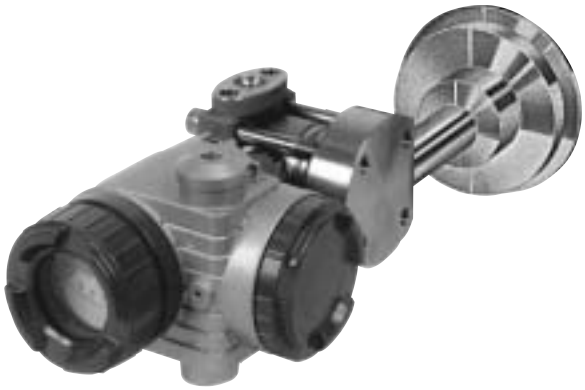
LEVEL TRANSMITTER <SANITARY TYPE>

DATA SHEET FKE···4

The FCX–AII level transmitter accurately measures liquid level 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
   0.2% accuracy for all calibrated spans is a standard feature for all 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–AII 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 service.
5. Programmable output Linearization Function
   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:

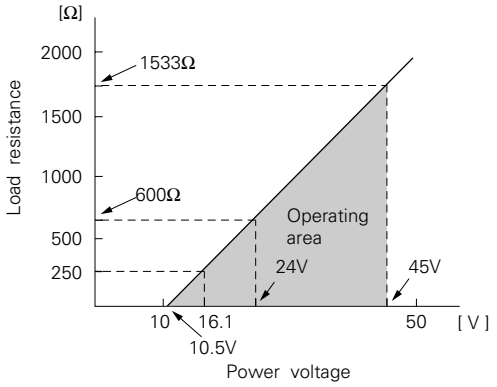
Type	Static pressure	Span limit [kPa] {m bar}		Range limit [kPa] {m bar}
		Min.	Max.	
FKE□□3	Up to flange rating	0.32 {3.2}	32 {320}	+/– 32 { +/– 320}
FKE□□5		1.3 {13}	130 {1300}	+/– 130 { +/– 1300}
FKE□□6		5 {50}	500 {5000}	+/– 500 { +/– 5000}

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=10^3kPa=10bar=10.19716kgf/cm^2=145.0377psi
  1kPa=10mbar=101.9716mmH_2O=4.01463inH_2O

Overrange limit: To maximum static pressure limit
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 250Ω 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, 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:
– 100% to + 100% of URL

Normal/reverse action:
Selectable from HHC(1)

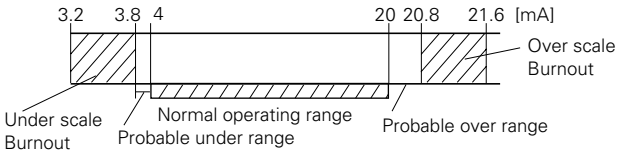
Indication: Analog indicator or 5-digit LCD meter, as specified.

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 {20.3mmHg 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-A Ⅱ.

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

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, 4-20 mA analog output in linear mode.

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

Static pressure effect:

Zero shift: ±0.2% of URL 1MPa

Span shift: – 0.2% of calibrated span / 1MPa

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"	0.55 s	0.2 s
"5" and "6"	0.3 s	

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

Mounting position effect:

Zero shift, less than 0.3kPa{3m bar} for a 10° tilt in any plane. (No extension)

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 x 1.5 conduit, as specified.

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

Process connections:

LP side: 1/4-18 NPT or Rc1/4.

HP side: IDF standard 4" clamp. See OUTLINE DIAGRAM for detailed dimensions.

Refer to "Code symbols"

Process-wetted parts material:

Material code (7th figure in "Code symbols")	LP side			HP side
	Process cover	Diaphragm	Wetted sensor body	Diaphragm & flange face
V	316 stainless steel (*2)	316L stainless steel	316 stainless steel	316L stainless steel

*(1) Sensor O-rings: Viton O-ring or teflon gasket selectable

(2) SCS14 Per JIS G5121

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.

Bolts and nuts: Cr-Mo alloy (standard) or 304 stainless steel

Fill fluid: Silicone oil (standard)

Mounting flange: 316 stainless steel

Environmental protection:

IEC IP67 and NEMA 6 / 6P

Flange mounting: See drawings

Mass{weight}: Transmitter approximately 13kg 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 with 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.

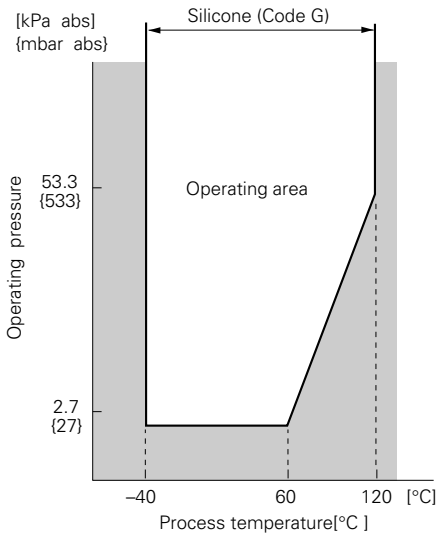


Fig. 1 Relation between process temperature and operating pressure

ACCESSORIES

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. 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.

