

ABSOLUTE PRESSURE TRANSMITTER

DATA SHEET

FKA...5

The FCX-AII 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 micro-processor technology to provide exceptional performance and functionality.

FEATURES

1. High accuracy

0.2% accuracy for all calibrated spans is a standard feature.

0.1% accuracy is available as option.

2. Minimum inventory and design

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

3. Minimum environmental influence

The "Advanced Floating Cell" design which protects the pressure sensor against changes in temperature, and over-pressure 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 :

- 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:

FKA: Smart, 4 to 20mA DC + Fuji/Hart® digital signal

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}
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:

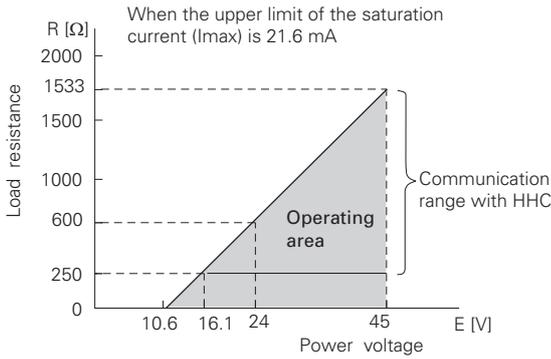
4 to 20mA DC with digital signal superimposed on the analogic signal.

Power supply:

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

10.5 V 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⁽¹⁾ (Model: FXW), min. of 250Ω is 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, li ≤ 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 (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: V _{max} =42.4V, I _{max} =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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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: V _{max} = 28 Vdc, I _{max} = 94.3 mA, P _{max} = 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																					
Factory Mutual (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"																					
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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.

Damping:

Adjustable from HHC or local adjustment unit with LCD display.

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

Zero elevation/suppression:

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

-100% to +100% of URL

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":

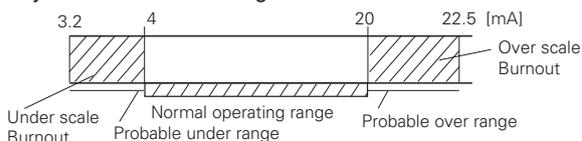
Output signal is hold as the value just before failure happens.

"Output Overscale":

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

"Output Underscale":

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



Output limits conforming to NAMUR NE43 by order.

Loop-check output:

Transmitter can be configured to provide constant signal 3.2 mA through 22.5 mA 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 explosion proof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

- Process: -40 to +85°C for silicone oil fill sensor
- Storage: -40 to +90°C

Humidity limit:

0 to 100% RH (Relative Humidity)

Communication:

With HHC⁽¹⁾ (model FXW, consult DS EDS8-47), following items can be remotely displayed or configured.

Note: HHC's version soft 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						
- 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

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

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:

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

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

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

For spans below 1/10 of URL:

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

Stability:

±0.2% of upper range limit (URL) for 10 years.

Temperature effect:

Effect per 28°C change between the limits of -40°C and +85°C

$$\text{Zero shift: } \pm \left(0.125 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$$

$$\text{Total effect: } \pm \left(0.15 + 0.1 \frac{\text{URL}}{\text{Span}} \right) \%$$

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

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 1 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: (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 plane. This error can be corrected by adjusting zero.

No effect on span.

Vibration effect:

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

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

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:

12 Ω 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 x 1.5

Process connections:

1/4"-18 NPT, as specified. Option: 1/2-14NPT for oval flanges.

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

Process-wetted parts material:

Material code (7th digit in code symbols")	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 "Code symbols".

Non-wetted parts material :

Electronics housing :

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

Bolts and nuts :

Standard : Cr-Mo alloy

Option : SS 316 (L) or SS 660

Fill fluid :

Silicone oil

Mounting bracket :

SS 304L or SS 316L.

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 3.5 kg without options.

Add: 0.3 kg for indicator option

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 FXW.

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, 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 0175/ISO 15156.

