

# ABSOLUTE PRESSURE TRANSMITTER

## DATA SHEET

FKA, FDA...4

The FCX-AII absolute pressure transmitter accurately measures absolute pressure and transmits a proportional 4 to 20mA signal.

The transmitter utilizes a unique micro-machined 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 a standard feature for all AP models covering 1.6kPa{0.016bar} range to 3000kPa{30bar} high pressure range. Fuji's micro-capacitance silicon sensor assures this accuracy for all suppressed calibration ranges without additional adjustment.

0,1% accuracy is available as option.

### 2. Minimum environmental influence

The "Advanced 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 :

- Analog indicator at either the electronics side or terminal side
- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- 5 digits LCD meter with engineering unit
- Stainless steel electronics housing
- Wide selection of materials.

### 5. Burnout current flexibility (Under Scale : 3,2 to 3,8mA, Over Scale : 20,8 to 21,6mA)

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 :

FKA : absolute pressure transmitter

FDA : FOUNDATION™ Fieldbus & Profibus™

#### 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.		
F□A □01	1.6 {0.016}	16 {0.16}	0 to +16 {0 to +0.16}	0.5 {5}
F□A □02	1.6 {0.016}	130 {1.3}	0 to +130 {0 to +1.3}	0.5 {5}
F□A □03	5 {0.05}	500 {5}	0 to +500 {0 to +5}	1.5 {15}
F□A □04	30 {0.3}	3000 {30}	0 to +3000 {0 to +30}	9 {90}

#### Remark :

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

The maximum span of each sensor can be converted to different units using factors as below:

- 1MPa abs=10<sup>3</sup>kPa abs=10bar abs=10.19716kgf/cm<sup>2</sup> abs=145.0377psi abs
- 1kPa abs=10mbar abs=101.9716mmH<sub>2</sub>O abs=4.01463inH<sub>2</sub>O abs=7.50062mmHg abs

#### Output signal:

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

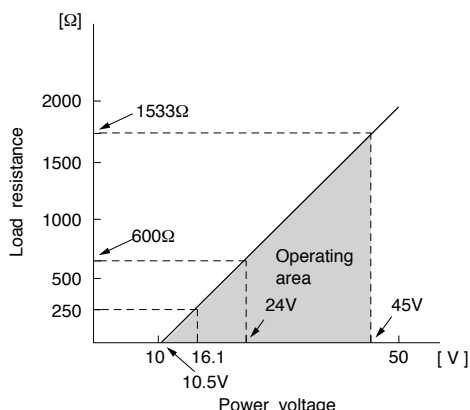
Digital signal based on FOUNDATION™ Fieldbus or Profibus™.

**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 FXW, min. of 250Ω is required.

**Hazardous locations :**

Designed to meet international intrinsic safety and flameproof (explosionproof) standards. Please consult the code symbols some pages further on, to know the different types of approvals (digit 10). Consult FUJI for status.

**Zero/span adjustment :**

Zero and span are adjustable by hand held communicator in Hart® or Fuji protocol. Local adjustment of zero are possible from outside screw on the electronic housing.

**Damping :** (adjustable from HHC)

A damping of the output signal is possible between 0 and 32 sec with the hand held communicator HHC. Local adjustment possibilities with LCD indicator (refer to optional indicator).

**Zero elevation/suppression :**

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

**Normal/reverse action :**

Selectable from HHC.

**Indication :**

A plug-in analog indicator can be mounted on the electronics unit or the terminal block.

The local LCD indicator (5 digits) is assembled on the electronics unit.

Additional local adjustment facilities are possible by the integrated switches in the LCD indicator :

- "Local/comm" switch gives the possibilities to make local adjustments of zero/span, damping or to configure the transmitter with a hand held communicator.
- The "mode" switch with 7 positions gives local adjustment possibilities for zero/span, 4/20mA, enable or inhibit the local adjustments.
- Local damping adjustment is possible via the "damp" switch.