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

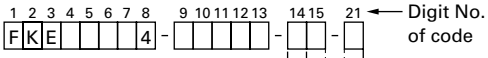
Note) Definition of performance criteria
A: During testing, normal performance within the specification limits.
B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

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 E 4 - - -
4	<Connections>					
	Process connection	Oval flange screw	Conduit connection			
	Rc1/4	7/16-20UNF	G 1/2	(×1)		A
	1/4-18NPT	7/16-20UNF	1/2-14NPT	(×1)	Combination with 12th digit code "C, E, P, Q" are not available.	B
	1/4-18NPT	M10	Pg13.5	(×1)		C
	1/4-18NPT	M10	M20×1.5	(×1)		D
	1/4-18NPT	7/16-20UNF	Pg13.5	(×1)		E
	Rc1/4	7/16-20UNF	G 1/2	(×2)		S
	1/4-18NPT	7/16-20UNF	1/2-14NPT	(×2)		T
	1/4-18NPT	M10	Pg13.5	(×2)		V
	1/4-18NPT	M10	M20×1.5	(×2)		W
	1/4-18NPT	7/16-20UNF	Pg13.5	(×2)		X
5	<Mounting flange>					
	Material	Size and rating			Note 1	L
	316 stainless	IDF standard 4" clamp				
6	<Span limit (*1) [kPa] {m bar}>					
	0.32 ----- 32 {3.2 ----- 320}					3
	1.3 ------ 130 {13 ------ 1300}					5
	5 -------- 500 {50 ------ 5000}					6
7	<Material>					
	LP side				Note 2	
	Process cover	Diaphragm	Wetted sensor body	HP side: Diaphragm and flange face		V (*2)
	316 stainless steel	316L stainless steel	316 stainless steel	316L stainless steel		
9	<Indicator and arrester>					
	Indicator		Arrester			
	None		None			A
	Analog, 0 to 100% linear scale		None			B
	Analog, custom scale		None		Z/S board attached	D
	None		Yes			E
	Analog, 0 to 100% linear scale		Yes			F
	Analog, custom scale		Yes			H
	Digital, 0 to 100%		None			L
	Digital, custom scale		None			P
	Digital, 0 to 100%		Yes			Q
	Digital, custom scale		Yes			S
	Digital, 0 to 100% (Local adjustment unit with LCD display)		None			1
	Digital, custom scale (Local adjustment unit with LCD display)		None			2
	Digital, 0 to 100% (Local adjustment unit with LCD display)		Yes			4
	Digital, custom scale (Local adjustment unit with LCD display)		Yes			5
10	<Approvals for hazardous locations>					
	None (for ordinary locations)					A
11	<Diaphragm extension [mm]>					
	Extension [mm]					
	0					Y
12	<Options>					
	Extra SS tag plate		Stainless steel elec. housing	Coating of cell		
	None		None	None		Y
	Yes		None	None		B
	None		Yes	None		C
	Yes	*3)	Yes	None	Note 3	E
	None		None	Yes		M
	Yes		None	Yes		N
	None		Yes	Yes		P
	Yes		Yes	Yes		Q
13	<Special applications and fill fluid>					
	Treatment		Fill fluid			
	Degreasing		Silicone oil			G

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 6th digit code "6", LP side diaphrgm is Hastelloy-C.
Note 3: (*3) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes".

Digit	Description	Note
14	<O-ring, gasket and Teflon membrane> O-ring / Gasket — Teflon membrane Viton (O-ring) — None Teflon (gasket) — None	
15	<Bolt/nut> *4) Cr-Mo alloy hexagon socket head cap screw/carbon steel nut Cr-Mo alloy hexagon bolt/nut 304 stainless steel bolt / 316 stainless steel nut	Note 4
21	<Other options> High accuracy type Low temperature effect type H+J	



