

General Specifications

EXA ISC

Model ISC202G, ISC202S, ISC202SJ 2-wire Inductive Conductivity Transmitter

GS 12D06A03-01E

■ General

The EXA ISC202 transmitter is a user programmable instrument for conductivity measurements in medium to highly conductive process liquids, using inductive measuring principles. It is used in combination with the Yokogawa model ISC40 inductive conductivity sensor, for concentration monitoring applications in the chemical industry and for various other conductivity applications in the food and pharmaceutical industry, the plating and metal finishing industry and pulp & paper industry. The robust chromated cast aluminium housing, makes it the ideal 2-wire transmitter for mounting directly on-site, even under tough environmental conditions.

Its 2-wire concept gives low installation costs, a safe operation and easy maintenance in the field. HART® communication is also available.

The ISC202 features user-selectable process dedicated temperature compensation for various (strong) acids and alkalis.

The process linearised output function and the “%”-concentration displays contribute to a highly functional inductive conductivity based concentration analyzer.



■ Features

- Process optimised temperature compensation on fit the instrument in any application.
- Extremely wide measuring range (> 6 decades) while maintaining a high resolution and accuracy using only one sensor type : 0 to 1999 mS/cm.
- Free programmable setting of the output range, including a 21-step table output to linearise the output function e.g. to % by weight.
- Programmable % by weight display indication.
- Proven simple 3-level operation system using YES/NO prompts where each level can separately be protected from unwanted access by a 3-digit passcode.
- Passive 2-wire system, 4 to 20 mA for easy installation at low costs and safe operation at 24 V DC.
- HART®, PROFIBUS-PA, FOUNDATION Fieldbus H1 communications

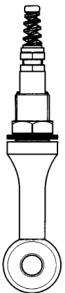
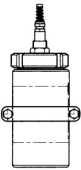
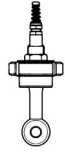
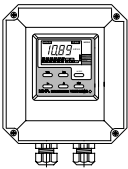
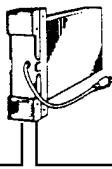
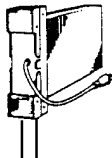
■ Applications

- Applications where severe electrode fouling prevents the use of contacting electrodes.
- All ranges except the (ultra) pure water applications.
- Chemical processes except concentrated sulfuric, nitric, and fluoric acids.
- Slurry applications where conventional systems suffer from plugging or erosion.
- Applications where the 6-decimal rangeability is necessary for accurate process control.

■ System configuration

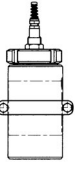
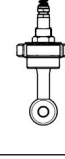
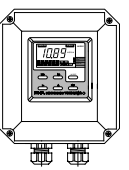
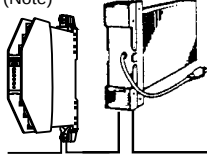
Refer to applicable GS for inductive conductivity sensor, fitting, terminal box, and extension cable.

Non-explosionproof System

Inductive Conductivity Sensor	Holders	Inductive Conductivity Transmitter	Distributor
Non-explosionproof type  ISC40G ISC40GJ	- Immersion ISC40FD ISC40FDJ - Flow-Through ISC40FF ISC40FFJ - Direct Insertion ISC40FS ISC40FSJ   	Non-explosionproof type Inductive Conductivity Transmitter ISC202G 	- Dedicated Distributor for EXA PH SC ISC PH201G*B  - Output 1 to 5 V DC - Hold contact output - Failure contact output - General Purpose Type Distributor SDBT, SDBS  - Output 1 to 5 V DC

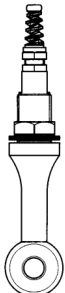
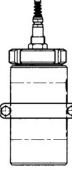
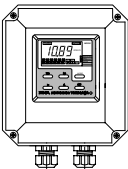
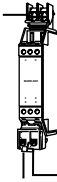
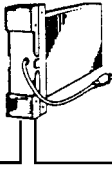
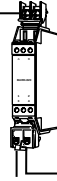
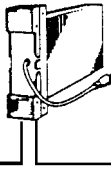
F001.EPS

Explosionproof System for ISC202S

Inductive Conductivity Sensor	Holders	Inductive Conductivity Transmitter	Safety Barrier & Distributor
Explosionproof type  ISC40S	- Immersion ISC40FD - Flow-Through ISC40FF - Direct Insertion ISC40FS   	Intrinsically safe type Inductive Conductivity Transmitter ISC202S  (Note) For intrinsically safe approval, use the safety barrier certified by the testing laboratories. (BARD-400, BARD-800 are not applicable.)	- Safety Barrier (Note) - Distributor  Output

F002.EPS

Explosionproof System for ISC202SJ (TIIS Certification)

Inductive Conductivity Sensor	Holders	Inductive Conductivity Transmitter	Safety Barrier & Distributor
TIIS certification type  ISC40SJ-TT (Note) The temperature of the sample solution in contact with detector should be the range of -10 to 105°C.	- Immersion ISC40FDJ  - Flow-Through ISC40FFJ  - Direct Insertion ISC40FSJ 	Intrinsically safe type Inductive Conductivity Transmitter ISC202SJ 	- Safety Barrier BARD-820  SUPPLY - Dedicated Distributor PH201G*B  Output 1 to 5 V DC Hold contact output Failure contact output - Safety Barrier BARD-820  SUPPLY - General Purpose Distributor SDBT  Output 1 to 5 V DC (Note) For intrinsically safe approval, BARD-400, BARD-800 are not applicable.)

F002j.EPS

Measurement principle

Unlike -2 or 4- electrode conductivity systems, the ISC202 analyzes conductivity without any contact between the electrodes and process fluid. The measurement is based on the inductive coupling of 2 ring transformers (Toroids) by the liquid.

The ISC202 supplies a reference voltage (V_1) at a high frequency to the "drive coil." The core of this coil is of a highly permeable magnetic material, and a strong magnetic field is generated in the toroid.

The liquid passes through the hole in the toroid and can be considered as a "one turn" secondary winding.

The magnetic field induces a voltage (V_2) in this liquid winding. The induced current thus made to flow is proportional to this voltage and the conductance of the liquid's "one turn winding" is according to Ohm's law.

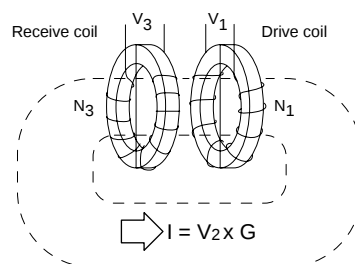
The conductance ($G = 1/R$) is proportional to the specific conductivity and a constant factor that is determined by the geometry of the sensor (the length divided by surface area of the hole in the toroid) and the installation of the sensor.

There are 2 toroids mounted in the doughnut-shaped sensor. The liquid also flows through the second toroid and therefore the liquid turn can be considered as the primary winding of the second ring transformer. The current in the liquid will create a magnetic field in the second toroid.

The induced voltage (V_3) being the result of this magnetic field can be measured as the output. The output voltage of this "receive coil" is, therefore, proportional to the specific conductivity of the process liquid.

There are 2 toroids mounted in the doughnut-shaped sensor.

Inductive conductivity measurement principle



F003.EPS

Process dedicated temperature compensation

The ISC202 features optimisation of the temperature compensation for virtually any process. From neutral salt solutions to the most concentrated acids and alkalis. From tight controlled and/or very stable processes to processes that have extreme variations in both conductivity and temperature. The ISC202's temperature compensation can easily be adapted to meet the accuracy requirements for temperature compensation imposed by the process control targets.