**Burnout direction :** (selected from HHC)

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

**"Output Hold" :**

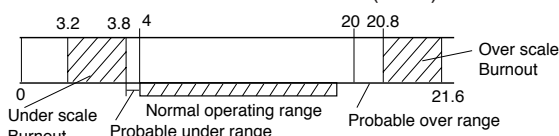
Output signal is hold as the value just before failure happens.

**"Output Overscale" :**

Adjustable within the range 20.8 mA to 21.6 mA from the hand held communicator (HHC).

**"Output Underscale" :**

Adjustable within the range 3.2 mA to 3.8 mA from the hand held communicator (HHC).



**Loop-check output :**

Transmitter can be configured to provide constant signal 3.8mA 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)

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

**Communication :**

With HHC (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Note : HHC's version must be more than 6.0

(or FXW□□□□1-A3), for FCX-All.

Items	HART® PROTOCOL		FUJI PROTOCOL	
	Display	Set	Display	Set
Tag n°	Yes	Yes	Yes	Yes
Model n°	-	-	Yes	Yes
Serial n°	Yes	-	Yes	-
Engineering unit	Yes	Yes	Yes	Yes
Range limit	Yes	-	Yes	-
Measuring range	Yes	Yes	Yes	Yes
Damping	Yes	Yes	Yes	Yes
Output mode	Yes	Yes	Yes	Yes
Burnout direction	Yes	Yes	Yes	Yes
Adjustment	Yes	Yes	Yes	Yes
Output adjust	-	Yes	-	Yes
Data	Yes	-	Yes	-
Self diagnoses	Yes	-	Yes	-
Printer	-	-	-	-
External switch lock	Yes	Yes	Yes	Yes
Transmitter display	Yes	Yes	Yes	Yes
Linearise	-	-	Yes	Yes
Rerange	Yes	Yes	Yes	Yes

**Programmable output linearization function :**

Output signal can be characterized with "14 points linear approximation function" from HHC.

**Field Bus units :**

Digital signal

Transmission technique : according to IEC61158-2

Power supply : 9VDC...32VDC

Base current : 15 ±2mA

Transmission rate : 31,25kbits/s

Profibus-PA : version 3.0, DPV1 version 2.0

Foundation Fielbus : FF-890/891

## Performance specifications

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

(Option)(not available for Max span 16kPa abs, 130kPa abs)

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

For spans below 1/10 of URL :  
 $\pm (0.05 + 0.05 \frac{0.1 \times \text{URL}}{\text{Span}})\%$  of span

### Stability :

±0.2% of upper range limit (URL) for 3 years

### Temperature effect :

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

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

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

Double the effects for material code (7th digit in code symbols) "H", "M" and "T"

### Overrange effect :

Zero shift :  
±0.2% of URL for any overrange to maximum limit

### Supply voltage effect :

Less than 0.05% of calibrated span per 10V

### RFI effect :

Less than 0.2% of URL for the frequencies of 20 to 1000MHz and field strength 30V/m when electronics covers on.

(Classification: 2-abc: 0.2% span per SAMA PMC 33.1)

### Step response : (Without electrical damping)

Time constant : 0.2s

Dead time : approximately 0.2s

Response time = 5 x time constant + dead time

Time constant ( $\tau$ ) = 63 % output signal

Note : faster response time is available as option (maximum update rate : 25 times per second).

### Mounting position effect :

Zero shift :

Less than 0.1kPa {1m bar} for a 10° tilt in any plane.

No effect on span.

This error can be corrected by adjusting Zero.

### Dielectric strength :

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

### Insulation resistance : More than 100MΩ at 500V DC.

### Turn-on time : 4 sec.

### Internal resistance for external field indicator :

12Ω or less.

## Physical specifications

### Electrical connections :

1/2"-14NPT, Pg13.5, or M20 x 1.5 conduit, as specified.

### Process connections :

1/4"-18 NPT

Meets DIN 19213.

