FUJI ELECTRIC

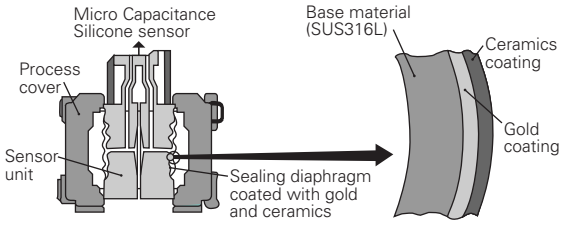
FCX –AX SERIES PRESSURE TRANSMITTER

Hydroseal® Diaphragm Version

DATA SHEET FHG,FKG···3

FEATURES

1. Unique hydroseal diaphragm
   Permeation of hydrogen into the detecting unit through seal diaphragm can be suppressed thanks to the unique seal diaphragm (double coating) which employs coating of gold and ceramic.



2. High accuracy
   ±0.15% accuracy for all calibrated spans is the standard feature for pressure transmitter covering 50 to 10000kPa (or 0.5 to 100 kgf/cm²). Fuji's Micro-capacitance silicon sensor assures this feature.
3. Minimum environment influence
   Fuji's patented "Advanced Floating Cell" design which protects the pressure sensor against changes in temperature and overpressure substantially reduces total measurement error in actual field applications.
4. Replaceable Communication Module
   Fuji micro-electronics manufacturing technology offers replaceable communication module that makes FCX–AX transmitter very unique in design. In case of change in communication protocol, all that needs to be done is just to replace the module and the transmitter gets upgraded to the new version.
5. Fuji/HART bilingual communication module
   The communication module is "bilingual" to speak both Fuji proprietary protocol and HART. Any HART compatible devices can communicate with FCX–AX series transmitters.
6. Application flexibility
   Various options that render the FCX–AX series suitable for almost any process applications include.
   — Analog indicator at either the electronics side or terminal side
   — Full range of hazardous location approvals
   — $4\frac{1}{2}$-digit LCD meter
   — Stainless steel electronics housing
   — Built-in RFI filter and lightning arrester
7. Burnout current flexibility (Under Scale: 3.2 to 3.8mA, Over Scale: 20.8 to 21.6mA)
   Burnout signal level is adjustable using Model FXW hand Held Communicator (HHC) to comply with NAMUR NE43. (Available for amplifier unit from version 24 and FXW (HHC) version 5.3.)

8. Dry calibration without reference pressure
   Thanks to the best combination of unique construction of mechanical parts (Sensor unit) and high performance electronics circuit (Electronics unit), reliability of dry calibration without reference pressure is at equal level as wet calibration.

SPECIFICATIONS

Functional specifications

Type:
Model FHG: 4 to 20mA, Traditional type
Model FKG: 4 to 20mA with digital signal, Smart type

Service: Liquid, gas, or vapour

Span, range and overrange limit:

Type	Static pressure [MPa] (kgf/cm²)	Span limit [kPa] (kgf/cm²) Min. FHG/FKG	Span limit [kPa] (kgf/cm²) Max. FHG/FKG	Range limit [kPa] (kgf/cm²) Lower limit	Range limit [kPa] (kgf/cm²) Upper limit	Over range lemit [MPa] (kgf/cm²)
F□G□02	–0.1 to 0.5 (–1 to 5)	50 (0.5)	500 (5)	Permis-sible negative pressure limit	500 (5)	1.5 (15)
F□G□03	–0.1 to 3 (–1 to 30)	300 (3)	3000 (30)		3000 (30)	9 (90)
F□G□04	–0.1 to 10 (–1 to 100)	1000 (10)	10000 (100)		10000 (100)	15 (150)

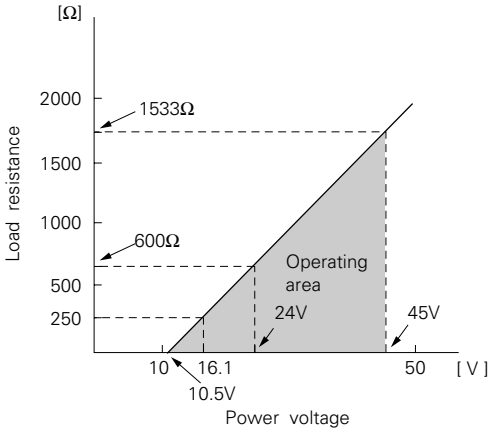
— Lower range limit (vacuum limit) ;
Silicone fill sensor: See Fig. 1
Fluorinated fill sensor: 66kPa abs (500mmHg abs) at below 60°C

— Conversion factors to different units;
1 MPa=10^3 kPa=10bar=10.19716kgf/cm²= 145.0377psi
1kPa=10mbar=101.9716mmH_2O =4.01463inH_2O

Output signal:
Model FHG: 4 to 20mA DC 2-wire
Model FKG: 4 to 20mA DC with digital signal superimposed on the 4 to 20mA signal.