Temperature compensation based on the IEC 60746-3 table for NaCl solution can be selected for standard conductivity measurements in different processes.

For measurements requiring accuracy such as concentration applications, the temperature compensation can be tailored to the process. This is done during commissioning of the transmitter by using the actual process solution by programming a (linear) temperature

coefficient : "α" (see Figure 1). For processes where the temperature coefficient varies with temperature and concentration (eg Sodiumhydroxide and Sulphuric acid), matrix compensation is applied.

To further simplify transmitter set up, the matrices for several common process solutions are stored in memory. Any of these can be selected from the Service Menu of the transmitter. These include:

Sulphuric Acid	H ₂ SO ₄	0.5 - 5.0 %	0 - 100 °C
Sulphuric Acid	H ₂ SO ₄	2.5 - 25.0 %	0 - 100 °C
Hydrochloric Acid	HCl	0.5 - 5.0 %	0 - 60 °C
Hydrochloric Acid	HCl	1.0 - 20.0 %	0 - 60 °C
Nitric Acid	HNO ₃	0.5 - 5.0 %	0 - 80 °C
Nitric Acid	HNO ₃	2.5 - 25.0 %	0 - 80 °C
Sodium Hydroxide	NaOH	0.5 - 5.0 %	0 - 100 °C
Sodium Hydroxide	NaOH	0.5 - 15.0 %	0 - 100 °C

If your process is not covered by one of these selectable curves, the user can create curves specific to the process. This is done by building a simple matrix table of temperature related conductivity values. Thus the accuracy of the measurement is fine-tuned to the specific process conditions.

The matrix compensation method guarantees optimal accuracy where TC dependence from conductivity and process temperature is taken into account.

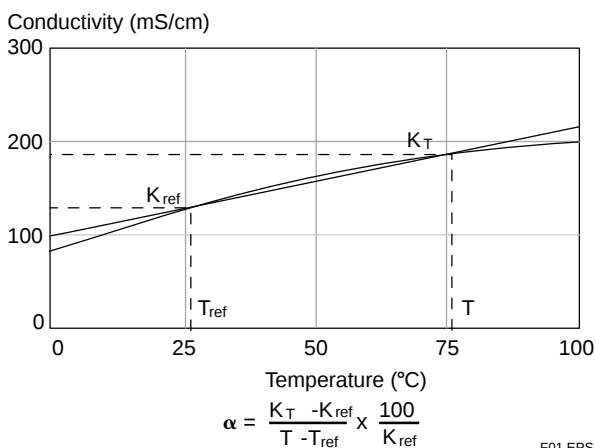


Figure 1 Definition of temperature compensation factor (α)

■ Output signal

The standard ISC202 features a 4-20 mA current output available for recording, indication or control functions which represent:

- the measured conductivity value

In addition the following output functions are available:

- a "HOLD" function that holds the last measured process value or a fixed value during maintenance or commissioning
- a "BURN" function that gives a high, low or pulsed output at fail status
- a programmable output function that allows the user to linearise the output when used as a concentration analyzer.

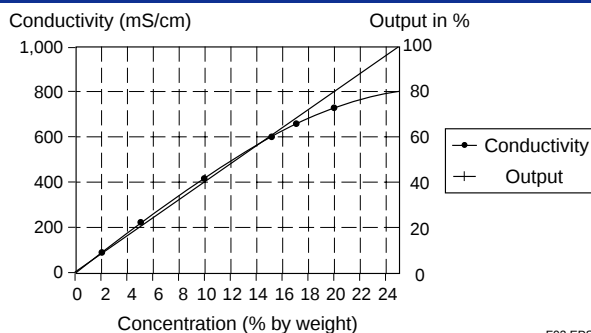


Figure 2 Linearization of output (Example: 0-25% Sulfuric acid)

Table 1 where Conductivity is converted to concentration (Example: 0-25% Sulfuric acid)

Code Output	mA 4-20	Conc. % H ₂ SO ₄	Cond. mS/cm
0	4.0	0.00	0
5	4.8	1.25	60
10	5.6	2.50	113
15	6.4	3.75	180
20	7.2	5.00	211
25	8.0	6.25	290
30	8.8	7.50	335
35	9.6	8.75	383
40	10.4	10.00	424
45	11.2	11.25	466
50	12.0	12.50	515
55	12.8	13.75	555
60	13.6	15.00	590
65	14.4	16.25	625
70	15.2	17.50	655
75	16.0	18.75	685
80	16.8	20.00	718
85	17.6	21.25	735
90	18.4	22.50	755
95	19.2	23.75	775
100	20.0	25.00	791

■ Fault diagnosis - burnout function

The measurement is continuously checked for faults, giving warning of abnormal conductivity readings and cable problems. These faults are signaled by the FAIL flag and can be transmitted to the control room by a current of 21 mA, or 3.6 mA (burn). This is also available in HART communication. The fault is also signaled by a special marker field in the display, and an error code in the message display.

■ Cell constant (Installation Factor)

The ISC40 sensor is a doughnut-shaped sensor. When installing the sensor, be sure to allow the process fluid to flow through the doughnut hole and around the sensor freely.

The sensor is provided with a gasket and retaining nut. This allows "bulkhead mounting" in a tank wall or standard flange through a hole with a 27-mm diameter (A). The insertion depth is 124 mm. Using a 20-mm size wrench, the sensor can be easily mounted and aligned.

The WF10(J) Extension Cable may be used with the BA10, BA20 Terminal Box. The total length of the extension cable and the sensor cable should not exceed 50 m.

The installation factor of the ISC40 is the ratio of the measured conductivity at the sensor and the specific conductivity of the solution. The unit is cm⁻¹ just as the cell constant of a contact electrode system. An installation factor unique to each sensor is indicated on the label of the sensor cable. (The nominal value is 1.88 cm⁻¹.) This

factor varies depending on materials of process piping and the distance between the doughnut sensor and process piping. If the distance is less than 30 mm, sensor calibration is required before using the ISC40. From the calibration results, the ISC202 will calculate an installation factor corresponding to the installation conditions and use it for conductivity measurement.

In case where sensor calibration is difficult to be conducted, enter the manually calculated installation factor into the ISC202 following the instructions below.

-When a sensor is installed in the standard stainless steel holder, ISC40FF-S, ISC40FFJ-S:

An installation factor decreases approximately 7%.
Reduce the value indicated on the label of the sensor cable by 7%, and then enter the result.

-When a sensor is installed in the standard polypropylene holder, ISC40FF-P, ISC40FFJ-P:

An installation factor increases approximately 1%.
Increase the value indicated on the label of the sensor cable by 1%, and then enter the result.

-When a sensor is installed in long piping with a distance (D) between the sensor and piping, as shown in Figure 3:

The installation factor for pipe mounting (reference data when the nominal value is 1.88 cm⁻¹) is shown in Figure 3. Divide the value indicated on the label of the sensor cable by 1.88 and then multiply the quotient by the value obtained from Figure 3. Enter the result.

