

PRESSURE TRANSMITTER (DIRECT MOUNT TYPE)

DATA SHEET

FKP...5

The FCX-AII pressure transmitter accurately measures gauge pressure and transmits proportional 4 to 20mA signal.

The transmitter utilizes the unique micromachined capacitive silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

FEATURES

1. High accuracy $\pm 0.1\%$

0.1% accuracy is a standard feature. Fuji's micro-capacitance silicon sensor assures this accuracy for all elevated or suppressed calibration ranges without additional adjustment.

2. Minimum environmental influence

The "Advance 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

FCX-AII series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-AII.

4. Application flexibility

Various options that render the FCX-AII suitable for almost any process applications include:

- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- 5-digit LCD meter with engineering unit

5. Burnout current flexibility (Under Scale: 3.2 to 4.0mA, Over Scale: 20.0 to 22.5mA)

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

Type:

FKP: Smart, 4 to 20mA DC + Fuji/Hart® 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.		
FKP□01	8.125 {0.08125}	130 {1.3}	-100 to +130 {-1 to +1.3}	1 {10}
FKP□02	31.25 {0.3125}	500 {5}	-100 to +500 {-1 to +5}	1.5 {15}
FKP□03	187.5 {1.875}	3000 {30}	-100 to +3000 {-1 to +30}	9 {90}
FKP□04	625 {6.25}	10000 {100}	-100 to +10000 {-1 to +100}	15 {150}

Lower range limit (vacuum limit) is;

Silicone fill sensor: See Fig. 1

Fluorinated fill sensor: 66kPa abs (500mmHg abs) at below 60°C

Output signal:

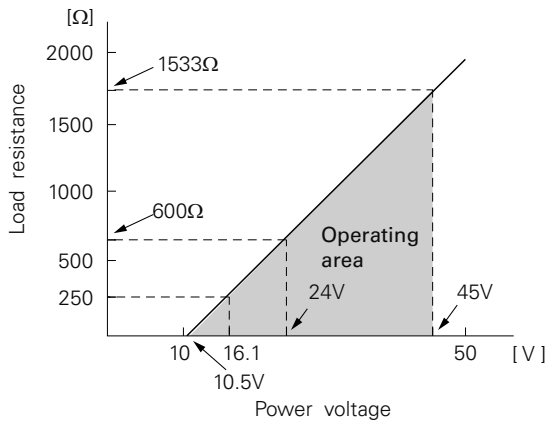
4 to 20mA DC with digital signal super-imposed on the 4 to 20mA signal.

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 250 Ω required.

Hazardous locations:

Authority (Digit 10=)	Intrinsic safety																					
ATEX (K)	Ex II 1 G Ex ia IIC T5 (-40°C ≤ Ta ≤ +50 °C) Ex ia IIC T4 (-40°C ≤ Ta ≤ +70 °C) IP66/67 Entity Parameters: Ui ≤ 28 Vdc, Ii ≤ 94.3 mA, Pi ≤ 0.66 W Ci = 36 nF/26 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator																					
Factory Mutual (pending) (H)	Class I II III Div.1 Groups A, B, C, D, E, F, G T4 Entity Type 4X <table border="1"> <thead> <tr> <th colspan="2">Model code</th> <th>Tamb</th> </tr> <tr> <th>9th digit</th> <th>13th digit</th> <th></th> </tr> </thead> <tbody> <tr> <td>A,B,C,D,J</td> <td>Y,G,N</td> <td>-40°C to +85°C</td> </tr> <tr> <td>L,P,M,1,2,3</td> <td>Y,G,N</td> <td>-20°C to +80°C</td> </tr> <tr> <td>Q,S,N,4,5,6</td> <td>Y,G,N</td> <td>-20°C to +60°C</td> </tr> <tr> <td>E,F,G,H,K</td> <td>Y,G,N</td> <td>-40°C to +60°C</td> </tr> <tr> <td>-</td> <td>W,A,D</td> <td>-10°C to +60°C</td> </tr> </tbody> </table> Entity Parameters: Vmax=42.4V, Imax=113mA, Pi=1W, Ci=35.98nF, Li=0.694mH	Model code		Tamb	9th digit	13th digit		A,B,C,D,J	Y,G,N	-40°C to +85°C	L,P,M,1,2,3	Y,G,N	-20°C to +80°C	Q,S,N,4,5,6	Y,G,N	-20°C to +60°C	E,F,G,H,K	Y,G,N	-40°C to +60°C	-	W,A,D	-10°C to +60°C
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-	W,A,D	-10°C to +60°C																				
CSA (J)	Ex ia Class I, Groups A, B, C and D; Class II, Groups E,F and G; Class III Per drawing TC 522873 Temp. code T5 for Tamb max = +50°C Temp. code T4 for Tamb max = +70°C Entity Parameters: Vmax = 28 Vdc, Imax = 94.3 mA, Pmax = 0.66 W Ci = 36 nF/25 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator																					
IECEX (T)	Ex ia IIC T5 (-40°C ≤ Ta ≤ +50 °C) Ex ia IIC T4 (-40°C ≤ Ta ≤ +70 °C) IP66/67 Entity Parameters: Ui ≤ 28 Vdc, Ii ≤ 94.3 mA, Pi ≤ 0.66 W Ci = 36 nF/26 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator																					