Power supply: Transmitter operates on 10.5V to 45V DC at transmitter terminals.
10.5V to 32V DC for the units with optional arrester.

Load limitations: see figure below



Note: For communication with HHC (Model: FXW), min. of 250 Ω required.

Hazardous locations: (Approval pending)

Authorities	Flameproof	Intrinsic safety	Type N Nonincendive
BASEEFA	Ex ds IIC T5, T6	EEx ia IIC T4, T5	Ex N II T5
Factory Mutual	Class I II III Div. 1 Groups B thru. G	Class I II III Div. 1 Groups A thru. F	Class I II III Div. 2 Groups A thru. G
CSA	Class I II III Div. 1 Groups C thru. G	Class I II III Div. 1 Groups A thru. G	Class I II III Div. 2 Groups A thru. G
RIIS	Ex ds IIB+H_2 T4	—	—
SAA	Ex d II C T5, T6 IP 66/67	Ex ia II C T5, T6 IP 66/67	Ex n II C T5, T6 IP 66/67

Zero/span adjustment:

Model FHG: Zero is adjustable from the external adjustment screw.
The adjustment screw can also function to adjust span when MODE SWITCH (located on the electronics unit) is in the span mode. INHIBIT mode to disable the adjustment screw is also available.

Model FKG: Zero and span are adjustable from the HHC. Zero is also adjustable externally from the adjustment screw.

Damping: Adjustable electrical damping.

Model FHG: The time constant is adjustable to 0, 0.3, 1.2, 4.8, or 19.2 seconds.

Model FKG: The time constant is adjustable between 0 to 38.4 seconds. (9 steps)

Zero elevation/suppression:
Zero can be elevated or suppressed within the specified range limit of each sensor model.

Normal/reverse action:
Selectable by moving a jumper pin located on the electronics unit.

Indication: Analog indicator or $4\frac{1}{2}$ -digit LCD meter, as specified.

Burnout direction: If self-diagnostic detect transmitter failure, the analog signal will be driven to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

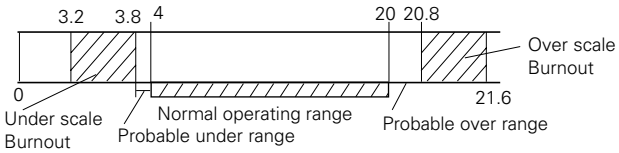
Model FHG: Unless otherwise specified in the order, the transmitter will be shipped in "Output Hold" mode.
(Output signal just before failure happens is maintained.)

Model FKG: Selectable from HHC

"Output Hold":
Output signal is hold as the value just before failure happens.

"Output Overscale":
Approx. 21.6mA
(Adjustable within the range 20.8mA to 21.6mA from HHC)

"Output Underscale":
Approx. 3.8mA
(Adjustable within the range 3.2mA to 3.8mA from HHC)



Loop-check output:

Model FHG: Transmitter can output a constant signal of 4mA, 12mA, or 20mA if MODE SWITCH is set to the loop check mode.

Model FKG: Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC.

Temperature limit: Ambient: –40 to +85°C
(–20 to +80°C for LCD indicator)
(–40 to +60°C for arrester option)
(–10 to +60°C for fluorinated oil fill transmitter)
For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.
Process: –40 to +100°C for silicone fill sensor
–20 to +80°C for fluorinated oil fill sensor
Storage: –40 to +90°C

Humidity limit: 0 to 100% RH

Communication: (Model FKG only)
With HHC (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Items	Display	Set
Tag No.	*v*	*v*
Model No.	*v*	*v*
Serial No.	*v*	—
Engineering unit	*v*	*v*
Range limit	*v*	—
Measuring range	*v*	*v*
Damping	*v*	*v*
Output mode	*v*	*v*
Burnout direction	*v*	*v*
Adjustment	*v*	*v*
Output adjust	—	*v*
Data	*v*	—
Self diagnoses	*v*	—
Printer	—	—
External switch lock	*v*	*v*
Transmitter display(*)	*v*	*v*

Note: (*) HHC's version must be more than 5.0 (or FXW □□□□1–□2), to use this function.

