

FCX-AII

FKH...5

ABSOLUTE PRESSURE TRANSMITTER

DATA SHEET

The FCX-All absolute pressure transmitter (direct mount type) 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. High accuracy

0.2% accuracy for all calibrated spans is the standard feature. Fuji's micro-capacitance silicon sensor assures this feature for all suppressed calibration ranges without additional adjustment.

2. Minimum inventory

Electronics unit, communication module, local indicators and electronics housing are interchangeable among all FCX-All models.

3. Replaceable Communication Module

Fuji micro-electronics manufacturing technology offers replaceable communication module that makes FCX-All transmitter very unique design. In case of change in communication protocol all that needs to be done is just replace the module and the transmitter gets upgraded to the new version.

4. Fuji/HART[™] bilingual communication module

The communication module is "bilingual" to speak both Fuji proprietary protocol and HART[®]. Any HART[®] compatible devices can communicate with FCX-AII series transmitters.

5. Application flexibility

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

- Full range of hazardous location approvals
- Built-in RFI filter and lightning arrester
- 5-digits LCD meter
- The maximum span of each sensor can be converted to in different units using below factors.

SPECIFICATIONS

Functional specifications

Type:

FKH: Smart, 4 to 20mA DC + Fuji/Hart[®] digital signal Service:

Liquid, gas, or vapour

Span, range, and overrange limit:

Туре	Span	limit [kPa ab	os] {bar abs}		Overr	
туре		Min.	Max.	- [kPa abs] {bar abs}	[MPa]	
FKH□02	8.125		130	0 to 130	0.5	
		{0.08125}	{1.3}	{0 to 1.3}		{5}
FKH 🗆 03	31.25		500	0 to 500	1.5	
		{0.3125}	{5}	{0 to 5}		{15}
FKH□04	187.5		3000	0 to 3000	9	
		{1.875}	{30}	{0 to 30}		{90}

Output signal:

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

Power supply:

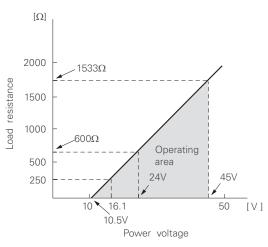
Transmitter operates on 10.5V to 45V DC at transmitter terminals.

10.5V to 32V DC for the units with optional arrester

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FKH---5

Load limitations: see figure below



Note: For communication with HHC $^{(1)},$ min. of 250 Ω required.

Hazardous locations:

Authority (Digit 10=)	Intrinsic safety								
ATEX (K)	Ex II 1 G Ex II 1 G Ex ia IIC T5 (-40°C \leq Ta \leq +50 °C) Ex ia IIC T4 (-40°C \leq Ta \leq +70 °C) IP66/67 Entity Parameters: Ui \leq 28 Vdc, Ii \leq 94.3 mA, Pi \leq 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								
Factory Mutual (pending)	Class I II III Div.1 Groups A, B, C T4 Entity Type 4X	Div.1 Groups A, B, C, D, E, F, G							
(H)	Model code 9th digit A,B,C,D,J L,P,M,1,2,3 Q,S,N,4,5,6 E,F,G,H,K - Entity Parameters: Vmax=42.4V, Imax=7 Ci=35.98nF, Li=0.694		Tamb -40°C to +85°C -20°C to +80°C -20°C to +60°C -40°C to +60°C -10°C to +60°C						
CSA (J)	Ex ia Class I, Groups Class II, Groups E,F Per drawing TC 5228 Temp. code T5 for Ta Temp. code T4 for Ta Entity Parameters: Vmax = 28 Vdc, Imax Ci = 36 nF/25 nF for Li = 0.7 mH/0.6 mH f	and G; Class III 373 amb max = +50°C amb max = +70°C x = 94.3 mA, Pma models with/with	2 ax = 0.66 W						
IECEx (T)	Ex ia IIC T5 (-40°C ≤ Ex ia IIC T4 (-40°C ≤ IP66/67 Entity Parameters: Ui ≤ 28 Vdc, li ≤ 94.3 Ci = 36 nF/26 nF for Li = 0.7 mH/0.6 mH f	Ta ≤+70 °C) mA, Pi ≤ 0.66 W models with/with							

