

# 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 for all AP models covering 1.6kPa {0.016bar} range to 3000kPa {30bar} high pressure range. 0.1% accuracy is available as option. Fuji's micro-capacitance silicon sensor assures this accuracy for all suppressed calibration ranges without additional adjustment.

### 2. 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.

### 3. 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.

### 4. 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

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

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:** 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:**

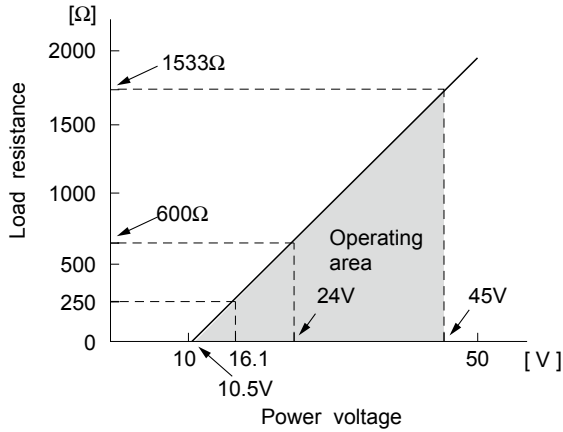
4 to 20mA DC with digital signal superimposed on the 4 to 20mA signal.

**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 HHC<sup>(1)</sup> (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, 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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**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 (span adjustment is not available with 9th digit code "L, P, Q, S").

**Damping:**

Adjustable from HHC or local adjustment unit with LCD display.

The time constant is adjustable between 0 to 32 seconds.

**Zero elevation/suppression:**

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

**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":

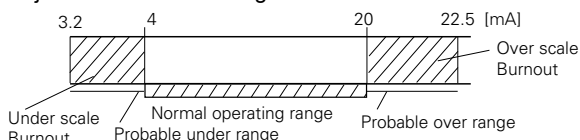
Output signal is hold as the value just before failure happens.

"Output Overscale":

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

"Output Underscale":

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



**Loop-check output:**

Transmitter can be configured to provide constant signal 3.2mA through 21.6mA by HHC<sup>(1)</sup>.

**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<sup>(1)</sup> (model FXW, consult DS EDS8-47), following items can be remotely displayed or configured.

Note: HHC's version soft must be higher than 6.0 (or FXW □□□□1-□3), for FCX -AII.

For supporting "Saturate current", "Write protect", and "History", HHC's version 6.3 or higher is necessary.

Items	Fuji Protocol with FXW		Hart Protocol	
	Display	Set	Display	Set
Tag No.	✓	✓	✓	✓
Model No.	✓	✓	—	—
Serial No. & Software Version	✓	—	✓	—
Engineering unit	✓	✓	✓	✓
Range limit	✓	—	✓	—
Measuring range	✓	✓	✓	✓
Damping	✓	✓	✓	✓
Output mode	✓	—	✓	—
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<sup>(1)</sup>.

**Performance specifications**

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4 to 20mA 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:

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

(Option) (code: 21th digit H)

(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:

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

**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 (7th digit in codes symbols) "H", "M" and "T"

**Overrange effect:**

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

**Supply voltage effect:**

Less than 0.005% of calibrated span per 1V

**Update rate:**

60 msec

**Response time:** (at 63,2% of output signal)

Time constant: 0.08s (at 23°C)

Dead time: 0.12s (without electrical damping)

Response time = time constant + dead time

**Mounting position effect:**

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

No effect on span. This error can be corrected by adjusting zero.

**Vibration effect:**

> ±0,25% of span for spans greater than 1/10 of URL.  
Frequency 10 to 150Hz, acceleration 39,2m/sec<sup>2</sup>.

**Material fatigue:**

Please consult Fuji Electric.

**Dielectric strength:**

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

**Insulation resistance:**

More than 100MΩ at 500V DC.

**Internal resistance for external field indicator:**

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

**Physical specifications**

**Electrical connections:**

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

**Process connections:**

1/4"-18 NPT, as specified.