Performance specifications

Accuracy rating: (including linearity, hysteresis, and repeatability)

For spans greater than 1/10 of URL: ±0.15% of span

For spans below 1/10 of URL (Model FKG only):

$$\pm \left(0.1+0.05 \frac{0.1 \times \text{URL}}{\text{Span}}\right) \% \text{ of span}$$

Linearity: 0.05% of calibrated span

Stability: ±0.15% of upper range limit (URL) for 24 months

Temperature effect:

Effects per 28°C change between the limits of –40°C and +85°C

Zero shift: $\pm(0.1+0.075 \frac{\text{URL}}{\text{span}})\%$ /28°C

Total effect: $\pm(0.125+0.075 \frac{\text{URL}}{\text{span}})\%$/28°C

Overrange effect: Zero shift; at maximum span is ±0.4/–0.1 MPa (–1kgf/cm^2) to over range limit

Supply voltage effect:

Less than 0.05% of calibrated span per 10V

RFI effect: Less than 0.2% of URL for the frequencies of 20 to 1000MHz and field strength 30 V/m when electronics covers on.
(Classification: 2-abc: 0.2% span per SAMA PMC 33.1)

Step response: Time constant: 0.2s
Dead time: approximately 0.3s
(without electrical damping)

Mounting position effect:

Zero shift, less than 0.1kPa {1m bar} for a 10° tilt in any plane.
No effect on span. This error can be corrected by adjusting Zero.
(Double the effect for fluorinated fill sensors)

Dielectric strength:

500V AC, 50/60Hz 1 min., between circuit and earth.

Insulation resistance:

More than 100MΩ at 500V DC.

Turn-on time: 4 sec.

Internal resistance for external field indicator:

12Ω or less

Physical specifications

Electrical connections:

G1/2, 1/2-14 NPT, Pg13.5, or M20 x 1.5 conduit, as specified.

Process connections:

1/4-18 NPT or Rc1/4 as specified.

Process-wetted parts material:

Material code	Process cover	Wetted sensor body	
		Diaphragm	Other wetted parts
C	316 stainless steel (*1)	316L stainless steel (*2)	316 stainless steel

Notes: *(1) SCS14 per JIS G 5121
*(2) The diaphragm face is coated with gold and ceramic.

Remark: Sensor O-rings : Viton and teflon selectable

Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy (standard), finished with polyester coating, or 304 stainless steel, as specified.

Bolts and nuts: Cr-Mo alloy (standard), or 304 stainless steel.

Fill fluid: Silicone oil (standard) or fluorinated oil (Daifloil)

Mounting bracket: Carbon steel with epoxy coating or 304 stainless steel, as specified

Environmental protection:

IEC IP67 and NEMA 4X

Mounting: On 60.5mm (JIS 50A) pipe using mounting bracket, direct wall mounting, or direct process mounting.

Mass {weight}: Transmitter approximately 3.4kg without options.

Add; 0.5kg for mounting bracket
0.8kg for indicator option
4.5kg for stainless steel housing option

Optional features

Indicator: A plug-in analog indicator (1.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing.
An optional $4\frac{1}{2}$ digits LCD meter is also available.

Arrester: A built-in arrester protects the electronics from lightning surges.
Lightning surge immunity : 4KV (1.2 x 50us)

Oxygen service: Special cleaning procedures are followed throughout the process to maintain all process wetted parts oil-free.
The fill fluid is fluorinated oil.

Chlorine service: The fill fluid is fluorinated oil.

Degreasing: Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.

NACE specification:
Metallic materials for all pressure boundary parts comply with NACE MR-01-75. ASTM B7M or L7M bolts and 2HM nuts (Class II) are standard.

Vacuum service: Special silicone oil and filling procedure are applied.
See below figure.