Authority	Flameproof
ATEX (X)	Ex II 2 GD Ex d IIC T6 (-40°C \leq Ta \leq +65 °C) Ex d IIC T5 (-40°C \leq Ta \leq +85 °C) Ex tD A21 IP66/67 T 85°C Ex tD A21 IP66/67 T 100°C Electrical ratings Model Without arrester: Ui \leq 45 Vdc, 4-20 mA loop powered, Pi \leq 1.0125 W Model With arrester: Ui \leq 32 Vdc, 4-20 mA loop powered, Pi \leq 1.0125 W
Factory Mutual (pending) (D)	Class I Div.1 Groups B, C, D T6 Type 4X Class II III Div.1 Groups E, F, G T6 Type 4X Tamb max = +60°C
CSA (E)	Class I, Groups C and D; Class II, Groups E,F and G ; Class III Maximum ambient temperature 85° C Maximum working pressure 50 Mpa Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA Model With arrester: Ui ≤ 32 Vdc, 4-20 mA Note: "Seal not required"
IECEx (R)	Ex d IIC T6 (-40°C \leq Ta \leq +65 °C) Ex d IIC T5 (-40°C \leq Ta \leq +85 °C) DIP A21 IP66/67 T 85°C DIP A21 IP66/67 T 100°C Electrical ratings Model Without arrester: Ui \leq 45 Vdc, 4-20 mA loop powered, Pi \leq 1.0125 W Model With arrester: Ui \leq 32 Vdc, 4-20 mA loop powered, Pi \leq 1.0125 W

Authority (Digit 10=)	Type n Nonincendive							
ATEX (P)	Ex II 3 G Ex II 3 G Ex nA II T5 (-40°C \leq Ta \leq +70 °C) IP66/67 Electrical ratings Model Without arrester: Ui \leq 45 Vdc, 4-20 mA loop powered, Pi \leq 1.0125 W Model With arrester: Ui \leq 32 Vdc, 4-20 mA loop powered, Pi \leq 1.0125 W Optional Analog indicator is not available for type "n"							
Factory Mutual (pending)	Class I II III Div.2 Groups A, B, C, D, F, G T4 Entity Type 4X							
	Model code		Tamb					
(H)	9th digit	13th digit						
(11)	A,B,C,D,J	Y,G,N	-40°C to +85°C					
	L,P,M,1,2,3	Y,G,N	-20°C to +80°C					
	Q,S,N,4,5,6	Y,G,N Y,G,N	-20°C to +60°C -40°C to +60°C					
	E,F,G,H,K	W,A,D	-40 C to +60 C					
	-	VV,A,D	-10 C 10 +00 C					
CSA (pending) (J)	Temp Code T4 Tar Entity Parameters: Vmax = 28 Vdc, Imax Ci = 36 nF/25 nF for Li = 0.7 mH/0.6 mH fr	nb max = +50°C nb max = +70°C < = 94.3 mA, Pma models with/with or models with/w						
IECEx (Q)	Ex nA II T5 (-40°C ≤ ⁻ IP66/67 Electrical ratings Model Without arrest Ui ≤ 45 Vdc, 4-20 mA Model With arrester: Ui ≤ 32 Vdc, 4-20 mA Optional Analog indic	er: Noop powered, F	Pi ≤ 1.0125 W					

Zero/span adjustment:

Zero and span are adjustable either from the HHC⁽¹⁾ in Hart[®] or Fuji protocol. Zero is also adjustable externally from the adjustable screw.

Damping: Adjustable from the HHC $^{(1)\!.}$

A damping of the output signal is possible between 0 to 32.0 seconds.

Zero elevation/suppression:

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

Normal/reverse action:

Configurable 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 Over-scale" 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 $\rm HHC^{(1)}$

"Output Underscale":

Adjustable within the range 3.2mA to 4.0mA from $\rm HHC^{(1)}$

3.2	4	20	22.5	mA]
			\overline{M}	Over scale Burnout
/	-L <u>////////////////////////////////////</u>			

Under scale / Normal operating range / Probable over range Burnout Probable under range

Loop-check output:

Transmitter can be configured to provide constant signal 3.2mA through 22.5mA by HHC⁽¹⁾.

