

FCX – AX SERIES SMALL FLANGE REMOTE SEAL TYPE PRESSURE TRANSMITTER

DATA SHEET

FHW,FKW...3

The FCX –AX Series small flange remote seal type pressure transmitter accurately measures gauge pressure and transmits a proportional 4 to 20mA signal. The transmitter utilizes a unique micromachined capacitance silicon sensor with state-of -the-art microprocessor technology to provide exceptional performance and functionality. Totally welded construction of the seals assures excellent reliability in high temperature and highly corrosive process conditions.

FEATURES

- 1. Directly connectable to 1-1/2in and 2in flanges**
The transmitter is connectable to 1-1/2in and 2in pipes without a reducer.
- 2. Connectable to 1/2in and 3/4in pipes**
Use of direct mounting adapter allows the transmitter to be connected to the following process.
1/2in and 3/4in flanges
Screw connection 1/2-14NPT, 3/4-14NPT, Rc1/2, Rc3/4
- 3. Minimum environmental influence**
The "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 suitable for almost any process applications include:
 - Analog indicator at either the electronics side or terminal side
 - Full range of hazardous area approvals
 - Built-in RFI filter and lightning arrester
 - 4¹/₂ -digits LCD meter
 - Stainless steel electronics housing
 - Wide selection of materials
 - High temperature, vacuum seals



- 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

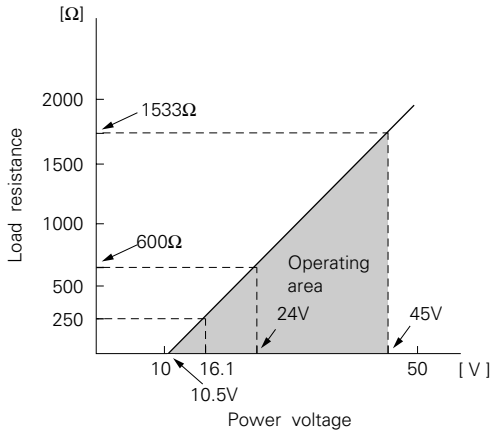
Functional specifications

- Type:**
Model FHW: 4 to 20mA
Model FKW: 4 to 20mA with digital signal
- Service:** Liquid, gas, or vapour
- Span, range, and overrange limit:**

Type	Span limit [kPa]{bar}			Range limit [kPa]{bar}	Overrange limit [MPa] {bar}
	Min.		Max.		
	FHW	FKW	FHW/FKW		
F□W□□3	300 {3}	50 {0.5}	3000 {30}	-100 to +3000 {-1 to +30}	4.5 {45}
F□W□□4	1000 {10}	250 {2.5}	10000 {100}	-100 to 10000 {-1 to 100}	15 {150}

- Lower range limit (vacuum limit) ;
Silicone fill sensor: See Fig. 1
Fluorinated fill sensor: Atmospheric pressure
 - Conversion factors to different units;
1MPa=10³kPa=10bar=10.19716kgf/cm²=145.0377psi
1kPa=10mbar=101.9716mmH₂O=4.01463inH₂O
- Output signal:**
Model FHW: 4 to 20mA DC 2-wire
Model FKW: 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 250Ω is required.

Hazardous locations: (Approval pending)

Authorities	Flameproof	Intrinsic safety	Type N Nonincendive
BASEEFA Factory Mutual	Ex ds IIC T5, T6 Class I II III Div. 1	EEx ia IIC T4, T5 Class I II III Div. 1	Ex N II T5 Class I II III Div. 2
RIIS	Groups B thru. G Ex ds IIB+H ₂ T4	Groups A thru. F	Groups A thru. G

Zero/span adjustment:

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

Damping: Adjustable electrical damping.

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

Model FKW: The time constant is adjustable between 0 to 38.4 seconds.

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

Model FKW: Selectable from HHC

"Output Hold":

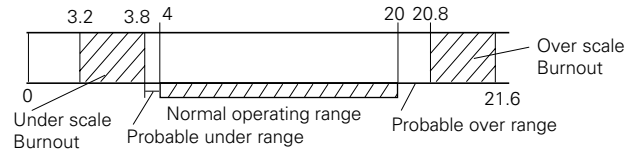
Output signal is hold as the value just before failure happens.