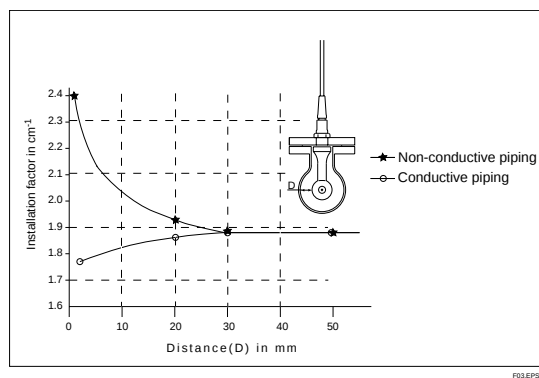


Figure 3 Installation Factor (Reference) for Pipe Mounting

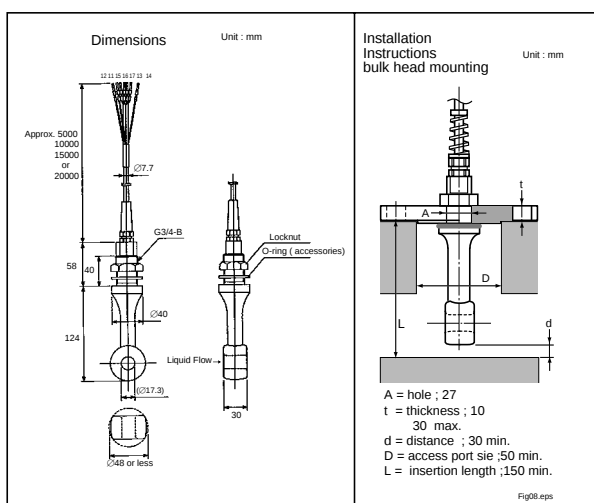


Figure 4 Three level operation

With this 3-level user-friendly approach, the instrument can be operated by anyone.

All three levels can be separately protected against unauthorised access by a password system using a three digit code.

HART Communication

One of the features of smart field devices is their ability to detect faults, either in the device electronics or in an associated sensor. Using a fieldbus system, such faults are reported in the device status byte in every message (assuming that communication is still possible!). For HART, it is still useful to follow the convention of indicating fault conditions by setting the analogue output current to a value which is recognisably beyond the normal operating range (including the small amount of linear over-range commonly allowed). If it is still alive, the current output value is set to an appropriate value with the intention that a host system should be able to set alarm thresholds just outside the normal 4 to 20 mA range, to indicate measurement out-of-range, and to set further alarm thresholds to indicate a fault condition.

DD specification and other support files

The ISC202 Device Description (DD) files are available enabling communications compatible HOST devices (and HHT for HART). Other files to support AMS, PRM and PDM are available as well.

■ General specifications

1. TRANSMITTER

Input specifications : Compatible with the Yokogawa inductive conductivity ISC40 series with integrated temperature sensor: Pt1000 or 30k Ω NTC.
ISC202S: use with ISC40S
ISC202SJ: use with ISC40SJ-TT

Input ranges
- Conductivity : 0 to 1999 mS/cm at 25 °C (77 °F) reference temperature.
- Temperature : -20 to 140 °C (4 to 284 °F) .
- Cable length : max. 60 meters total length of fixed sensor cable + WF10(J) extension cable.
Influence of cable can be adjusted by doing an AIR CAL with the cable connected to a dry cell.
Terminal box and extension cable can not be used with ISC202SJ.

Functional specification

Accuracy (under reference conditions):
(Output span is 0 - 100 μ S/cm or more)

- Conductivity :
Linearity : $\pm (0.4 \%FS + 0.3 \mu S/cm)$
Repeatability : $\pm (0.4 \%FS + 0.3 \mu S/cm)$
- Temperature : $\pm 0.3 ^\circ C$

Note on accuracy specifications: The following tolerance is added to above performance.
mA output tolerance : ± 0.02 mA of "4 - 20 mA"

- Step response : ≤ 8 seconds for 90 % (for 2 decade step).

Indicating range

Main display : 0 to 1999 mS/cm (1st compensation)
Message display : 0 to 1999 mS/cm (2nd compensation),
Temperature -20 to 140 °C (0 to 280 °F)
Concentration 0 to 100.0 %
Temperature compensation methods NaCl, T.C., Matrix
Cell constant [cm⁻¹]
Reference Temperature (°C/°F)
Software Release.

Transmission signal

Output signal : Isolated output of 4-20 mA DC.
Burn up (21 mA) or Burn down (3.6 mA when HART or distributor comm. is non-used, 3.9 mA when HART or distributor comm. is used) or pulse of 21 mA to signal failure.

Hold : Outputs may be set to hold the last or a fixed value during maintenance.

Transmission range

Conductivity : Minimum span: 100 μ S/cm
Maximum span: 1999 mS/cm
Setting value at 4 mA output: ≤ 90 % of setting value at 20 mA output

Maximum load resistance :

For the ISC202G, see figure 5.

200 Ω or less with the PH201G

50 Ω or less with the SDBT

For the ISC202S, see figure 6.

For the ISC202SJ using with BARD-820, wiring resistance between ISC202SJ and BARD-820 should be 25 Ω or less .

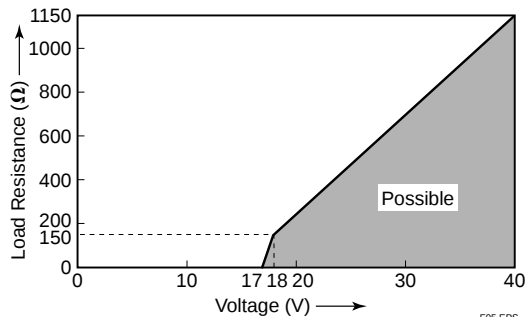


Figure 5 Supply voltage/ load diagram (ISC202G)

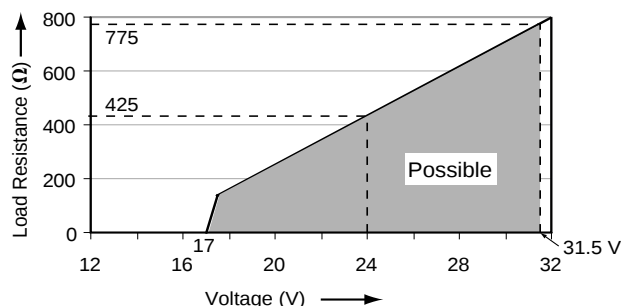


Figure 6 Supply voltage/ load diagram (ISC202S)

Environment and operational conditions

Ambient temp. : -10 to +55 °C (10 to 130 °F)
Storage temp. : -30 to +70 °C (-20 to 160 °F)
Relative humidity : 10 to 90% RH at 40°C ambient temperature, non condensing

Temperature compensation

Sensor types : Pt1000 or 30k Ω NTC.
Automatic : -20 to 140 °C (0 to 280 °F)
Algorithm : selectable as mentioned below
NaCl according to IEC 60746-3 tables.
Two T.C. setting possible between 0.00 to 3.50 %/°C
Matrix: user selectable/ configurable. 8 selectable for concentrated solutions, 1 free programmable.
Reference temperature adjustable between -20 to 140 °C (0 to 280 °F)

Sensor diagnostics : Abnormal temperature, abnormal conductivity values, e.g. dry cell, wiring problems.

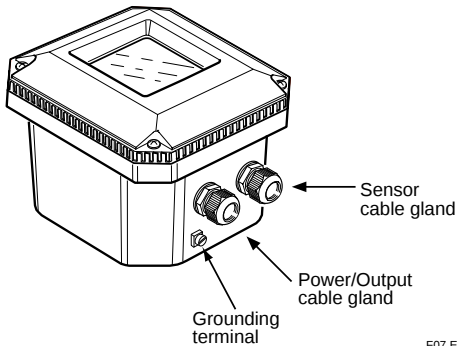
Calibration : Manual, calibration Input pre-measured data (cell constant).