Temperature limit:

Ambient: -40 to +85°C (-20 to +80°C for LCD indicator)

(-40 to +60°C for arrester option)

For explosion proof 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:

O to 100% RH

Communication:

With HHC⁽¹⁾ (model FXW, consult DS N°EDS8-47), following items can be remotely displayed or configured. Note:

HHC's version must be higher than 7.0 (or

FXW <u>1</u>–<u>4</u>), for FC-All for supporting these items: "Saturate current", "Write protect", and "History".

Items		rotocol FXW	Hart Protocol		
	Display	Set	Display	Set	
Tag No.	v	v	v	v	
Model No.	v	v	—	_	
Serial No. & Software Version	v	—	v	_	
Engineering unit	v	v	v	v	
Range limit	v	—	v	_	
Measuring range	v	v	v	v	
Damping	v	v	V	v	
Output mode	v	—	V	—	
Burnout direction	v	v	V	v	
Calibration	v	v	V	v	
Output adjust	—	V	—	v	

Data	v	—	V	—
Self diagnoses	v	—	v	—
Printer (In case of FXW with printer option)	v	_	_	_
External switch lock	v	v	v	v
Transmitter display	v	v	v	v
Linearize*	v	v	—	—
Rerange	v	v	v	v
Saturate current	v	v	v	v
Write protect	v	v	v	v
History – Calibration history – Ambient temperature history	v v	<u>v</u>	v v	

(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⁽¹⁾.

Performance specifications

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

For spans greater than 1/10 of URL: $\pm 0.2\%$ of span For spans below 1/10 of URL:

$$\pm (0.1 + 0.1 \frac{0.1 \text{ x URL}}{\text{span}}) \% \text{ of span}$$

Stability:

±0.2% of upper range limit (URL) for 10 years (In case of 6th digit code "3", "4")

Temperature effect:

Effect per 28°C change between the limits of -40°C and +85°C

Zero shift: ± (0.4 + 0.2 URL span)%/28°C

Overrange effect:

Zero shift, 0.3% of URL for any overrange to maximum limit

Update rate:

60 msec

Response time: (without electrical damping)

Time constant. 0.08 s (at 23°C) Dead time: about 0.12 s

Response time = time constant + dead time

Mounting position effect:

Zero shift, less than 0.1kPa for a 10° tilt in any plane. No effect on span.

This error can be corrected by adjusting zero.

Vibration effect:

< \pm 0,25% Of spans for spans greater than 1/10 of URL.

Frequency 10 to 150Hz, acceleration 39,2m/sec²

Material fatigue:

Please consult Fuji Electric.

Dielectric strength:

500V AC, 50/60Hz 1 min., between circuit and earth. **Insulation resistance:**

More than 100M Ω at 500V DC.

Internal resistance for external field indicator:

 12Ω Max (connected to test terminal CK+ and CK-

Physical specifications

Electrical connections:

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

Process connections:

1/2-14 NPT, 1/4-18 NPT, Rc 1/2, G1/2 A manometer fitting.

Process-wetted parts material:

Material code (7th digit in "Code symbols")	Process cover	Diaphragm	Wetted sensor body	Vent/drain
J	316L SS	316L SS + gold	316L SS	316 SS
V	316 SS	coat 316L SS	316L SS	316 SS

Non-wetted parts material:

Electronics housing:

Low copper die cast aluminum alloy (standard), finished with polyester coating, or 316 SS as specified. Fill fluid: Silicone oil

Mounting bracket: 304 stainless steel

Environmental protection:

IEC IP67 and NEMA 4X

Mounting:

On 60.5mm (JIS 50A or 2B) pipe using mounting bracket, direct wall mounting, or direct process mounting.

Mass{weight}:

Transmitter approximately 2.2kg without options. Add; 0.5kg for mounting bracket

Optional features

Indicator:

A plug-in turnable analog indicator (2.5% accuracy) An optional 5 digits LCD meter 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 HHC.

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 for oxygen or chlorine measurement.

NACE specification:

Metallic materials for all pressure boundary parts comply with NACE MR-01-75.

Customer tag:

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

ACCESSORIES

Hand held communicator:

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

Two valve Manifold:

Available in 316 stainless steel and pressure rating 10MPa (100bar).