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

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

Temperature limit:

Ambient: -15 to +65°C
 (-15 to +60°C for arrester option)
 (-10 to +60°C for fluorinated oil fill transmitter)
 (-10 to +60°C for silicone oil "H", "S")
 For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

Process:

Fill fluid	13th digit of "Code symbols"	Process temperature	Lower limit of static press.
Fluorinated oil	W, A and D	-20 to 120°C	Atmospheric pressure
Silicone oil	H	0 to 250°C	2.7kPa abs {20mmHg abs}
	Y and G	-40 to 120°C	
	S	0 to 250°C	

Storage: -40 to +70°C

Humidity limit: 0 to 100% RH

Communication: (Model FKW only)

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

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

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)
(Standard)

For spans greater than 1/10 of URL: $\pm 0.25\%$ of span

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

$$\pm \left(0.17 + 0.08 \frac{0.1 \times \text{URL}}{\text{Span}} \right) \% \text{ of span}$$

(Option)

For spans greater than 1/10 of URL: $\pm 0.1\%$ of span

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

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

Linearity: 0.1% of calibrated span

Stability: $\pm 0.2\%$ of upper range limit (URL) for 24 months

Temperature effect:

Effect per 28°C change between the limits of -15°C and $+65^\circ\text{C}$

Zero shift: $\pm 0.5\%/28^\circ\text{C}$

(x equal to 1/6.5 URL or more)

$$\text{Zero shift; } \pm \left(0.5 \frac{\text{URL}}{6.5 \times x} \right) \% / 28^\circ\text{C}$$

(x less than 1/6.5 URL)

Total shift: $\pm 0.75\%/28^\circ\text{C}$

(x less than 1/6.5 URL or more)

$$\text{Total shift; } \pm \left(0.25 + 0.5 \frac{\text{URL}}{6.5 \times x} \right) \% / 28^\circ\text{C}$$

(x less than 1/6.5 URL)

Where, x: Calibrated span

URL: Maximum span (Upper Range Limit)

Note 1: Condition:

Capillary length: 3m max.

In case the capillary length is 5m, the performance becomes 1.5 times worse than above.

Note 2: In case the 7th code (material code) is other than W, A, B, C or D, the performance becomes 2.5 times worse than above.

Note 3: Above specifications are based on the conditions that flange and sensor unit are at the same temperature and in the same level. If temperature is different at flange, capillary or sensor unit, output variation may increase.

Overrange effect: Zero shift; 0.2% of URL/(1.5 x URL)

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.

Step response: Time constant: 0.3s (with 1.5m capillary)
Dead time: approximately 0.3s (without electrical damping)

Dielectric strength:

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

Insulation resistance:

More than 100M Ω /500V DC.

Turn-on time: 4 sec.

Internal resistance for external field indicator:

12 Ω or less

Physical specifications

Electrical connections:

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

Process connections:

JIS;

10K, 20K, 30K, 63K -40, 50A

10K, 20K, 30K, 63K -15, 20A (with Adapter)

ANSI/JPI;

150LB, 300LB, 600LB, -1 1/2", 2"

150LB, 300LB, 600LB, -1/2", 3/4" (with Adapter)

Screw connection (with Adapter);

Rc1/2, Rc3/4, 1/2-14NPT, 3/4-14NPT

Diaphragm extension:

0, 50, 100, 150, or 200mm as specified.

(See model code. Extended diaphragm is available only with 316L stainless steel diaphragm)

Process-wetted parts material:

Diaphragm: 316L stainless steel, Hastelloy-C Monel or Tantalum

Flange face: 316 stainless steel, Hastelloy-C lining
Monel lining or Tantalum lining

Extension: 316 stainless steel

(Refer to "Code symbols")

Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy (standard), finished with polyester coating, or 316 stainless steel (SCSI4 per JIS G5121), as specified.

Capillary: In case of 13th code "Y. W. G. A. D", PVC armored stainless steel.

In case of 13th code "H. S", stainless steel armored stainless steel.

Mounting flange: (option) 304 stainless steel or carbon 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

Mass (weight):

Transmitter approximately 10kg without options.