Weather resistant : IP65, NEMA 4X, Type 3S

Mounting : Pipe, Wall or Panel.

Dimensions : Refer to the appropriate external dimensions.

- Weight : approx. 1.6 kg
Mounting brackets weight approx. 0.7 kg
- Logbook : Software record of important events and diagnostic data.
- Construction
- Display : Custom liquid crystal display
 - Main display : 3 1/2 digits, 12.5 mm high, zero change included.
 - Message display : 6 alphanumeric characters, 7 mm high.
 - Special fields : Flags for status indication : FAIL and HOLD.
 - Measuring units : $\mu\text{S}/\text{cm}$ or mS/cm
 - Key prompts : YES, NO, >, ^, ENT, Menu pointer
 - Keys : 6 keys operated through flexible window with tactile feedback. One hidden key behind the front cover.
- Power supply : Normal 24 V DC loop powered system, see Figure 5, 6, 7.
ISC202G: 17 - 40 V DC
ISC202S: 17 - 31.5 V DC
ISC202SJ: 16.3 - 31.5 V DC
- Input Isolation : Maximum 1000 V DC
- Housing
- Material : Cast aluminium case with chemically resistant coating, cover with flexible polycarbonate window.
 - Color : Case : Off-white (Equivalent to Munsell 2.5Y8.4/1.2)
Cover : Deepsea Moss green (Equivalent to Munsell 0.6GY3.1/2.0)
 - Cable gland : 2-Pg13.5



F07.EPS

- Automatic safeguard: Return to measuring mode after 10 minutes when no keystroke.
- Operation protection : 3 digital pass codes (programmable).
- Data protection : EEPROM for configuration.
- Cable and terminals: The glands will form a tight seal on cables with an outside diameter in the range of 6 to 12 mm.
For terminal end, see right figure.

Requirement of connecting with external instruments

	Terminal for pin cable terminal	Screw terminal (option /TB)
Crimp contact for cable	Pin-shaped crimp contact with sleeve insulator	Ring-shaped or fork-shaped crimp contact
Usable contact	max. 2.5 mm	Crimp contact shown as the figures under this table, which meets M3 screw
Torque for fixing	0.5 N·m or less	1.35 N·m (recommended)
Example of crimp contact*	Weidmuller Co., Ltd. made: H0.34/10, H0.5/12, H1/12, H1.5/12S	JST, Mfg. Co., Ltd. made: VD1.25-3(Ring shape), VD1.25-S3A(Fork shape)

*Note: Other crimp contact may be required, depending on core-cable diameter.

T02.eps

Regulatory compliance (without ISC202SJ)

EMC: conforms to EN61326 Class A
AS/NZS CISPR11

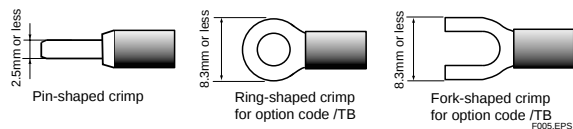
Explosionproof type for ISC202S

Item	Description	Code
Factory Mutual (FM)	FM Intrinsically safe Approval Applicable standard: FM3600, FM3610, FM3810 Intrinsically Safe for Class I, Division 1, Groups ABCD Class I, Zone 0, AEx ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Intrinsically Safe Apparatus Parameters $V_{\text{max}}=31.5 \text{ V}$, $I_{\text{max}}=100 \text{ mA}$, $P_{\text{max}}=1.2 \text{ W}$, $C_i=22 \text{ nF}$, $L_i=35 \mu\text{H}$	-A
	FM Non-incendive safe Approval Applicable standard: FM3600, FM3611, FM3810 Non-incendive Safe for Class I, Division 2, Groups ABCD, Zone 2 Temp. Class: T4, Amb. Temp.: -10 to 55°C Non-incendive Safe Apparatus Parameters $V_{\text{max}}=31.5 \text{ V}$, $C_i=22 \text{ nF}$, $L_i=35 \mu\text{H}$	-N
CENELEC ATEX	CENELEC ATEX (KEMA) Intrinsically safe Approval Applicable standard: EN60079-0, EN50020 EN60079-26 Certificate: KEMA 06ATEX0222 X Ex ia IIC, Group: II, Category: 1G Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C $U_i=31.5 \text{ V}$, $I_i=100 \text{ mA}$, $P_i=1.2 \text{ W}$, $C_i=22 \text{ nF}$, $L_i=35 \mu\text{H}$	-A
	CENELEC ATEX (KEMA) Type of protection "n" Applicable standard: EN60079-0:2006, EN60079-15:2003 Certificate: KEMA 06ATEX0223 Ex nA [nL] IIC, Group: II, Category: 3G Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C $U_i=31.5 \text{ V}$, $C_i=22 \text{ nF}$, $L_i=35 \mu\text{H}$	-N

2.EPS

Item	Description	Code
Factory Mutual (FM)	FM Intrinsically safe Approval Applicable standard: FM3600, FM3610, FM3810 Intrinsically Safe for Class I, Division 1, Groups ABCD Class I, Zone 0, AEx ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Intrinsically Safe Apparatus Parameters Entity { $V_{\text{max}}=24 \text{ V}$, $I_{\text{max}}=250 \text{ mA}$, $P_{\text{max}}=1.2 \text{ W}$, $C_i=220 \text{ pF}$, $L_i=0 \mu\text{H}$ FISCO { $V_{\text{max}}=17.5 \text{ V}$, $I_{\text{max}}=380 \text{ mA}$, $P_{\text{max}}=5.32 \text{ W}$, $C_i=220 \text{ pF}$, $L_i=0 \mu\text{H}$	-P or -F
	FM Non-incendive safe Approval Applicable standard: FM3600, FM3611, FM3810 Non-incendive Safe for Class I, Division 2, Groups ABCD, Zone 2 Temp. Class: T4, Amb. Temp.: -10 to 55°C Non-incendive Safe Apparatus Parameters Entity { $V_{\text{max}}=32 \text{ V}$, $P_{\text{max}}=1.2 \text{ W}$, $C_i=220 \text{ pF}$, $L_i=0 \mu\text{H}$ FNICO { $V_{\text{max}}=32 \text{ V}$, $P_{\text{max}}=5.32 \text{ W}$, $C_i=220 \text{ pF}$, $L_i=0 \mu\text{H}$	-B or -D

FM.EPS



F005.EPS

Item	Description	Code
CENELEC ATEX Entity	CENELEC ATEX (KEMA) Intrinsically safe Approval Applicable standard: EN60079-0, EN50020 EN60079-26 Certificate: KEMA 07ATEX0052 X Ex ia IIC, Group: II, Category: 1G Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=220 pF, Li=0 µH	-P
	or	
CENELEC ATEX FISCO	CENELEC ATEX (KEMA) Intrinsically safe Approval Applicable standard: EN60079-0, EN50020 EN60079-26, EN60079-27 Certificate: KEMA 07ATEX0052 X Ex ia IIC, Group: II, Category: 1G Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=220 pF, Li=0 µH	-F
	or	
CENELEC ATEX	CENELEC ATEX (KEMA) Type of protection "n" Applicable standard: EN60079-0:2006, EN60079-15:2003 Certificate: KEMA 07ATEX0053 EEx nA [nL] IIC, Group: II, Category: 3G Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=32 V, Ci=220 pF, Li=0 µH	-B
	or	-D

