

ABSOLUTE PRESSURE TRANSMITTER

DATA SHEET

FKA...4

The FCX-A II absolute pressure transmitter accurately measures absolute 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.

FEATURES

1. High accuracy

0.2% accuracy for all calibrated spans is a standard feature for all AP models covering 1.6kPa{0.016bar} range to 3000kPa{30bar} high pressure range. 0.1% accuracy is available as option. Fuji's micro-capacitance silicon sensor assures this accuracy for all suppressed calibration ranges without additional adjustment.

2. Minimum environmental influence

The "Advanced Floating Cell" design which protects the pressure sensor against changes in temperature, and overpressure substantially reduces total measurement error in actual field applications.

3. Fuji/HART® bilingual communications protocol and FOUNDATION™ fieldbus and Profibus™ compatibility

FCX-AII series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-AII. Further, by upgrading electronics FOUNDATION™ fieldbus and Profibus™ are also available.

4. Application flexibility

Various options that render the FCX-A II 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
- 5-digit LCD meter with engineering unit
- Stainless steel electronics housing
- Wide selection of materials

5. 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.

6. 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

Service: Liquid, gas, or vapour
Span, range, and overrange limit:

Type	Span limit [kPa abs] [bar abs]		Range limit [kPa abs] [bar abs]	Overrange limit [MPa] [bar]
	Min.	Max.		
FKA□01	1.6 {0.016}	16 {0.16}	0 to +16 {0 to +0.16}	0.5 {5}
FKA□02	1.6 {0.016}	130 {1.3}	0 to +130 {0 to +1.3}	0.5 {5}
FKA□03	5 {0.05}	500 {5}	0 to +500 {0 to +5}	1.5 {15}
FKA□04	30 {0.3}	3000 {30}	0 to +3000 {0 to +30}	9 {90}

Remark: To minimize environmental influence, span should be greater than 1/40 of the max. span in most applications.

- The maximum span of each sensor can be converted to different units using factors as below.

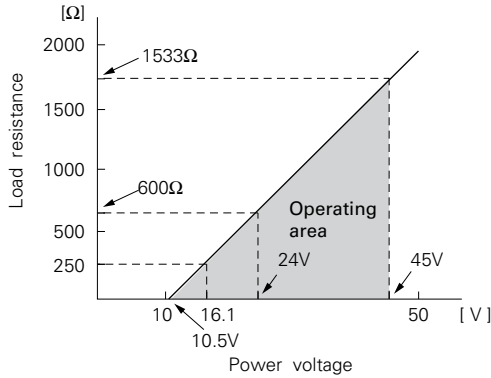
$$1 \text{ MPa abs} = 10^3 \text{ kPa abs} = 10 \text{ bar abs} = 10.19716 \text{ kgf/cm}^2 \text{ abs} = 145.0377 \text{ psi abs}$$

$$1 \text{ kPa abs} = 10 \text{ mbar abs} = 101.9716 \text{ mmH}_2\text{O abs} = 4.01463 \text{ inH}_2\text{O abs} = 7.50062 \text{ mmHg abs}$$

Output signal: 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⁽¹⁾ (Model: FXW), min. of 250Ω is required.

Hazardous locations:

Authorities	Flameproof	Intrinsic safety	Type n Nonincendive
ATEX	Ex II 2 GD - EExd IIC T5/T6	Ex II 1 GD - EExia IIC T4/T5	Ex II 3 GD - EExn IIC T4/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 Ex do IIB+H ₂ T4	Class I II III Div. 1 Groups A thru. G	Class I II III Div. 2 Groups A thru. G
TIIS		Ex ia IIC T4 (*)	—

(*) Approval pending

Zero/span adjustment:

Zero and span are adjustable from the HHC⁽¹⁾. Zero and span are also adjustable externally from the adjustment screw (span adjustment is not available with 9th digit code "L, P, Q, S").

Damping:

Adjustable from HHC or local adjustment unit with LCD display. The time constant is adjustable between 0.12 to 32 seconds.

Zero elevation/suppression:

Zero can be elevated within the specified range limit of each sensor model.

Normal/reverse action:

Selectable from HHC⁽¹⁾.

Indication:

Analog indicator or 5-digit LCD meter, as specified.

Burnout direction: Selectable from HHC⁽¹⁾

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

"Output Hold":

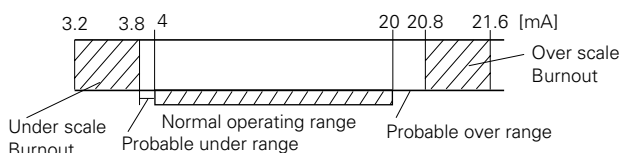
Output signal is hold as the value just before failure happens.

