wiring entries with suitable conduit or cable gland.

  Conduit Seal Fittings be suitably rated and certified for the end use low ambient temperature.

  Refer to the following table for details of ambient temperature and process temperature ratings.

Ex db

Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas	–	T6	-60°C≤Ta≤+75°C	-60°C≤Tp≤+80°C
		T5	-60°C≤Ta≤+80°C	-60°C≤Tp≤+95°C
		T4	-60°C≤Ta≤+75°C	-60°C≤Tp≤+120°C

Ex tb

Type	Output signal code	Maximum surface temperature	Ambient temperature	Process temperature
Dust	–	T85°C	-40°C≤Ta≤+75°C	-40°C≤Tp≤+80°C

- For Division system of area classification
  Refer to the following table for details of ambient temperature and process temperature ratings.

Ex db

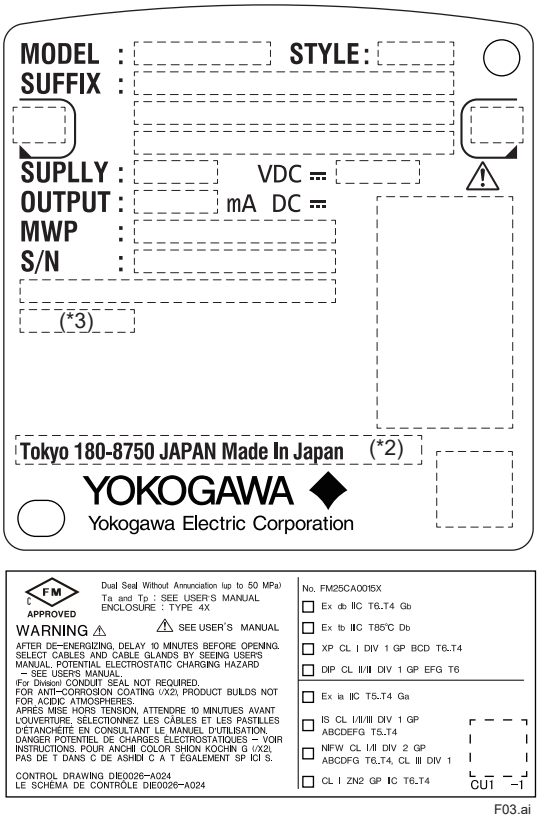
Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas	–	T6	-50°C≤Ta≤+75°C	-50°C≤Tp≤+80°C
		T5	-50°C≤Ta≤+80°C	-50°C≤Tp≤+95°C
		T4		-50°C≤Tp≤+130°C

Ex tb

Type	Output signal code	Maximum surface temperature	Ambient temperature	Process temperature
Dust	–	T6	-40°C≤Ta≤+75°C	-40°C≤Tp≤+80°C

4.1.7 Nameplate

Example for the nameplate in case of approval code -CU1, Canadian explosionproof and intrinsic safety type.



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- MODEL: Specified model code
- SUFFIX: Suffix codes of the model code
- STYLE: Specified style code
- SUPPLY: Power supply voltage of apparatus
- OUTPUT: Output signal of apparatus
- MWP: Maximum working pressure of apparatus
- S/N.: Manufacturing serial number
- Cable Entry: Screw form / size
- YOKOGAWA ◆: Name of manufacturer

- Tokyo 180-8750 JAPAN: address of manufacturer (*1)
- TYPE 4X: Enclosure protection code
- WARNING: Warning to apparatus
- No. FM25CA0015X: Certification number

*1: “180-8750” is a zip code which represents the following address: 2-9-32 Nakacho, Musashino-shi, Tokyo Japan
*2: Country of origin
*3: Year and month of manufacturing

4.2 Intrinsic safety (Certification Code: -CS1, -CU1, -VU1)

4.2.1 Technical Data

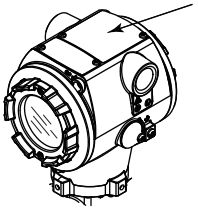
- Applicable Standard
  CSA C22.2 No. 94.2
  CSA C22.2 No. 213
  CSA C22.2 No. 60079-0
  CSA C22.2 No. 60079-11
  CSA C22.2 No. 61010-1-12
  CSA C22.2 No. 60079-40
  CSA C22.2 No. 0
- Specific Ex marking
  Intrinsic safety for
  IS Class I, Division 1, Groups A, B, C, D;
  Class II, Division 1, Groups E, F, G;
  Class III, Division 1;
  Temperature Code: T5…T4
  Zone 0, Ex ia IIC T5…T4 Ga
  Nonincendive for
  Class I, Division 2, Groups A, B, C, D,
  Class II,Division 2, Groups F, G;
  Class III, Division 1;
  Temperature Code: T6…T4
  Class I, Zone 2, Group IIC T6…T4
- Ambient Temperature
  See “4.2.6 Specific conditions of use”.
- Process Temperature
  See “4.2.6 Specific conditions of use”.
- Power Supply
  HART: 10.5 to 30 Vd.c., 21.6 mA(max)
  PROFINET(APL): 9 to 15 Vd.c., 55.56 mA(max), 0.54W(max)
  Nonincendive: 10.5 to 42 Vd.c., 21.6 mA(max)
- Enclosure
  For Division system of area classification: Type 4X
- Maximum Working Pressure
  50 MPa (MWP varies depending on the model codes. Refer to the General Specifications or the nameplate of each product.)

