

# FCX SERIES ABSOLUTE PRESSURE TRANSMITTER

DATA SHEET

FHA, FKA

The FCX series absolute pressure transmitter accurately measures absolute pressure and transmits proportional 4 to 20mA 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. Outstanding accuracy

0.2% accuracy for all calibrated spans is the standard feature for all AP models covering from 1.6 to 3000kPa abs (or 0.016 to 30 bar abs) high pressure range. Fuji's Micro-Capacitance Silicon Sensor assures this feature for all elevated or suppressed calibration ranges without additional adjustment.

### 2. Minimum environment influence

"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. Smart/Traditional convertible

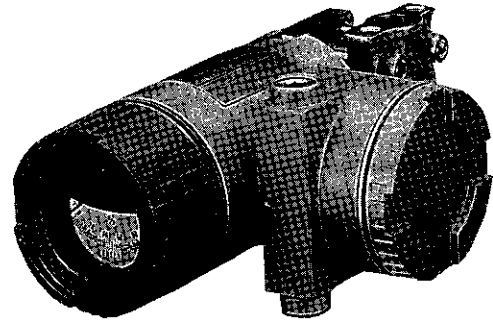
Fuji micro-electronics manufacturing technology offers free selection of Smart/Traditional transmitters.

A small plug-in communication module upgrades your model FHA to smart type model FKA, which has full remote communication capabilities. A Hand Held Communicator (HHC), model FXW can remotely display or reconfigure all transmitter parameters at any point on the loop without affecting the transmitter signal.

### 4. Application flexibility

Example features that render the FCX series suitable for almost any process applications includes:

- Analog indicator at either the electronics side or terminal side
- Full range of hazardous location approvals
- Built-in RFI filter and lightning arrester
- 4-digits LCD meter
- Stainless steel electronics housing
- Wide selection of materials



## SPECIFICATIONS

### Functional specifications

#### Type:

Model FHA: 4 to 20mA, Traditional type

Model FKA: 4 to 20mA with digital signal, Smart type

#### 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.	Lower	Upper	
	FHA	FKA	FHA/FKA			
F□A□01	1.6 (0.016)	1.6 (0.016)	16 (0.16)	0	16 (0.16)	0.5 (5)
F□A□02	13 (0.13)	1.6 (0.016)	130 (1.3)	0	130 (1.3)	0.5 (5)
F□A□03	50 (0.5)	5 (0.05)	500 (5)	0	500 (5)	1.5 (15)
F□A□04	300 (3)	30 (0.3)	3000 (30)	0	3000 (30)	9 (90)

Remark: To minimize environment influence, span should be greater than 1/25 of the max. span in most applications.

- The maximum span of each sensor can be converted to in different units using below factors.

$$1\text{MPa}=10^3\text{kPa}=10\text{bar}=10.19716\text{kgf/cm}^2=145.0377\text{psi}$$

$$1\text{kPa}=10\text{mbar}=7.50062\text{mmHg}=101.9716\text{mmH}_2\text{O}=4.01463\text{inH}_2\text{O}$$

#### Output signal:

Model FHA: 4 to 20mA DC 2-wire

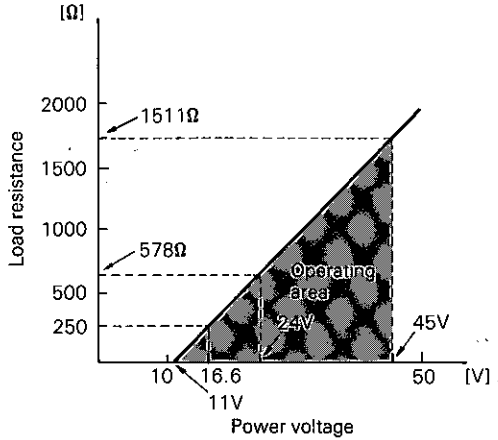
Model FKA: 4 to 20mA DC with digital signal superimposed on the 4 to 20mA signal.

#### Power supply:

Transmitter operates on 11V to 45V DC at transmitter terminals.

11V to 27V DC for the units with optional arrester

Load limitations: see figure below



Note: For communication with FXW, min. of 250 Ω required.

**Hazardous locations:**

Designed to meet international intrinsic safety and flameproof (explosionproof) standards.

