FUJI ELECTRIC

FCX-AII Series

REMOTE SEAL TYPE
DIFFERENTIAL PRESSURE TRANSMITTER <SANITARY TYPE>

DATA SHEET FKD···4

The FCX – A Ⅱ differential pressure transmitter accurately measures differential pressure, liquid level or gauge pressure and transmits a proportional 4 to 20mA signal. The transmitter utilizes a unique micromachined capacitance silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality. Totally welded construction of the seals assures excellent reliability in high temperature and highly corrosive process conditions.

FEATURES

1. High accuracy
   0.2% accuracy for all calibrated spans is a standard feature for all DP models covering 0.32kPa{3.2mbar} range to 500kPa{5bar} high differential pressure range. 0.1% accuracy is available as option. Fuji's micro-capacitance silicon sensor assures this accuracy for all elevated or suppressed calibration ranges without additional adjustment.
2. 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.
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 – A Ⅱ suitable for almost any process applications include:
   – Analog indicator at either the electronics side or terminal side
   – Built-in RFI filter and lightning arrester
   – 5-digit LCD meter with engineering unit
   – Stainless steel electronics housing
   – Wide selection of materials
   – High temperature, high vacuum seals
5. Programmable output Linearization Function
   In addition to Linear and Square Root, output signal can be freely programmable.
   (Up to 14 compensated points at approximation.)
6. 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.
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

Service: Liquid, gas, or vapour

Static pressure, span, and range limit:

Type	Static pressure	Span limit [kPa] {m bar}		Range limit [kPa] {m bar}
		Min.	Max.	
FKD□□3	Up to flange rating	0.32 { 3.2}	32 { 320}	+/– 32 {+/– 320}
FKD□□5		1.3 {13 }	130 {1300}	+/– 130 {+/– 1300}
FKD□□6		5 {50 }	500 {5000}	+/– 500 {+/– 5000}

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

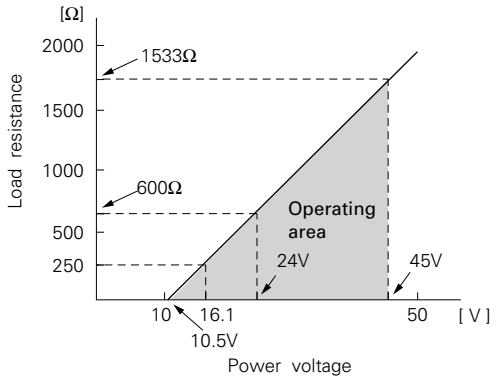
– Lower limit of static pressure (vacuum limit), Silicone fill sensor: See Fig. 1
– The maximum span of each sensor can be converted to different units using factors as below.
  $1MPa = 10^3 kPa = 10bar = 10.19716kgf/cm^2$
  $= 145.0377psi$
  $1kPa = 10mbar = 101.976mmH_2O = 4.01463H_2O$

Overrange limit: To maximum static pressure limit

Output signal: 4 to 20mA DC (linear or square root) 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[1] (Model: FXW), min. of 250Ω is required.

Zero/span adjustment:
Zero and span are adjustable from the HHC[1]. Zero and span are also adjustable externally from the adjustment screw (Span adjustment is not available with 9th digit code "L, P, M, Q, S, N").

Damping: Adjustable from HHC or local adjustment unit with LCD display.
The time constant is adjustable between 0.12 to 32 seconds.

Zero elevation/suppression:
–100% to +100% of URL

Normal/reverse action:
Selectable from HHC[1]

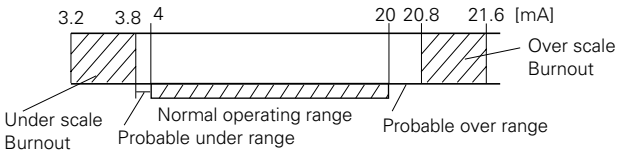
Indication: Analog indicator or 5-digit LCD meter, as specified.