**Process-wetted parts material:**

Material code (7th digit in Code symbols*)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316 SS (*1)	316L SS	316 SS (*1)	316 SS (*1)
H	PVDF or 316 SS (*1)	Hastelloy-C	Hastelloy-C lining	316 SS (*1)
M	PVDF or 316 SS (*1)	Monel	Monel lining	316 SS (*1)
J	316 SS (*1)	316 SS + gold coat	Tantalum lining	316 SS (*1)
T	PVDF or 316 SS (*1)	Tantalum	316 stainless	316 SS (*1)

Remark: Sensor gasket : Viton o-ring or PTFE square section gasketAvailability 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 316 stainless steel, as specified.

Bolts and nut:  
Cr-Mo alloy (standard), or 316 SS

Option : 630/304 SS  
Fill fluid: Silicone oil  
Mounting bracket: 304 SS.

**Environmental protection:**

IEC IP67 and NEMA 6/6P

**Mounting:**

Without mounting bracket : direct mounting on mani-fold (optional)

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

**Mass{weight}:**

Transmitter approximately 2.9 to 3.4kg without options.

Add: 0.5kg for mounting bracket  
4.5kg for stainless steel housing option

**Optional features**

**Indicator:**

A plug-in analog indicator (2.5% accuracy)  
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 as using communication with FXW.

**Arrester:**

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

Lightning surge immunity: 4kV (1.2 × 50µs)

**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 bound ary parts comply with NACE MR-01-75. 630/304 stainless steel bolts and nuts comply with NACE.

**Optional tagplate:**

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 in 316 stainless steel.

**Hand held communicator:**

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

**ORDERING INFOMATION**

When ordering this instrument, specify.

1. CODE SYMBOLS
2. Measuring range.
3. Output orientation (burnout direction) when abnormality is occurred in the transmitter.  
Hold / Overscale / Underscale  
Unless otherwise specified, output hold function is supplied.
4. Indication method (indicated value and unit) in case of the actual scale (code D, H, P, S on 9th digit).
5. Tag No. (up to 20 alphanumeric characters), if required.

# CODE SYMBOLS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																																																																																																																																				
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Notes\* :

- 1- Turn down of 100 : 1 is possible, but it should be used at a span greater than 1/40 of the maximum span for better performance.
- 2- When no code can be found in the current code symbols, place\* in concerned code digit(s) & add\* in 16 th digit
- 3- Process cover with PVDF insert with 1/2-18 NPT side process connection/no vent drain, other upon request - square section PTFE gasket
- 4- Our stainless steel bolts/nuts in SS630 are in conformity with the NACE requirements and must be used for NACE service
- 5- Code "D & V" FM approval only possible with electrical connection 1/2" NPT.

The product conforms to the requirements of the Electro-magnetic 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	