Authority	Flameproof																					
ATEX (X)	Ex II 2 GD Ex d IIC T6 (-40°C ≤ Ta ≤ +65 °C) Ex d IIC T5 (-40°C ≤ Ta ≤ +85 °C) Ex tD A21 IP66/67 T 85°C Ex tD A21 IP66/67 T 100°C Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W																					
Factory Mutual (pending) (D)	Class I Div.1 Groups B, C, D T6 Type 4X Class II III Div.1 Groups E, F, G T6 Type 4X Tamb max = +60°C																					
CSA (E)	Class I, Groups C and D; Class II, Groups E,F and G ; Class III Maximum ambient temperature 85°C Maximum working pressure 50 Mpa Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA Model With arrester: Ui ≤ 32 Vdc, 4-20 mA Note: "Seal not required"																					
IECEX (R)	Ex d IIC T6 (-40°C ≤ Ta ≤ +65 °C) Ex d IIC T5 (-40°C ≤ Ta ≤ +85 °C) DIP A21 IP66/67 T 85°C DIP A21 IP66/67 T 100°C Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W																					
Authority (Digit 10=)	Type n Nonincendive																					
ATEX (P)	Ex II 3 G Ex nA II T5 (-40°C ≤ Ta ≤ +70 °C) IP66/67 Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Optional Analog indicator is not available for type "n"																					
Factory Mutual (pending) (H)	Class I II III Div.2 Groups A, B, C, D, F, G T4 Entity Type 4X <table border="1"> <thead> <tr> <th colspan="2">Model code</th> <th>Tamb</th> </tr> <tr> <th>9th digit</th> <th>13th digit</th> <th></th> </tr> </thead> <tbody> <tr> <td>A,B,C,D,J</td> <td>Y,G,N</td> <td>-40°C to +85°C</td> </tr> <tr> <td>L,P,M,1,2,3</td> <td>Y,G,N</td> <td>-20°C to +80°C</td> </tr> <tr> <td>Q,S,N,4,5,6</td> <td>Y,G,N</td> <td>-20°C to +60°C</td> </tr> <tr> <td>E,F,G,H,K</td> <td>Y,G,N</td> <td>-40°C to +60°C</td> </tr> <tr> <td>-</td> <td>W,A,D</td> <td>-10°C to +60°C</td> </tr> </tbody> </table>	Model code		Tamb	9th digit	13th digit		A,B,C,D,J	Y,G,N	-40°C to +85°C	L,P,M,1,2,3	Y,G,N	-20°C to +80°C	Q,S,N,4,5,6	Y,G,N	-20°C to +60°C	E,F,G,H,K	Y,G,N	-40°C to +60°C	-	W,A,D	-10°C to +60°C
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CSA (J)	Class I Div.2 Groups A, B, C, D Class II Div.2 Groups E, F, G Class III Div.2 Temp Code T5 Tamb max = +50°C Temp Code T4 Tamb max = +70°C Entity Parameters: Vmax = 28 Vdc, Imax = 94.3 mA, Pmax = 0.66 W Ci = 36 nF/25 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator																					
IECEX (Q)	Ex nA II T5 (-40°C ≤ Ta ≤ +70 °C) IP66/67 Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Optional Analog indicator is not available for type "n"																					

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 not available with 9th digit code "L, P, Q, S").

