FUJI ELECTRIC
e-Front runners Fuji Electric France S.A.

FCX-AII

PRESSURE TRANSMITTER (DIRECT MOUNT TYPE)

DATA SHEET **FKP, KHP···5**

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

The transmitter utilizes the unique micromachined capaci- tive silicon sensor with state-of-the-art microprocessor tech- nology to provide exceptional performance and functionality.

FEATURES

1. High accuracy ±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 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–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
FDP: FOUNDATION™ Fieldbus and Profibus™

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

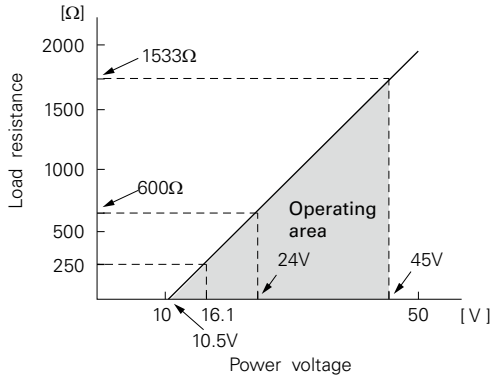
Output signal:

4 to 20mA DC with digital signal super-imposed on the 4 to 20mA signal.
Digital signal based on FOUNDATION™ Fieldbus or Profibus™

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: SEE TABLE3

Authorities	Intrinsic safety
ATEX (pending)	Ex II 1 GD Ex ia IIC T5 Tamb = −40°C to +50°C Ex ia IIC T4 Tamb = −40°C to +70°C Entity Parameters: Ui=28V, Ii=93.3mA, Pi=0.66W, Ci=25.18nF (Without Arrester), Ci=35.98nF (With Arrester), Li=0.694mH
Factory Mutual (pending)	Class I II III Div.1 Groups A, B, C, D, E, F, G T4 Entity Type 4X Model code / 9th digit / 13th digit / Tamb 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 Entity Parameters: Vmax=42.4V, Imax=113mA, Pi=1W, Ci=35.98nF, Li=0.694mH
CSA (pending)	Class I Div.1 Groups A, B, C, D Class II Div.1 Groups E, F, G Class III Div.1 Temp Code T5 Tamb max = +50°C Temp Code T4 Tamb max = +70°C Entity Parameters: Vmax=28V, Imax=93mA, Ci=25.18nF (Without Arrester), Ci=35.98nF (With Arrester), Li=0.694mH
TIIS (pending)	Ex ia IIC T4 Tamb max = +60°C Entity Parameters: Ui=28V, Ii=94.3mA, Pi=0.66W, Ci=38.4nF, Li=0.694mH
IECEx Scheme (pending)	Ex ia IIC T4 IP66/67 Tamb = −40°C to +70°C Ex ia IIC T5 IP66/67 Tamb = −40°C to +50°C Entity Parameters: Ui=28V, Ii=93.3mA, Pi=0.66W, Ci=35.98nF , Li=0.694mH
NEPSI (pending)	Ex ia IIC T4 Ex d IIB+H_2 T6 / Ex ia IIC T4 Model code / 9th digit / 13th digit / Tamb A,B,D,J / Y,G,H,J,S,T,K / −40°C to +85°C L,P,1,2 / Y,G,H,J,S,T,K / −20°C to +80°C Q,S,4,5 / Y,G,H,J,S,T,K / −20°C to +60°C E,F,H,K / Y,G,H,J,S,T,K / −40°C to +60°C – / W,A,D / −10°C to +60°C Entity Parameters: Ui=42.4V, Ii=113mA, Pi=1W, Ci=35.98nF , Li=0.694mH

Authorities	Flameproof
ATEX (pending)	Ex II 2 GD Ex d IIC T6 IP66/67 T85°C Tamb = −40°C to +65°C Ex d IIC T5 IP66/67 T100°C Tamb = −40°C to +85°C
Factory Mutual (pending)	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	Class I Div.1 Groups C, D Class II Div.1 Groups E, F, G Class III Div.1 Note) "Seal Not Required" enclosure is allowed.
TIIS	Ex do IIB+H_2 T4 Tamb max = +60°C Maximum process temp. = +120°C
IECEx Scheme (pending)	Ex d IIC T5 IP66/67 Tamb = −40°C to +85°C Ex d IIC T6 IP66/67 Tamb = −40°C to +65°C
NEPSI	Ex d IIB+H_2 T6 Tamb = −40°C to +60°C