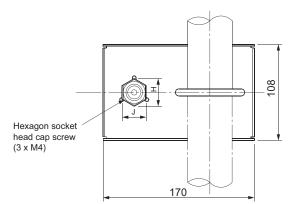
CODE SYMBOLS

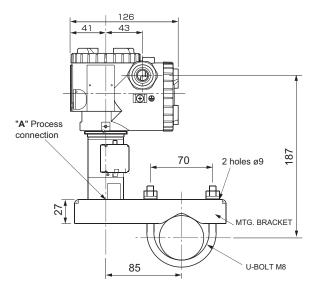
1 2 3	4	5	6	7	8		9	10	11	12	13		14	15								
FKH		0			5	-						-	0					DE	SCRIPTION			
																	Туре					
																	Smart, 4-20 mAdc + Fu	ji/Hart [⊚] digital signal				
																	Connections		1			
																	Process	Electrical				
	₋									-					-		connection	connection 1/2-14 NPT	{			
	T V																See digit 15 See digit 15	Pg 13,5				
	Ŵ									+					+		See digit 15	M 20 x 1,5				
										-					-		Range & wetted parts					
																	Span	Diaphragm ma	aterial	Wetted parts		
		0	2	v						1							0,08125/1,3 bar	316 L S		316 SS		
		0	2	J													0,08125/1,3 bar	316 L SS/gold	d coat	316 SS		
		0	з	V													0,3125/5 bar	316 L S	s 🛛	316 SS		
		0	3	J													0,3125/5 bar	316 L SS/gold	d coat	316 SS		
		0	4	V													1,875/30 bar	316 L S		316 SS		
	I	0	4	J													1,875/30 bar	316 L SS/gold	d coat	316 SS		
																	Indicator & Arrester					
										-					-		Indicator			Arrester	Initial setting	
					5	-	A		-	-	-				-	-	None			None		
					5	-	B	<u> </u>	-	-	-				-	-	Analog, 0-100% linears	scale		None		
					5 5	-	J	<u> </u>	-	-	-				-	-	Analog, Custom scale Analog, double scale			None None		
					э 5		E	<u> </u>		+	-				-	1	None			Yes	4-20 mA DC	
					5	-	F	<u> </u>		+					-	-	Analog, 0-100% linear	scale		Yes	4-20 IIIA DO	
					5	_	н	<u> </u>		1	-				-		Analog, Custom scale			Yes	+	
					5	-	ĸ			1					-		Analog, double scale			Yes		
					5	-	1										Digital, 0-100%			None	Hart [®] / Fuji	
					5	-	2										Digital, Custom scale			None	digital signal	
					5	-	4										Digital, 0-100%			Yes	"SMART"	
					5	-	5										Digital, Custom scale			Yes		
																	Approvals for hazard	ous locations (consu	It FUJI for ava	ailability)		
								A									None (Standard)					
								X									ATEX - Flameproof end	closures (digit 4 = "M, I	P, R, I" & "W" (only)		
								K D									ATEX - Intrinsic Safety	digit 4 = "D" 8 "T" oph/	`			
								E		-					-	(*1)	FM - Explosion-Proof (CSA - Explosion-Proof					
								H									FM - Intrinsic Safety an		y)			
								J	<u> </u>	-					-		CSA - Intrinsic Safety	id Non incentive				
								P		-					-		ATEX - Type "n" (digit 9	A F 1 2 3 4 5 8	6 only)			
								Q	<u> </u>						-		IECEx - Type "n" (digit					
								R		-							IECEx - Flameproof en			only)		
								т									IECEx - Intrinsic Safety					
								L									CSA - Explosion-Proof	& Intrinsic Safety com	bined approval	l (digit 4 = "P" & "1	Γ" only)	
								м									1				"M, P, R, T" & "W" only)	
								N													= "M, P, R, T" & "W" only)	
								V									FM - Explosion-Proof 8	Intrinsic Safety comb	ined approval ((digit 4 = "P" & "T	" only)	
															-	-	Mounting bracket					
									A	L	<u> </u>				-	-	None					
									С	-	-				-	-	Yes (SS)					
										1							SS parts	CC heurine	1			
										Y	<u> </u>				-	-	SS tag plate None	SS housing None	1			
										В					-	-	Yes	None				
										C	<u> </u>	-			-	-	None	Yes				
										E							Yes	Yes				
																	Special applications 8		•			
																	Treatment	Fill fluid]			
											Y						None (std)	Silicone oil				
											G						Degreasing	Silicone oil				
											Ν						NACE	Silicone oil				
																	Processconnection (w		stainless steel	l parts		
												-	0	Y	<u> </u>	-	None - (1/2 - 14 NPTI c	onnection)				
												-	0	В	<u> </u>	-	Rc 1/2 I					
												-	0	C	<u> </u>	-	1/4 - 18 NPTI 1/2 - 14 NPTE					
												· ·	0	DE	<u> </u>	-	1/2 - 14 NPTE G 1/2"A manometer fitti	na				
												<u> </u>	U				10 1/2 A manometer fitti	ng				

