

# ABSOLUTE PRESSURE TRANSMITTER

## DATA SHEET

**FKA...5**

The FKA model of FCX-AII V5 series of pressure transmitters accurately measures an absolute pressure and transmits a proportional 4-20 mA output signal.

The transmitter uses an unique micro-capacitive silicon sensor in combination with a state-of-the-art digital signal processing to provide exceptional performances in terms of accuracy and stability.

## FEATURES

### 1. High accuracy

- ±0.2% accuracy for all calibrated spans is standard.
- ±0.1% accuracy is available in option.

### 2. Minimum inventory and design

Electronics unit, local indicators and electronics housing are interchangeable among all FCX-AII V5 transmitters.

### 3. Minimum environmental influence

The "Advanced Floating Cell" technology provides a high immunity against temperature variations and overpressure commonly found in process industry and substantially reduces the overall measurement error.

### 4. HART/Fuji Electric communication protocols

FCX-AII V5 series of pressure transmitters can communicate using either the universal HART or the proprietary and faster Fuji Electric communication protocol.

By the use of Device Description files, HART compatible devices can communicate with any FCX-AII V5 transmitter.

### 5. Application flexibility

Various options are available to address most of the process industry applications, including :

- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- Analog or 5 digits local display with engineering units
- Stainless steel electronics housing
- Wide selection of wetted part materials

### 6. Programmable output Linearization Function

The output signal can be linearized using up to 14 point-pairs.

### 7. Burnout current flexibility

The burnout current value can be adjusted in the ranges of [3.2 ; 4.0] and [20.0 ; 22.5] mA and can be compliant with NAMUR NE43 recommendations.



## FUNCTIONAL SPECIFICATIONS

### Type :

**FKA:** Smart, 4-20mA DC + Hart/Fuji Electric communication protocols

### Service :

Liquid, gas, or vapour

### Span, range, and overrange limit :

Model	Span limits kPa abs {bar abs}		Range limits 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}
FKA□05	100 {1}	10000 {100}	0 to +10000 {0 to +100}	15 {150}

### Remark :

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

### Output signal :

4-20 mA with digital signal superimposed on the analog signal.

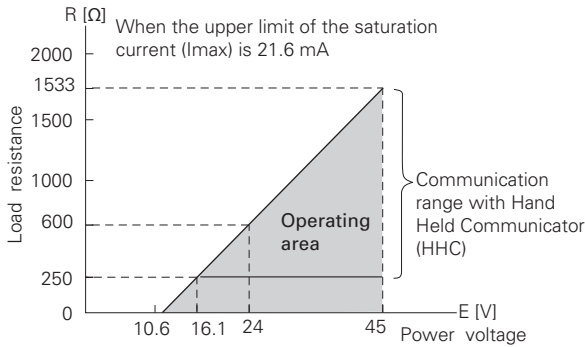
### Power supply :

10.5 to 45 V DC at transmitter terminals.

10.5 to 32 V DC with the optional arrester.

Refer to hazardous location table for specific limitations.

Load limitations : see figure below



Note 1 : 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 2 : For communication with HHC (FXW model), a minimum load of 250 Ω is required.

**Hazardous locations :**

(See Table below)