Damping:

Adjustable from HHC ⁽¹⁾ or local adjustment unit with LCD display.
The time constant is adjustable between 0 to 32 seconds.

Zero elevation/suppression:

Zero can be elevated or suppressed 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":

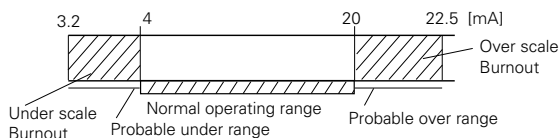
Output signal is hold as the value just before failure happens.

"Output Overscale":

Adjustable within the range 20.0mA to 22.5mA from HHC⁽¹⁾

"Output Underscale":

Adjustable within the range 3.2mA to 4.0mA from HHC⁽¹⁾



Output limits conforming to NAMUR NE43 by order.

Loop-check output:

Transmitter can be configured to provide constant signal 3.2 through 22.5mA 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:

With HHC⁽¹⁾ (Model FXW, consult DataSheet N° EDS8-47), following items can be remotely displayed or configured.

Note:

HHC's version must be higher than 7.0 (or FXW □□□□ 1-□4), for FCX -AII for supporting these items : "Saturate current", "Write protect", and "History".

Items	Fuji Protocol with FXW		Hart Protocol	
	Display	Set	Display	Set
Tag No.	✓	✓	✓	✓
Model No.	✓	✓	—	—
Serial No. & Software Version	✓	—	✓	—
Engineering unit	✓	✓	✓	✓

Range limit	✓	—	✓	—
Measuring range	✓	✓	✓	✓
Damping	✓	✓	✓	✓
Output mode	✓	—	✓	—
Burnout direction	✓	✓	✓	✓
Calibration	✓	✓	✓	✓
Output adjust	—	✓	—	✓
Data	✓	—	✓	—
Self diagnoses	✓	—	✓	—
Printer (In case of FXW with printer option)	✓	—	—	—
External switch lock	✓	✓	✓	✓
Transmitter display	✓	✓	✓	✓
Linearize*	✓	✓	—	—
Rerange	✓	✓	✓	✓
Saturate current	✓	✓	✓	✓
Write protect	✓	✓	✓	✓
History				
- Calibration history	✓	✓	✓	✓
- Ambient temperature history	✓	—	✓	—

(Note) (1) HHC: Hand Held Communicator

***Local configurator with LCD display (option):**

Local configurator with 3 push button and LCD display can support all items (Fuji Protocol list) except "Linearize" function.

Programmable output linearization function:

Output signal can be characterized with "14 points linear approximation function" from HHC⁽¹⁾.

Performance specifications

Accuracy rating:

(including linearity, hysteresis, and repeatability)

For spans greater than 1/10 of URL:

±0.1% of span

For spans below 1/10 of URL :

± (0.05 + 0.05 $\frac{0.1 \times \text{URL}}{\text{span}}$) % of span

Stability:

±0.2% of upper range limit (URL) for 10 years (In case of 6th digit code "2", "3", "4")

Temperature effect:

Effects per 55°C change between the limits of -40°C and +85°C

Zero shift :

± (0.4 + 0.1 $\frac{\text{URL}}{\text{span}}$) %/28°C

Total effect:

± (0.475 + 0.1 $\frac{\text{URL}}{\text{span}}$) %/28°C

Overrange effect:

Zero shift, 0.3% of URL for any overrange to maximum limit

Supply voltage effect:

Less than 0.05% fo calibrated span per 10V

Update rate:

60 msec

Response time: (without electrical damping)

Time constant. 0.08 s (at 23°C)

Dead time: about 0.12 s

Response time = time constant + dead time

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.

(Double the effect for fluorinated fill sensors)

Vibration effect:

< ±0,25% Of spans for spans greater than 1/10 of URL.

Frequency 10 to 150Hz, acceleration 39,2m/sec²

Material fatigue:

Please consult Fuji Electric.