Authorities	Type n Nonincendive
ATEX (pending)	Ex II 3 GD Ex nL IIC T5 Tamb = −40°C to +50°C Ex nL IIC T4 Tamb = −40°C to +70°C Specific Parameters: Model without arrester: Ui=42.4V, Ii=113mA, Pi=1W, Ci=25.18nF, Li=0.694mH Model with arrester: Ui=32V, Ii=113mA, Pi=1W, Ci=35.98nF, Li=0.694mH Ex nA IIC T5 Tamb = −40°C to +50°C Ex nA IIC T4 Tamb = −40°C to +70°C Specific Parameters: Model without arrester: Umax=42.4V, Imax=113mA, Pmax=1W Model with arrester: Umax=32V, Imax=113mA, Pmax=1W
Factory Mutual (pending)	Class I II III Div.2 Groups A, B, C, D, F, G T4 Entity Type 4X Model code / 9th digit / 13th digit / Tamb 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
CSA (pending)	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=28V, Ci=25.18nF (Without Arrester), Ci=35.98nF (With Arrester), Li=0.694mH

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":

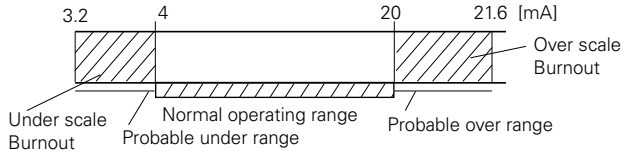
Output signal is hold as the value just before failure happens.

"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 3.2mA 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: With HHC(1) (Model FXW, consult Data Sheet No. EDS8-47), following items can be remotely displayed or configured.

Note: HHC's version must be higher than 6.0 (or FXW □□□□1–□3), for FCX-AⅡ.

For supporting "Saturate current", "Write protect", and "History", HHC's version 6.3 or higher is necessary.

Items	Fuji Protocol with FXW		Hart Protocol	
	Display	Set	Display	Set
Tag No.	*v*	*v*	*v*	*v*
Model No.	*v*	*v*	—	—
Serial No. & Software Version	*v*	—	*v*	—
Engineering unit	*v*	*v*	*v*	*v*
Range limit	*v*	—	*v*	—
Measuring range	*v*	*v*	*v*	*v*
Damping	*v*	*v*	*v*	*v*
Output mode	*v*	—	*v*	—
Burnout direction	*v*	*v*	*v*	*v*
Calibration	*v*	*v*	*v*	*v*
Output adjust	—	*v*	—	*v*
Data	*v*	—	*v*	—
Self diagnoses	*v*	—	*v*	—
Printer (In case of FXW with printer option)	*v*	—	—	—
External switch lock	*v*	*v*	*v*	*v*
Transmitter display	*v*	*v*	*v*	*v*
Linearize*	*v*	*v*	—	—
Rerange	*v*	*v*	*v*	*v*
Saturate current	*v*	*v*	*v*	*v*
Write protect	*v*	*v*	*v*	*v*
History – Calibration history – Ambient temperature history	 *v* *v*	 *v* —	 *v* *v*	 *v* —

***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).

Fieldbus units:

Digital signal
Transmission technique: according to IEC61158-2
Power supply: 9VDC...32VDC
Base current: 16±2mA
Transmission rate: 31,25 kbits/sec
Profibus-PA: DPV1 version 3.0
Fieldbus Foundation: FF-890/891

(Note) (1) HHC: Hand Held Communicator

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 :

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

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 :

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

Total effect:

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

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

Step response:
Time constant: 0.08s (at 23°C)
Dead time: about 0.12s
(without electrical damping)

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)

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
V	316 stainless steel	316L stainless steel	316 stainless steel

Non-wetted parts material:
Electronics housing: Low copper die-cast aluminum alloy (standard), finished with polyester coating.
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 (JIS 50A or 2B) 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.