Marking (Digit 10 =)	Protection type	
ATEX	Intrinsic Safety "i"	
	Ex II 1 G/D	
	Ex ia IIC T4 Ga (-40°C ≤ Ta ≤ +70°C)	
	Ex ia IIC T5 Ga (-40°C ≤ Ta ≤ +50°C)	
	Ex ia IIIC T135°C Da (-40°C ≤ Ta ≤ +70°C)	
	Ex ia IIIC T100°C Da (-40°C ≤ Ta ≤ +50°C)	
	IP 66/67	
	Electrical Parameters :	
	Ui ≤ 28 Vdc, li ≤ 94.3 mA, Pi ≤ 0.66 W	
	Ci = 26 nF(1) / 36 nF(2), Li = 0.6 mH(3) / 0.7mH(4)	
	(K)	Flameproof Enclosure "d"
		Ex II 2 G/D
		Ex d IIC T5 Gb (-40°C ≤ Ta ≤ +85°C)
		Ex d IIC T6 Gb (-40°C ≤ Ta ≤ +65°C)
		Ex tb IIIC T100°C Db (-40°C ≤ Ta ≤ +85°C)
Ex tb IIIC T85°C Db (-40°C ≤ Ta ≤ +65°C)		
45 Vdc max		
(P)	Increased Safety "e"	
	Ex II 3 G/D	
	Ex ec IIC T5 Gc (-40°C ≤ Ta ≤ +70°C)	
	Ex tc IIIC T100°C Dc (-40°C ≤ Ta ≤ +70°C)	
45 Vdc max		
(M)	Combination (K) + (X)	
IECEX	Intrinsic Safety "i"	
	Ex ia IIC T4 Ga (-40°C ≤ Ta ≤ +70°C)	
	Ex ia IIC T5 Ga (-40°C ≤ Ta ≤ +50°C)	
	Ex ia IIIC T135°C Da (-40°C ≤ Ta ≤ +70°C)	
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	Electrical Parameters :	
	Ui ≤ 28 Vdc, li ≤ 94.3 mA, Pi ≤ 0.66 W	
	Ci = 26 nF(1) / 36 nF(2), Li = 0.6 mH(3) / 0.7mH(4)	
	(R)	Flameproof Enclosure "d"
		Ex d IIC T5 Gb (-40°C ≤ Ta ≤ +85°C)
		Ex d IIC T6 Gb (-40°C ≤ Ta ≤ +65°C)
		Ex tb IIIC T100°C Db (-40°C ≤ Ta ≤ +85°C)
		Ex tb IIIC T85°C Db (-40°C ≤ Ta ≤ +65°C)
		45 Vdc max
(Q)	Increased Safety "e"	
	Ex ec IIC T5 Gc (-40°C ≤ Ta ≤ +70°C)	
	Ex tc IIIC T100°C Dc (-40°C ≤ Ta ≤ +70°C)	
	45 Vdc max	
(N)	Combination (T) + (R)	
ATEX	(W) Combination (K) + (X) + (T) + (R) + (J) + (E)	
IECEX		
cCSAus		

cCSAus		Intrinsic safety / Non Incendive / Class 1 Division 2
(J)		IS Class I Division 1, Groups ABCD Ex ia
		Class II Groups EFG; Class III
		NI Class I Division 2, Groups ABCD
		(Per control drawing TC522873)
		Class I Division 2, Groups ABCD
		T4 (-40°C ≤ Ta ≤ +70°C)
		T5 (-40°C ≤ Ta ≤ +50°C)
		Ui ≤ 28 Vdc, li ≤ 94.3 mA, Pi ≤ 0.66 W
		Ci = 26 nF(1) / 36 nF(2), Li = 0.6 mH(3) / 0.7mH(4)
		(E)
XP Class I Division 1, Groups CD		
Class II Groups EFG; Class III		
T5 (-40°C ≤ Ta ≤ +85°C)		
T6 (-40°C ≤ Ta ≤ +65°C)		
Vmax = 42.4 Vdc		
(L)		Combination (J) + (E)

- (1) Without optional arrester
- (2) With optional arrester
- (3) Without analog indicator
- (4) With analog indicator

**Configuration :**

Configuration of the FCX-All V5 series of pressure transmitters can be carried out by either using a Hand Held Communicator (ie. Fuji Electric FXW or third party HART terminal) or the 3 push-buttons optional indicator.

A third party HART hand held communicator can be used in combination with Fuji Electric FCX-All V5 HART Device Description files (<https://fieldcommgroup.org>).

Functions	Fuji Electric FXW		Third party HART HHC		3 push buttons optional indicator	
	Display	Set	Display	Set	Display	Set
Tag Nb	✓	✓	✓	✓	✓	✓
Model Nb	✓	✓	✓	✓	✓	✓
Serial Nb & Software revision	✓	—	✓	—	✓	—
Engineering units	✓	✓	✓	✓	✓	✓
Upper Range Value	✓	—	✓	—	✓	—
Measuring Range	✓	✓	✓	✓	✓	✓
Damping	✓	✓	✓	✓	✓	✓
Output signal type	Linear	✓	✓	✓	✓	✓
	Square Root	✓	✓	✓	✓	✓
Burnout current	✓	✓	✓	✓	✓	✓
Calibration	✓	✓	✓	✓	✓	✓
Output Adjust	—	✓	—	✓	—	✓
Measuring Value	✓	—	✓	—	✓	—
Self Diagnosis	✓	—	✓	—	✓	—
Printer (option)	✓	—	—	—	—	—
External Adj Screw Lock	✓	✓	✓	✓	✓	✓
Transmitter Display	✓	✓	✓	✓	✓	✓
Linearization	—	—	✓	✓	✓	✓
Rerange	✓	✓	✓	✓	✓	✓
Saturation Current	✓	✓	✓	✓	✓	✓
Write Protect	✓	✓	✓	✓	✓	✓
History	—	—	—	—	—	—
	— Calibration History	✓	✓	✓	✓	✓
— Ambient T° History	✓	—	✓	—	✓	—