Add; 0.5kg for mounting bracket

0.8kg for indicator option

4.5kg for stainless steel housing option

1.5kg per 50mm extension of diaphragm

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 4½ digits LCD meter is also available.
- Arrester:** A built-in arrester protects the electronics from lightning surges.
Lightning surge immunity is 4kV (1.2 x 50µs).
- 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:** Oil-free procedures as above. Includes fluorinated oil for fill.
Not available with material code "W".
- Degreasing:** Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.
- Vacuum and high temperature service:** Special silicone oil and filling procedure are applied.
See below figure.

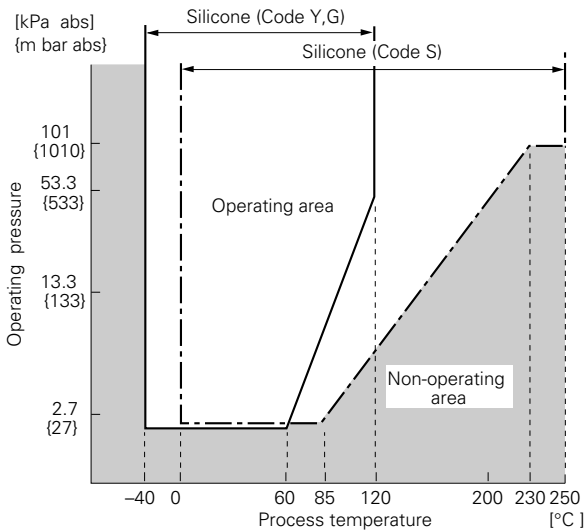


Fig. 1 Relation between process temperature and operating pressure

- Customer tag:** A stainless steel tag for 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 extremely corrosive.

ACCESSORIES

- Hand-held communicator:** (Model FXW, refer to Data Sheet No. EDS8-47)
- Communication module:** (Standard for FKW)
By adding communication module, remote setting function becomes available for model FHW.
Remark: When the communication module is connected, the operation mode of external zero/span adjustment screw is limited to zero adjustment only.

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

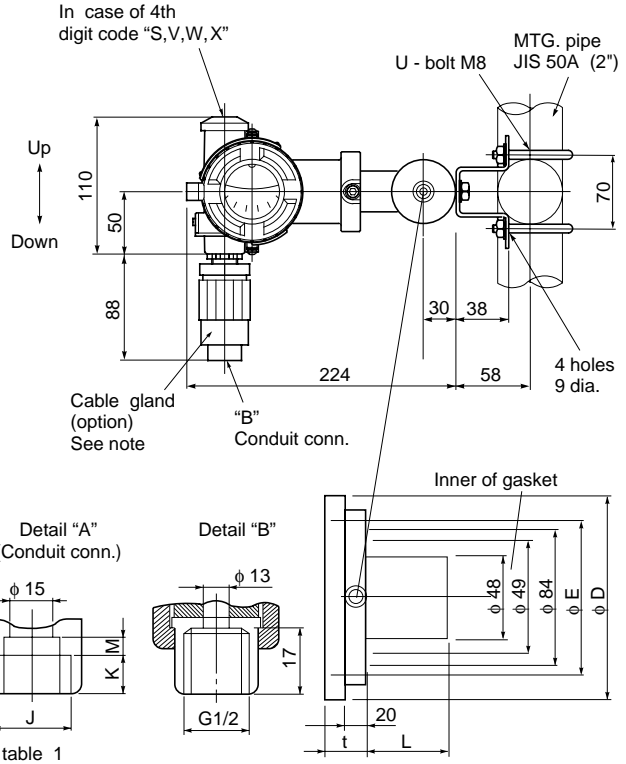
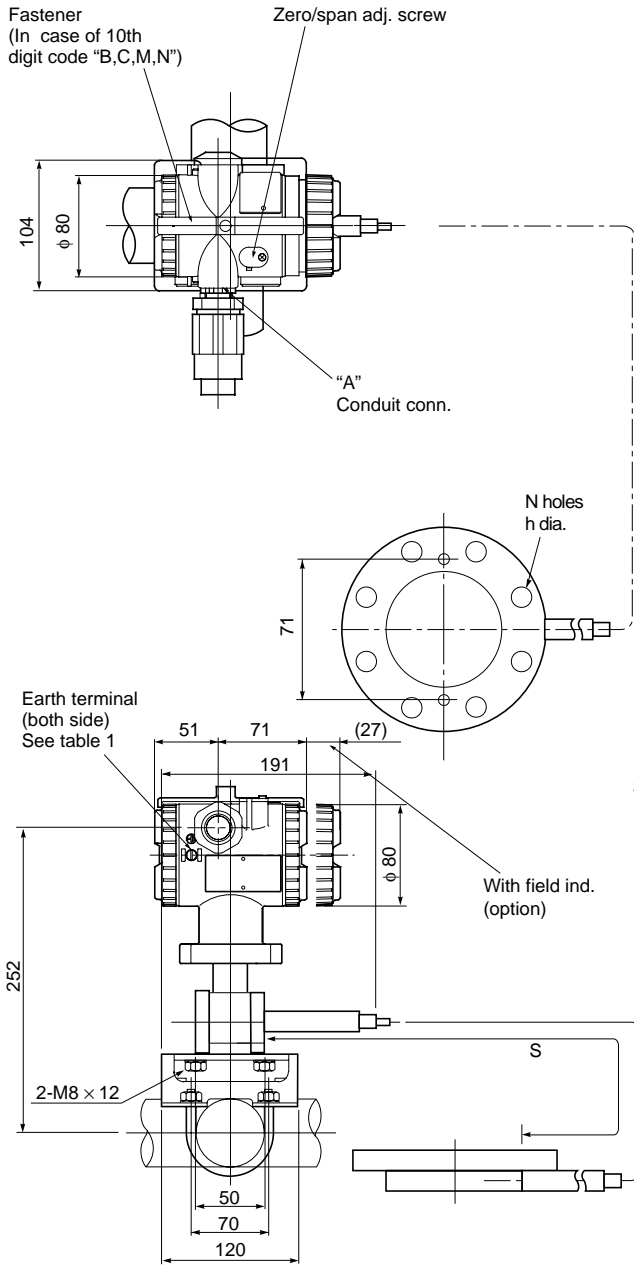
"LVD - The transmitter is not covered by the requirements of the LVD standard."

