

# PRESSURE TRANSMITTER

DATA SHEET

FKP, FDP...4

The FCX-CII pressure transmitter accurately measures gauge 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

0.1% accuracy for all calibrated spans is the standard feature covering 81,25mbar to 100bar. Fuji's micro-capacitance silicon sensor assures this feature for all elevated or suppressed calibration ranges without additional adjustment.

### 2- Minimum inventory

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

### 3- Fuji/HART® bilingual communication protocol and FOUNDATION FIELDBUS and PROFIBUS compatibility

FCX-CII series transmitter offers bilingual communication to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-CII. Further, by upgrading electronics Foundation Fieldbus and Profibus is also available.

### 4- Application flexibility

Example features that render the FCX-CII 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
- 5 digits LCD meter

### 5- Programmable output Linearisation Function

In addition to linear and square root, output signal can be freely programmable.

### 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), reliability of dry calibration without reference pressure is at equal level as wet calibration.



## SPECIFICATIONS

### Functional specifications

#### Type :

FKP : Smart, 4-20mA DC + Fuji/Hart® digital signal  
FDP : Fieldbus Foundation & Profibus

#### Service :

Liquid, gas or vapour

#### Span, range and overrange limit :

Type	Span limit (bar)		Range limit (bar)	Overrange limit (bar)
	Min.	Max.		
F□P□01	0.08125	1.3	-1 to +1.3	10
F□P□02	0.3125	5	-1 to +5	15
F□P□03	1.875	30	-1 to +30}	90
F□P□04	6.25	100	-1 to + 100	150

- Lower range limit (vacuum limit) is :

Silicone fill sensor : See Fig. 1

Fluorinated fill sensor : 66kPa abs (500mmHg abs) at below 80°C

- Conversion factors to different units :

1MPa=10<sup>3</sup>KPa=10bar=10.19716kgf/cm<sup>2</sup>= 145.0377psi  
1KPa=10mbar=101.9716mmH<sub>2</sub>O =4.01463inH<sub>2</sub>O

#### Output signal :

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

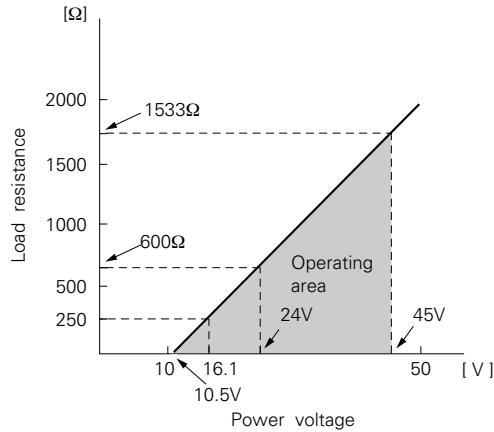
Digital signal based on Foundation Fieldbus or Profibus

#### 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 FXW, min. of 250 Ω required.

**Hazardous locations :**

Designed to meet international intrinsic safety and flameproof (explosionproof) standards. Please consult the code symbols some pages further on, to know the different types of approvals (digit 10). Consult FUJI for status.

**Zero/span adjustment :**

Zero and span are adjustable from the communicator HHC. Zero is also adjustable externally from the adjustable screw.

**Damping :** adjustable electrical damping.

The time constant is adjustable between 0 to 38.4 seconds with the communicator HHC.

**Zero elevation/suppression :**

Selectable with the communicator HHC

**Normal/reverse action :**

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

**Indication :**

Analog indicator or 5 digit LCD meter, as specified.

**Burnout direction:** Selected from HHC

If self-diagnostic detect transmitter failure, the analog signal will be driven to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

**"Output Hold" :**

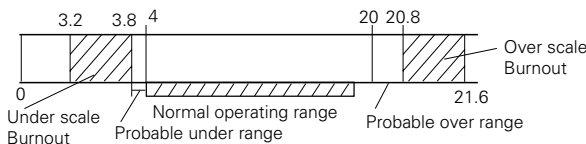
Output signal is hold as the value just before failure happens.

**"Output Overscale" :** approx. 21,6 mA

Adjustable within the range 20,8 mA to 21,6 mA from the HHC

**"Output Underscale" :** approx. 3,8 mA

Adjustable within the range 3,2 mA to 3,8 mA from the communicator HHC.



**Loop-check output :**

Transmitter can be configured to provide by HHC constant signal output between 3.8mA and 21.6mA.