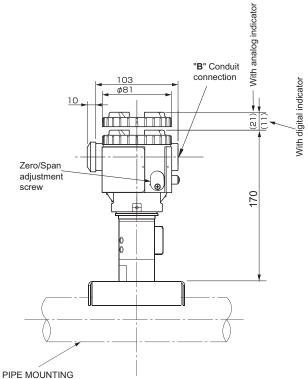
Note* :

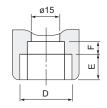
1- Code "D" FM approval only possible with electrical connection 1/2-14 NPT.

OUTLINE DIAGRAM (unit:mm)





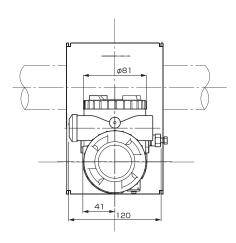




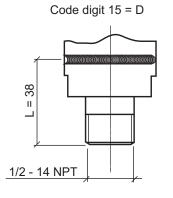
Details of "B"

4th digit of the	Conduit connections					
code symbols	D	Е	F			
Т	1/2-14 NPT	16	5			
V	Pg13.5	8	4.5			
W	M20x1.5	16	5			
	Table 1					

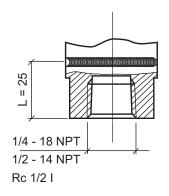


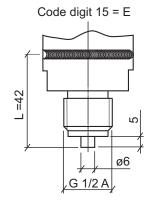


Details "A" - Process connection

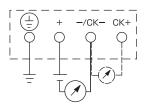


Code digit 15 = Y, B or C





CONNECTION DIAGRAM



EMC Directive (2004/108/EC)

All models of FCX series transmitters type FCX-All are in accordance with :

the harmonized standards:

- EN 61326-1 : 2006 (Electrical equipment for measurement, control and laboratory use EMC requirements).
- EN 61326-2-3 : 2006 (Part 2-3 : Particular requirements Test configuration, operational conditions and performance criteria for tranducers with integrated or remote signal conditioning)

Emission limits : EN 61326-1 : 2006

Frequency range (MHz)	Limits	Basic standard
30 to 230	40 dB (μ V/m) quasi peack, measured at 10m distance	EN 55011 / CISPR 11
		Group 1 Class A
230 to 1000	47 dB ($\mu V/m)$ quasi peack, measured at 10m distance	

Immunity requirements : EN 61326-1 : 2006 (Table 2)

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge (EDS)	4 kV (Contact)	EN 61000-4-2	В
	8 kV (Air)	IEC 61000-4-2	
Electromagnetic field	10V/m (80 to 1000 MHz)	EN 61000-4-3	
	3 V/m (1.4 to 2.0 GHz)	IEC 61000-4-3	А
	1 V/m (2.0 to 2.7 GHz)		
Rated power frequency	30 A/m	EN 61000-4-8	Α
Magnetic field		IEC 61000-4-8	
Burst	2 kV (5/50 NS, 5 kHz	EN 61000-4-4	В
		IEC 61000-4-4	
Surge	1 kV Line to line	EN 61000-4-5	В
	2 kV Line to line	IEC61000-4-5	
Conducted RF	3 V (150 kHz to 80 MHz)	EN 61000-4-6	Α
		IEC61000-4-6	

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.

Fuji Electric

Your distributor: Coulton Instrumentation Ltd

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