

ABSOLUTE PRESSURE TRANSMITTER

DATA SHEET

FKH...5

The FCX-All absolute pressure transmitter (direct mount type) accurately measures absolute 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

0.2% accuracy for all calibrated spans is the standard feature. Fuji's micro-capacitance silicon sensor assures this feature for all suppressed calibration ranges without additional adjustment.

2. Minimum inventory

Electronics unit, communication module, local indicators and electronics housing are interchangeable among all FCX-All models.

3. Minimum environmental influence

The "Advanced Floating Cell" design which protects the pressure sensor against changes in temperature, static pressure, and overpressure substantially reduces total measurement error in actual field applications..

4. Fuji/HART® bilingual communications protocol

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

5. Application flexibility

Various options that render the FCX-All 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. 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.

7. 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:

FKH: Smart, 4 to 20 mA 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.		
FKH□02	8.125 {0.08125}	130 {1.3}	0 to 130 {0 to 1.3}	0.5 {5}
FKH□03	31.25 {0.3125}	500 {5}	0 to 500 {0 to 5}	1.5 {15}
FKH□04	187.5 {1.875}	3000 {30}	0 to 3000 {0 to 30}	9 {90}

Output signal:

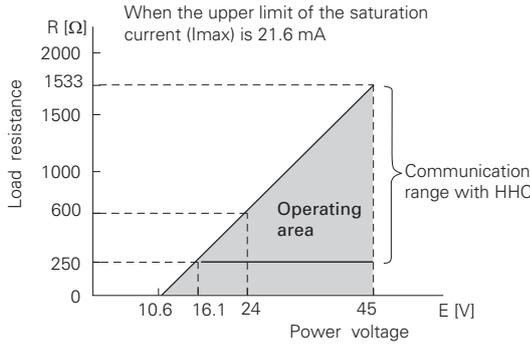
4 to 20 mA DC with digital signal superimposed on the analogic signal

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]

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

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 (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																					
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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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Zero/span adjustment:

Zero and span are adjustable either from the HHC⁽¹⁾ in Hart® or Fuji protocol. Zero is also adjustable externally from the adjustable screw.

Damping:

Adjustable from HHC⁽¹⁾ or local adjustment unit with LCD display.

The time constant is adjustable between 0.06 to 32 sec

Zero elevation/suppression:

0 kPa abs to +100% of URL

Normal/reverse action:

Selectable from HHC⁽¹⁾.

Indication:

Analog indicator or 5 digit LCD meter, as specified.

An analog display may be mounted at the location of one or the other of the housing.

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":

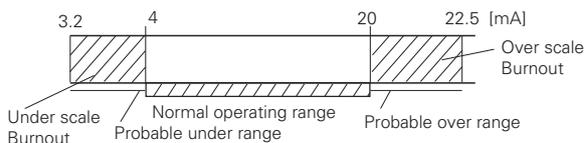
Output signal is hold as the value just before failure happens.

"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 explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

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

Storage: -40 to +90°C

Humidity limit:

0 to 100% RH (Relative humidity)

Communication:

With HHC⁽¹⁾ (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 FC-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 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: ±0.2% of span

For spans below 1/10 of URL:

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

Stability:

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

(In case of 6th digit code "3", "4")

Temperature effect:

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

$$\text{Zero shift: } \pm (0.4 + 0.2 \frac{\text{URL}}{\text{span}}) \% / 28^\circ\text{C}$$

$$\text{Total effect: } \pm (0.475 + 0.2 \frac{\text{URL}}{\text{span}}) \% / 28^\circ\text{C}$$

Overrange effect:

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

Supply voltage effect :

Less than 0.05% of 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: (63,3% of output signal without 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 for a 10° tilt in any plane.

This error can be corrected by adjusting Zero.

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/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:

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 x 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:

Material code (7th digit in "Code symbols")	Process cover	Diaphragm	Wetted sensor body	Vent/drain
J	SS 316L	SS 316L + gold coat	SS 316L	SS 316L
V	SS 316L	SS 316L	SS 316L	SS 316L

Non-wetted parts material:

Electronics housing:

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

Fill fluid:

Silicone oil

Mounting bracket:

SS 304L

Environmental protection:

IEC IP66/IP67 and NEMA 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 approximately 1,7 kg without options.