ATEX.EPS

Item	Description	Code
Canadian Standards Association (CSA)	CSA Intrinsically safe Approval Applicable standard: C22.2, No. 0-M1991, C22.2, No. 04-M2004, C22.2, No. 157-M1992, C22.2, No. 61010-1 Ex ia Class I, Division 1, Groups ABCD Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Entity { Ui(Vmax)=24 V, Ii(Imax)=250 mA, Pi(Pmax)=1.2 W, Ci=220 pF, Li=0 µH FISCO { Ui(Vmax)=17.5 V, Ii(Imax)=380 mA, Pi(Pmax)=5.32 W, Ci=220 pF, Li=0 µH	-P or -F
	CSA Non-incendive safe Approval or type of protection "n" Applicable standard: C22.2, No.0-M1991, C22.2, No.04-M2004, C22.2, No.157-M1992, C22.2, No.213-M1987, C22.2, No. 61010-1 Class I, Division 2, Groups ABCD Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Entity: Ui(Vmax)=32 V, Ci=220 pF, Li=0 µH FNICO: Ui(Vmax)=32 V, Ci=220 pF, Li=0 µH	-B or -D

CSA.EPS

Item	Description	Code
Canadian Standards Association (CSA)	CSA Intrinsically safe Approval Applicable standard: C22.2, No. 0-M1991, C22.2, No. 04-M2004, C22.2, No. 157-M1992, C22.2, No. 61010-1 Ex ia Class I, Division 1, Groups ABCD Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui(Vmax)=31.5 V, Ii(Imax)=100 mA, Pi(Pmax)=1.2 W, Ci=22 nF, Li=35 µH	-A
	CSA Non-incendive safe Approval or type of protection "n" Applicable standard: C22.2, No.0-M1991, C22.2, No.04-M2004, C22.2, No.157-M1992, C22.2, No.213-M1987, C22.2, No.61010-1 Class I, Division 2, Groups ABCD Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui(Vmax)=31.5 V, Ci=22 nF, Li=35 µH	-N
IECEX Scheme	IECEX Intrinsically safe Applicable standard: IEC 60079-0, IEC60079-11, IEC60079-26 Certificate: IECEX KEM 06.0054X Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=31.5 V, Ii=100 mA, Pi=1.2 W, Ci=22 nF, Li=35 µH	-A
	IECEX Type of protection "n" Applicable standard: IEC 60079-15:2001, IEC 60079-0:2004 Certificate: IECEX KEM 06.0054X Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=31.5 V, Ci=22 nF, Li=35 µH	-N

T12E.EPS

Item	Description	Code
IECEX Scheme Entity	IECEX Intrinsically safe Applicable standard: IEC 60079-0, IEC60079-11, IEC60079-26 Certificate: IECEX KEM 07.0028X Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=24 V, Ii=250 mA, Pi=1.2 W, Ci=220 pF, Li=0 µH	-P
	or	
IECEX Scheme FISCO	IECEX Intrinsically safe Applicable standard: IEC 60079-0, IEC60079-11, IEC60079-26, IEC60079-27 Certificate: IECEX KEM 07.0028X Ex ia IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C Ui=17.5 V, Ii=380 mA, Pi=5.32 W, Ci=220 pF, Li=0 µH	-F
	IECEX Type of protection "n" Applicable standard: IEC 60079-15:2001, IEC 60079-0:2004 Certificate: IECEX KEM 07.0028X Ex nA [nL] IIC Temp. Class: T4, Amb. Temp.: -10 to 55°C T6, Amb. Temp.: -10 to 40°C Ui=32 V, Ci=220 pF, Li=0 µH	-B or -D

IEC.EPS

HART® communications

Input : Two-wire system, 4-20 mA DC

Power supply : ISC202G : up to 40 volts
ISC202S : up to 31.5 volts
ISC202SJ : up to 31.5 volts

Note: The transmitter contains a switched power supply, drawing its energy from the 0-4 mA section of the signal. Consequently the 17 volt limit is applied at 4 mA. The characteristic of the unit is such that above about 7 mA on the output, the terminal voltage can drop to 14.5 volts without problem.

Transmission Signal : Isolated output of 4 to 20 mA DC.
: Maximum load 425Ω at 24 VDC
Burn to signal failure acc. NAMUR Recommendation NE43 (18.01.1994)

Operating range : 3.9 to 21 mA
Communication : HART®, 1200 Baud, FSK
modulated on 4 to 20 mA signal

Configuration Software : Local with 6 keys
: Firmware based on Yokogawa stack.

Hardware : Yokogawa HART Modem
F9197UB

TIIS Intrinsic Safe Type ISC202SJ Transmitter

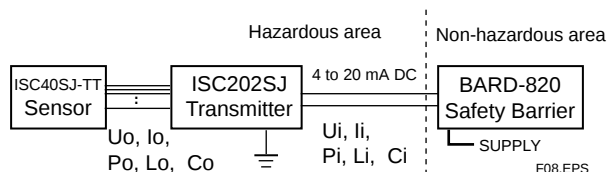
TIIS intrinsically safe type certification

Protection Concept and Adapter Groupe: Ex ia IIC T4

Intrinsic safe rating:

Ui=31.5V, Ii=100mA, Pi=1.2W, Li=35µH, Ci=22nF

Uo=14.4V, Io=20mA, Po=190mW, Lo=88mH, Co=600nF



F08.EPS

Environment and operational conditions

The temperature of the sample solution in contact with ISC40SJ-TT sensor should be the range of -10 to 105°C.

Other Control systems : Yokogawa PRM,
Rosemount AMS, Siemens PDM
Hand Terminal : Rosemount HHT 275/375
Output span :
-Conductivity : min 100 μ S/cm,max.1999 mS/cm.
(max 90% zero suppression)
Cable specification: 0.5 mm diameter or 24 AWG over
maximum length of 1500 m
DD specification : The ISC202 Device Description is
available enabling
communications with the
Handheld communicator and
compatible devices.

PROFIBUS-PA communications

Input signal: Digital
Supply voltage: 9 to 32 V DC
Operating current: 26.0 mA
Operating values: According to IEC 1158-2
Bus connection: Fieldbus interface based on IEC
1158-2 according to FISCO-Model
Power supply: Power supply is achieved dependant
on the application by means of
segment coupler
Data transfer: According to PROFIBUS- PA profile
class B based on EN 50170 and
DIN 19245 part 4
GSD file: The actual file can be downloaded from
www.profibus.com
Configuration: Local with 6 keys
Software: Firmware based on Siemens DPC31 stack.
Hardware: PC- or PCMCIA-interfaces from Siemens
Other control: Siemens PDM systems
Electrical connection: Terminals acc. to IEC 1158-2
Fieldbus-cable-types: Twisted and shielded two wire
cable according to recommendation
based on IEC 1158-2
Cable diameter: 6 to 12 mm (0.24 to 0.47 inch)

FOUNDATION Fieldbus H1 communications

Input signal: Digital
Supply voltage: 9 to 32 V DC
Operating current: 26.0 mA (base current)
Operating values: According to IEC 1158-2
Bus connection: Fieldbus interface based on IEC
1158-2 according to FISCO-Model
Power supply: Power supply is achieved dependant
on the application by means of
segment coupler
Data transfer: FF Specification Rev. 1.4, Basic device
Function blocks: 3xAI, Transducer, Resource
Files: Actual file can be downloaded from our
homepage
Configuration: Local with 6 keys,
Software: National Instruments, NI-FBUS configurator
Hardware: FBUS-interfaces from National Instruments
(AT-FBUS and PCMCIA FBUS)
Other control systems: Yokogawa PRM, DMT

2. DISTRIBUTOR: PH201G (Style B)

The PH201G supplies drive power to 2-wire transmitter.
The PH201G receives a 4-20 mA DC current signal from
the transmitter, and converts the signal to a 1-5 V DC
voltage signal. Simultaneously, it also receives a digital
signal superimposed on the 4-20 mA DC current signal,
and provides as outputs a hold-contact signal and a fail-

contact signal. In addition, the PH201G has a built-in
current regulator so that it will not supply an excess current
even if the circuit or the power supply cable on the
transmitter shorts.