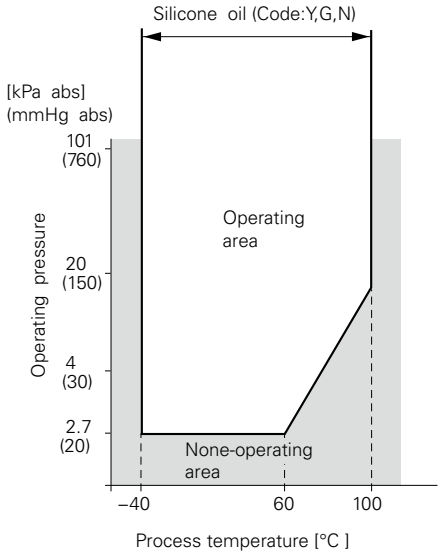


Fig.1 Relation between process temperature and operating pressure

ACCESSORIES

Hand-held communicator:

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

The product conforms to the requirements of the Electromagnetic 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 (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	

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	1.2µs/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

CODE SYMBOLS

1	2	3	4	5	6	7	8	-	9	10	11	12	13	-	14	15		DESCRIPTION
				0			5	-						-	0			
																		Type
F	K	P																Smart, 4-20 mAdc + Fuji/Hart™ digital signal
F	D	P																Fieldbus Foundation™ & Profibus™
																		Connections
			T															See digit 15 / 1/2-14 NPT
			V															See digit 15 / Pg 13,5
			W															see digit 15 / M 20 x 1,5
																		Range & wetted parts material
				0	1	V												0,08125/1,3 bar / 316 L SS / 316L SS
				0	2	J												0,08125/1,3 bar / 316 L SS/gold coat / 316L SS
				0	2	V												0,3125/5 bar / 316 L SS / 316L SS
				0	2	J												0,3125/5 bar / 316 L SS/gold coat / 316L SS
				0	3	V												1,875/30 bar / 316 L SS / 316L SS
				0	3	J												1,875/30 bar / 316 L SS/gold coat / 316L SS
				0	4	V												6,25/100 bar / 316 L SS / 316L SS
				0	4	J												6,25/100 bar / 316 L SS/gold coat / 316L SS
																		Indicator & Arrester
							5	-	A									None / None /
							5	-	B									Analog, 0-100% linear scale / None /
							5	-	D									Analog, Custom scale / None /
							5	-	J									Analog, double scale / None /
							5	-	E									None / Yes / 4-20 mA DC
							5	-	F									Analog, 0-100% linear scale / Yes /
							5	-	H									Analog, Custom scale / Yes / +
							5	-	K									Analog, double scale / Yes /
							5	-	1									Digital, 0-100% / None / Hart™/Fuji
							5	-	2									Digital, Custom scale / None / digital signal
							5	-	4									Digital, 0-100% / Yes / "SMART"
							5	-	5									Digital, Custom scale / Yes /
																		Fieldbus Foundation™
							5	-	A									None / No / Fieldbus Foundation™
							5	-	E									None / Yes / Fieldbus Foundation™
							5	-	P									Digital / No / Fieldbus Foundation™
							5	-	S									Digital / Yes / Fieldbus Foundation™
																		Profibus
							5	-	R									None / No / Profibus
							5	-	T									None / Yes / Profibus
							5	-	V									Digital / No / Profibus
							5	-	W									Digital / Yes / Profibus
																	A	**Approvals for hazardous locations (consult FUJI for availability)**
																		None (standard)
																	X	Flameproof housing ATEX Ⓔx II 2 GD - Ex d IIC T5/T6 (code 4 = "M, P, R, T" & "W" only)
																	K	(*3) Intrinsic Safety ATEX Ⓔx II 1 GD - Ex ia IIC T4/T5
																	D	(*2) FM - Flameproof housing Class I, Division 1, Groups B,C,D; T6
																		Dust ingnitionproof Class II/III, Division 1, Groups E,F,G; T6; Type 4x - (code 4 = "P" & "T" only)
																	E	CSA - Flameproof housing Class I, Groups C,D - Class II, Group E,F,G Class III - (code 4 = "P" & "T" only)
																	H	FM - Intrinsic safety Class I, II, III, Division 1, Group A,B,C,D,E,F,G; T4
																		Non-Incendive Class I,II,III, Division 2, Groups A,B,C,D,F,G; T4; Type 4x
																	J	CSA - Intrinsic safety & Non-Incendive Class I, Groups A,B,C,D - Class II, Groups E,F,G - Class III
																	P	Type n ATEX Ⓔx II 3 GD - Ex nA / Ex nL IIC T4/T5
																	Q	IECEx Type n
																	R	IECEx Flameproof housing Ex d IIC T5/T6 (code 4 = "M, P, R, T" & "W" only)
																	T	IECEx Intrinsic safety Ex ia T4/T5
																	L	Combined CSA approval for flameproof and Intrinsic safety (code 4 = "P" & "T" only)
																	M	Combined ATEX approval for flameproof and Intrinsic safety (code 4 = "M, P, R, T" & "W" only)
																	N	Combined IECEx approval for flameproof and Intrinsic safety (code 4 = "M, P, R, T" & "W" only)
																	V	Combined FM approval for flameproof and Intrinsic safety (code 4 = "P" & "T" only)
																		Fieldbus Foundation™ & Profibus ™
																	A	None (standard)
																	X	Flameproof housing ATEX Ⓔx II 2 GD - Ex d IIC T5/T6
																	K	(*3) Intrinsic Safety ATEX Ⓔx II 1 GD - Ex ia IIC T4
																	4	ATEX - FISCO Ⓔx II 1 GD - Ex ia IIC T4
																		Mounting bracket
																	A	None
																	C	Yes (SS)
																		SS parts
																	Y	None / None
																	B	Yes / None
																	C	None / Yes
																	E	Yes / Yes
																		Special applications & fill fluid
																	Y	None (std) / Silicone oil
																	G	Degreasing / Silicone oil
																	A	Oxygen service / Fluorinated oil
																	N	NACE / Silicone oil
														-	0	Y		**Processconnection (welded) adaptor - all stainless steel parts**
														-	0	Y		None - (1/2 - 14 NPTI connection)
														-	0	B		Rc 1/2 I
														-	0	C		1/4 - 18 NPTI
														-	0	D	(*1)	1/2 - 14 NPTE
														-	0	E	(*1)	G 1/2"A manometer fitting