"Output Overscale":

Adjustable within the range 20.8mA to 21.6mA from HHC⁽¹⁾

"Output Underscale":

Adjustable within the range 3.2mA to 3.8mA from HHC⁽¹⁾



Loop-check output:

Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC⁽¹⁾.

Temperature limit:

Ambient: -40 to +85°C
 (-20 to +80°C for LCD indicator)
 (-40 to +60°C for arrester option)
 For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

Process: -40 to +85°C for silicone fill sensor

Storage: -40 to +90°C

Humidity limit: 0 to 100% RH

Communication: With HHC⁽¹⁾ (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Note: HHC's version must be more than 6.0 (or FXW□□□□1-□3), for FCX-A II.

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

Performance specifications

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4 to 20mA analog output in linear mode.

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

(Standard)

For spans greater than 1/10 of URL: ±0.2% of span
 For spans below 1/10 of URL:

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

(Option) (code: 21th digit H)

(Not available for Max span 16kPa abs, 130kPa abs)

For spans greater than 1/10 of URL: ±0.1% of span

For spans below 1/10 of URL:

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

(Note) (1) HHC: Hand Held Communicator

Stability: ±0.2% of upper range limit (URL) for 6 month.

Temperature effect:
Effect per 28°C change between the limits of -40°C and +85°C
Zero shift: $\pm \left(0.125 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$
Total effect: $\pm \left(0.15 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$

Overrange effect: Zero shift; ±0.2% of URL for any overrange to maximum limit

Supply voltage effect:
Less than 0.005% of calibrated span per 1V

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

Step response: Time constant: 0.2 s*)
Dead time: 0.2 s*)
(without electrical damping)
) Faster response is available as option (maximum update rate: 25 times per second).

Mounting position effect:
Zero shift, less than 0.1kPa{1mbar} for a 10° tilt in any plane.
No effect on span. This error can be corrected by adjusting zero.

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, 1/2-14NPT, Pg13.5, or M20 x 1.5 conduit, as specified.
1-port (standard) or 2-port with each conduit, as specified.

Process connections:
1/4-18 NPT or Rc1/4 on 54mm centers, as specified.

Process-wetted parts material:

Material code (7th digit in "Code symbols")	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316 stainless steel	316L stainless steel	316 stainless steel	316 stainless steel
H	316 stainless steel	Hastelloy-C	Hastelloy-C lining	316 stainless steel
M	316 stainless steel	Monel	Monel lining	316 stainless steel
T	316 stainless steel	Tantalum	Tantalum lining	316 stainless steel

Notes: Sensor O-rings: Viton
Availability of above material design depends on ranges. Refer to "Code symbols".

Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy finished with epoxy/polyurethane double coating (standard), or 316 stainless steel (SCS14 per JIS G5121), as specified.
Bolts and nut: Cr-Mo alloy (standard) or 304 stainless steel
Fill fluid: Silicone oil
Mounting bracket: 304 stainless steel.

Environmental protection:

IEC IP67 and NEMA 6/6P

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 5-digit LCD meter with engineering unit is also available.

Local adjustment unit with LCD display: An optional 5-digit LCD meter with Zero/ Span adjustment function, loop-check function and damping adjustment function, is available.

Arrester: A built-in arrester protects the electronics from lightning surges.
Lightning surge immunity:
4kV (1.2 × 50μs)

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. 304 stainless steel bolts and nuts, ASTM B7M or L7M bolts and 2HM nuts (Class II) are available.

Optional tagplate: An extra 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

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.EDS 8-47)

Z/S board: Parts No.=ZZPFCX4-A070
When Z/S board is mounted on the FCX-AII amplifier unit, external adjustment screw will be available for zero and span adjustment.

