PRESSURE TRANSMITTER

DATA SHEET FHG···4

The FCX – AIIe pressure transmitter accurately measures 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.

FEATURES

1. **High accuracy ±0.1%**
   0.1% accuracy is a standard feature. Fuji's micro-capacitance silicon sensor assures this accuracy for all elevated or suppressed calibration ranges without additional adjustment.
2. **Minimum environmental influence**
   The "Advance 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**
   FCX–AIIe series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX–AIIe.
4. **Application flexibility**
   Various options that render the FCX – AIIe 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
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

Service: Liquid, gas, or vapour

Span, range and overrange limit:

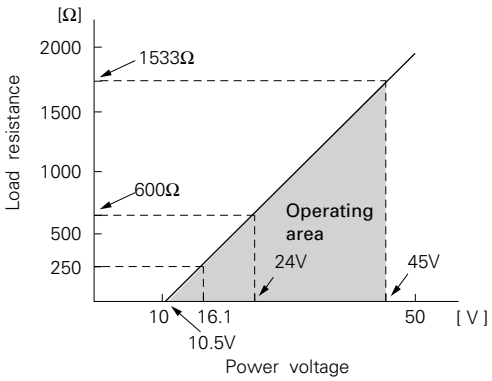
Type	Span limit [kPa] {bar}		Range limit [kPa] {bar}		Overrange limit [MPa] {bar}
	Min.	Max.	Lower limit	Upper limit	
FHG□02	16.66 {0.16}	500 {5}	–100 {–1}	500 {5}	1.5 {15}
FHG□03	100 {1}	3000 {30}	–100 {–1}	3000 {30}	9 {90}
FHG□04	333.3 {3.33}	10000 {100}	–100 {–1}	10000 {100}	15 {150}

– Lower range limit (vacuum limit) ;
  Silicone fill sensor: See Fig. 1
  Fluorinated fill sensor: 66kPa abs (500mmHg abs) at below 60°C
– Conversion factors to different units;
  1 MPa=10^3 kPa=10bar=10.19716kgf/cm^2= 145.0377psi
  1kPa=10mbar=101.9716mmH_2O =4.01463inH_2O

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(1) (Model: FXW), min. of 250 Ω required.

Hazardous locations:

Authorities	Flameproof	Intrinsic safety	Type n Nonincendive
Factory Mutual	Class I II III Div. 1 Groups B thru. G	Class I II III Div. 1 Groups A thru. F	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
TIIS	Ex do IIB+H_2 T4	Ex ia II C T4 (*)	—

(*) Approval pending

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, Q, S").

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

Normal/reverse action:
Selectable from HHC(1).

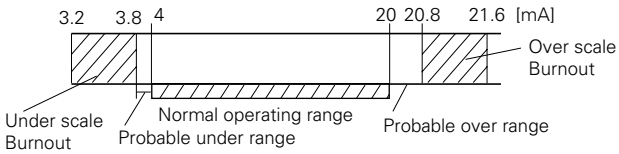
Indication: Analog indicator or 5-digit LCD meter, as specified.

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



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)
(–10 to +60°C for fluorinated oil fill transmitter)
For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.
Process: –40 to +100°C for silicone fill sensor
–20 to +80°C for fluorinated oil fill sensor
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	*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*

(Note) (1) HHC: Hand Held Communicator

Performance specifications

Reference conditions, silicone oil fill, 316SS isolating diaphragms, 4 to 20mA analog output in linear mode.

Accuracy rating: (including linearity, hysteresis, and repeatability)

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 6 month.

Temperature effect:

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

Zero shift: $\pm(0.1+0.025 \frac{\text{URL}}{\text{span}})\%$

Total effect: $\pm(0.125+0.025 \frac{\text{URL}}{\text{span}})\%$

Overrange effect: Zero shift; 0.3% of URL for any overrange to maximum limit

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: Time constant: 0.2s
Dead time: approximately 0.2s
(without electrical damping)

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:

G1/2, 1/2-14 NPT, Pg13.5, or M20 × 1.5 conduit, as specified.
1-port (standard), as spcified.