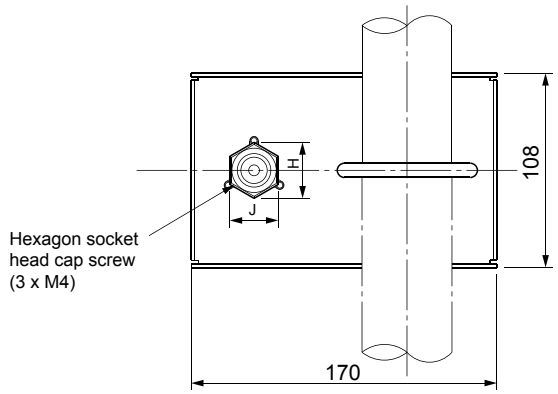
Note :

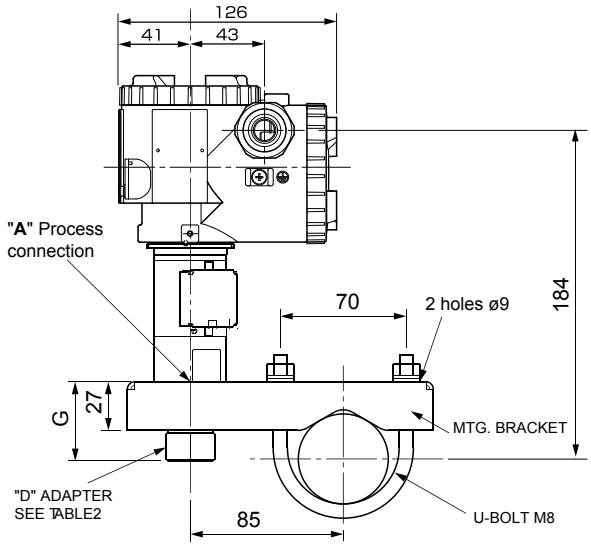
1 - Digit 11 code “C“ not possible - no mounting bracket can be used on these transmitters .