**Note) Definition of performance criteria**

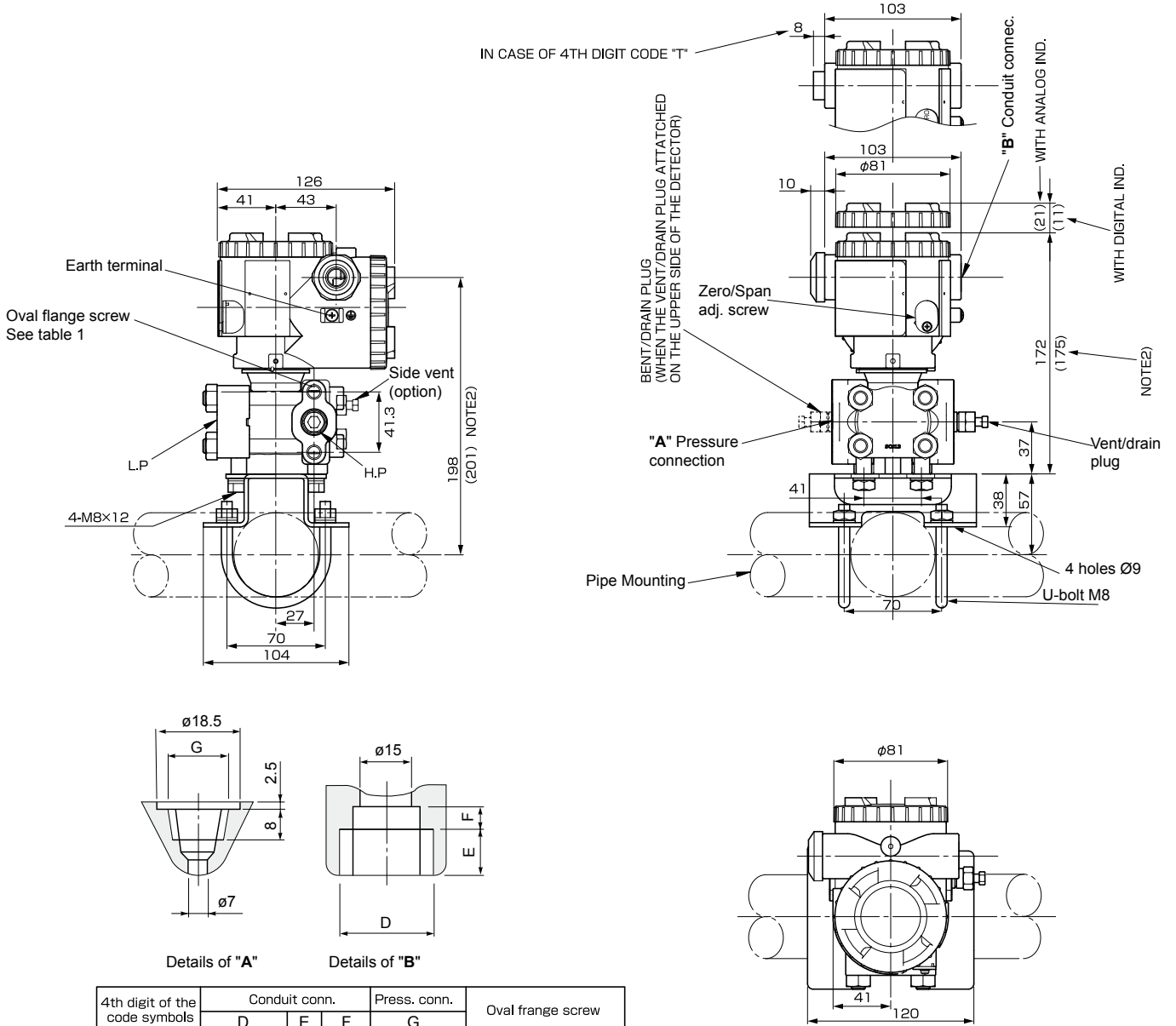
- A : During testing, normal performance within the specification limits**
- B : During testing, temporary degradation, or loss of function or performance which is self-recovering.**

**EMS (Immunity) EN61326 : 1997**

Annex A (standard 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

# OUTLINE DIAGRAM (Unit:mm)

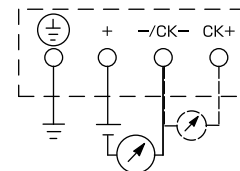


4th digit of the code symbols	Conduit conn.			Press. conn.	Oval frange screw
	D	E	F	G	
R	M20x1.5	16	5	1/4-14NPT	7/16-20UNF
T	1/2-14NPT	16	5	1/4-14NPT	7/16-20UNF
V	Pg13.5	8	4.5	1/4-14NPT	M10 or M12
W	M20x1.5	16	5	1/4-14NPT	M10 or M12
X	Pg13.5	8	4.5	1/4-14NPT	7/16-20UNF

TABLE 1

NOTE1) IN CASE OF 10TH CODE "C", φ11 CABLE IS SUITBLE.  
 NOTE2) WHEN THE 7TH DIGIT OF THE CODE SYMBOLS "H,M,T"

## CONNECTION DIAGRAM



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

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Web : [www.fujielectric.fr](http://www.fujielectric.fr)

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