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

Note : HHC's version must be higher than 6.0 (or FXW □□□□1-A3)

Items	HART® PROTOCOL		FUJI PROTOCOL	
	Display	Set	Display	Set
Tag n°	Yes	Yes	Yes	Yes
Model n°	-	-	Yes	Yes
Serial n°	Yes	-	Yes	-
Engineering unit	Yes	Yes	Yes	Yes
Range limit	Yes	-	Yes	-
Measuring range	Yes	Yes	Yes	Yes
Damping	Yes	Yes	Yes	Yes
Output mode	Yes	-	Yes	-
Burnout direction	Yes	Yes	Yes	Yes
Adjustment	Yes	Yes	Yes	Yes
Output adjust	-	Yes	-	Yes
Data	Yes	-	Yes	-
Self diagnoses	Yes	-	Yes	-
Printer	-	-	-	-
External switch lock	Yes	Yes	Yes	Yes
Transmitter display	Yes	Yes	Yes	Yes
Linearise	-	-	Yes	Yes
Rerange	Yes	Yes	Yes	Yes

**Programmable output linearization function :**

Output signal can be characterized with "14 points linear approximation function" from HHC.

**Field Bus units :**

- Digital signal
- Transmission technique : according to IEC61158-2
- Power supply : 9VDC...32VDC
- Base current : 15 ±2mA
- Transmission rate : 31,25kbits/s

Profibus-PA : version 3.0, DPVI version 2.0

Foundation Fieldbus : FF-890/891

## Performance specifications

### Accuracy rating :

(including linearity, hysteresis, and repeatability)

For spans greater than 1/10 of URL :

$$\pm 0.1\% \text{ of span}$$

For spans below 1/10 of URL :

$$\pm (0.05 + 0.05 \frac{0.1 \times \text{URL}}{\text{span}}) \% \text{ of span}$$

### Stability :

$\pm 0.2\%$  of upper range limit (URL) for 24 months

### Temperature effect :

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

Zero shift :

$$\pm 0.25\%/28^\circ\text{C at } (1 \text{ to } 1/2.5) \times \text{URL}$$

$$\pm (0.25 \frac{0.4 \times \text{URL}}{\text{span}}) \%/28^\circ\text{C}$$

For spans below 1/2.5 of URL

Total effect :

$$\pm 0.5\%/28^\circ\text{C at } (1 \text{ to } 1/2.5) \times \text{URL}$$

$$\pm (0.25 + 0.25 \frac{0.4 \times \text{URL}}{\text{span}}) \%/28^\circ\text{C}$$

For spans below 1/2.5 of URL

### Overrange effect :

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

### Supply voltage effect :

Less than 0.05% fo calibrated span per 10V

### 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)

Time constant : 0.2s

Dead time : about 0.3s

Time constant ( $\tau$ ) = 63 % output signal

Response time = 5 x time constant + dead time

### Mounting position effect :

Zero shift, less than 0.1kPa {1mbar} for a 10° tilt in any plane.

No effect on span. This error can be corrected by adjusting zero.

(Double the effect for fluorinated fill sensors)

### Dielectric strength :

500V AC, 50/60Hz 1 min., between circuit and earth

### Insulation resistance :

More than 100M $\Omega$  at 500V DC

### Turn-on time :

4 sec.

### Internal resistance for external field indicator :

12 $\Omega$  or less

## Physical specifications

### Electrical connections :

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

### Process connections :

1/2"-14NPTI, 1/2"-14NPTE, 1/4"-18NPTI, 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
V	316L stainless steel	316L stainless steel	316L stainless steel

### Non-wetted parts material :

Electronics housing :

Low copper die cast aluminum alloy (standard), finished with epoxy/polyurethane double coating, as specified.

Fill fluid :

Silicone oil (standard) or fluorinated oil

Mounting bracket :

304 stainless steel

### Environmental protection :

IEC IP67 and NEMA 6/6P

### Mounting :

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

### Mass{weight} :

Transmitter approximately 1.9kg without options.

Add : 0.5kg for mounting bracket

0.8kg for indicator (option)

**Optional features**

**Indicator :**

A plug-in turnable analog indicator (1.5% accuracy) can be located in the electronics compartment or in the terminal box of the housing.

An optional 5 digits LCD meter is also available.

**Arrester :**

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

Lightning surge immunity : 4KV (1.2 x 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.

**Degreasing :**

Process-wetted parts are cleaned, but the fill fluid is standard silicone oil.

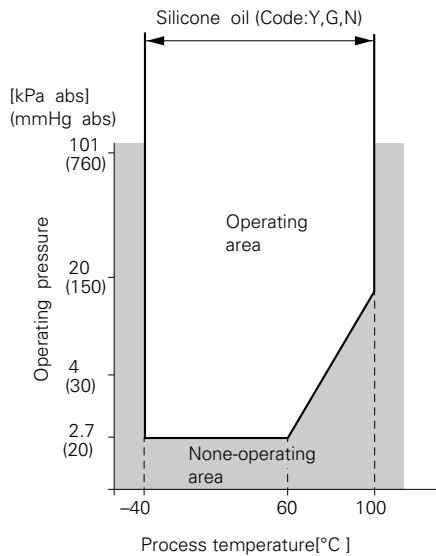
Not for use for oxygen or chlorine measurement.