<Input/Output Signal Specifications>

Number of input points
(Number of transmitter units connectable)
: 1 point
Output signal : 1 to 5 V DC (2 points)
Load resistance : 2k Ω or less (1 to 5 V DC Output)
Isolation system : Loop isolation type
Between input and output is not
isolated
Between input/output and power
supply is Isolated

<Mounting / Form>

Mounting method : Indoor rack mounting
Connection method: External signal connection
: M4 screw terminal connection
Power supply / Ground connection :
100V : JIS C8303 ground type 2 plug
connection or M4 screw terminal
connection (option:/TB)
220V : CEE 7VII (European electrical
device standard) plug connection
Cable length : 300 mm
External dimensions
: 180H x 48W x 300D mm
Weight : Approx. 1.7 kg (Including rack and
case)

<Standard Specifications>

Accuracy : $\pm 0.2\%$ of span
Transmitter supply voltage :
: 26.5 $\pm$ 1.5 V DC
Maximum current and power consumption
24V DC : Approx. 4.8 W
100V AC : Approx. 7 VA
220V AC : Approx. 11VA
Insulation resistance
Between I/O terminals and ground pin
: 100 M Ω / 500 V DC
Between power supply pins and ground pin
: 100 M Ω / 500 V DC

<Operating Specifications>

Ambient temperature
: 0 to 50 $^{\circ}$ C
Ambient humidity : 5 to 90% RH (Non-condensing)
Power supply : Dual use AC/DC
100V : DC power 20 to 130 V, no polarity
AC power 80 to 138 V, 47 to 63 Hz
220V : DC power 120 to 340 V, no polarity
AC power 138 to 264 V, 47 to 63 Hz

<Contact Output>

Contact rating : 250 V AC, maximum 100 VA
220 V DC, maximum 50 W
Hold contact output : N.C. 1 contact, Normally energized
Contact closes when power is off
or during maintenance.
Failure contact output
: N.C. 1 contact, Normally energized
Contact closes when power is off
or during failure.

■ Model and suffix codes

1. 2-wire Inductive conductivity transmitter (Non-explosionproof type)

[Style: S2]

Model	Suffix Code	Option Code	Description
ISC202G	.....	.....	2-wire Inductive conductivity transmitter
Type	-A -P -F	..... ..... .....	mA with HART Profibus FF
Language	-J -E	..... .....	Japanese English
Option	Mounting Hardware Hood Tag Plate Conduit Adapter	/U /PM /H /H2 /SCT /AFTG /ANSI /TB /X1	Pipe, wall mounting bracket (Stainless steel) Panel Mounting bracket(Stainless steel) Hood for sun protection (Carbon steel) Hood for sun protection (Stainless steel) Stainless steel tag plate G1/2 1/2NPT Screw terminal (*1) Epoxy baked finish (*2)

(*1) It can be specified when the suffix code -A is selected.

(*2) The housing is coated with epoxy resin.

T03.EPS

2. 2-wire Inductive conductivity transmitter (Explosionproof type)

[Style: S3]

Model	Suffix Code	Option Code	Description
ISC202S	.....	.....	2-wire Inductive conductivity transmitter
Type	-A -P -F -B -N -D	..... ..... ..... ..... ..... .....	Intrinsic safe mA with HART Intrinsic safe Profibus Intrinsic safe FF Non-incendive FF (*2) Non-incendive mA (*2) Non-incendive Profibus (*2)
Language	-J -E	..... .....	Japanese English
Option	Mounting Hardware Hood Tag Plate Conduit Adapter	/U /PM /H /H2 /SCT /AFTG /ANSI /X1	Pipe, wall mounting bracket (Stainless steel) Panel Mounting bracket(Stainless steel) Hood for sun protection (Carbon steel) Hood for sun protection (Stainless steel) Stainless steel tag plate G1/2 1/2NPT Epoxy baked finish (*1)

(*1) The housing is coated with epoxy resin.

(*2) When the instrument with Suffix Code "-B, -N, -D" is used, take measures so that the display window is not exposed to direct sunlight.

T03s.EPS

[Style: S1]

Model	Suffix Code	Option Code	Description
ISC202SJ	.....	.....	Intrinsically safe type inductive conductivity transmitter
Type	-1	.....	TIIS certification (*1)
Language	-J	.....	Japanese
	-E	.....	English
Option	Mounting Hardware	/U	Pipe, wall mounting bracket (Stainless steel)
		/PM	Panel Mounting bracket (Stainless steel)
	Hood	/H	Hood for sun protection (Carbon steel)
		/H2	Hood for sun protection (Stainless steel)
	Tag Plate	/SCT	Stainless steel tag plate
	Conduit Adapter	/AFTG	G1/2
		/ANSI	1/2NPT
		/X1	Epoxy baked finish (*2)

(*1) "TIIS Certification" as a certified explosion approval from the Technology Institution of Industrial Safety.

(*2) The housing is coated with epoxy resin.