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
 F W | | | 3 | | | | | | | | | | | | | | | |

		Description	
		Indicator and arrester <9th digit>	
		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%	None
P		Digital, custom scale	None (Model FKW only)
Q		Digital, 0 to 100%	Yes
S		Digital, custom scale	Yes (Model FKW only)
		Approvals for hazardous locations <10th digit> (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")	
M		BASEEFA, Flameproof (Conduit seal)	
N		BASEEFA, Flameproof (Cable gland seal) (Conduit connection G 1/2 only)	
H		FM, Intrinsic safety and Nonincendive	
K		CENELEC, Intrinsic safety	
P		CENELEC, Intrinsic safety and BASEEFA, Type N	
		Capillary and mounting bracket <11th digit>	
		mounting bracket	Capillary
A		Carbon steel	1.5m
B			3m
G			5m
D		Stainless steel	1.5m
E			3m
L			5m
		Stainless steel parts <12th digit>	
		<u>Stainless steel tag plate</u>	<u>Stainless steel elec. housing</u>
		<u>Coating of cell</u>	
Y		None	None
B		Yes	None
C		None	Yes
E		Yes	Yes
M		None	None
N		Yes	None
P		None	Yes
Q		Yes	Yes
		Treatment/Fill fluid <13th digit>	
		Treatment	Fill fluid
Y		None	Silicone oil (for general use)
W		None	Fluorinated oil
G		Degreasing	Silicone oil
A		Oxygen service	Fluorinated oil (7th digit code "W", "A", "B", "C" and "D")
D		Chlorine service	Fluorinated oil (7th digit code "H" and "T")
H		High temp. 250°C	Silicone oil
S		High temp. and vacuum (250°C)	Silicone oil } (7th digit code "W", "A", "B", "C" and "D")
		Teflon membrane <14th digit>	
Y		None	
C		Yes (7th digit code "W", "H", "M", and "T")	
		Bolt/nut <15th digit>	
Y		None	
A		Standard (Cr-Mo alloy hexagon socket head cap bolt/ carbon steel nut)	6th digit code "3"
B		Cr-Mo alloy hexagon bolt/carbon steel nut	6th digit code "4"
E		304 stainless steel bolt/304 stainless steel nut	

Odering information

1. When ordering this instrument, specify the output orientation (burnout direction) in case of abnormality in the transmitter. Unless otherwise specified, the output hold function is supplied.