CODE SYMBOLS

Digit	Description	Note	Digit No. of code																		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	21			
4	<Connections>		F	K	A	0	4	-													
	Process connection	Oval flange screw	Conduit connection																		
	Rc1/4	7/16-20UNF	G1/2 (x1)	Combination with 12th digit code "C, E, P, Q" are not available.																	
	1/4-18NPT	7/16-20UNF	1/2-14NPT (x1)																		
	1/4-18NPT	M10	Pg 13.5 (x1)																		
	1/4-18NPT	M10	M20x1.5 (x1)																		
	1/4-18NPT	7/16-20UNF	Pg 13.5 (x1)																		
	Rc1/4	7/16-20UNF	G1/2 (x2)	A	B	C	D	E	S	T	V	W	X								
	1/4-18NPT	7/16-20UNF	1/2-14NPT (x2)																		
	1/4-18NPT	M10	Pg 13.5 (x2)																		
1/4-18NPT	M10	M20x1.5 (x2)																			
1/4-18NPT	7/16-20UNF	Pg 13.5 (x2)																			
6, 7					Note1																
	Span limit [kPa abs](bar abs)(*1)	Process cover	Diaphragm	Wetted cell body																	
	1.6...16 {0.016...0.16}	316 stainless steel	316L stainless steel	316 stainless steel		1V															
		316 stainless steel	Hast. C	Hast. C lining		1H															
		316 stainless steel	Monel	Monel lining		1M															
	1.6...130 {0.016...1.3}	316 stainless steel	316L stainless steel	316 stainless steel		2V															
		316 stainless steel	Hast. C	Hast. C lining		2H															
		316 stainless steel	Monel	Monel lining		2M															
		316 stainless steel	Tantalum	Tantalum lining		2T															
	5...500 {0.05...5}	316 stainless steel	316L stainless steel	316 stainless steel		3V															
		316 stainless steel	Hast. C	Hast. C lining		3H															
		316 stainless steel	Monel	Monel lining		3M															
		316 stainless steel	Tantalum	Tantalum lining		3T															
	30...3000 {0.3...30}	316 stainless steel	316L stainless steel	316 stainless steel		4V															
		316 stainless steel	Hast. C	Hast. C lining		4H															
		316 stainless steel	Monel	Monel lining		4M															
		316 stainless steel	Tantalum	Tantalum lining		4T															
	9	<Indicator and arrester>																			
<u>Indicator</u>		<u>Arrester</u>																			
None		None		Z/S board attached.	A																
Analog, 0 to 100% linear scale		None		Approval	B																
Analog, custom scale		None			D																
None		Yes		pending for	E																
Analog, 0 to 100% linear scale		Yes		10th digit code	F																
Analog, custom scale		Yes		"G, H, J, K, P"	H																
Digital, 0 to 100%		None			L																
Digital, custom scale		None			P																
Digital, 0 to 100%		Yes			Q																
Digital, custom scale		Yes			S																
Digital, 0 to 100%		None		Approval pending for 10th digit code "D, E, G, H, J, K, P"	1																
(Local adjustment unit with LCD display)		None			2																
Digital, custom scale		None			4																
(Local adjustment unit with LCD display)		Yes			5																
Digital, custom scale		Yes																			
(Local adjustment unit with LCD display)		Yes																			
10	<Approvals for hazardous locations>																				
	None (for ordinary locations)				A																
	TIIS, Flameproof (Conduit seal)		(Available for 4th digit code "A", "S")		B																
	TIIS, Flameproof (Cable gland seal)		(Available for 4th digit code "A", "S")		C																
	FM, Flameproof (or explosionproof)		(Available for 4th digit code "B", "T")		D																
	CSA, Flameproof (or explosionproof)		(Available for 4th digit code "B", "T")		E																
	ATEX, Flameproof				X																
	TIIS, Intrinsic safety (Approval pending)				G																
	FM, Intrinsic safety and nonincendive				H																
	CSA, Intrinsic safety and nonincendive				J																
	ATEX, Intrinsic safety				K																
	ATEX, Type n				P																
11	<Vent/ drain and mounting bracket>																				
	<u>Vent/drain</u>		<u>Mounting bracket</u>																		
	Standard	None			A																
	Standard	Yes, stainless steel			C																
	Side	None			D																
Side	Yes, stainless steel			F																	

Note1: (*1) 100: 1 turn down is possible, but should be used at a span greater than 1/40 of the maximum span for better performance.

Digit	Description	Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	21	Digit No. of code
12	<Options> Extra SS tag plate Stainless steel elec. housing Coating of cell None None None Yes None None None Yes None Yes Yes None ----- None None Yes Yes None Yes None Yes Yes Yes Yes Yes	Note2	F	K	A	0	4												
13	<Special applications and fill fluid> Treatment Fill fluid Standard Silicone oil Degreasing Silicone oil NACE specification Silicone oil (7th digit code "T" and 15th digit code "A", "B" are not available)																		
14	<Sensor O-ring> Viton																		
15	<Bolt/nut> (*3) Cr-Mo alloy hexagon socket head cap screw/carbon steel nut Cr-Mo alloy hexagon bolt/nut NACE bolt/nut (ASTM A193 B7M/A194 2HM) NACE bolt/nut (ASTM A320 L7M/A194 2HM) 304 stainless steel bolt/304 stainless steel nut	Note 3																	
21	<Other options> High accuracy type																		

Note2: (*2) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes".