Dielectric strength:

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

Insulation resistance:

More than 100MΩ at 500V DC

Internal resistance for external field indicator:

12Ω or less.

Physical specifications

Electrical connections:

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

Process connections:

1/2"-14NPT, Rc1/2", Rc1/4" or 1/4"-18NPT, as specified.

Process-wetted parts material:

Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body
J	316L SS	316L SS + Gold coating	316L SS
V	316L SS	316L SS	316L SS

Non-wetted parts material:

Electronics housing:

Standard:

Low copper die-cast aluminum alloy , finished with polyester coating.

Option: SS360

Fill fluid:

Silicone oil (standard) or fluorinated oil (Daifloil)

Mounting bracket:

304 stainless steel

Environmental protection:

IEC IP67 and NEMA 6/6P

Mounting:

On 60.5mm pipe using mounting bracket, direct wall mounting, or direct process mounting.

Mass{weight}:

Transmitter approximately :

2.2kg without options.

Add; 0.5kg for mounting bracket

Optional features

Indicator:

A plug-in turnable analog indicator (2.5% accuracy)

An optional 5digits LCD meter with engineering unit is also available.

Local configurator with LCD display:

An optional 5 digits LCD meter with 3 push buttons can support items as using communication with FXW.

Arrester:

A built-in arrester protects the electronics from lightning surges.

Lightning surge immunity: 4kV (1.2 x 50 μs)

Oxygen service:

Special cleaning procedures are followed throughout the process to maintain all process wetted parts oil-free.

The fill fluid is fluorinated oil.

Degreasing:

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

NACE specification:

Metallic materials for all pressure boundary parts comply with NACE MR-01-75.

Optional tag plate:

An extra stainless steel tag with customer tag data is wired to the transmitter.

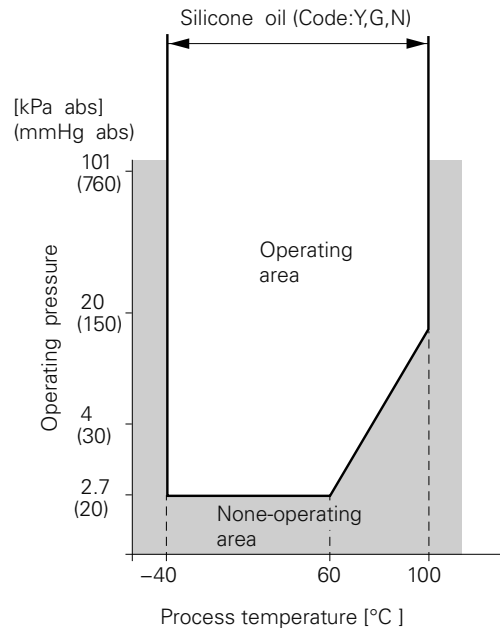


Fig.1 Relation between process temperature and operating pressure

ACCESSORIES

Hand-held communicator:

(Model FXW, refer to Data Sheet No. EDS8-47)

The product conforms to the requirements of the Electro-magnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

EMI (Emission) EN61326 : 1997

Class A (std for Industrial Location)

Frequency range MHz	Limits	Reference Standard
3 to 230	40dB ($\mu\text{V/m}$) quasi peak measured at 10m distance	CISPR16-1 and CISPR16-2
230 to 1000	47dB ($\mu\text{V/m}$) quasi peak, measured at 10m distance	

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.**

EMS (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	1.2 μs /50 μs 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