Authorities	Flameproof	Intrinsic safety	Type N Nonincendive
BASEEFA Factory Mutual	Ex ds IIC T5, T6 Class I II III Div. 1 Groups B thru. G	EEx ia IIC T4, T5 Class I II III Div. 1 Groups A thru. G	Ex N II T5 Class I II III Div. 2 Groups A thru. G
CSA	Class I II III Div. 1 Groups C thru. G	Class I II III Div. 1 Groups A thru. G	Class I II III Div. 2 Groups A thru. G
RIIS SAA NEPSI	ds2G4 Exd IIB T6 IP67 dIICT5	i3aG4 Ex ia IIC T5, T6 iaIICT4	— — —

**Zero/span adjustment:**

Model FHA: Zero is adjustable externally from the push buttons (UP and DOWN).

The push buttons can also function to adjust span when MODE SWITCH (located on the front face of electronics unit) is in the span mode. INHIBIT mode to disable the push buttons is also available.

Model FKA: Zero and span are adjustable either from the HHC or by the external push buttons. (one-push function)

**Damping:** Adjustable electrical damping

Model FHA: The time constant is adjustable to 0, 0.3, 1.2, 4.8, or 19.2 seconds.

Model FKA: The time constant is adjustable between 0 to 38.4 seconds.

**Zero elevation/suppression:**

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

**Normal/reverse action:**

Model FHA: Selectable by moving a jumper pin located on the electronics unit.

Model FKA: Configurable from HHC.

**Indication:** Analog indicator or 4-digit LCD meter, as specified.

**Burnout direction:**

Output hold  
Output 21.6mA } selectable  
Output 3.8mA }

Model FHA: Unless otherwise specified, the output is in hold position.

Model FKA: Selectable from HHC.

**Loop-check output:**

Model FHA: Transmitter can output constant signal of 4mA, 12mA, or 20mA if MODE SWITCH is set to the loop check mode.

Model FKA: Transmitter can be configured to provide constant signal 4mA or 20mA 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:** (Model FKA only)

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

Items	Display	Set
Tag No.	✓	✓
Model No.	✓	✓
Serial No.	✓	—
Engineering unit	✓	✓
Range limit	✓	—
Measuring range	✓	✓
Damping	✓	✓
Output mode	✓	—
Burnout direction	✓	✓
Input adjust	✓	✓
Output adjust	—	✓
Data	✓	—
Self diagnoses	✓	—
Printer	—	—
External switch lock	✓	✓

**Performance specifications**

**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 (Model FKA only):

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

**Linearity:** 0.1% of calibrated span

**Stability:** ±0.2% of upper range limit (URL) for 6 months

**Temperature effect:**

Effect per 55°C change between the limits of -40°C and +85°C

Zero shift: ±0.5% of URL

Total effect: ±0.8% of URL

**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 10V/m when electronics covers on.

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

**Step response:** Time constant. 0.2 s

Dead time: about 0.3 s

(without electrical damping)

**Mounting position effect:**

Zero shift, less than 0.1kPa(10.2 mmH<sub>2</sub>O) 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 (For the type with arrester, remove earthing plate.)

**Insulation resistance:**

More than 100MΩ at 500V DC (For the type with arrester, remove earthing plate.)

**Turn-on time:** 4 sec**Physical specifications****Electrical connections:**

G1/2, 1/2-14NPT, Pg13.5, or M20 x 1.5 conduit, as specified.

**Process connections:**

1/4-18 NPT or Rc1/4, as specified.

**Process-wetted parts material (\*1):**

Material code (7th digit in "Code symbols")	Process cover	Diaphragm	Wetted sensor body	Vent/drain
W V H	316SS(*2)	Hastelloy-C 316LSS Hastelloy-C	316SS 316SS Hastelloy-C lining	316SS
M T		Monel Tantalum	Monel lining Tantalum lining	

Notes: \* (1) SS : Stainless steel

(2) SCS14 per JIS G5121

Remarks: • Sensor O-rings: Viton

• 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 epoxy/polyurethane double coating, or 304SS, as specified.

Bolts and nut: Cr-Mo alloy (standard) or 304SS

Fill fluid: Silicone oil

Mounting bracket: Carbon steel with epoxy coating or 304SS, as specified

**Environmental protection:**

IEC IP67 and NEMA 4X

**Mounting:**

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

**Mass(weight):**

Transmitter approximately 3.7kg 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 turnable analog indicator (1.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing.

An optional 4 digits LCD meter is also available.

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

Not available with intrinsic safety approvals.

**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 MR0175. Includes ASTM B7M or L7M bolts and 2HM nuts. (Class II)

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

**ACCESSORIES**

**Oval flanges:** (Model FFP, refer to Data Sheet No. EDS6-10)

Converts process connection to 1/2-14 NPT or to Rc1/2; in carbon steel or in 316 SS.

**Hand held communicator:**

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

**Communication module:**

When using this module for model FHA, remote setting function becomes available

Remark: When the communication module is connected, the operation mode of external zero/span is changed from UP-DOWN to one-push adjustment.