Note 1 : The FXW firmware revision must be higher than 7.0 in order to address FCX-All V5 "Saturation current", "Write protect" and "History" functions.

Note 2 : The "Linearization" function is not accessible through the 3 push-buttons optional indicator.

**Zero and span adjustment :**

Zero and span are adjustable remotely with a Hand Held Communicator or locally with the external adjustment screw.

**Damping :**

The damping time constant can be adjusted within the range of [0.06 to 32] seconds.

**Normal/reverse action :**

Selectable from a Hand Held Communicator

**Local indicator :**

Optional analog or 5-digits LCD local indicator.

### Burnout direction and saturation currents :

If the self-diagnostic functions detect a transmitter failure, the burnout function will drive the output signal to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

When "Output Hold" :

The output signal is held as the last value just before the failure happens.

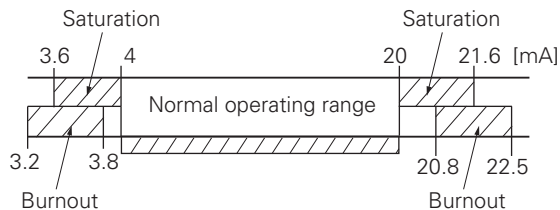
When "Output Overscale" :

The output signal is set within the range of [20.0 to 22.5] mA

When "Output Underscale" :

The output signal is set within the range of [3.2 to 4.0] mA

Both burnout and saturation current can be adjusted within the range of [3.2 ; 4.0] and [20.0 ; 22.5] mA



### Loop-check / fixed output currents :

The transmitter can be configured to provide a constant output signal from 3.2 up to 22.5 mA.

### Temperature limit :

Ambient :

-40 to +85°C

-20 to +80°C (with optional LCD unit)

-40 to +60°C (with optional arrester)

Please refer to the hazardous locations table for ambient temperature limitations according to the standard and type of protection.

Process :

-40 to +85°C for silicone oil filling

Storage :

-40 to +90°C

### Humidity limit:

0 to 100% RH (Relative Humidity)

## PERFORMANCE SPECIFICATIONS

Reference conditions, silicone filling oil, SS 316L isolating diaphragms, 4-20 mA analog output.

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

Standard :

For spans > 1/10 of URL :

$\pm 0.2\%$  of span

For spans < 1/10 of URL :

$\pm (0.1 + 0.01 \times \frac{URL}{Span})\%$  of span

Optional : not available for 16 kPa abs and 130 kPa abs models

For spans > 1/10 of URL :

$\pm 0.1\%$  of span

For spans < 1/10 of URL :

$\pm (0.1 + 0.005 \times \frac{URL}{Span})\%$  of span

**Stability** :

$\pm 0.2\%$  of upper range limit (URL) for 10 years.

**Temperature effect** :

Effect per 28°C change within the range of -40°C and +85°C

Zero shift :

$\pm (0.125 + 0.1 \times \frac{URL}{Span})\%$  of span

Total effect :

$\pm (0.15 + 0.1 \times \frac{URL}{Span})\%$  of span

Double the effects for material code "H" (7th digit in the model code)

**Overrange effect** :

Zero shift :

$\pm 0.2\%$  of URL for any overrange to maximum limit

**Supply voltage effect** :

Less than 0.005% of calibrated span per 1 V

**Update rate** :

60 msec

**RFI effect** :

< 0,2% of the URL for the frequencies from 20 up to 1000 MHz with an electrical field strength of 10 V/m and housing covers in place. (Classification : 2-abc : 0.2% of span according SAMA PMC 33.1)

**Response time** : (At 63,3% of output signal without electrical damping)

Time constant :

0.08 sec (at 23°C)

Dead time :

0.12 sec

Response time = time constant + dead time

**Mounting position effect** :

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

**Vibration effect** :

<  $\pm 0,25\%$  of span 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 (except with the optional arrester).