### Process-wetted parts material :

Material code (7th digit in "Code symbols")	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316SS	316LSS	316SS	316SS
H	PVDF or 316SS	Hastelloy-C	Hastelloy-C lining	316SS
M	PVDF or 316SS	Monel	Monel lining	316SS
T	PVDF or 316SS	Tantalum	Tantalum lining	316SS

### Notes :

Sensor gasket : viton o-ring or PTFE square section gasket.

Availability of above material design depends on ranges.

Refer to "Code symbols".

### Non-wetted parts material :

Electronics housing :

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

Bolts and nut:

Cr-Mo alloy (standard) or 316 stainless steel

Fill fluid :

Silicone oil

Mounting bracket :

304 stainless steel.

### Environmental protection :

IEC IP67 and NEMA 6/6P

### Mounting :

On 50 mm (2") pipe using mounting bracket, direct wall mounting or direct process mounting.

### Mass{weight} :

Transmitter approximately 3.4kg without options.

Add : 0.5kg for mounting bracket  
0.8kg for indicator option  
4.5kg for stainless steel housing (option)

**Optional features**

**Indicator :**

A plug-in analog indicator (1.5% accuracy) can be located in the electronics compartment or in the terminal box of the housing.  
An optional 5-digits LCD meter is also available.

**Arrester :**

A built-in arrester protects the electronics from lightning surges.  
Lightning surge immunity : 4kV (1.2 x 50 μs)

**Degreasing :**

Process-wetted parts are cleaned, but the fill fluid is standard silicone oil except oxygen or chlorine application.

**NACE specification :**

Metallic materials for all pressure boundary parts comply with NACE MR-01-75. 316 stainless steel bolts and nuts, ASTM B7M or L7M bolts and 2HM nuts (Class II) are standard.

**Customer tag :**

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

**ACCESSORIES**

**Oval flanges :**

Converts process connection to 1/2"-14 NPT, material 316 stainless steel.

**Hand held communicator :**

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

**Manifolds :**

Available in 316 stainless steel and in pressure rating 16MPa or 42MPa.

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	

**EMS (Immunity) EN61326 : 1997**

Annex A (std 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

**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.**

# CODE SYMBOLS

F	K	A								Smart 4-20 mAdc + Fuji/Hart® digital signal
F	D	A								FOUNDATION™ Fieldbus & Profibus™
										<b>Connections</b>
										Process connection
										Oval flange
										Conduit
R										1/4"-18NPT
T										7/16-20 UNF
V										M 20x 1,5
W										1/4"-18NPT
X										7/16-20 UNF
										1/2"-14NPT
										M 10
										Pg 13,5
										M 20x 1,5
										Pg 13,5
										<b>Range and materials</b>
										(*1) Span(*1)
										Process cover
										Diaphragm
										Wetted cell body
	0	1	V							316 SS
	0	1	H							316L SS
	0	1	M							316 SS
(*2)	9	1	H							Hast.C
(*2)	9	1	M							Monel
	0	2	V							Monel lining
	0	2	H							Hast. C
	0	2	M							Hast.C lining
	0	2	T							Monel lining
(*2)	9	2	H							316 SS
(*2)	9	2	M							316 SS
(*2)	9	2	T							Hast.C
	0	3	V							Monel
	0	3	H							Monel lining
	0	3	M							Tantalum
	0	3	T							Tantalum lining
(*2)	9	3	H							Hast. C
(*2)	9	3	M							Monel
(*2)	9	3	T							Monel lining
	0	4	V							Monel lining
	0	4	H							Tantalum
	0	4	M							Tantalum lining
	0	4	T							Hast. C
(*2)	9	4	H							Hast.C lining
(*2)	9	4	M							Monel lining
(*2)	9	4	T							Monel lining