Process connections:

1/4-18 NPT or Rc1/4 on 54mm centers, as specified.
Meet DIN 19213

Process-wetted parts material:

Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316 stainless steel(*1)	316L stainless steel	316 stainless steel	316 stainless steel

Note: *(1) SCS14 per JIS G 5121
Remark: Sensor O-rings: Viton O-ring and teflon gasket selectable

Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy finished with epoxy/polyurethane double coating.
Bolts and nuts: Cr-Mo alloy (standard), or 304 stainless steel (630 stainless steel for 50MPa unit).
Fill fluid: Silicone oil (standard) or fluorinated oil
Mounting bracket: 304 stainless steel

Environmental protection:

IEC IP67

Mounting: On 60.5mm (JIS 50A) 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

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)

Oxygen service: Special cleaning procedures are followed throughout the process to maintain all process wetted parts oil-free.
The fill fluid is fluorinated oil.

Chlorine service: The fill fluid is fluorinated oil.

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 boundary parts comply with NACE MR-01-75. ASTM B7M or L7M bolts and 2HM nuts (Class II) are available.

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

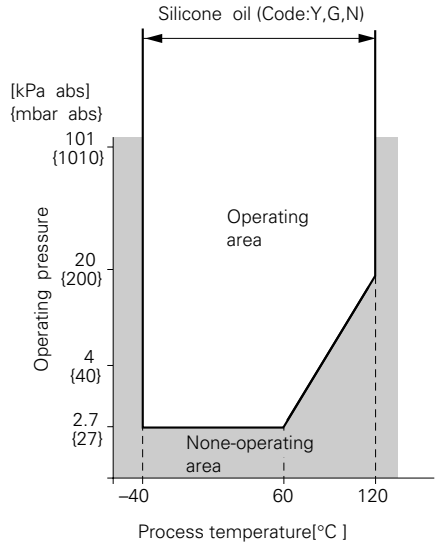


Fig. 1 Relation between process temperature and operating pressure

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 stainless steel.

Hand-held communicator:
(Model FXW, refer to Data Sheet No. EDS8-47)

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.

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

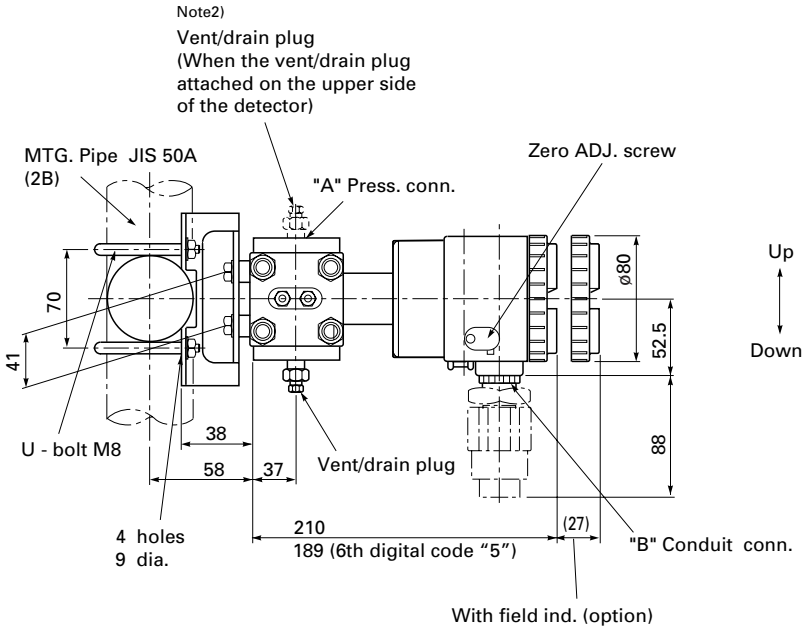
When ordering this instrument, specify.
1. CODE SYMBOLS
2. Measuring range
3. Output orientation (burnout direction) when abnormality is occured in the transmitter.
   Hold/Overscale (21.6mA)/Overscale (3.2mA)
   Unless otherwise specified, output hold function is supplied.
4. Indication method (indicated value and unit) in case of the actual scale (code D,H,P,S on 9th digit).
5. Tag No.(up to 26 alphanumerical characters), if required.