**NACE specification :**

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

**Vacuum service :**

Special silicone oil and filling procedure are applied. See figure 1 below



**Fig.1 Relation between process temperature and operating pressure**

**Customer tag :**

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

**ACCESSORIES**

**Hand-held communicator :**

Model FXW, refer to Data Sheet No. EDS8-47)

**Two valve Manifold :**

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

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

**EMI (Emission) EN50081-2 : 1993**

Test item	Frequency range	Basic standard
Applicable Electromagnetic Radiation Disturbance	30-1000MHz	EN55011 Class B

**EMS (Immunity) EN50082-2 : 1995**

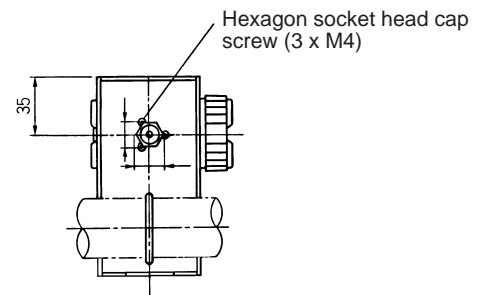
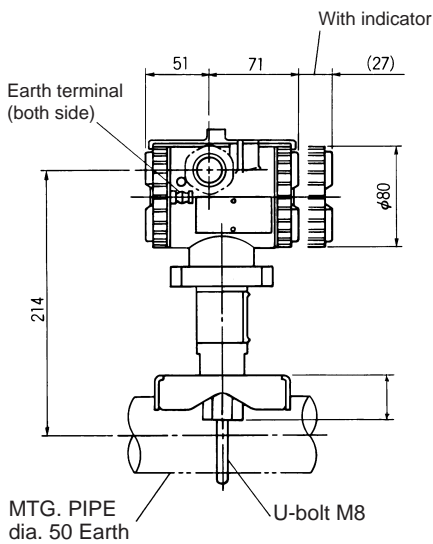
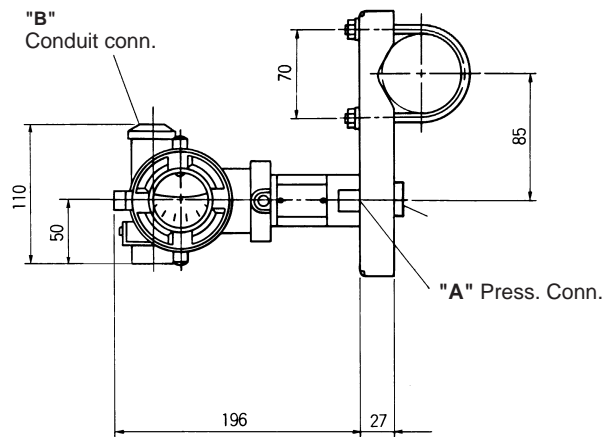
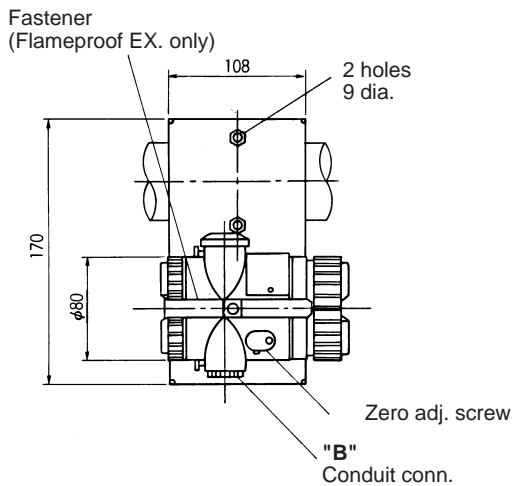
Test item	Test specification	Basic standard	Performance criteria
Electrostatic discharge	8kV (Air)	EN61000-4-2 (1995)	B
Radio-frequency Electromagnetic Field Amplitude Modulated	80-1000MHz 10V/m (unmodulated) 80% AM/1kHz	ENV50140 (1993)	A
Radio-frequency Electromagnetic Field Pulse Modulated	900MHz 10V/m (unmodulated) 50% Duty 200 Hz (Rep. Freq.)	ENV50204 (IEC 1000-4-3, 1995)	A
Radio-frequency Common Mode Amplitude Modulated	150kHz-80MHz 10V/m(unmodulated) 80% AM/1kHz	ENV50141 (IEC 1000-4-6, 1995)	A
Fast transients common mode	2kV, 5/50 (Tr/Th) ns 5kHz Rep.	EN61000-4-4 (IEC 1000-4-4, 1995)	B

"LVD - The transmitter is not covered by the requirements of the LVD standard."