**Insulation resistance**:

More than 100 MΩ at 500 V DC.

**Internal resistance for external field indicator**:

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

**Pressure Equipment Directive (PED) 2014/68/EU**

According to article 4.3

## PHYSICAL SPECIFICATIONS

**Conduit connections :**

1/2-14 NPT, Pg13.5, or M20 x 1.5

**Process connections :**

Standard :

1/4-18 NPT

Option :

1/2-14 NPT with oval flanges.

Remark : the codification does not include the oval flange accessories.

**Process-wetted parts material :**

Material code (7th digit in the model code)	Process cover	Diaphragm	Wetted sensor body	Vent / drain
V	SS 316L	SS 316L	SS 316L	SS 316L
H	PVDF or SS 316L	Hastelloy C	Hastelloy C	SS 316L
J	SS 316L	SS 316L + gold coating	SS 316L	SS 316L

Remark :

Sensor gasket : Viton o-ring or PTFE square section gasket.  
Availability of above material design depends on ranges and static pressure. Refer to the "Model code symbols".

**Non-wetted parts material :**

Electronics housing :

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

Bolts and nuts :

Standard :

Cr-Mo alloy

Option :

SS 316(L) or SS 660

Filling fluid :

Silicone oil

Mounting bracket :

SS 304L or SS 316L

**Environmental protection:**

IEC IP66/IP67 and Type 4X

**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 only : 3.5 kg without options.

Add : 0.3 kg for indicator option  
0.5 kg for mounting bracket  
2.0 kg for SS housing (option)

## OPTIONAL FEATURES

**Local indicator :**

A plug-in analog indicator (2.5% accuracy) can be mounted into the electronics compartment or the terminal box of the housing.

An optional 5 digit indicator with engineering units is also available.

**Local configuration with the 3 push-buttons indicator :**

A local configuration can be carried out with the optional 3 push-buttons 5-digits indicator.

**Arrester :**

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

Lightning surge immunity :

±4 kV (1.2 × 50 µs)

**Degreasing :**

Process-wetted parts are cleaned and the filling fluid is the standard silicone oil. Not for use with oxygen or chlorine presence.

**NACE specification :**

Metallic materials for all pressure boundary parts comply with NACE MR 0175/ISO 15156.

