

# PRESSURE TRANSMITTER (DIRECT MOUNT TYPE)

**DATA SHEET**
**FKP...5**

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

Electronics unit, local indicators and electronics housing are interchangeable among all FCX-AII transmitters.

### 3. 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.

### 4. 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.

### 5. Application flexibility

Various options that render the FCX-AII 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

### 6. Programmable output Linearization Function

Output signal can be freely programmable.

(Up to 14 compensated points at approximation)

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

Burnout signal level is adjustable using Model FXW or Hand Held Communicator (HHC) to comply with NAMUR NE43.

### 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:

FKP: Smart, 4 to 20 mA 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: 66 kPa abs (500mmHg abs) at below 60°C

#### Output signal:

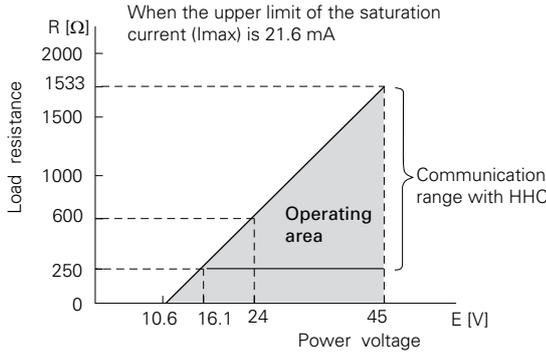
4 to 20 mA DC with digital signal superimposed on the analogic signal

#### Power supply:

Transmitter operates on 10.5 to 45 V DC at transmitter terminals.

10.5 to 32 V DC for the units with optional arrester

Load limitations: see figure below



Note) The load resistance varies with the upper limit of the saturation current [I max]

$$R [\Omega] = \frac{E [V] - 10.5}{(I_{max} [mA] + 0.9) \times 10^{-3}}$$

Note: For communication with HHC<sup>(1)</sup> (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																					
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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																					
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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																					
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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 (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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**Zero/span adjustment:**

Zero and span are adjustable from the HHC<sup>(1)</sup>. Zero and span are also adjustable externally from the adjustment screw.

**Damping:**

Adjustable from HHC<sup>(1)</sup> or local adjustment unit with LCD display.

The time constant is adjustable between 0,06 to 32 sec.

**Zero elevation/suppression:**

-100% to +100% of URL

**Normal/reverse action:**

Selectable from HHC<sup>(1)</sup>.

**Indication:**

Analog indicator or 5 digit LCD meter, as specified.

**Burnout direction:** Selectable from HHC<sup>(1)</sup>

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

"Output Hold":

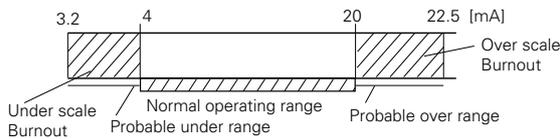
Output signal is hold as the value just before failure happens.

"Output Overscale":

Adjustable within the range 20.0 to 22.5 mA from HHC<sup>(1)</sup>

"Output Underscale":

Adjustable within the range 3.2 to 4.0 mA from HHC<sup>(1)</sup>



Output limits conforming to NAMUR NE43 by order.

**Loop-check output:**

Transmitter can be configured to provide constant signal 3.2 through 22.5 mA 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 oil fill sensor
- 20 to +80°C for fluorinated oil fill sensor

Storage: -40 to +90°C

**Humidity limit:**

0 to 100% RH (Relative Humidity)

**Communication:**

With HHC<sup>(1)</sup> (Model FXW, consult DS 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-All for supporting these items: "Saturate current", "Write protect", and "History".

Items	Fuji Protocol with FXW		Hart® Protocol		By local configurator (with 3 push button), (LCD indicator)	
	Display	Set	Display	Set	Display	Set
Tag No.	✓	✓	✓	✓	✓	✓
Model No.	✓	✓	✓	✓	✓	✓
Serial No. & Software Version	✓	—	✓	—	✓	—
Engineering unit	✓	✓	✓	✓	✓	✓
Range limit	✓	—	✓	—	✓	—
Measuring range	✓	✓	✓	✓	✓	✓
Damping	✓	✓	✓	✓	✓	✓
Output mode	Linear	✓	✓	✓	✓	✓
	Square root	✓	✓	✓	✓	✓

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	—	—	—	—	—	—
	—	—	—	—	—	—

(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<sup>(1)</sup>.