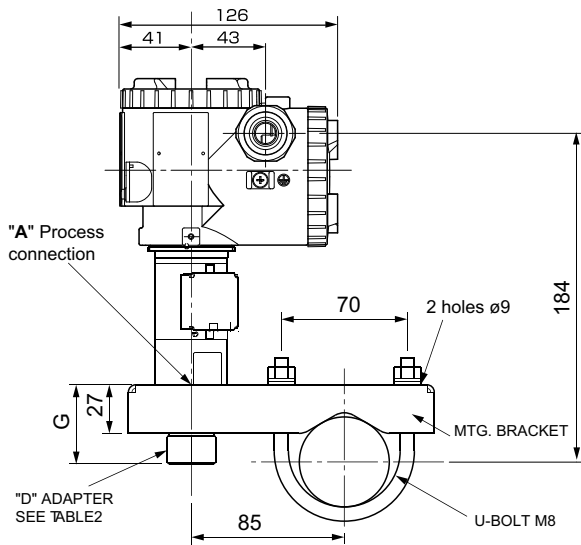
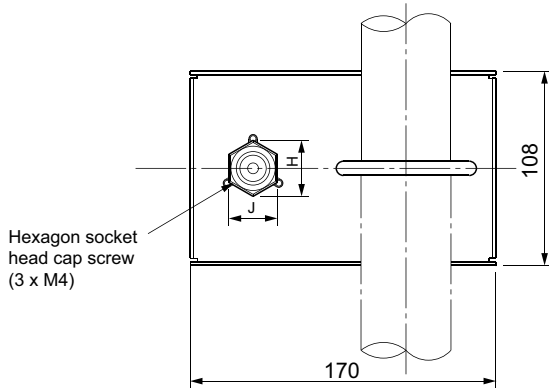
CODE SYMBOLS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	DESCRIPTION
F	K	P		0			5						0		
															Type Smart, 4-20 mAdc + Fuji/Hart® digital signal
															Connections
															Process connection
															Electrical connection
															See digit 15
															1/2-14 NPT
															See digit 15
															Pg 13,5
															See digit 15
															M 20 x 1,5
															Range & wetted parts material
															Span
															Diaphragm material
															Wetted parts
															0,08125/1,3 bar
															316 L SS
															0,08125/1,3 bar
															316 L SS/gold coat
															316L SS
															0,3125/5 bar
															316 L SS
															0,3125/5 bar
															316 L SS/gold coat
															316L SS
															1,875/30 bar
															316 L SS
															1,875/30 bar
															316 L SS/gold coat
															316L SS
															6,25/100 bar
															316 L SS
															6,25/100 bar
															316 L SS/gold coat
															316L SS
															Indicator & Arrester
															Indicator
															Arrester
															Initial setting
															None
															None
															Analog, 0-100% linear scale
															None
															Analog, Custom scale
															None
															Analog, double scale
															None
															None
															Yes
															4-20 mA DC
															Yes
															Analog, 0-100% linear scale
															Yes
															Analog, Custom scale
															Yes
															Analog, double scale
															Yes
															Digital, 0-100%
															None
															Digital, Custom scale
															None
															Digital, 0-100%
															Yes
															Digital, Custom scale
															Yes
															Approvals for hazardous locations (consult FUJI for availability)
															None (Standard)
															ATEX - Flameproof enclosures (digit 4 = "R, T" & "W" only)
															ATEX - Intrinsic Safety
															(*) FM - Explosion-Proof (digit 4 = "T" only)
															CSA - Explosion-Proof (digit 4 = "T" only)
															FM - Intrinsic Safety and Non Incendive
															CSA - Intrinsic Safety
															ATEX - Type "n" (digit 9 = A, E, 1, 2, 3, 4, 5 & 6 only)
															IECEX - Type "n" (digit 9 = A, E, 1, 2, 3, 4, 5 & 6 only)
															IECEX - Flameproof enclosures (digit 4 = "R, T" & "W" only)
															IECEX - Intrinsic Safety
															CSA - Explosion-Proof & Intrinsic Safety combined approval (digit 4 = "T" only)
															ATEX - Flameproof enclosures & Intrinsic Safety combined approval (digit 4 = "R, T" & "W" only)
															IECEX - Flameproof enclosures & Intrinsic Safety combined approval (digit 4 = "R, T" & "W" only)
															FM - Explosion-Proof & Intrinsic Safety combined approval (digit 4 = "T" only)
															Mounting bracket
															None
															Yes (SS)
															SS parts
															SS tag plate
															SS housing
															None
															None
															Yes
															None
															Yes
															Yes
															Special applications & fill fluid
															Treatment
															Fill fluid
															None (std)
															Silicone oil
															Degreasing
															Silicone oil
															Oxygen service
															Fluorinated oil
															NACE
															Silicone oil
															Processconnection (welded) adaptor - all stainless steel parts
															None - (1/2 - 14 NPTI connection)
															Rc 1/2 I
															1/4 - 18 NPTI
															1/2 - 14 NPTE
															G 1/2"A manometer fitting

Note :

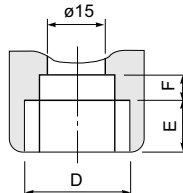
1 - Code "D" FM approval only possible with electrical connection 1/2" NPT.