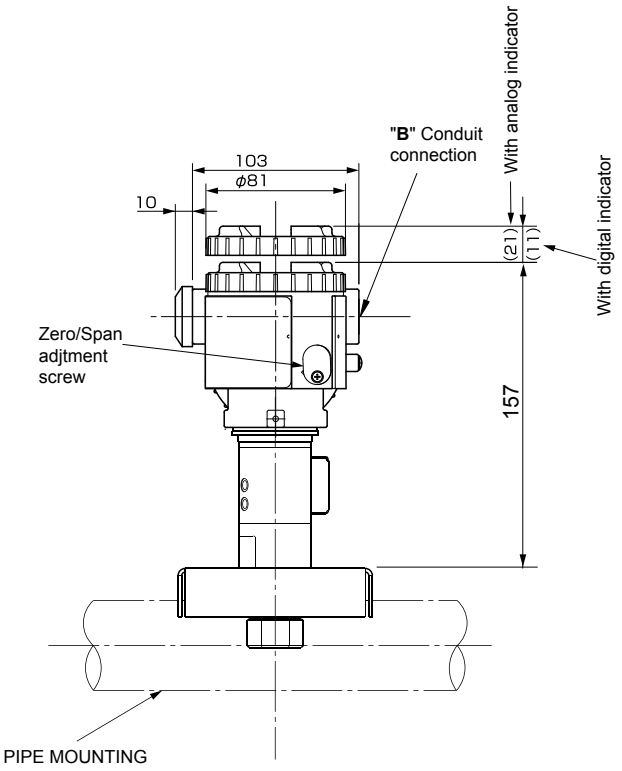
2 - Code "D" FM approval only possible with electrical connection 1/2" NPT.

3 - For FKP transmitter please use approval ATEX Ⓔx II 1 GD - EEx ia IIC T4/T5 and for FDP transmitter ATEX Ⓔx II 1 GD - EEx ia IIC T4

OUTLINE DIAGRAM (Unit:mm)

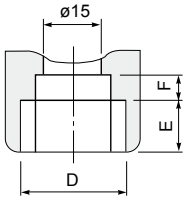






"D" ADAPTER				
CONN.L	G	H	J	K
1/4 NPT	14	25	22	8

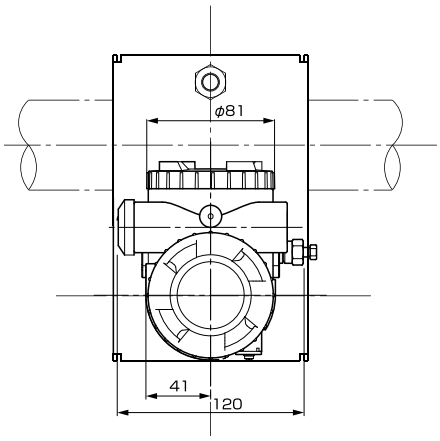
Table 2



Details of "**B**"

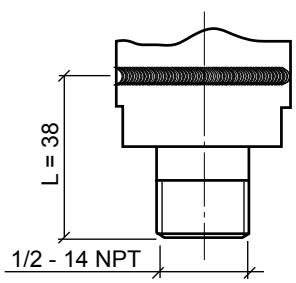
4th digit of the code symbols	Conduit connections		
	D	E	F
T	1/2-14NPT	16	5
V	Pg13.5	8	4.5
W	M20x1.5	16	5

Table 1

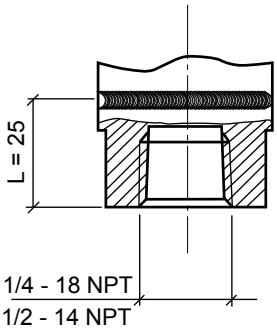


Details "A" - Process connection

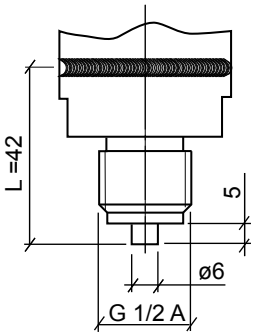
Code digit 15 = D



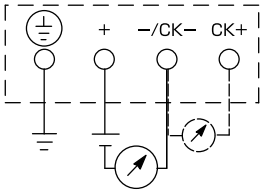
Code digit 15 = Y ou C



Code digit 15 = E



CONNECTION DIAGRAM



Fuji Electric France S.A.

46, Rue Georges Besse - Z I du Brézet
63 039 Clermont-Ferrand cedex 2 — FRANCE
France : Tél. 04 73 98 26 98 - Fax 04 73 98 26 99
International : Tél. (33) 4 7398 2698 - Fax. (33) 4 7398 2699
E-mail : sales.dpt@fujielectric.fr
Web : www.fujielectric.fr