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 20.8mA to 21.6mA from HHC[1]

"Output Underscale":
Adjustable within the range 3.2mA to 3.8mA from HHC[1]



Loop-check output:
Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC[1].

Temperature limit:
Ambient: – 40 to + 85°C
(– 20 to + 80°C for LCD indicator)
(– 40 to + 60°C for arrester option)

Process:

Fill fluid	Code in the 13th digit of "Code symbols"	Process temperature	Lower limit of static press
Silicone oil	G	–40 to 120°C	2.7kPa abs {20mmHg abs}

Storage: – 40 to + 90°C

Humidity limit: 0 to 100% RH

Communication: With HHC[1] (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–□3), for FCX-AⅡ.

Items		Display	Set
Tag No.		v	v
Model No.		v	v
Serial No.		v	—
Engineering unit		v	v
Range limit		v	—
Measuring range		v	v
Damping		v	v
Output mode	Linear	v	v
	Square root	v	v
Burnout direction		v	v
Calibration		v	v
Output adjust		—	v
Data		v	—
Self diagnoses		v	—
Printer		—	—
External switch lock		v	v
Transmitter display		v	v
Linearize		v	v
Rerange		v	v

Programmable output linearization function:
Output signal can be characterized with "14 points linear approximation function" from HHC[1].

(Note) (1) HHC: Hand Held Communicator

Performance specifications

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4 to 20mA analog output in linear mode and capillary length of 1.5m.

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,K)

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

For span 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 6 month.

Temperature effect (*):

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

(Standard) Zero shift: ±0.35% of URL

Total effect: ±0.5% of URL

(Option) (Code; 21th digit J,K)

Zero shift: ±0.3% of URL

Total effect: ±0.4% of URL

Note: * Excluding effects by temperature difference between the seals.

Static pressure effect:

Zero shift: ±0.2% of URL for flange rating pressure

Span shift: –0.2% of calibrated span for flange rating pressure

Overrange effect: Zero shift; ±0.1% of URL for flange rating pressure

Supply voltage effect:

Less than 0.005% of calibrated span per 1V

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

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

Step response: (without electrical damping)

Range code	Time constant (*)	Dead time (*)
"3"	2 s	0.2 s
"5"	1.7 s	
"6"	1.7 s	

*) Faster response is available as option (maximum update rate: 25 times per second).

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:

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

And 1-conduit or 2-conduit, as specified.

Process connections:

IDF standard 4" clamp.

See OUTLINE DIAGRAM for detailed dimensions.

Process-wetted parts material:

Diaphragm: 316L stainless steel

Flange face: 316 stainless steel

Extension: 316 stainless steel

Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy finished with epoxy/polyurethane double coating (standard), or 316 stainless steel (SCS14 per JIS G5121), as specified.

Capillary: In case of 11th code "D, E, F, L, M, N, P", PVC armored stainless steel. In case of 13th code "Q, R, S, T, V, W, X", stainless steel armored stainless steel.

Mounting flange: 316 stainless steel

Fill fluid: Silicone oil (standard)

Mounting bracket: 304 stainless steel

Environmental protection:

IEC IP67 and NEMA 6/6P

Mounting: On 60.5mm (JIS 50A) pipe using mounting bracket, direct wall mounting

Mass{weight}: Transmitter approximately 15kg 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 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 adjustment unit with LCD display:
An optional 5-digit LCD meter with Zero/Span adjustment function, loop-check function and damping adjustment function, is available.

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.

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

Coating of cell: Cell's surface is finished with epoxy/polyurethane double coating. Specify if environment is extremely corrosive.