4.2.2 Process Seal

Dual seal without annunciation (up to 50 MPa).

4.2.3 Installation

- When installing the equipment, the selected Type of Protection should be ticked as follows.
  ☑ Ex ia IIC T5…T4 Ga
  ☐ IS CL I/II/III DIV 1 GP ABCDEFG T5…T4
  ☐ NIFW CL I/II DIV 2 GP ABCDFG T6…T4, CL III DIV 1
  ☐ CL I ZN 2 GP IIC T6…T4
- The equipment shall be installed in accordance with C22.1 and relevant local codes and requirements.
- See the control drawing DIE0026-A024. (4.2.8 Control Drawing.)
- Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the nameplate.



Nameplate

Marking	Screw form / size
M20	ISO M20 × 1.5
1/2NPT	ANSI 1/2NPT

F01.ai

4.2.4 Operation

WARNING

- POTENTIAL ELECTROSTATIC CHARGING HAZARD
  DANGER POTENTIEL DE CHARGES ÉLECTROSTATIQUES
  Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.

4.2.5 Maintenance and Repair

WARNING

- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.
- The transmitter can be recalibrated. The process connectors and bug screen can be disassembled from the transmitter and restored by the users for cleaning and replacement purpose. Refer to IM 01C33B01-01EN for procedures.

4.2.6 Specific Conditions of Use

- Precaution shall be taken to minimize the risk from electrostatic discharges or propagating brush discharges on the non-metallic parts (excluding glass parts), metal tag plate or coated parts of the equipment.
- When the enclosure of the equipment is made of aluminum alloy, if it is mounted in Zone 0, it must be installed such that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.
- For nonincendive, the installer must ensure the process temperature does not increase the ambient temperature above the maximum ambient temperature value allowed for the temperature code marked on the product.
- Refer to the following table for details of ambient temperature and process temperature ratings.

Ex ia

Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas	-J	T5	-55°C≤Ta≤+40°C	Tp≤+95°C
		T4	-55°C≤Ta≤+60°C	Tp≤+120°C

Type	Output signal code	Maximum surface temperature	Ambient temperature	Process temperature
Dust	-J	T85°C	-40°C≤Ta≤+60°C	Tp≤+80°C
		T100°C		Tp≤+95°C
		T120°C		Tp≤+115°C

Nonincendive

Type	Output signal code	Temperature class	Ambient temperature	Process temperature
Gas Dust	-J	T6	-40°C≤Ta≤+53°C	-40°C≤Tp≤+80°C
		T5	-40°C≤Ta≤+66°C	-40°C≤Tp≤+95°C
		T4	-40°C≤Ta≤+80°C	-40°C≤Tp≤+130°C

4.2.7 Nameplate

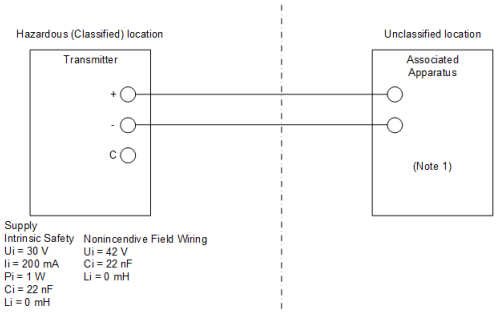
Please see an example in 4.1.7 “Nameplate.”