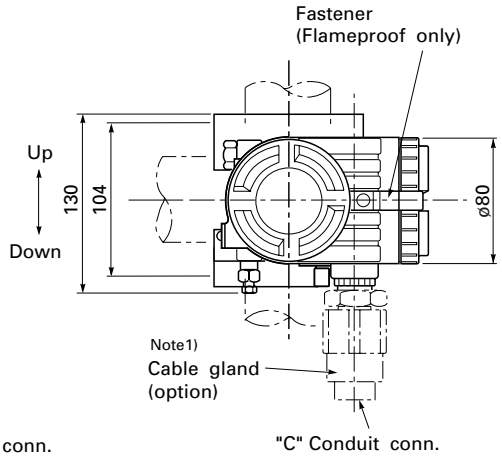
CODE SYMBOLS

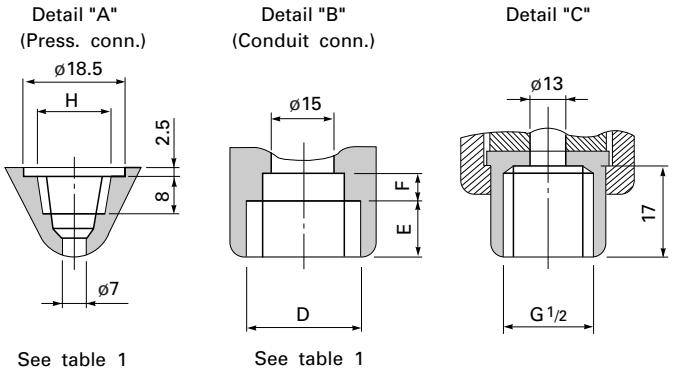
Digit	Description	Note	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 ← Digit No. of code F H G		0			4	–						–		
4	<Connections> Process connection / Oval flange screw / Conduit connection Rc1/4 / 7/16-20UNF / G1/2 (×1) 1/4-18NPT / 7/16-20UNF / 1/2-14NPT (×1) 1/4-18NPT / M10 / Pg13.5 (×1) 1/4-18NPT / M10 / M20×1.5 (×1) 1/4-18NPT / 7/16-20UNF / Pg13.5 (×1)			A B C D E													
6, 7	<Span and materials> Span limit [kPa]{bar} / Process cover / Diaphragm / Wetted cell body 16.66…500 {0.16…5} / 316 stainless steel / 316L stainless steel / 316 stainless steel 100…3000 {1…30} / 316 stainless steel / 316L stainless steel / 316 stainless steel 333.3…10000 {3.33…100} / 316 stainless steel / 316L stainless steel / 316 stainless steel					2V 3V 4V										
9	<Indicator and arrester> Indicator / Arrester None / None (Z/S board attached. Approval pending for 10th digit code "G, H, J") Analog, 0 to 100% linear scale / None (Z/S board attached. Approval pending for 10th digit code "G, H, J") Analog, custom scale / None (Z/S board attached. Approval pending for 10th digit code "G, H, J") None / Yes (Z/S board attached. Approval pending for 10th digit code "G, H, J") Analog, 0 to 100% linear scale / Yes (Z/S board attached. Approval pending for 10th digit code "G, H, J") Analog, custom scale / Yes (Z/S board attached. Approval pending for 10th digit code "G, H, J") Digital, 0 to 100% / None Digital, custom scale / None Digital, 0 to 100% / Yes Digital, custom scale / Yes Digital, 0 to 100% (Local adjustment unit with LCD display) / None (Approval pending for 10th digit code "D, E, G, H, J") Digital, custom scale (Local adjustment unit with LCD display) / None (Approval pending for 10th digit code "D, E, G, H, J") Digital, 0 to 100% (Local adjustment unit with LCD display) / Yes (Approval pending for 10th digit code "D, E, G, H, J") Digital, custom scale (Local adjustment unit with LCD display) / Yes (Approval pending for 10th digit code "D, E, G, H, J")						A B D E F H L P Q S 1 2 4 5								
10	<Approvals for hazardous locations> None (for ordinary locations)									A							
	TIIS, Flameproof (Conduit seal) (Available for 4th digit code "A")									B							
	TIIS, Flameproof (Cable gland seal) (Available for 4th digit code "A")									C							
	FM, Flameproof (or explosion proof) (Available for 4th digit code "B")									D							
11	CSA Frameproof (or explosion proof) (Available for 4th digit code "B")									E							
	TIIS, Intrinsic safety (Approval pending)									G							
	FM, Intrinsic safety and Nonincendive									H							
	CSA Intrinsic safety and Nonincendive									J							
12	<Vent/ drain and mounting bracket> Vent/drain / Mounting bracket Standard / None Standard / Yes, stainless steel Side / None Side / Yes, stainless steel										A C D F						
	<Options> Extra SS tag plate / Stainless steel elec. housing / Coating of cell None (*1) / None / None	Note 1										Y					
	Yes (*1) / None / None											B					
	None / None / Yes											M					
	Yes / None / Yes											N					
13	<Special applications and fill fluid> Treatment / Fill fluid Standard / Silicone oil												Y				
	Degreasing / Silicone oil												G				
	Oxygen service / Fluorinated oil (7th digit code "V" only)												A				
	NACE specification / Silicone oil (Not available for 15th digit code "A", "B")												N				
14	<Sensor O-ring / Gasket> Viton (O-ring)													A			
	Teflon (gasket)													B			
15	<Bolt/nut> Cr-Mo alloy hexagon socket head cap screw/carbon steel nut														A		
	Cr-Mo alloy hexagon bolt/nut														B		
	NACE bolt/nut (ASTM A193 B7M/A194 2HM)														C		
	NACE bolt/nut (ASTM A320 L7M/A194 2HM)														D		
	304 stainless steel bolt/304 stainless steel nut														E		