OUTLINE DIAGRAM (Unit:mm)



"D" ADAPTER				
CONN.L	G	H	J	K
1/4 NPT	14	25	22	8

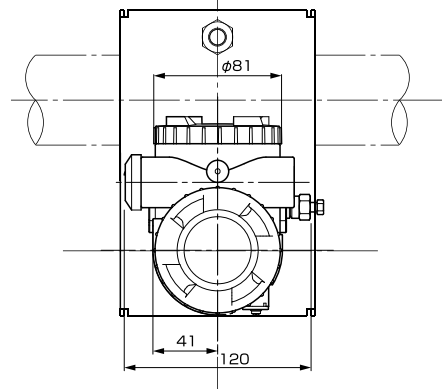
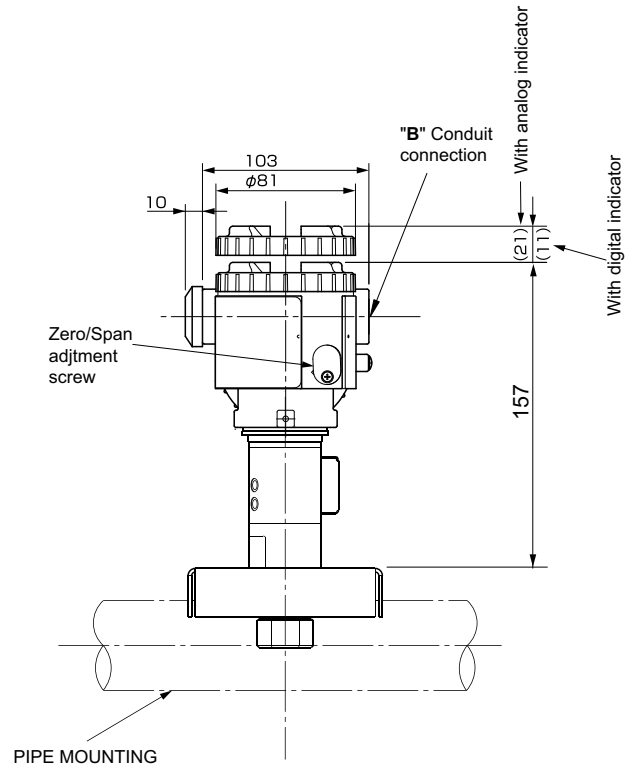
Table 2



Details of "B"

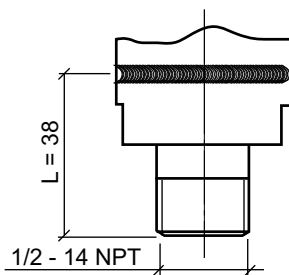
4th digit of the code symbols	Conduit connections	
	D	E F
T	1/2-14NPT	16 5
V	Pg13.5	8 4.5
W	M20x1.5	16 5

Table 1

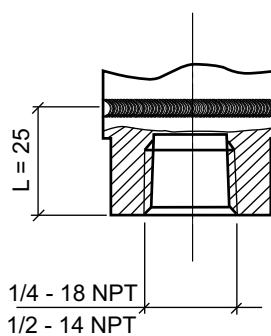


Details "A" - Process connection

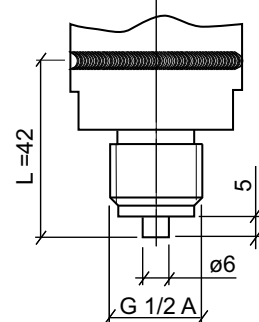
Code digit 15 = D



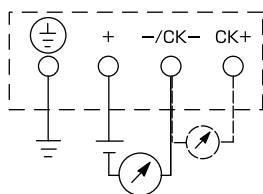
Code digit 15 = Y ou C



Code digit 15 = E



CONNECTION DIAGRAM



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