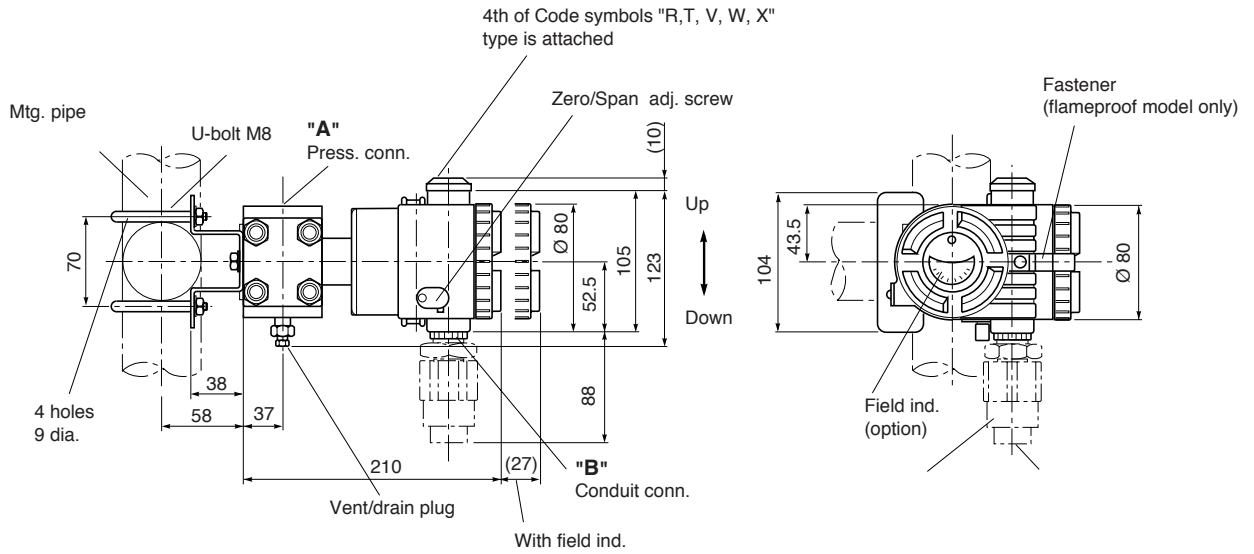
- Notes \*:
- 1- Turn down of 100:1 is possible, but should be used at the span greater than 1/40 of the maximum span for better performance
  - 2- Process cover with PVDF insert with 1/2 - 18NPT side process connection without vent drain, other upon request  
PTFE square section gasket

# CODE SYMBOLS

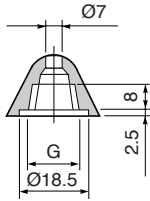
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
F	K	A					4	-						
F	D	A					4	-						