**Performance specifications**

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

**Accuracy rating:**

(including linearity, hysteresis, and repeatability)

For spans greater than 1/10 of URL:

$$\pm 0.1\% \text{ of span}$$

For spans below 1/10 of URL :

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

**Stability:**

$\pm 0.2\%$  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 :

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

Total effect:

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

**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 10 V

**Update rate:**

60 msec

**RFI effect :**

< 0,2% of URL for the frequencies of 20 to 1000 MHz and field strength of 10 V/m when electronic housing covers are on (Classification : 2-abc : 0,2% of span according SAMA PMC 33.1)

**Response time:** (without electrical damping)

Time constant. 0.08 seconds (at 23°C)

Dead time: about 0.12 seconds

Response time = time constant + dead time

**Mounting position effect:**

Zero shift, less than 0.1 kPa {1mbar} for a 10° tilt in any plane.

This error can be corrected by adjusting zero.

(Double the effect for fluorinated fill sensors).

No effect on span.

**Vibration effect:**

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

Frequency 10 to 150 Hz, acceleration 39,2 m/sec<sup>2</sup>

**Material fatigue:**

Please consult Fuji Electric.

**Dielectric strength:**

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

**Insulation resistance:**

More than 100 MΩ at 500 V DC

**Internal resistance for external field indicator:**

12Ω Max (connected to test terminal CK+ and CK-).

**Pressure equipment directive (PED) 97/23/EC:**

According to Article 3.3

**Physical specifications**

**Electrical connections:**

1/2"-14 NPT, Pg13.5, or M20×1.5

**Process connections:**

1/2-14 NPT, 1/4-18 NPT, Rc 1/2, G1/2 A manometer fitting, M20 x 1,5.

**Process-wetted parts material:**

**Non-wetted parts material:**

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

**Electronics housing:**

Low copper die-cast aluminum alloy , finished with polyester coating (standard), or SS 316L as specified.

**Fill fluid:**

Silicone oil (standard) or fluorinated oil (option)

**Mounting bracket:**

SS 304L

SS 316L (option)

**Environmental protection:**

IEC IP66/IP67 and NEMA4X

**Mounting:**

Without mounting bracket : direct mounting on manifold (optional)

With optional mounting bracket : for 50 mm (2") pipe or direct wall mounting

**Mass {weight}:**

Transmitter approximately : 1,7 kg without options.

Add; 0.5 kg for indicator

0.5 kg for mounting bracket

2 kg for stainless steel housing option

**Optional features**

**Indicator:**

A plug-in analog indicator (2.5% 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 configurator with LCD display:**

An optional 5 digits LCD meter with 3 push buttons can support items without using communication with HHC.

**Arrester:**

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

Lightning surge immunity: 4 kV (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 0175 / ISO 15156.

SS 660 or SS 660/660 bolts and nuts comply with NACE MR 0175 / ISO 15156.

**Optional tag plate:**

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

**Vacuum service :**

Special silicone oil and filling procedure are applied.