T2.2.1E.eps

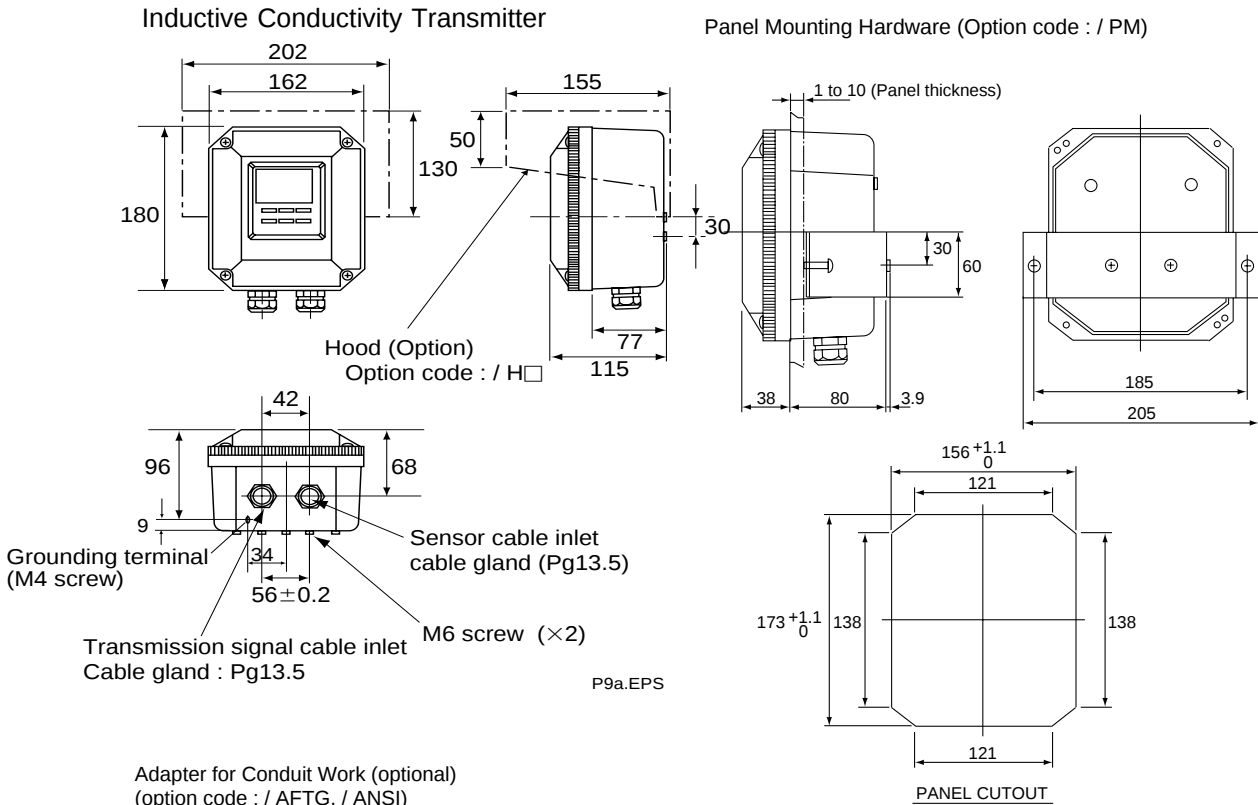
3. Dedicated distributor

Model	Suffix Code	Option Code	Description
PH201G	.....	.....	Distributor
Power Supply	-A1	.....	100V AC
	-A2	.....	220V AC
—	*B	.....	Style B
Option		/TB	Terminal for Power connection

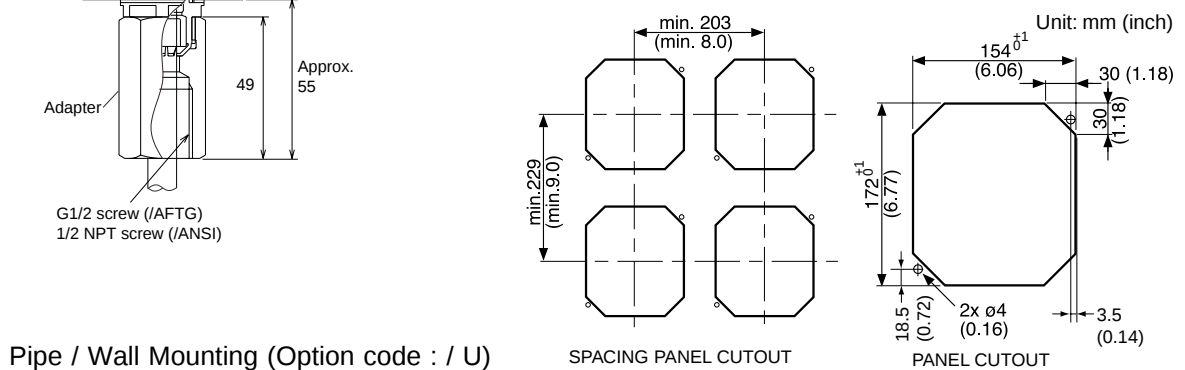
T04.EPS

■ Dimensions

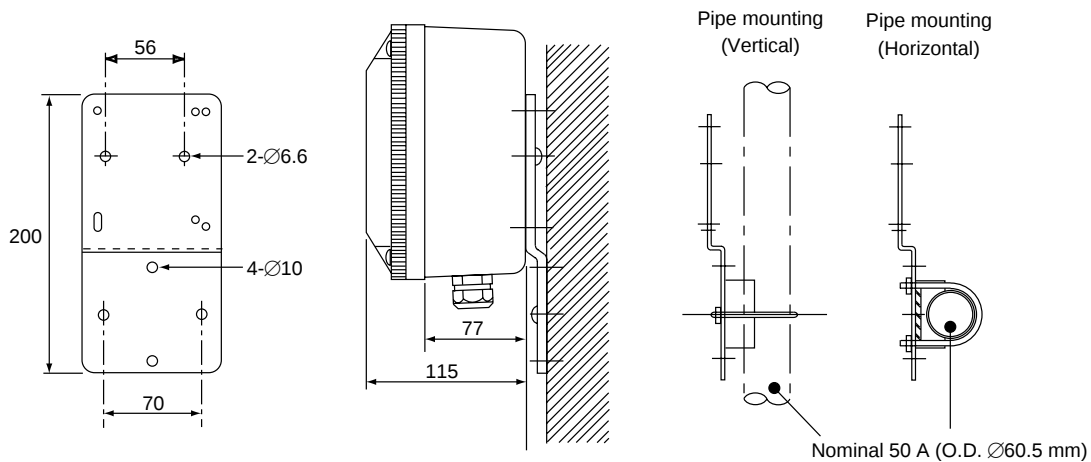
Unit : mm



Panel Mounting when using two (2) self-taping screws

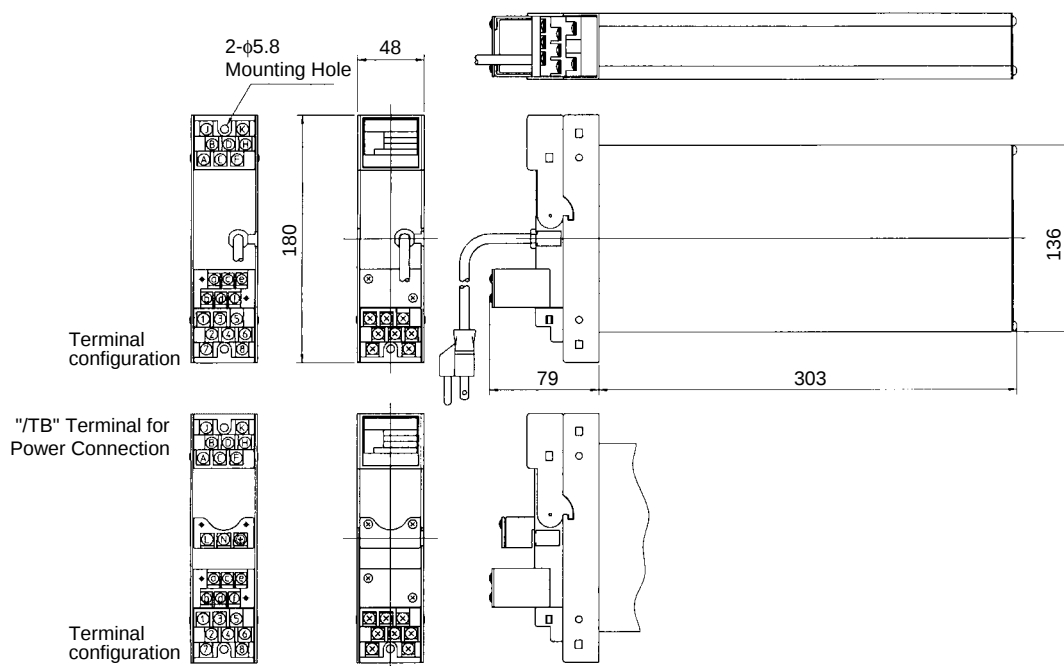


Pipe / Wall Mounting (Option code : / U)