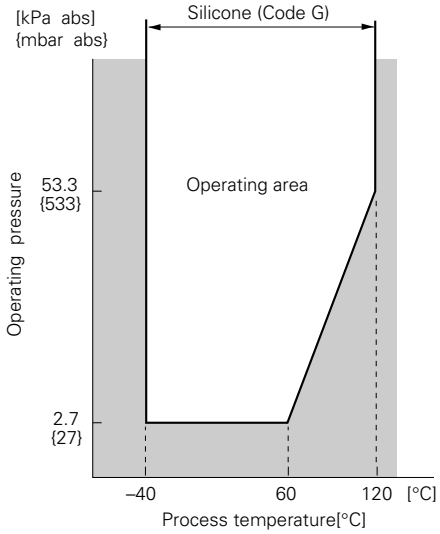


Fig. 1 Relation between process temperature and operating pressure

ACCESSORIES

Hand held communicator:
(Model FXW, refer to Data Sheet No. EDS 8-47)

Z/S board: Parts No.=ZZPFCX4-A070
When Z/S board is mounted on the FCX–AII amplifier unit, external adjustment screw will be available for zero and span adjustment.

CODE SYMBOLS

Digit	Description	Note	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 21 ← Digit No. of code F K D □ □ □ □ 4 - □ □ □ □ □ - Y Y - □
4	<Conduit connection> G 1/2 (×1) 1/2-14NPT (×1) Pg13.5 (×1) M20 × 1.5 (×1) Combination with 12th digit code "C, E, P, Q" are not available. G 1/2 (×2) 1/2-14NPT (×2) Pg13.5 (×2) M20 × 1.5 (×2)		A B C D S T V W
5	< Flange> Mounting flange: 316 stainless steel; Flange size and rating: IDF standard 4" clamp		L
6	<Span limit (*1) [kPa]{m bar}> 0.32..... 32 {3.2..... 320} 1.3..... 130 {13..... 1300} 5..... 500 {50..... 5000}	Note 1	3 5 6
7	<Material/diaphragm extension> Diaphragm: 316L stainless steel; Flange face: 316 stainless steel; Diaph. extension [mm]: 0		V
9	<Indicator and arrester> Indicator / Arrester None / None Analog, 0 to 100% linear scale / None Analog, 0 to 100% sq. root scale / None(*2) Analog, custom scale / None Analog, double scale (linear and sq. root) / None (Z/S board attached.) None / Yes Analog, 0 to 100% linear scale / Yes Analog, 0 to 100% sq. root scale / Yes(*2) Analog, custom scale / Yes Analog, double scale (linear and sq. root) / Yes Digital, 0 to 100% / None Digital, custom scale / None Digital, 0 to 100% square root / None Digital, 0 to 100% / Yes Digital, custom scale / Yes Digital, 0 to 100% square root / Yes Digital, 0 to 100% (Local adjustment unit with LCD display) / None Digital, custom scale (Local adjustment unit with LCD display) / None Digital, 0 to 100% square root (Local adjustment unit with LCD display) / None Digital, 0 to 100% (Local adjustment unit with LCD display) / Yes Digital, custom scale (Local adjustment unit with LCD display) / Yes Digital, 0 to 100% square root (Local adjustment unit with LCD display) / Yes	Note 2 Note 2	A B C D J E F G H K L P M Q S N 1 2 3 4 5 6
10	<Approvals for hazardous locations> None (for ordinary locations)		A
11	<Capillary and mounting bracket> Capillary / Mounting bracket / Armor of capilary 1.5 m / 304 Stainless steel / PVC 3 / 304 Stainless steel / PVC 5 / 304 Stainless steel / PVC 6 / 304 Stainless steel / PVC 7 / 304 Stainless steel / PVC 8 / 304 Stainless steel / PVC 10 / 304 Stainless steel / PVC 1.5 / 304 Stainless steel / Stainless steel 3 / 304 Stainless steel / Stainless steel 5 / 304 Stainless steel / Stainless steel 6 / 304 Stainless steel / Stainless steel 7 / 304 Stainless steel / Stainless steel 8 / 304 Stainless steel / Stainless steel 10 / 304 Stainless steel / Stainless steel		D E L F M N P Q R S T V W X

Note 1: (*1) 100: 1 turn down is possible, but should be used at a span greater than 1/40 of the maximum span for better performance.
Note 2: (*2) In case of square root output mode, square root scale is not available.