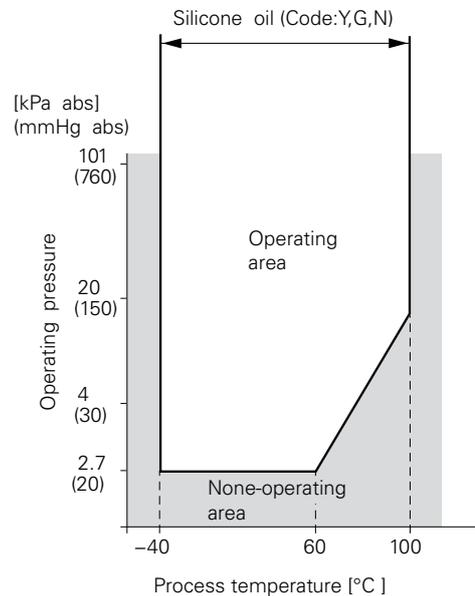


Fig.1 Relation between process temperature and operating pressure

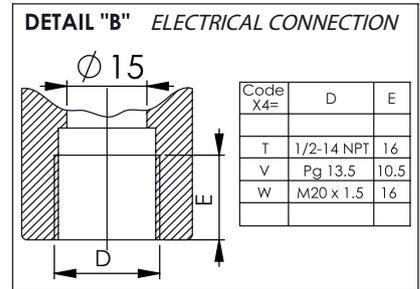
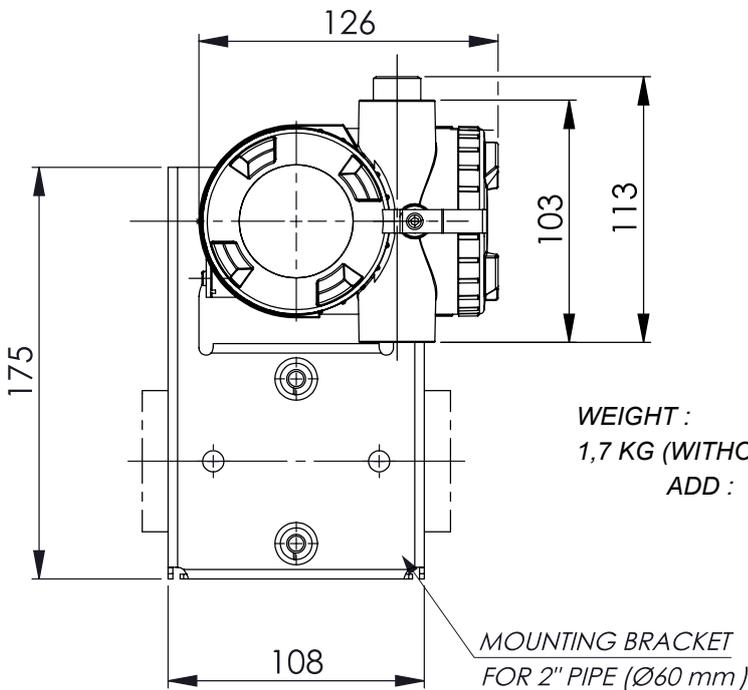
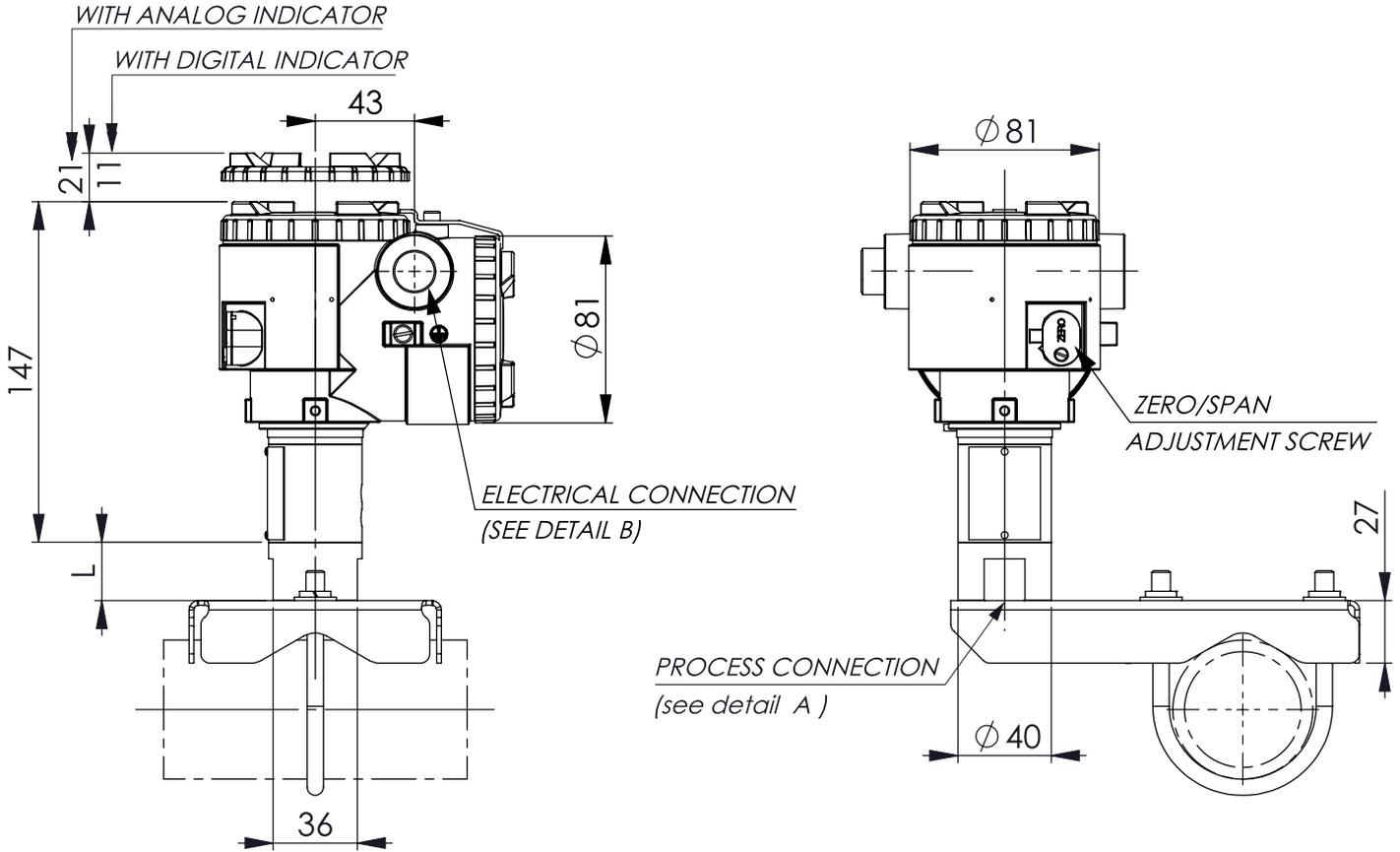
**ACCESSORIES**