Add : 0.3 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 communication with HHC.

Arrester:

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

Lightning surge immunity: 4 KV (1.2x50 μs)

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.

Customer tag:

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

ACCESSORIES**Hand held communicator:**

Model FXW, refer to datasheet (EDS8-47)

Two valve Manifold:

Available in SS 316 and pressure rating 10 MPa (100bar).

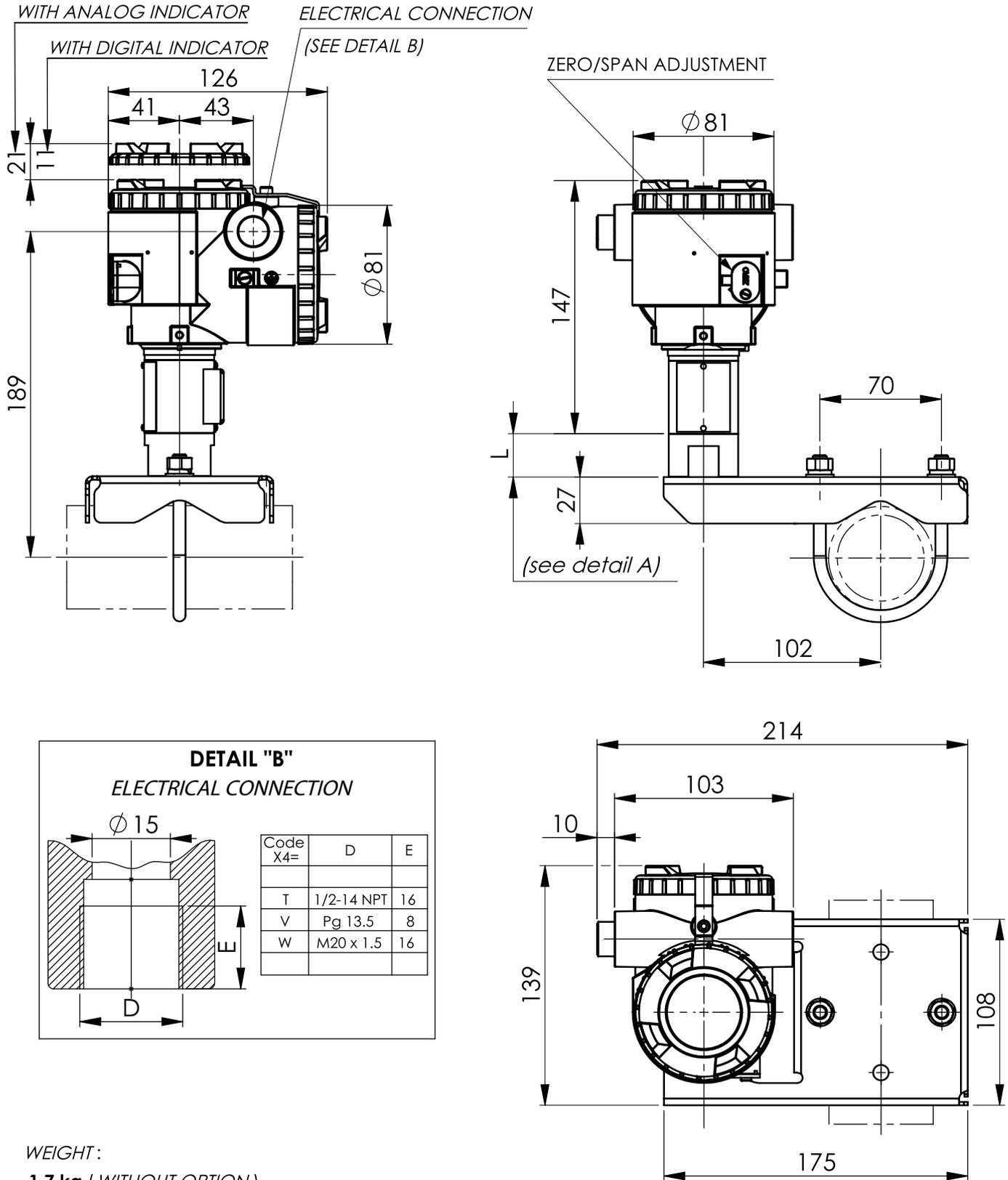
CODE SYMBOLS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	DESCRIPTION
F	K	H		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 (bar abs)
															Diaphragm material
															Wetted parts
															0,08125/1,3
															SS 316L
															SS 316L
															0,08125/1,3
															SS 316L / gold coat
															SS 316L
															0,3125/5
															SS 316L
															0,3125/5
															SS 316L / gold coat
															SS 316L
															1,875/30
															SS 316L
															1,875/30
															SS 316L / gold coat
															SS 316L
															Indicator & Arrestor
															Indicator
															Arrestor
															Initial setting
															None
															None
															Analog, 0-100% linear scale
															None
															Analog, Custom scale
															None
															Analog, double scale
															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, Custom scale
															Yes
															Digital, 0-100% with push button
															None
															Digital, Custom scale with push button
															None
															Digital, 0-100% with push button
															Yes
															Digital, Custom scale with push button
															Yes
															Digital, Custom scale with push button
															Yes
															Approvals for hazardous locations (consult FUJI for availability)
															None (Standard)
															ATEX - Flameproof enclosures (digit 4 = "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 only)
															IECEx - Type "n" (digit 9 = A, E, 1, 2, 3, 4 & 5 only)
															IECEx - Flameproof enclosures (digit 4 = "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 = "T" & "W" only)
															IECEx - Flameproof enclosures & Intrinsic Safety combined approval (digit 4 = "T" & "W" only)
															FM - Explosion-Proof & Intrinsic Safety combined approval (digit 4 = "T" only)
															Mounting bracket (stainless steel)
															None
															Yes
															Stainless steel 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
															NACE
															Silicone oil
															Processconnection (welded) adaptor - all stainless steel parts
															1/2 - 14 NPTI
															Rc 1/2 I
															1/4 - 18 NPTI
															1/2 - 14 NPTE
															G 1/2"A manometer fitting
															M20 x 1,5