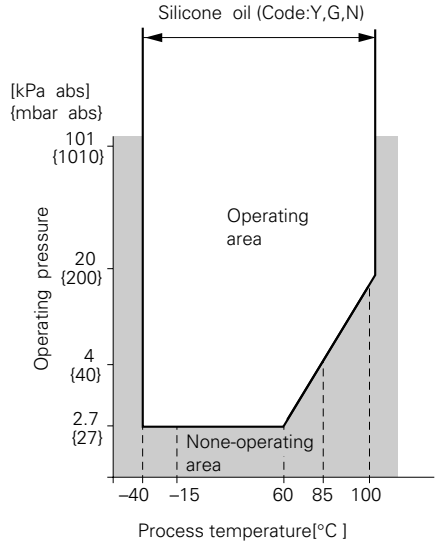


Fig. 1 Relation between process temperature and operating pressure

Customer tag: A stainless steel tag with customer tag data is wired to the transmitter.

Coating of cell: Cell's surface is finished with epoxy/polyurethane double coating. Specify if environment is extermely corrosive.

ACCESSORIES

Oval flanges: (Model FFP, refer to Data Sheet No. EDS6-10)
Converts process connection to 1/2-14 NPT or to Rc1/2; in carbon steel or in 316 stainless steel.

Hand-held communicator:
(Model FXW, refer to Data Sheet No. EDS8-47)

Communication module: (Standard for model FKG)
When using this module for model FHG, remote setting function becomes available.
Remark: When the communication module is connected, the operation mode of external zero/span adjustment screw is changed to zero adjustment.

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN510412. The applicable standards used to demonstrate compliance are :-

EMI (Emission) EN50081-1 : 1992

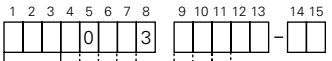
Test item	Frequency range	Basic standard
Applicable Electro-magnetic Radiation Disturbance	30-1000MHz	EN55022 Class B

EMS (Immunity) EN50082-1 : 1992

No.	Test item	Test specification	Basic standard	Performance criteria
1	Electrostatic discharge	8kV (Air)	IEC 801-2:1984	B
2	Radio-frequency electromagnetic field.	27-500MHz 3V/m (Unmodulated)	IEC 801-3:1984	A
3	Fast transients common mode	0.5kV, 5/50 (Tr/Th) ns 5kHz Rep.	IEC 801-4:1988	B

"LVD - The transmitter is not covered by the requirements of the LVD standard."

CODE SYMBOLS



	Description
	Type
FHG	4 to 20mA, Output type
FKG	4 to 20mA with digital signal, Output type

Connections

	Process connection	Oval flange screwConduit	Conduit connection
S	Rc1/4	7/16-20UNF	G 1/2
T	1/4-18NPT	7/16-20UNF	1/2-14NPT
V	1/4-18NPT	M10	Pg 13.5
W	1/4-18NPT	M10	M20×1.5
X	1/4-18NPT	7/16-20UNF	Pg 13.5

Span [KPa] (kgf/cm²)

2	50…… 500	(or 0.5…5)	FHG
3	300 3000	(or 3…30)	FHG
4	1000… 10000	(or 10…100)	FHG
7	50…… 500	(or 0.5…5)	FKG
8	300 3000	(or 3…30)	FKG
9	1000… 10000	(or 10…100)	FKG

Material and arrester

	Process cover	Wetted cell body: Diaphragm	Wetted cell body: Other wetted parts
C	SUS316	SUS316L (Note 1)	SUS316

Indicator and arrester

	Indicator	Arrester
A	None	None
B	Analog, 0 to 100% linear scale	None
D	Analog, Custom scale	None
J	Analog, Double scale	None
E	None	Yes
F	Analog, 0 to 100% linear scale	Yes
H	Analog, Custom scale	Yes
K	Analog, Double scale	Yes
L	Digital, 0 to 100% linear scale	None
P	Digital, Custom scale (Note 2)	None
Q	Digital, 0 to 100% linear scale	Yes
S	Digital, Custom scale (Note 2)	Yes

Approvals for hazardous locations (Approval pending)