Digit	Description			Note	1 2 3 4 5 6 7 8	9 10 11 12 13	14 15	21 ← Digit No. of code
					F K D		Y Y	
12	<Options>							
	Extra SS tag plate	Stainless steel elec. housing	Coating of cell					
	None (*3)	None	None			Y		
	Yes (*3)	None	None			B		
	None (*3)	Yes	None			C		
	Yes (*3)	Yes	None	Note 3		E		
	None (*3)	None	Yes			M		
	Yes (*3)	None	Yes			N		
	None (*3)	Yes	Yes			P		
13	Yes (*3)	Yes	Yes			Q		
13	<Special applications and fill fluid>							
	Treatment	Fill fluid						
21	Degreasing	Silicone oil				G		
21	<Other options>							
	High accuracy type							H
	Low temperature effect type							J
	H+J							K

Note 3: (*3) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes".

The product conforms to the requirements of the Electromagnetic compatibility Directive 94/9/EC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

EMI (Emission) EN61326 : 1997
Class A (standard for Industrial Location)

Frequency range MHz	Limits	Reference standard
30 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	

EMI (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

Note) Definition of performance criteria

A: During testing, normal performance within the specification limits.

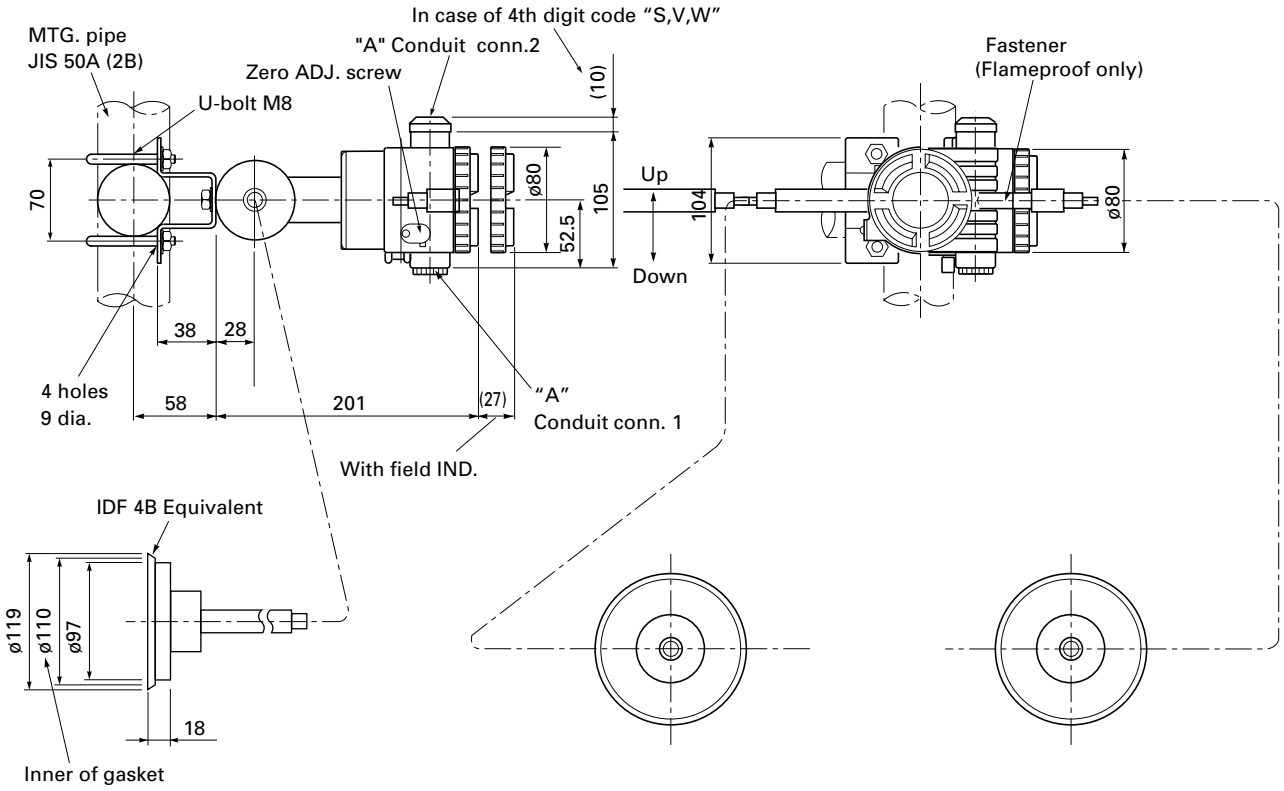
B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