Note* :

1- Code "D" & "V" FM approval only possible with electrical connection 1/2-14 NPT.

OUTLINE DIAGRAM (unit:mm)



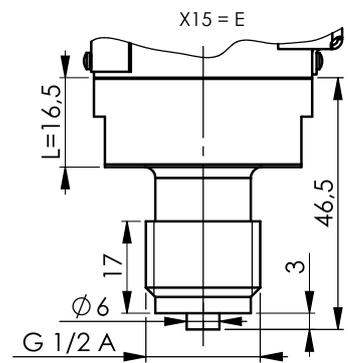
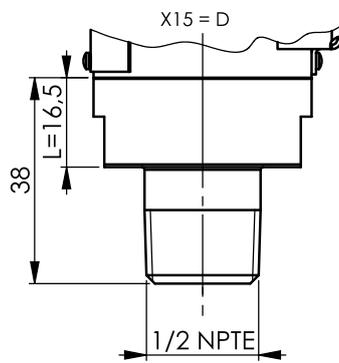
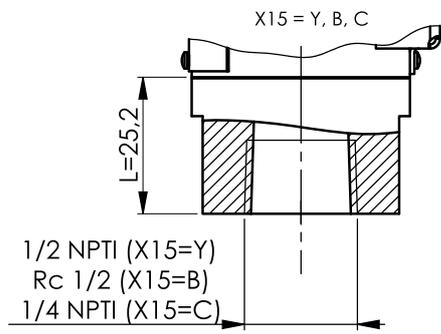
WEIGHT:

1,7 kg (WITHOUT OPTION)

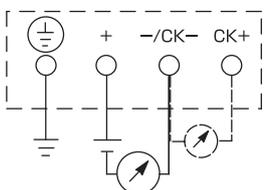
ADD : - 0,4 kg FOR MOUNTING BRACKET

- 1,5 kg FOR STAINLESS STEEL HOUSING OPTION

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 F K H <input type="checkbox"/> 0 <input type="checkbox"/> <input type="checkbox"/> 5 - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> - 0 <input type="checkbox"/>	SPAN LIMIT	
	Min.	Max.
FKH□02	8,125 KPa (81,25 mbar)	130 KPa (1300 mbar)
FKH□03	31,25 KPa (0,3125 mbar)	500 KPa (5 bar)
FKH□04	187,5 KPa (1,875 mbar)	3000 KPa (30 bar)



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) 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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