CODE SYMBOLS

1 2 3 4 5 6 7 8 9 10 11 12 13

													Description		
													<b>Type</b>		
F H A													4 to 20mA, Traditional type		
F K A													4 to 20mA with digital signal, Smart type		
													<b>Connections</b>		
													<b>Process connection</b>	<b>Oval flange screw</b>	<b>Conduit connection</b>
S													Rc1/4	7/16-20UNF	G 1/2
T													1/4-18NPT	7/16-20UNF	1/2-14NPT
V													1/4-18NPT	M10	Pg 13.5
W													1/4-18NPT	M10	M20×1.5
X													1/4-18NPT	7/16-20UNF	Pg 13.5
													<b>Span limit [kPa abs] {bar abs}</b>		
													FHA		FKA
1													1.6 ..... 16 {0.016 ..... 0.16}	1.6 ..... 16 {0.016 ..... 0.16}	
2													13 ..... 130 {0.13 ..... 1.3}	1.6 ..... 130 {0.016 ..... 1.3}	
3													50 ..... 500 {0.5 ..... 5}	5 ..... 500 {0.05 ..... 5}	
4													300 .. 3000 {3 ..... 30}	30 .... 3000 {0.3 ..... 30}	
													<b>Material</b>		
													<b>Process cover</b>	<b>Diaphragm</b>	<b>Wetted sensor body</b>
W													316SS	Hastelloy-C	316 SS
V													316SS	316L SS	316 SS
H													316SS	Hastelloy-C	Hastloy-C
M													316SS	Monel	Monel
T													316SS	Tantalum	Tantalum--- Span code*1* (6th digit) is not available

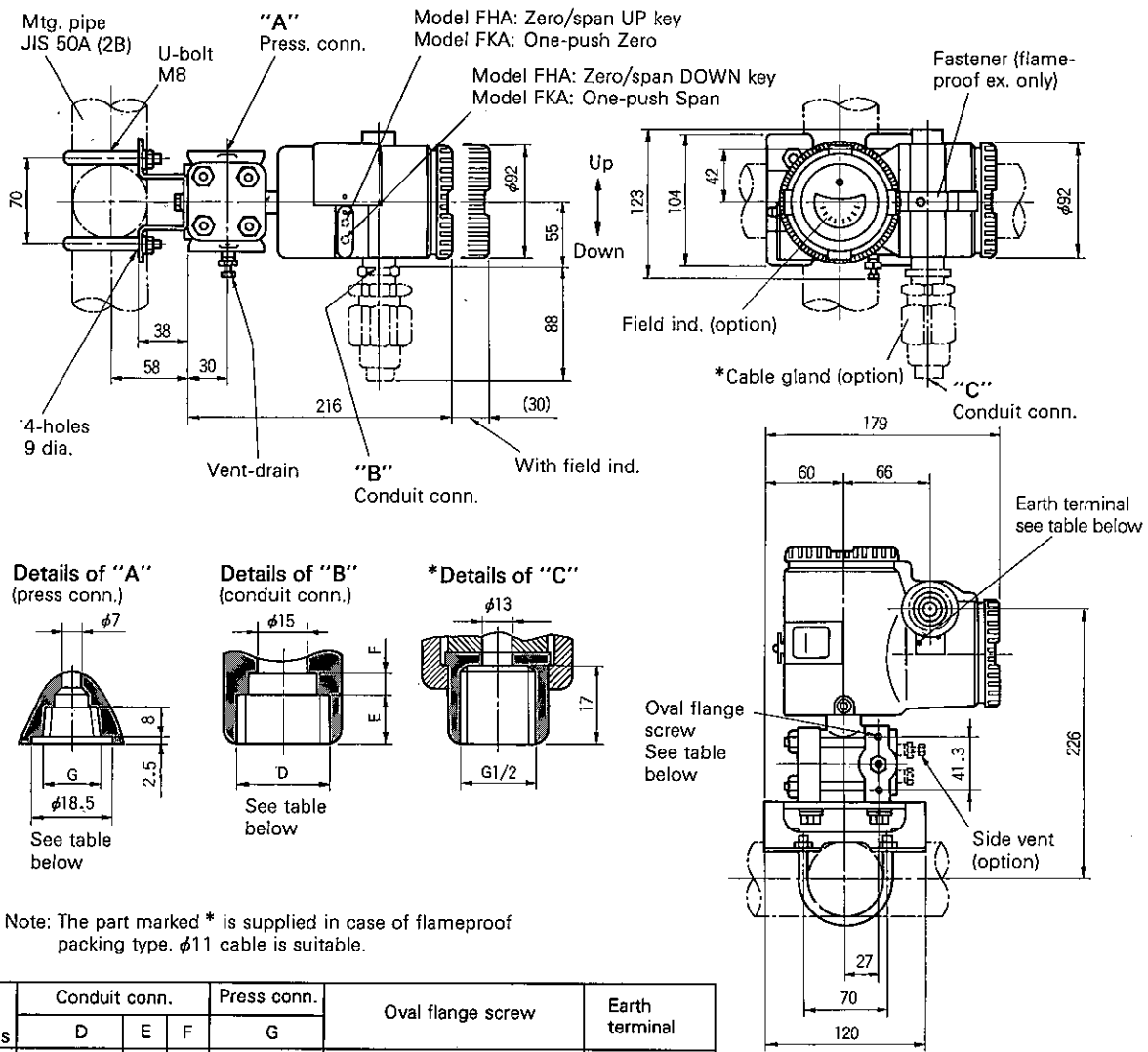
Note: \* Minimum spans are for model FHA.  
 100:1 turn down is possible for model FKA, but should be used at the span greater than 1/25 of the maximum span for better performance.