7th digit of Code symbols	L	Mass approx. [kg]
W, H, M, T	0	9.5
A	50	10.5
B	100	11.5
C	150	12
D	200	12.5

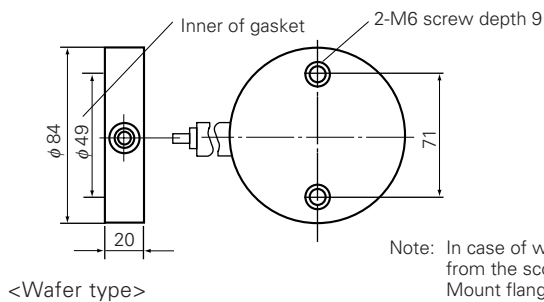
11th digit of code symbols	Capillary length S [mm]
A, D	1500
B, E	3000
G, L	5000

5th digit of code symbols	φD	φE	t	N-φh	Flange
0, G	140	105	36	4-19	JIS-10K-40A
1, H	155	120	36	4-19	JIS-10K-50A
2, J	140	105	38	4-19	JIS-20K-40A
3, K	155	120	38	8-19	JIS-20K-50A
4, L	160	120	42	4-23	JIS-30K-40A
5, M	165	130	42	8-19	JIS-30K-50A
6, N	175	130	52	4-25	JIS-63K-40A
7, P	185	145	54	8-23	JIS-63K-50A
A, Q	127	98.4	37.5	4-16	ANSI/JPI-150LB-1 1/2"
B, R	152	120.6	39.5	4-20	ANSI/JPI-150LB-2"
C, S	156	114.3	41	4-23	ANSI/JPI-300LB-1 1/2"
D, T	165	127	42.5	8-20	ANSI/JPI-300LB-2"
E, U	156	114.3	42.5	4-23	ANSI/JPI-600LB-1 1/2"
F, V	165	127	45.5	8-20	ANSI/JPI-600LB-2"

4th digit of Code symbols	Conduit conn.			Earth terminal
	J	K	M	
S	G1/2	17	8	No. 8-32UNC
T	1/2-14NPT	16	5	M4
V	Pg13.5	8	4.5	M4
W	M20x1.5	16	5	M4

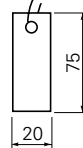
Table 1

Note *: Cable gland is supplied in case of flameproof packing type.
φ11 cable is suitable.

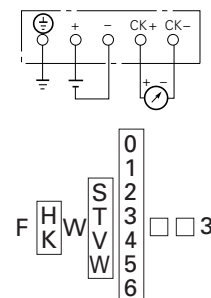


Note: In case of wafer type, flange is excluded from the scope of supply.
Mount flange, referring to the view.

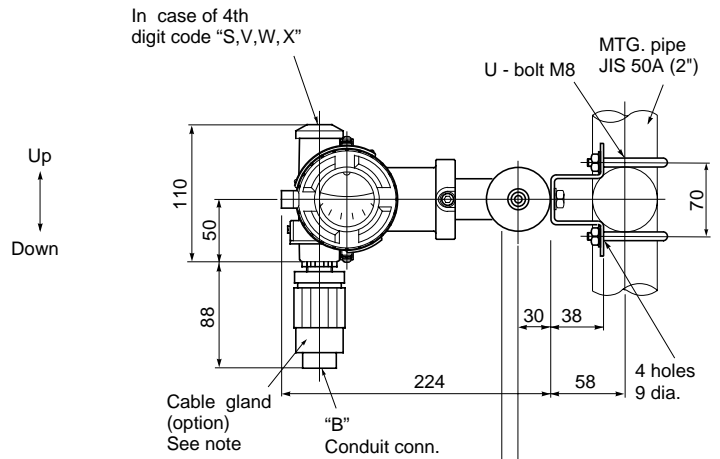
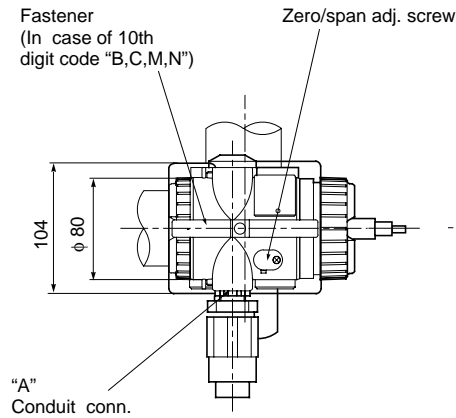
<Optional stainless steel tag>