A	None (for ordinary locations)
B	JIS, Flameproof (Conduit seal) (Available for 4th digit code "S")
C	JIS, Flameproof (Cable gland seal) (Available for 4th digit code "S")
D	FM, Flameproof (or explosionproof) (Available for 4th digit code "T")
E	CSA, Flameproof (or explosionproof) (Available for 4th digit code "T")
M	BASEEFA, Flameproof (Conduit seal)
N	BASEEFA, Flameproof (Cable gland seal) (Conduit connection G 1/2 only)
H	FM, Intrinsic safety and Nonincendive
J	CSA, Intrinsic safety and Nonincendive
K	CENELEC, Intrinsic safety
P	CENELEC, Intrinsic safety and BASEEFA, Type N
R	SAA Flameproof (Conduit seal)(Available for 4th digit cord ("S,T,W)
T	SAA Intrinsic safety (Available for 4th digit cord ("S,T,W)
Q	SAA Type–N (non-sparking)(Available for 4th digit cord ("S,T,W)

Process connection

	Side vent/drain	Mounting bracket	Process conneection method
A	None	None	Standard
B	None	Yes (carbon steel)	Standard
C	None	Yes (stainless steel)	Standard
D	Yes	None	Standard
E	Yes	Yes (Carbon steel)	Standard
F	Yes	Yes (stainless steel)	Standard
G	Yes	None	Rear connection
H	Yes	Yes (Carbon steel)	Rear connection
J	Yes	Yes (stainless steel)	Rear connection

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

F H G □ □ □ □ 3 □ □ □ □ □ – □ □

F K G □ □ □ □ 3 □ □ □ □ □ – □ □

	Description		
	Special specifications		
	Stainless steel tag	Stainless steel elec. housing	Corrosion-resistive coating of cell
Y	None	Without	None
G	Yes	Without	None
C	None	With	None
E	Yes	With	None
M	None	Without	Yes
N	Yes	Without	Yes
P	None	With	Yes
Q	Yes	With	Yes

	Treatment	Fuill fluid
Y	None	Silicon oil
W	None	Fluorinated oil
G	Degreasing	Silicon oil
A	Oxygen service	Fluorinated oil
N	Nace specification	Silicon oil

Oring

A Viton

B Teflon

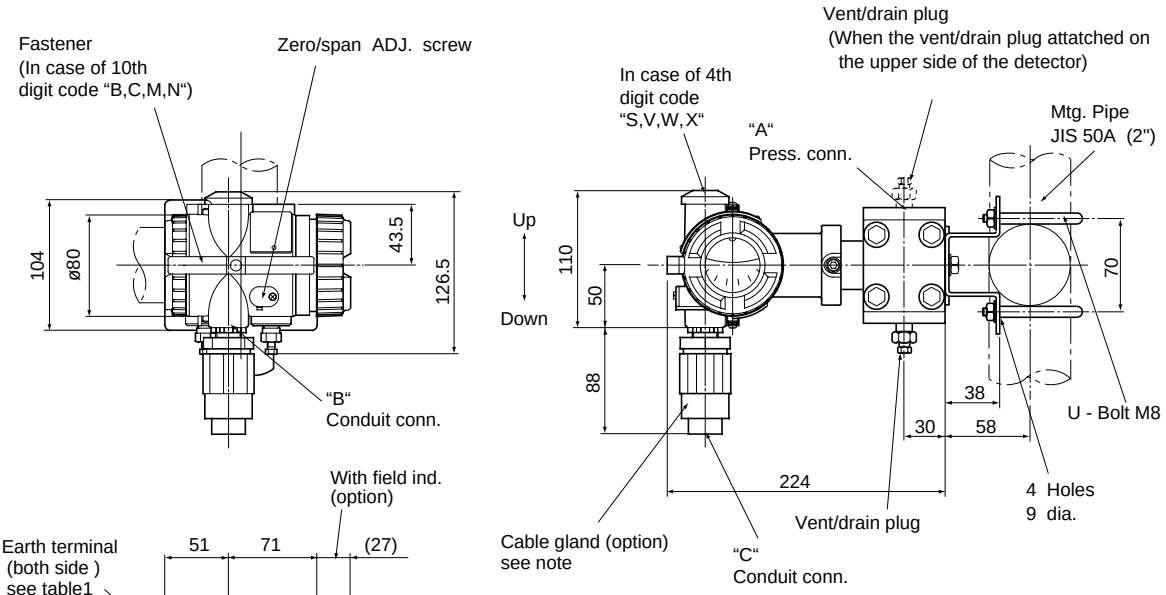
	Vent/drain type	Casing bolt/nut material	Remarks
A	Standard	Standard (hexagonal socket head cap bolt)	
B	Outlet vertical to	Cr-Mo hexagonal bolt/nut	
C	axial direction	NACE bolt/nut (ASTM A193 B7M/A 194 2HM)	
D		NACE bolt/nut (ASTM A320 L7M/A194 2HM)	
E		Stainless steel SUS304/SUS304	
G	A Type	Standard (hexagonal socket head cap bolt)	
H	(Outlet aligned in	Cr-Mo hexagonal bolt/nut	
J	axial direction)	NACE bolt/nut (ASTM A193 B7M/A 194 2HM)	
K		NACE bolt/nut (ASTM A320 L7M/A194 2HM)	
L		Stainless steel SUS304/SUS304	
N	Long-A Type	Standard (hexagonal socket head cap bolt)	
P	Outlet aligned in	Cr-Mo hexagonal bolt/nut	
Q	(axial direction)	NACE bolt/nut (ASTM A193 B7M/A 194 2HM)	
R		NACE bolt/nut (ASTM A320 L7M/A194 2HM)	
S		Stainless steel SUS304/SUS304	