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

**Optional tag plate :**

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

## ACCESSORIES

**Oval flange :**

Converts process connection to 1/2-14 NPT

**Hand Held Communicator :**

FXW model, refer to datasheet No. EDS 8-47

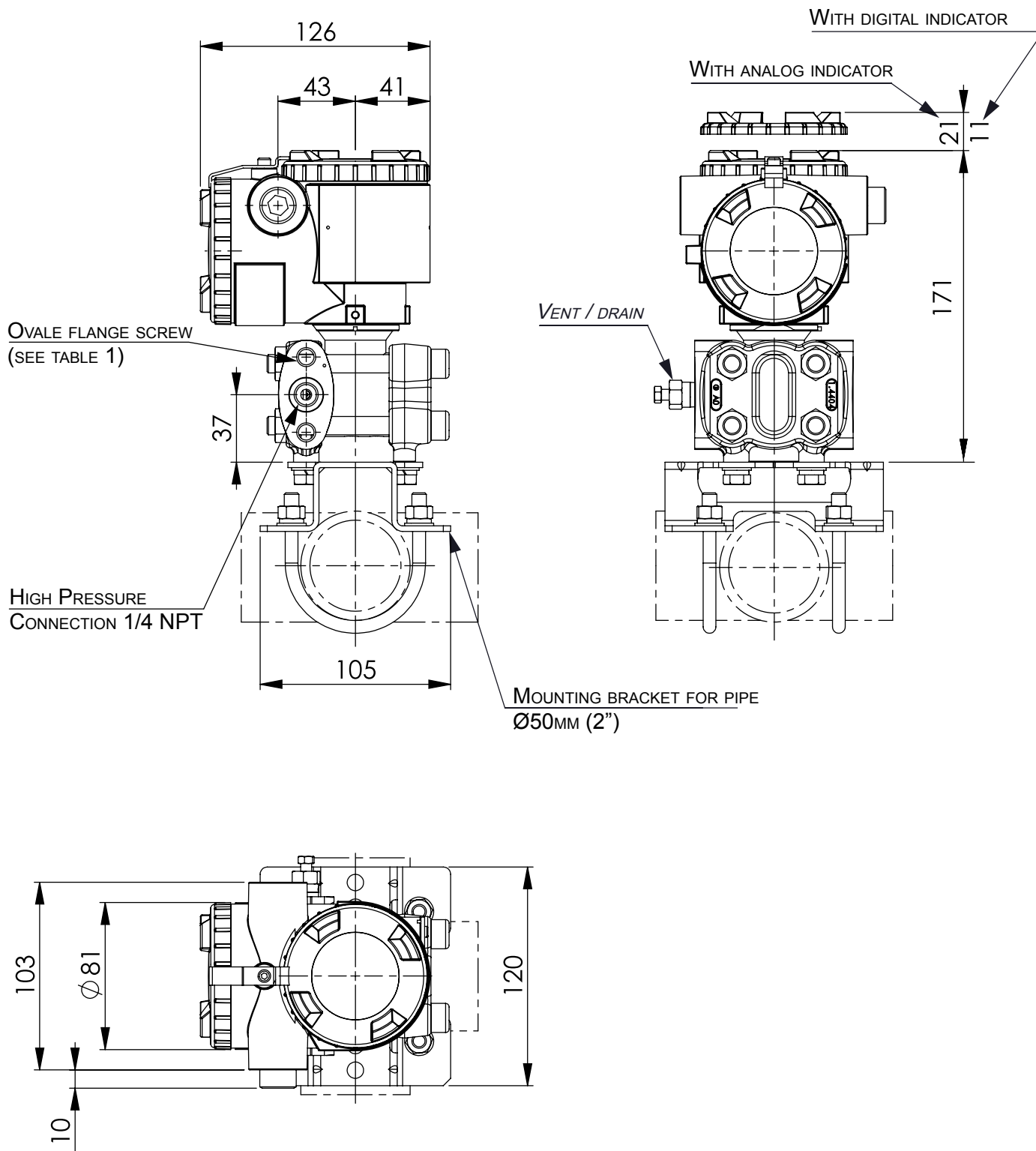
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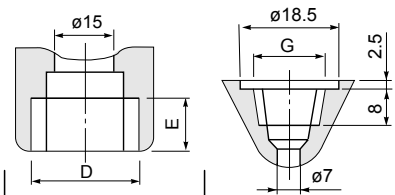
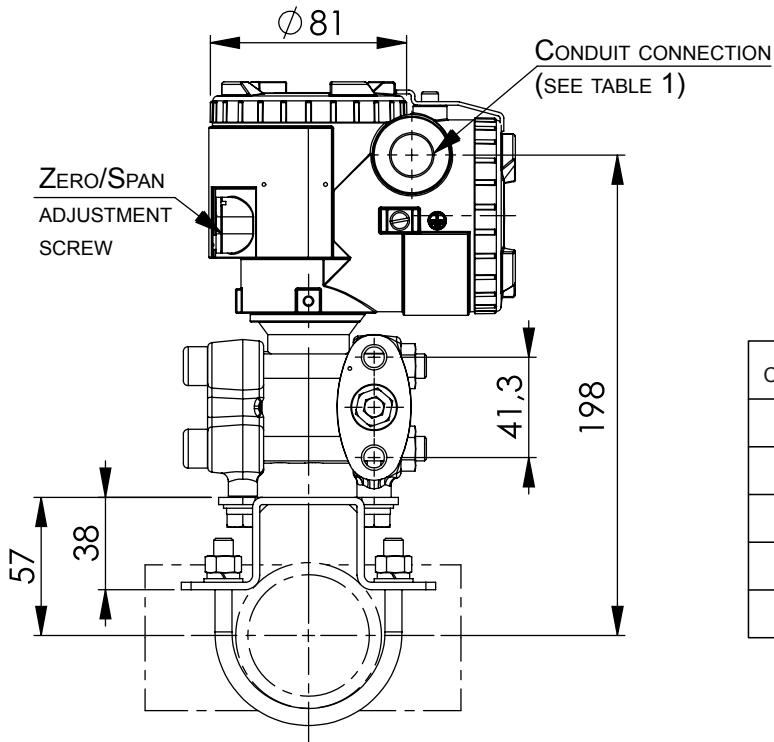
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**Notes\* :**