Note3: (*3) In case of tropical use, select stainless bolts and nuts.

The product conforms to the requirements of the Electromagnetic compatibility Directive 94/9/EC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

EMI (Emission) EN61326 : 1997
Class A (standard for Industrial Location)

Frequency range MHz	Limits	Reference standard
30 to 230	40dB (µV/m) quasi peak, measured at 10m distance	CISPR16-1 and CISPR16-2
230 to 1000	47dB (µV/m) quasi peak, measured at 10m distance	

EMI (Immunity) EN61326: 1997
Annex A (standard for Industrial Location)

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge	4kV (Contact) 8kV (Air)	IEC61000-4-2	B
Electromagnetic field	80 to 1000MHz 10V/m 80%AM (1kHz)	IEC61000-4-3	A
Rated power frequency magnetic field	30A/m 50Hz	IEC61000-4-8	A
Burst	2kV 5kHz	IEC61000-4-4	B
Surge	1.2µs/50µs 1kV (Line to line) 2kV (Line to ground)	IEC61000-4-5	B
Conducted RF	0.15 to 80MHz 3V 80%AM (1kHz)	IEC61000-4-6	A

Note) Definition of performance criteria

A: During testing, normal performance within the specification limits.

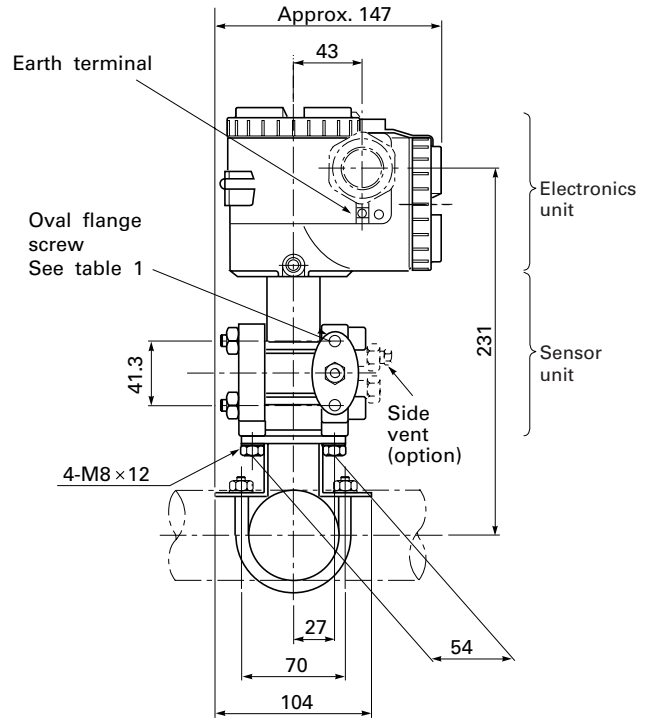
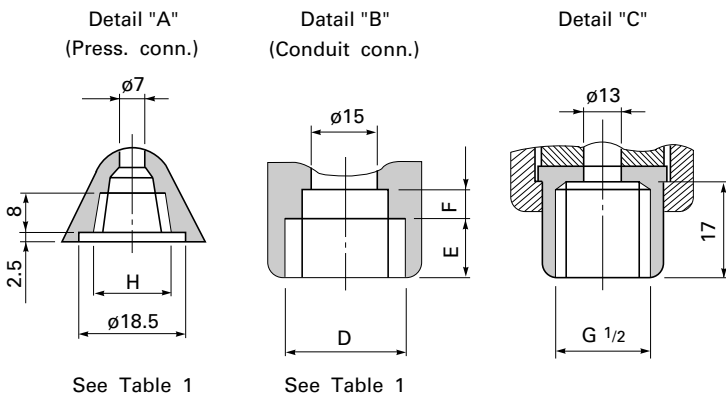
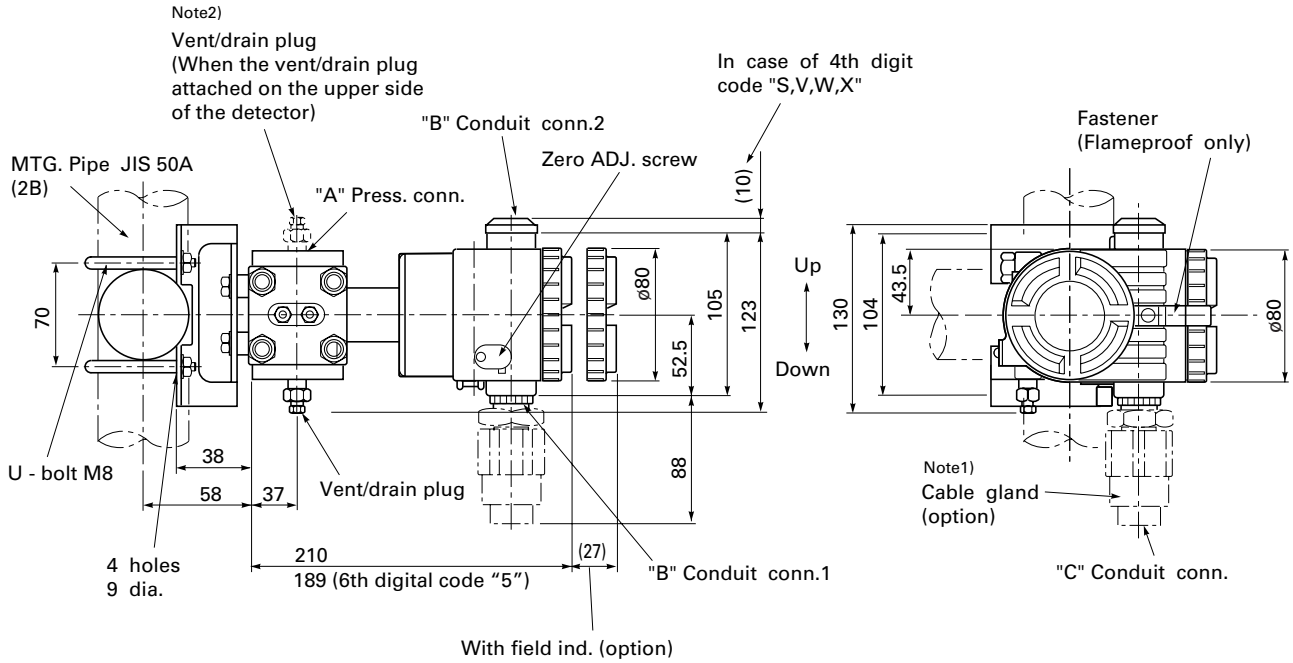
B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