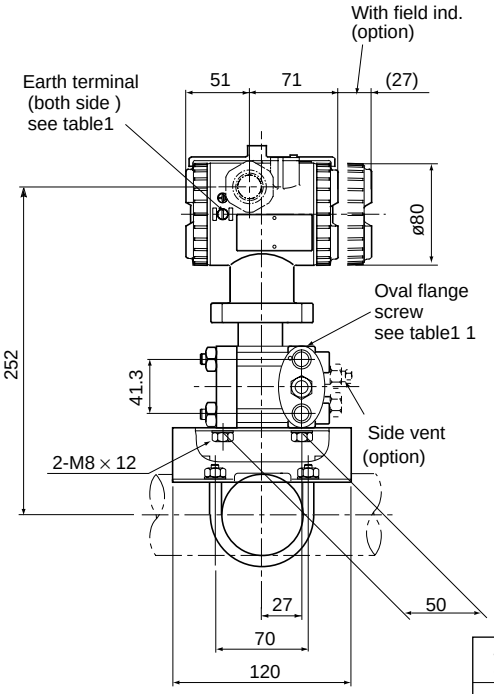
Notes: 1. The diaphragm face is coated with gold and ceramic.
2. Digital indicator / custom scale indication can be selected only for model FKG.
3. The safety barrier can be ordered in PWXA□□□1.

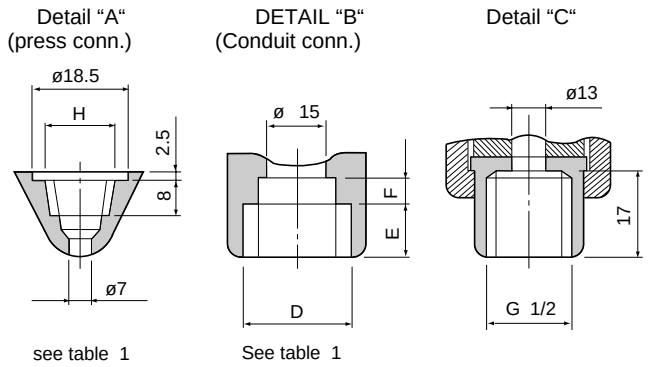
ORDERING INFORMATION

When ordering, specify the output direction (burnout direction) selected with an error has occurred on the transmitter. Unless otherwise specified, the output direction will be held.

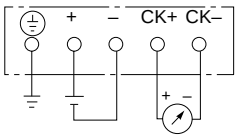
OUTLINE DIAGRAM (Unit:mm)







CONNECTION DIAGRAM



4th digit code	Conduit conn. D	E	F	Press. conn. H	Oval flange screw	Earth terminal
S	G1/2	17	8	Rc1/4	7/16-20UNF Screw depth13	M4
T	1/2 –14NPT	16	5	1/4–18NPT	7/16-20UNF Screw depth13	No. 8-32UNC
V	Pg13.5	8	4.5	1/4–18NPT	M10 Screw depth13	M4
W	M20 × 1.5	16	5	1/4–18NPT	7M10 Screw depth13	M4
X	Pg13.5	8	4.5	1/4–18NPT	7/16-20UNF Screw depth13	M4

Table 1

Note1) : Cable gland is supplied in case of flamproof packing type.
ø11 cable is suitable.

F [H/K] G [S/T/V/W/X] 0 □ [C] 3

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