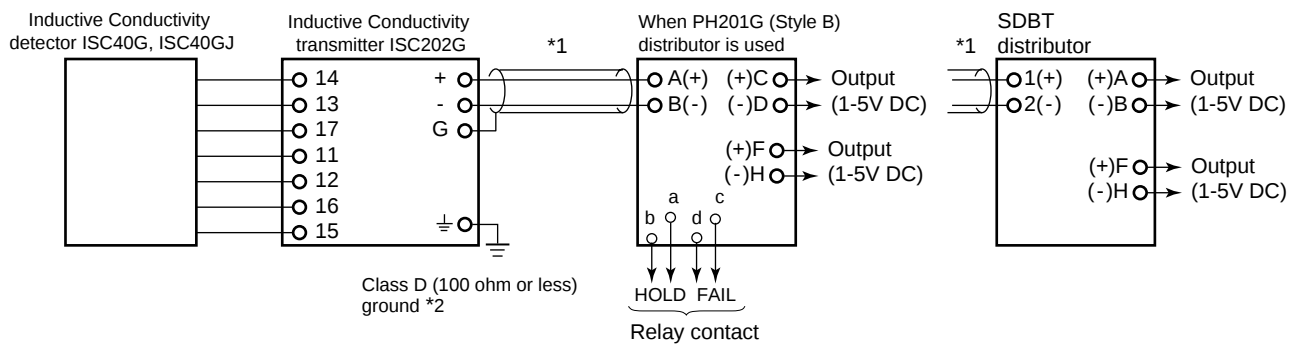
PH201G Distributor (Style B)

Unit : mm



■ External wiring

Non-explosionproof System



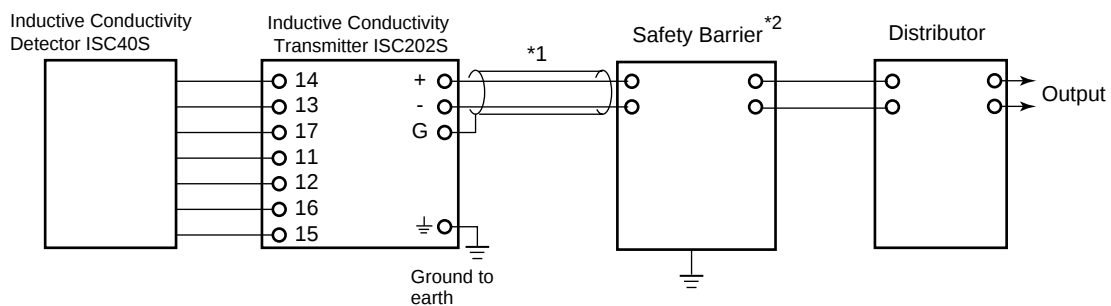
*1 Use two-wire cable with OD (Outside Diameter) of 6 to 12 mm

Make sure distributor voltage does not drop below minimum for ISC202G

*2 Ground ISC202G (Class D ground: 100 ohm or less)

F006.eps

Explosionproof System for ISC202S

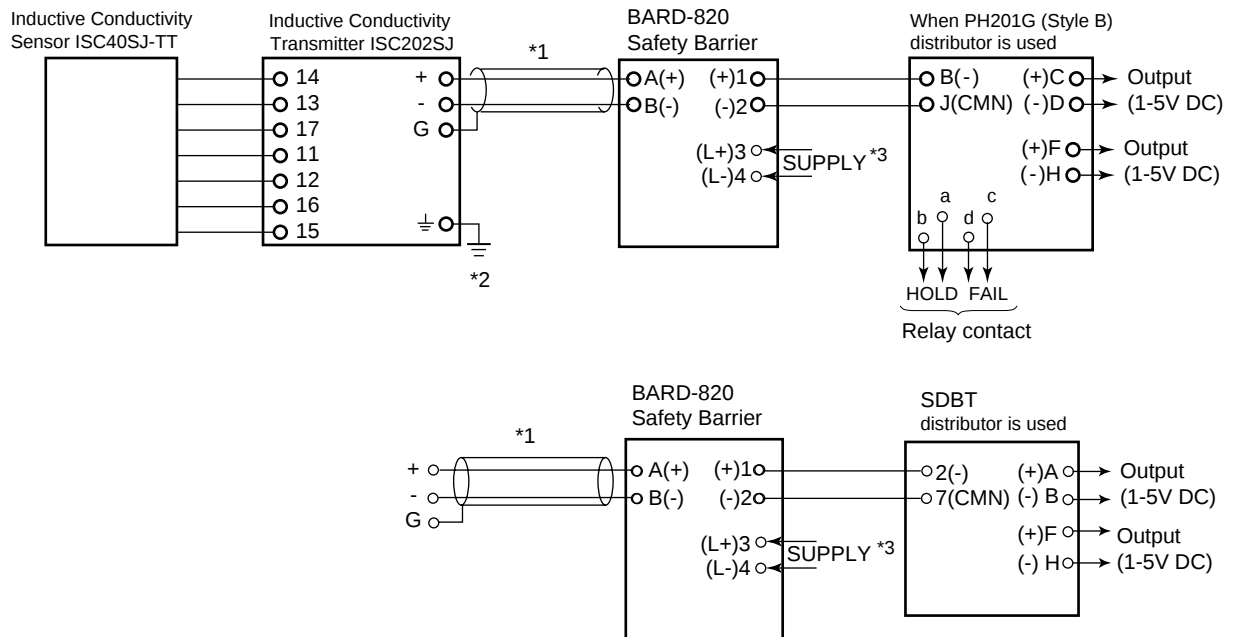


*1 Use two-wire cable with OD (Outside Diameter) of 6 to 12 mm.

*2 For intrinsically safe approval, use the safety barrier certified by the testing laboratories.
In case of non-incendive type (ISC202S-B, -N, -D), the safety barrier is not necessary.

F007-1.eps

Explosionproof System for ISC202SJ (TIIS Certification)



*1 Use two-wire cable with OD (Outside Diameter) of 6 to 12 mm.

*2 ISC202SJ must be grounded using external terminal (grounded resistance: 100 ohm or less). BARD-820 should not be grounded to earth.

*3 BARD-820 is recommended. Power of BARD-820 should be supplied separately. (PH201G or SDBT distributors can not supply power to BARD-820.)

F007.eps

Inquiry Specifications for 2-wire Inductive Conductivity Transmitter System

Make inquiries by filling in related boxes with checks (✓) and writing in the underlined parts.

1. General Items

Name of your company: _____
 Person in charge: _____ Belongs to: _____ (Phone No. _____)
 Name of plant: _____
 Measuring point: _____
 Purpose of use: ☐ Indication ☐ Record ☐ Alarm ☐ Control
 Power supply to Distributor: _____ V AC

2. Measuring Conditions

(1) Liquid temperature: _____ to _____, Normal _____ [°C]
 (2) Liquid pressure: _____ to _____, Normal _____ [kPa]
 (3) Flow rate: _____ to _____, Normal _____ [l / min.]
 (4) Flow speed: _____ to _____, Normal _____ [m / s]
 (5) Slurry or fouling components: ☐ No ☐ Yes
 (6) Name of measuring liquid: _____
 (7) Components of measuring liquid: _____
 (8) Others: _____

3. Installing Location

(1) Ambient temperature: _____
 (2) Installing location: ☐ Outdoors ☐ Indoors _____
 (3) Others: _____

4. Specification Requirements

(1) Measuring range: ☐ _____
 (2) Transmission output: ☐ 4 to 20mA DC ☐ HART® ☐ PROFIBUS-PA ☐ FOUNDATION Fieldbus H1
 (3) Type of transmission output: ☐ Linear ☐ Non-linear
 (4) System configuration selection: ☐ Sensor ☐ Holder ☐ Transmitter ☐ Terminal box ☐ Extension cable
 (5) Sensor mounting: ☐ Immersion ☐ Flow-through ☐ Direct insertion
 (6) Sensor cable length: _____ m
 (7) Extension cable length: _____ m
 (8) Others: _____