ORDERING INFORMATION

When ordering this instrument, specify.

1. CODE SYMBOLS
2. Measuring range.
3. Output orientation (burnout direction) when abnormality is occurred in the transmitter.
Hold / Overscale (21.6mA) / Underscale (3.2mA)
Unless otherwise specified, output hold function is supplied.
4. Indication method (indicated value and unit) in case of the actual scale (code D, H, P, S on 9th digit).
5. Tag No. (up to 26 alphanumeric characters), if required.

OUTLINE DIAGRAM (Unit:mm)

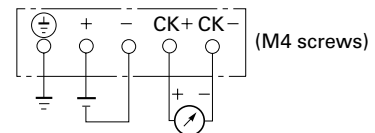


4th digit of the code symbols	Conduit conn.			Press.conn.	Oval flange screw
	D	E	F	H	
A, S	G1/2	17	8	Rc1/4	7/16-20UNF screw depth15
B, T	1/2-14NPT	16	5	1/4-18NPT	7/16-20UNF screw depth15
C, V	Pg13.5	8	4.5	1/4-18NPT	M10 screw depth15
D, W	M20x1.5	16	5	1/4-18NPT	M10 screw depth15
E, X	Pg13.5	8	4.5	1/4-18NPT	7/16-20UNF screw depth15

Table 1

- Note1) Cable gland is supplied in case of 10th digit code "C".
ø11 cable is suitable.
- Note2) The pressure connector is located on the down side surface of the detector, when the vent/drainplug is attached on the upper side of the detector
(When the 21th digit of the code symbols :C).

CONNECTION DIAGRAM



Fuji Electric Co.,Ltd.

Head office
11-2 Osaki 1-chome, Shinagawa-ku, Tokyo, 141-0032 Japan
<http://www.fujielectric.co.jp>

Fuji Electric Instruments Co.,Ltd.

Sales Div.
International Sales Dept.
No.1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan
Phone: 81-42-585-6201, 6202
Fax: 81-42-585-6187
<http://www.fic-net.co.jp>