4.2.8 Control Drawing

Yokogawa Electric Corporation		Model		TRANSMITTER Series			
Title	Control drawing (Canada) Intrinsic Safety						
No.	DIE0026-A024	Page	1	Revision	0	Date	2023-10-31
Revised pages	–						

Certification: -CS1, -CU1, -VU1
Communication and I/O: -J

Intrinsic Safety	Nonincendive
Class I Division 1 Group ABCD	Class I Division 2 Group ABCD
Class II Division 1 Group EFG	Class II Division 2 Group FG
Class III Division 1	Class III Division 1
Class I Zone 0 Group IIC	Class I Zone 2 Group IIC



Supply
Intrinsic Safety
Ui = 30 V
Ii = 200 mA
Pi = 1 W
Ci = 22 nF
Li = 0 mH

Nonincendive Field Wiring
Ui = 42 V
Ci = 22 nF
Li = 0 mH

Notes:
1. Expect Associated Nonincendive Field Wiring Apparatus, the Associated Apparatus must be a linear power source whose output current is resistively limited.
2. The following conditions must be satisfied for each circuit. When more than one intrinsically safe apparatus are connected in an intrinsically safe circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Io (or Isc) ≤ Ii
   Po ≤ Pi
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable
3. Control equipment connected to the Associated Apparatus must not use or generate a voltage more than Um of the Associated Apparatus.
4. The control drawing of the Associated Apparatus must be followed when installing the equipment.
5. In case Nonincendive Field Wiring Concept is used for the interconnection, FM-approved Associated Nonincendive Field Wiring Apparatus, which meets the following conditions, must be used as the Power Supply / Control Equipment. When more than one Nonincendive Field Wiring Apparatus are connected in a Nonincendive Field Wiring circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

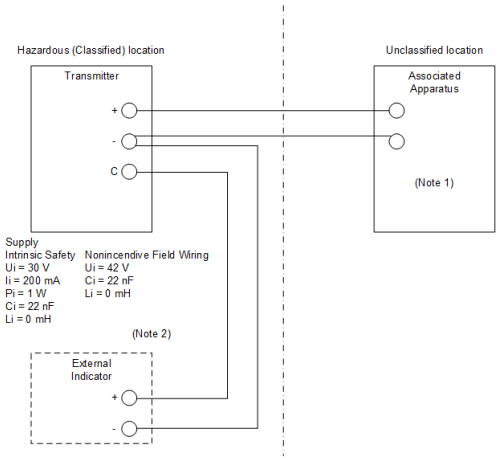
Transmitter provides nonincendive field wiring outputs and hazardous location suitability of the output: Class I/II Division 2 Group ABCDFG and Class III Division 1.

Yokogawa Electric Corporation		Model		TRANSMITTER Series	
Title	Control drawing (Canada) Intrinsic safety				
No.	DIE0026-A024	Page	2	Revision	0

Circuit connection with an external indicator

Certification: -CS1, -CU1, -VU1
Communication and I/O: -J

Intrinsic Safety	Nonincendive
Class I Division 1 Group ABCD	Class I Division 2 Group ABCD
Class II Division 1 Group EFG	Class II Division 2 Group FG
Class III Division 1	Class III Division 1
Class I Zone 0 Group IIC	Class I Zone 2 Group IIC



Supply
Intrinsic Safety
Ui = 30 V
Ii = 200 mA
Pi = 1 W
Ci = 22 nF
Li = 0 mH

Nonincendive Field Wiring
Ui = 42 V
Ci = 22 nF
Li = 0 mH

Yokogawa Electric Corporation		Model		TRANSMITTER Series	
Title	Control drawing (Canada) Intrinsic safety				
No.	DIE0026-A024	Page	3	Revision	0

Notes:
1. Expect Associated Nonincendive Field Wiring Apparatus, the Associated Apparatus must be a linear power source whose output current is resistively limited.
2. Maximum voltage, current, and power applied to External Indicator are equal to Uo, Io, and Po of Associated Apparatus (Transmitter does not convert the voltage, current, or power).
3. The following conditions must be satisfied for each circuit. When more than one intrinsically safe apparatus are connected in an intrinsically safe circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Io (or Isc) ≤ Ii
   Po ≤ Pi
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable
4. Control equipment connected to the Associated Apparatus must not use or generate a voltage more than Um of the Associated Apparatus.
5. The control drawing of the Associated Apparatus must be followed when installing the equipment.
6. In case Nonincendive Field Wiring Concept is used for the interconnection, FM-approved Associated Nonincendive Field Wiring Apparatus, which meets the following conditions, must be used as the Power Supply / Control Equipment. When more than one Nonincendive Field Wiring Apparatus are connected in a Nonincendive Field Wiring circuit, total Ci and Li of the connected apparatus must be considered.
   Uo (or Voc) ≤ Ui
   Co (or Ca) ≥ Ci + Ccable
   Lo (or La) ≥ Li + Lcable

   Transmitter provides nonincendive field wiring outputs and hazardous location suitability of the output: Class I/II Division 2 Group ABCDFG and Class III Division 1.

Revision Information

- Title: OpreX Pressure Transmitter
  EJX S Series Explosion Protection for US and CANADA
  (Approval Codes -FS1, -FF1, -FU1, -CS1, -CF1, -CU1, and -VU1)
- Manual No.: IM 01C33A21-01EN

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