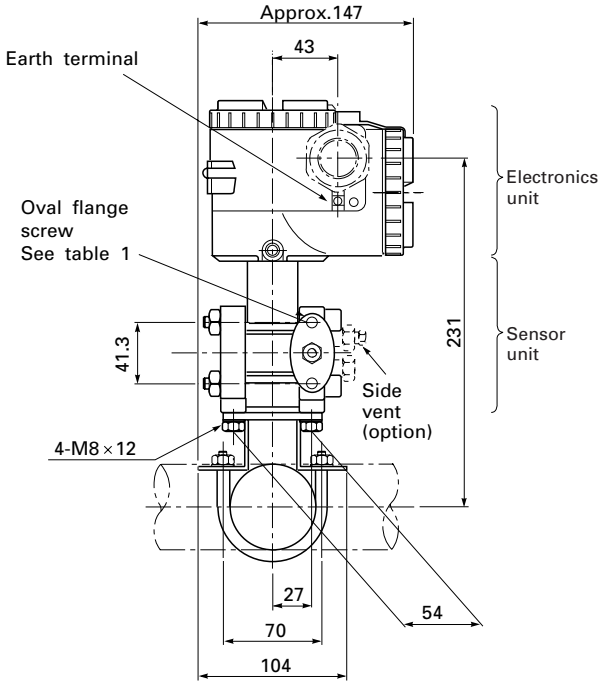
Note 1: (*1) Costomer tag number can be engraved on standartd stainless steel name plate.
If extra tag plate is required, select "Yes".

OUTLINE DIAGRAM (Unit:mm)









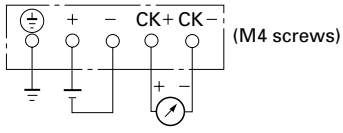
4th digit of the code symbols	Conduit conn.			Press.conn.	Oval flange screw
	D	E	F	H	
A	G1/2	17	8	Rc1/4	7/16-20UNF Screw depth15
B	1/2-14NPT	16	5	1/4-18NPT	7/16-20UNF Screw depth15
C	Pg13.5	8	4.5	1/4-18NPT	M10 Screw depth15
D	M20×1.5	16	5	1/4-18NPT	M10 Screw depth15
E	Pg13.5	8	4.5	1/4-18NPT	7/16-20UNF Screw depth15

Table 1

Note1) Cable gland is supplied in case of 10th digit code "C". ø11 cable is suitable.

Note2) The pressure connector is located on the down side surface of the detector, when the vent / drainplug is attatched on the upper side of the detector

CONNECTION DIAGRAM



⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.

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