Description																	
<b>Indicator &amp; Arrester</b>																	
Initial setting      Indicator      Arrester																	
4 - A															4-20mA DC	None	none
4 - B															+	Analog, 0-100% linear scale	none
4 - D															HART®/FUJI	Analog, Custom scale	none
4 - J															digital signal	Analog, double scale	none
4 - E															"SMART"	none	yes
4 - F																Analog, 0-100% linear scale	yes
4 - H																Analog, Custom scale	yes
4 - K																Analog, double scale	yes
4 - L																Digital, 0-100%	none
4 - P																Digital, Custom scale	none
4 - Q																Digital, 0-100%	yes
4 - S																Digital, Custom scale	yes
4 - R															FF	None	yes
4 - T															FF	Digital, Custom scale	yes
4 - V															Profibus	None	yes
4 - W															Profibus	Digital, Custom scale	yes
<b>Approvals for hazardous locations (consult FUJI for availability)</b>																	
A															None (standard)		
X															Flameproof housing ATEX <sup>(Ex)</sup> II 2 GD - EEx d IIC T5/T6		
K															Intrinsic safety ATEX <sup>(Ex)</sup> II 1 GD - EEx ia IIC T4/T5		
D															FM - Flameproof housing Class I, Division 1, Groupe B, C, D		
E															Dust ignitionproof Class II/III, Division 1, Group E, F, G - (elec. conn. code "T" only)		
H															CSA - Flameproof housing Class I, II, III, Division 1, Group C, D - Class II, Group E, F, G - Class III - (elec. conn. code "T" only)		
J															FM - Intrinsic safety Class I, II, III, Division 1, Group A, B, C, D, E, F, G		
P															Nonincendive Class I,II,III, Division 2, Group A,B,C,D,F,G		
															CSA - Intrinsic safety & Nonincendive Class I, Group A,B,C,D - Class II, Group E,F,G		
															Class III - Temp code T4 for all classes (electrical connection code "T" only)		
															ATEX type "n" <sup>(Ex)</sup> II 3 GD - EEx nL/nAL IIC T4/T5		
<b>Side vent/drain and mounting bracket</b>																	
Side vent/drain      Mounting bracket																	
A															None	None	
C															None	Yes, stainless steel	
D															Yes	None	
F															Yes	Yes, stainless steel	
<b>SS parts</b>																	
SS tag plate      SS housing																	
Y															none	none	
B															yes	none	
C															none	yes	
E															yes	yes	
<b>Special applications and fill fluid</b>																	
Treatment      Fill fluid																	
Y															None (standard)	Silicone oil	
G															Degreasing	Silicone oil	
N															NACE specification	Silicone oil	
<b>Process cover gasket</b>																	
- A Viton																	
- C PTFE square section gasket in SS flange																	
- D PTFE square section gasket in PVDF insert																	
<b>Bolts/screws material</b>																	
A Cr-Mo (standard)																	
E SS 316/316 (bolt/nuts)																	

# OUTLINE DIAGRAM (Unit : mm)

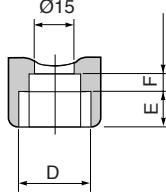


Details of "A"

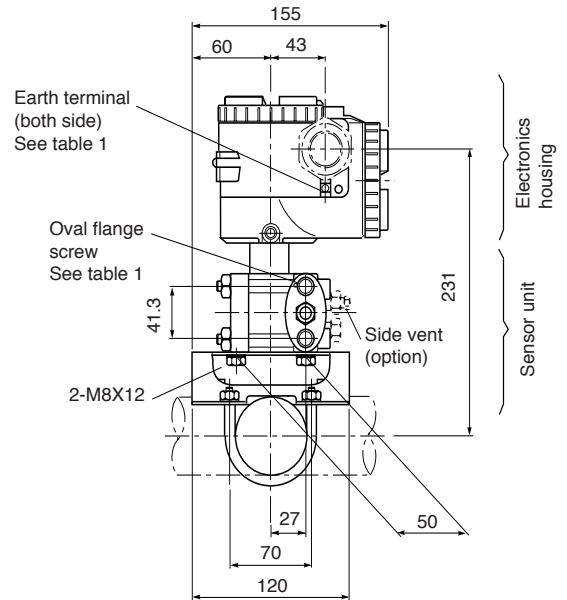


See table 1

Details of "B"



See table 1

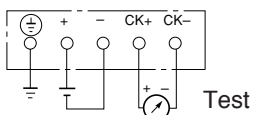


4th of Code symbols	Conduit conn.			Press. conn. G	Oval flange screw
	D	E	F		
R	M20x1.5	16	5	1/4-18NPT	7/16-20UNF
T	1/2-14NPT	16	5	1/4-18NPT	7/16-20UNF
V	Pg13.5	8	4.5	1/4-18NPT	M10 or M12
W	M20x1.5	16	5	1/4-18NPT	M10 or M12
X	Pg13.5	8	4.5	1/4-18NPT	7/16-20UNF

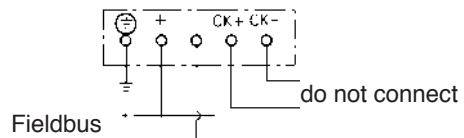
Table 1

## CONNECTION DIAGRAM

FKA unit



FDA unit



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

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