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

Optional tag plate:

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

ACCESSORIES

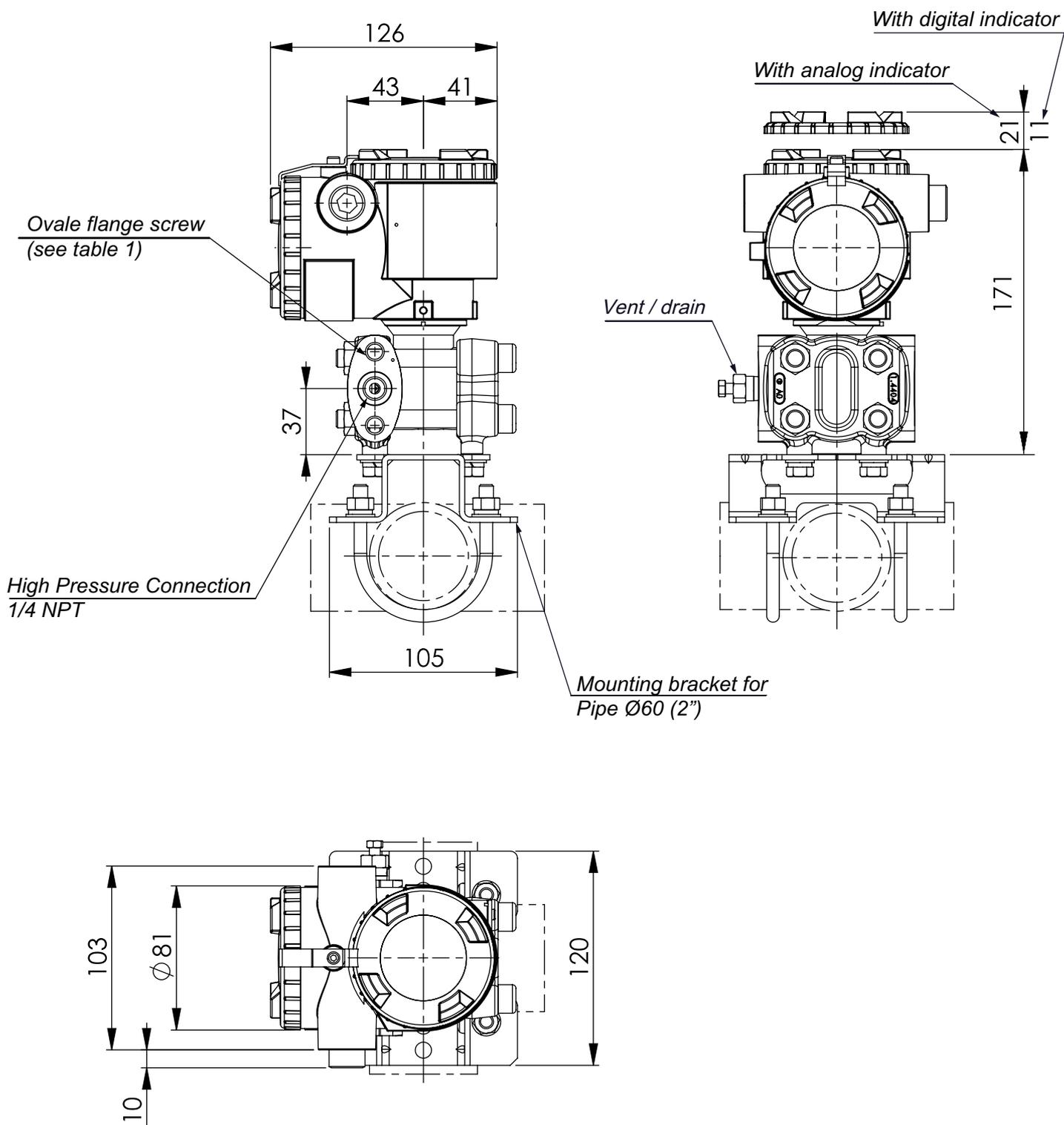
Oval flanges:

Converts process connection to 1/2-14 NPT

Hand held communicator:

(Model FXW, refer to datasheet No. EDS 8-47)

OUTLINE DIAGRAM (Unit:mm)