- Turn down ratio of 100 is possible but span greater than 1/40 of the URL is recommended for better performances.
- When no code can be found in the current model code, place "\*" in the corresponding digit code as well as in the 16th digit.
- Process cover with PVDF insert: 1/2"-14NPT side process connection, no vent/drain, PTFE square section gasket.
- SS 660 bolts/nuts are in conformity with NACE MR0175/ISO 15156
- Only with digit 4 = "R", "T", "W", "6", "8"
- Except digit 10 = "P", "Q"
- SS 316L enclosure not available for "T" shape version
- Gold coating on wetted parts of the measuring cell for hydrogen service.

OUTLINE DIAGRAM (unit : mm)





Code X=4	CONDUIT CONNECTION		OVAL FLANGE SCREW
	D	E	G
R	M20x1.5	16	7/16-20 UNF
T	1/2-14NPT	16	7/16-20 UNF
V	Pg13.5	10,5	M10
W	M20x1.5	16	M10
X	Pg13.5	10,5	7/16-20 UNF

TABLE 1

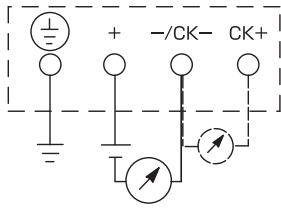
**WEIGHT :**

- TRANSMITTER ONLY :** - 3,5 KG (WITHOUT OPTION)
- ADD :**
  - 0,3 KG FOR INDICATOR OPTION
  - 2 KG FOR STAINLESS STEEL HOUSING OPTION
  - 0,5 KG FOR MOUNTING BRACKET

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> - X <sub>16</sub>	SPAN LIMIT	
	Min.	Max.
F K A □ □ □ □ 5 - □ □ □ □ □ - □ □ - □	1,6 KPa (16 mbar)	16 KPa (160 mbar)
	1,6 KPa (16 mbar)	130 KPa (1,3 bar)
	5 KPa (50 mbar)	500 KPa (5 bar)
	30 KPa (300 mbar)	3 MPa (30 bar)
	100 KPa (1 bar)	10 MPa (100 bar)



## CONNECTION DIAGRAM



### ELECTROMAGNETIC COMPATIBILITY

All FCX-All series of pressure transmitters are in conformity with the provision of the EMC Directive 2014/30/EU on the harmonization of the laws of the Members States relating to electromagnetic compatibility.

All these models of pressure transmitters are in accordance with the following harmonized standards :

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

### Emission limits (according to EN 55011 / CISPR 11, Group 1 Class A)

Frequency range (MHz)	Limits	Result
30 to 230	40 dB (µV/m) quasi peak, measured at 10 m distance	Passed
230 to 1000	47 dB (µV/m) quasi peak, measured at 10 m distance	

### Immunity

Phenomenon	Test value	Standard	Required Performance criteria	Result of criteria
Electrostatic Discharge	±4 kV (Contact) ±8 kV (Air)	EN/IEC 61000-4-2	<b>B</b>	<b>A</b>
Radiated, Electromagnetic Field	10 V/m (0.08 to 1.0 GHz) 3 V/m (1.4 to 2.0 GHz) 1 V/m (2.0 to 2.7 GHz)	EN/IEC 61000-4-3	<b>A</b>	<b>A</b>
Fast transients (burst)	2 kV (5/50 ns, 5 kHz)	EN/IEC 61000-4-4	<b>B</b>	<b>A</b>
Surge Transients	1 kV Line to line 2 kV Line to ground	EN/IEC 61000-4-5	<b>B</b>	<b>A</b>
Conducted RF Disturbances	3 Vrms (150 kHz to 80 MHz) 80% AM @ 1 kHz	EN/IEC 61000-4-6	<b>A</b>	<b>A</b>
Power Frequency Magnetic Field	30 A/m (50 Hz, 60 Hz)	EN/IEC 61000-4-8	<b>A</b>	<b>A</b>

Performance criteria (A & B): according to IEC 61326



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