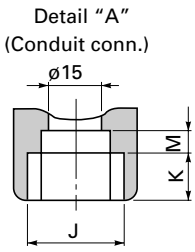
ORDERING INFORMATION

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 (21.6mA) / Underscale (3.2mA)
   Unless otherwise specified, output hold function is supplied.
4. Output mode (linear or square root output)
   Unless otherwise specified, output mode is linear.
5. Indication method (indicated value and unit) in case of the actual scale (code D, H, P, S on 9th digit).
6. Tag No. (up to 26 alphanumerical characters), if required.

OUTLINE DIAGRAM (Unit:mm)

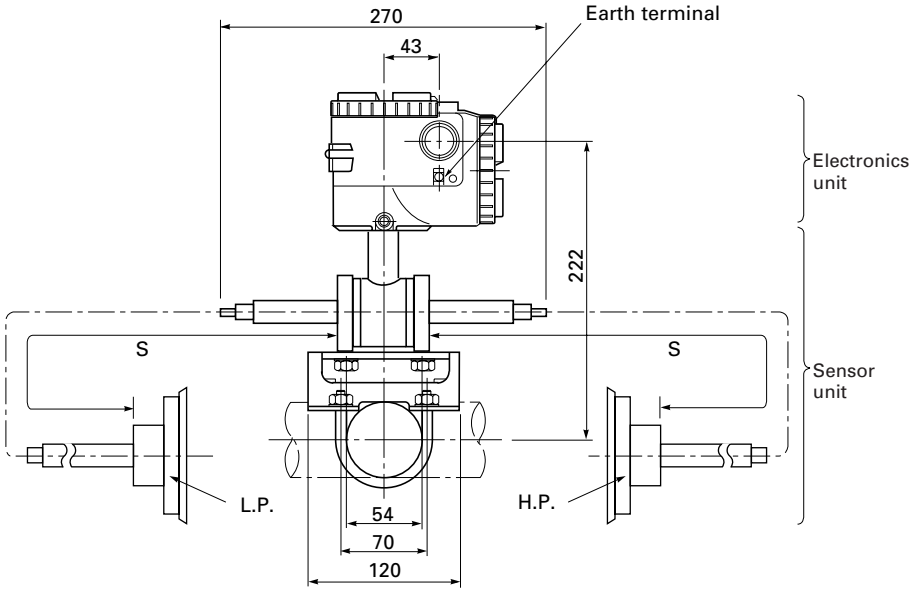


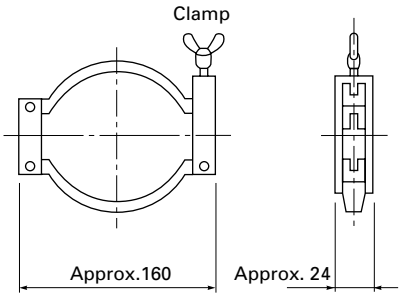


See table 1

4th digit code	Conduit conn.		
	J	K	M
A, S	G1/2	17	8
B, T	1/2-14NPT	16	5
C, V	Pg13.5	8	4.5
D, W	M20 × 1.5	16	5

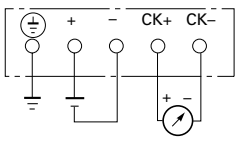
Table 1





11th digit code	S (m)	11th digit code	S (m)
D,Q	1.5	M,V	7
E,R	3	N,W	8
L,S	5	P,X	10
F,T	6		

CONNECTION DIAGRAM



(M4 screws)

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