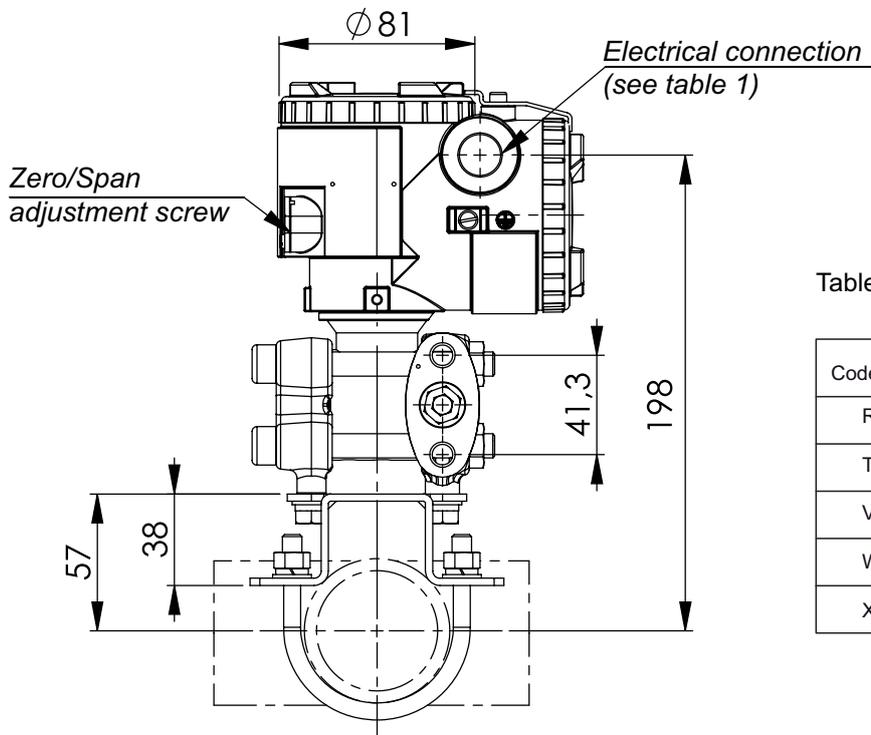


Table 1

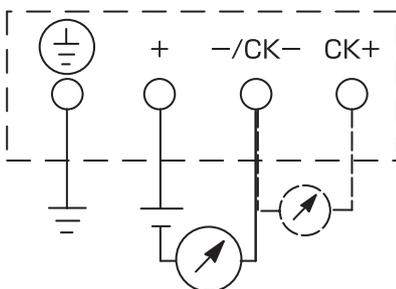
Code X=4	Electrical connection		Oval flange screw
	D	E	
R	M20x1.5	16	7/16-20 UNF
T	1/2-14NPT	16	7/16-20 UNF
V	Pg13.5	10,5	M10
W	M20x1.5	16	M10
X	Pg13.5	10,5	7/16-20 UNF

Weight :
3,5 kg (without option)

Add : - 0,8 kg for indicator option
- 2 kg for stainless steel housing option
- 0,5 kg for mounting bracket

X ₁ X ₂ X ₃ X ₄ X ₅ X ₆ X ₇ X ₈ - X ₉ X ₁₀ X ₁₁ X ₁₂ X ₁₃ - X ₁₄ X ₁₅ - X ₁₆ F K A □ □ □ □ 5 - □ □ □ □ □ - □ □ - □	SPAN LIMIT	
	Min.	Max.
FKA□01	1,6 KPa (16 mbar)	16 KPa (160 mbar)
FKA□02	1,6 KPa (16 mbar)	130 KPa (1,3 bar)
FKA□03	5 KPa (50 mbar)	500 KPa (5 bar)
FKA□04	30 KPa (300 mbar)	3 MPa (30 bar)
FKA□05	100 KPa (1 bar)	10 MPa (100 bar)

CONNECTION DIAGRAM



EMC Directive (2004/108/EC)

All models of **FCX** series transmitters type **FCX-AII** 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 (µV/m) quasi peak, measured at 10m distance	EN 55011 / CISPR 11 Group 1 Class A
230 to 1000	47 dB (µV/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) 8 kV (Air)	EN 61000-4-2 IEC 61000-4-2	B
Electromagnetic field	10V/m (80 to 1000 MHz) 3 V/m (1.4 to 2.0 GHz) 1 V/m (2.0 to 2.7 GHz)	EN 61000-4-3 IEC 61000-4-3	A
Rated power frequency Magnetic field	30 A/m	EN 61000-4-8 IEC 61000-4-8	A
Burst	2 kV (5/50 NS, 5 kHz)	EN 61000-4-4 IEC 61000-4-4	B
Surge	1 kV Line to line 2 kV Line to line	EN 61000-4-5 IEC61000-4-5	B
Conducted RF	3 V (150 kHz to 80 MHz)	EN 61000-4-6 IEC61000-4-6	A

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.



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