1	2	3	4	5	6	7	8	9	10	11	12	13
F	H	A	0	1								
F	K	A	0	1								

		Description		
<b>Indicator and arrester</b>				
		Indicator	Arrester(*)	
A		None	None	
B		Analog, 0 to 100% linear scale	None	
D		Analog, custom scale	None	
E		None	Yes	
F		Analog, 0 to 100% linear scale	Yes	
H		Analog, custom scale	Yes	
L		Digital, 0 to 100%	None	
P		Digital, custom scale	None (Model FKA only)	
Q		Digital, 0 to 100%	Yes	
S		Digital, custom scale	Yes (Model FKA only)	
<b>Approvals for hazardous locations</b>				
A		None (for ordinary locations)		
B		JIS, Flameproof (Conduit seal)		
C		JIS, Flameproof (Cable gland seal)		
D		FM, Flameproof (or explosionproof)		
E		CSA, Flameproof (or explosionproof)		
M		BASEEFA, Flameproof (Conduit seal)		
N		BASEEFA, Flameproof (Cable gland seal) (Conduit connection G1/2 only)		
R		SAA, Flameproof (Conduit seal)		
S		SAA, Flameproof (Cable gland seal) (Conduit connection G1/2 only)		
G		JIS, Intrinsic safety		
H		FM, Intrinsic safety and nonincendive		
J		CSA, Intrinsic safety and nonincendive		
K		BASEEFA, Intrinsic safety		
P		BASEEFA, Intrinsic safety and Type N		
T		SAA, Intrinsic safety		
V		NEPSI, Flameproof (Conduit seal)		
W		NEPSI, Intrinsic safety		
<b>Side vent/ drain and mounting bracket</b>				
		Side vent/drain	Mounting bracket	
A		None	None	
B		None	Yes, CS (*2)	
C		None	Yes, SS	
D		Yes	None	
E		Yes	Yes, CS (*2)	
F		Yes	Yes, SS	
<b>Stainless steel parts</b>				
		SS bolt/nut	SS tag plate	SS elec. housing
Y		None	None	None
A		Yes	None	None
B		None	Yes	None
C		None	None	Yes
D		Yes	Yes	None
E		None	Yes	Yes
F		Yes	None	Yes
G		Yes	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	

Notes: \* (1) Arrester option is not available when intrinsic safety is specified.  
 (?) CS : Carbon steel

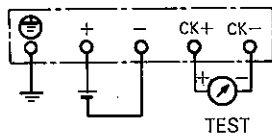
**OUTLINE DIAGRAM (Unit: mm)**



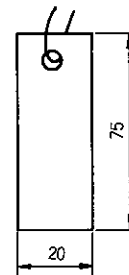
Note: The part marked \* is supplied in case of flameproof packing type.  $\phi 11$  cable is suitable.

4th of code symbols	Conduit conn.			Press conn.	Oval flange screw	Earth terminal
	D	E	F	G		
S	G1/2	17	8	Rc1/4	7/16-20UNF screw depth 13	M4
T	1/2-14NPT	16	5	1/4-18NPT	7/16-20UNF screw depth 13	No. 8-32UNC
V	Pg13.5	8	4.5	1/4-18NPT	M10 or M12 screw depth 13	M4
W	M20 x 1.5	16	5	1/4-18NPT	M10 or M12 screw depth 13	M4
X	Pg13.5	8	4.5	1/4-18NPT	7/16-20UNF screw depth 13	M4

**CONNECTION DIAGRAM**



<Optional stainless steel tag>



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