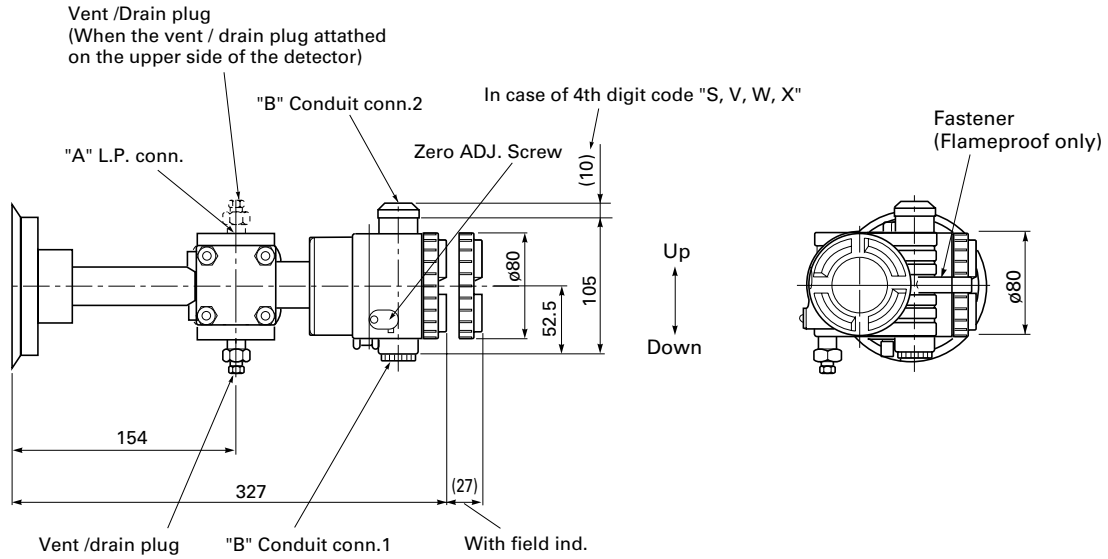
Note 4: (*4) In case of tropical use, select stainless bolts and nuts.

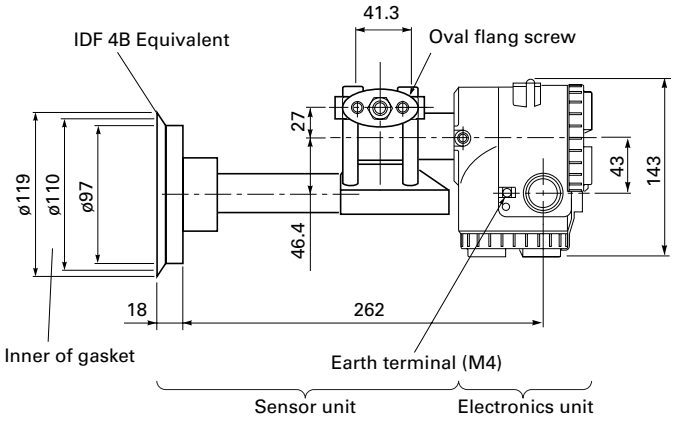
ORDERING INFORMATION

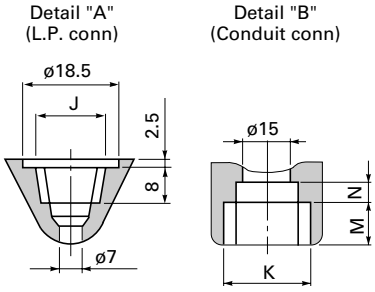
When ordering this instrument, specify:

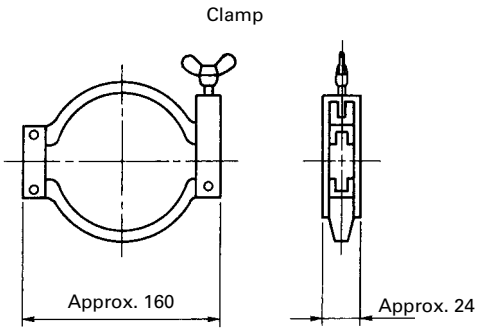
1. CODE SYMBOLS
2. Measuring range
3. Output orientation (burnout direction) when abnormality is occurred in the transmitter.
   Hold / Overscale (21.6mA) / Underscale (3.2mA).
   Unless otherwise specified, output hold function is supplied.
4. Indication method (indicated value and unit) in case of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

OUTLINE DIAGRAM (Unit:mm)







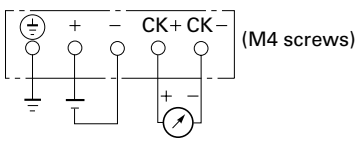


4th digit of the code symbols	Conduit conn.			Press.conn.	Oval flage screw
	K	M	N	J	
A, S	G1/2	17	8	Rc1/4	7/16-20UNF Screw depth15
B, T	1/2-14NPT	16	5	1/4-18NPT	7/16-20UNF Screw depth15
C, V	Pg13.5	8	4.5	1/4-18NPT	M10 Screw depth15
D, W	M20 ×1.5	16	5	1/4-18NPT	M10 Screw depth15
E, X	Pg13.5	8	4.5	1/4-18NPT	7/16-20UNF Screw depth15

Table 1

Note 1) The pressure connector is located on the down side surface of the detector, when the vent / detector (When the 21th degit of the code symbols : C).

CONNECTION DIAGRAM



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