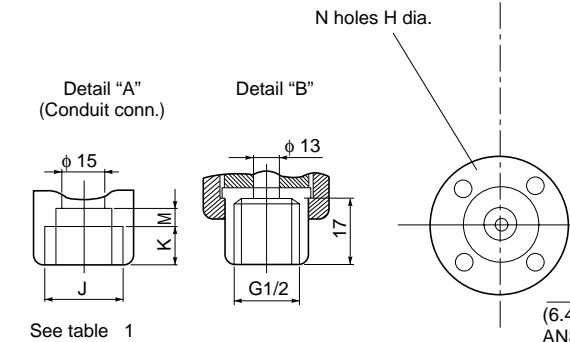
CONNECTION DIAGRAM



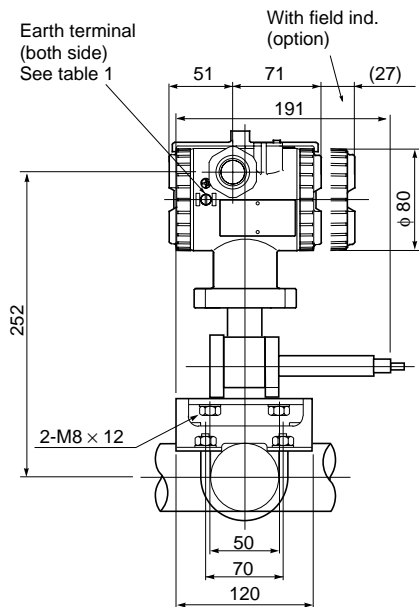
OUTLINE DIAGRAM (Unit:mm)



Specifications for instrument with direct mounting adapter



See table 1



(6.4) In case of ANSI/JPI-600LB flange
(T) In case of ANSI/JPI-600LB flange

Vent/drain plug
Long vent/drain plug (added specification)

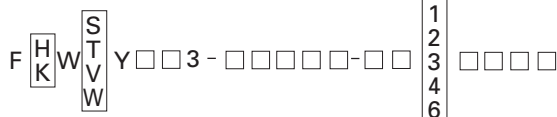
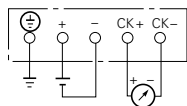
Table 1

4th digit of Code symbols	Conduit conn.			Earth terminal
	J	K	M	
S	G1/2	17	8	M4
T	1/2-14NPT	16	5	No. 8-32UNC
V	Pg13.5	8	4.5	M4
W	M20x1.5	16	5	M4

11th digit of code symbols	S
A, D	1500
B, E	3000
G, L	5000

16th digit of code symbols	17th digit of code symbols	øD	øE	øF	t	N-øh	Flange
1	1	95	70	51	12	4-15	JIS-10K-15A
1	2	100	75	56	14	4-15	JIS-10K-20A
2	1	95	70	51	14	4-15	JIS-20K-15A
2	2	100	75	56	16	4-15	JIS-20K-20A
3	1	115	80	55	18	4-19	JIS-30K-15A
3	2	120	85	60	18	4-19	JIS-30K-20A
6	1	120	85	55	23	4-19	JIS-63K-15A
6	2	135	95	60	25	4-23	JIS-63K-20A
1	H	89	60.3	34.9	11.5	4-16	ANSI/JPI-150LB-1/2"
1	T	98	69.9	42.9	13	4-16	ANSI/JPI-150LB-3/4"
2	H	95	66.7	34.9	14.5	4-16	ANSI/JPI-300LB-1/2"
2	T	117	82.5	42.9	16	4-20	ANSI/JPI-300LB-3/4"
4	H	95	66.7	34.9	14.5	4-16	ANSI/JPI-600LB-1/2"
4	T	117	82.5	42.9	16	4-20	ANSI/JPI-600LB-3/4"

CONNECTION DIAGRAM



Note *: Cable gland is supplied in case of flameproof packing type. ø11 cable is suitable.