**Hand-held communicator:**

(Model FXW, refer to DSt n° EDS8-47)



OUTLINE DIAGRAM (Unit:mm)

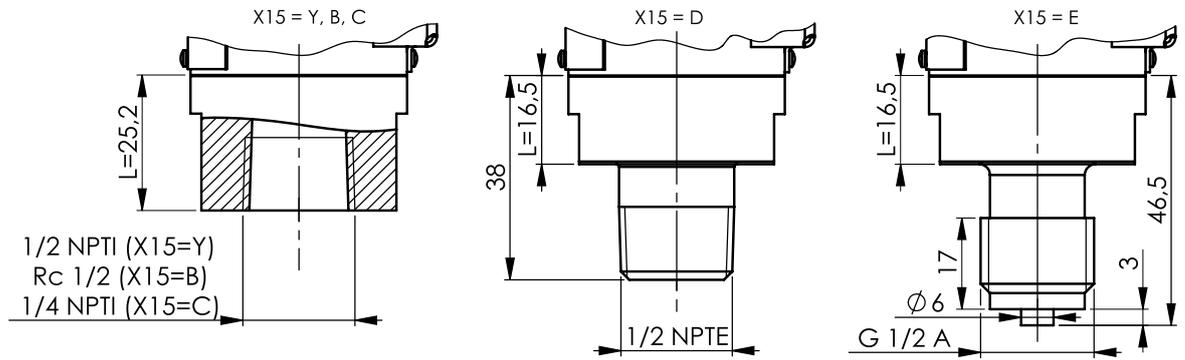


WEIGHT :  
1,7 KG (WITHOUT OPTION)

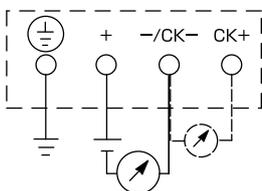
ADD :  
- 0,5 KG FOR MOUNTING BRACKET  
- 2 KG FOR STAINLESS STEEL HOUSING OPTION

X <sub>1</sub> X <sub>2</sub> X <sub>3</sub> X <sub>4</sub> X <sub>5</sub> X <sub>6</sub> X <sub>7</sub> X <sub>8</sub> - X <sub>9</sub> X <sub>10</sub> X <sub>11</sub> X <sub>12</sub> X <sub>13</sub> - X <sub>14</sub> X <sub>15</sub> F K P □ 0 □ V 5 - □ □ □ □ □ - 0 □	SPAN LIMIT	
	Min.	Max.
FKP□01	8,125 kPa (0,08125 bar)	130 kPa (1,3 bar)
FKP□02	31,25 kPa (0,3125 bar)	500 kPa (5 bar)
FKP□03	187,5 kPa (1,875 bar)	3000 kPa (30 bar)
FKP□04	625 kPa (6,25 bar)	10000 kPa (100 bar)

# Details "A" - Process connection



# CONNECTION DIAGRAM



**EMC Directive (2004/108/EC)**

All models of **FCX** series transmitters type **FCX-All** are in accordance with :

- the harmonized standards:
  - EN 61326-1 : 2006 (Electrical equipment for measurement, control and laboratory use - EMC requirements).
  - EN 61326-2-3 : 2006 (Part 2-3 : Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning)

**Emission limits** : EN 61326-1 : 2006

Frequency range (MHz)	Limits	Basic standard
30 to 230	40 dB ( $\mu\text{V/m}$ ) quasi peak, measured at 10m distance	EN 55011 / CISPR 11 Group 1 Class A
230 to 1000	47 dB ( $\mu\text{V/m}$ ) quasi peak, measured at 10m distance	

**Immunity requirements** : EN 61326-1 : 2006 (Table 2)

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge (EDS)	4 kV (Contact)	EN 61000-4-2	<b>B</b>
	8 kV (Air)	IEC 61000-4-2	
Electromagnetic field	10V/m (80 to 1000 MHz)	EN 61000-4-3	<b>A</b>
	3 V/m (1.4 to 2.0 GHz)	IEC 61000-4-3	
	1 V/m (2.0 to 2.7 GHz)		
Rated power frequency Magnetic field	30 A/m	EN 61000-4-8	<b>A</b>
		IEC 61000-4-8	
Burst	2 kV (5/50 NS, 5 kHz)	EN 61000-4-4 IEC 61000-4-4	<b>B</b>
Surge	1 kV Line to line 2 kV Line to line	EN 61000-4-5	<b>B</b>
		IEC61000-4-5	
Conducted RF	3 V (150 kHz to 80 MHz)	EN 61000-4-6 IEC61000-4-6	<b>A</b>

**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.



**Fuji Electric France S.A.S.**

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