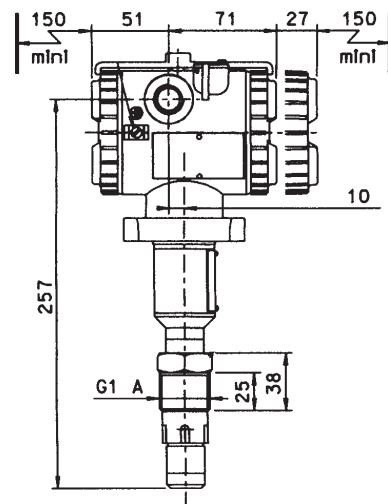
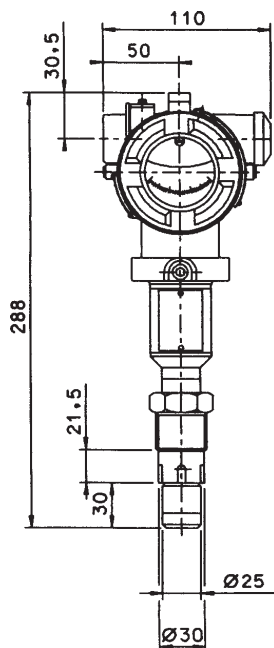
# CODE SYMBOLS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	DESCRIPTION
F		P		0			4	-						0	<b>Type</b> Smart, 4-20 mAdc + Fuji/Hart® digital signal Fieldbus Foundation & Profibus
F	K	P													
F	D	P													<b>Connections</b> Process connections Electrical connection see digit 15 see digit 15 see digit 15 1/2"-14 NPT Pg 13,5 M 20 x 1,5
															<b>Range &amp; wetted parts material</b> Span Diaphragm material Wetted parts
				0	1	V									
				0	2	V									
				0	3	V									
				0	4	V									
															<b>Indicator &amp; Arrester</b> Initial setting Indicator Arrester
				4	-	A									
				4	-	B									
				4	-	D									
				4	-	J									
				4	-	E									
				4	-	F									
				4	-	H									
				4	-	K									
				4	-	L									
				4	-	P									
				4	-	Q									
				4	-	S									
				4	-	R									
				4	-	T									
				4	-	V									
				4	-	W									
															<b>Approvals for hazardous locations (consult FUJI for availability)</b> None (standard) Flameproof housing ATEX $\text{Ex}$ II 2 GD - EEx d IIC T5/T6 Intrinsic safety ATEX $\text{Ex}$ II 1 GD - EEx ia IIC T4/T5 FM - Flameproof housing FM - Intrinsic safety & Nonincendive ATEX type "n" $\text{Ex}$ II 3 GD - EEx nL IIC T4/T5
				A											
				X											
				K											
				D											
				H											
				P											
															<b>Mounting bracket</b> None Yes (SS)
				A											
				C											
															<b>Stainless tag plate</b> None Yes
				Y											
				B											
															<b>Special applications &amp; fill fluid</b> Treatment Fill fluid (cell) None (std) degreasing Oxygen service NACE Silicone oil Silicone oil Fluorinated oil Silicone oil
				Y											
				G											
				A											
				N											
															<b>Process adaptor - all stainless steel parts</b> - 0 Y None - (1/2 - 14 NPTE connection) - 0 B Rc 1/2" I - 0 C 1/4" - 18 NPTE - 0 D 1/2" - 14 NPTE - 0 E G 1/2" A manometer fitting - 0 M G 1" A flush diaphragm seal - No vacuum service

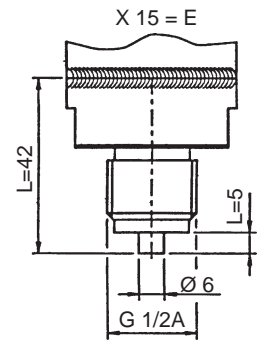
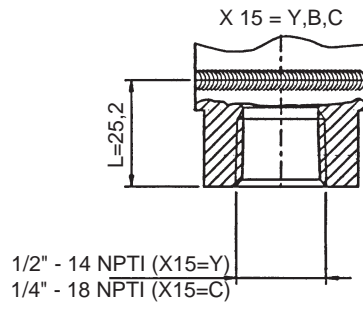
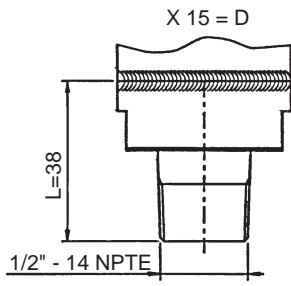
**OUTLINE DIAGRAM** (Unit : mm)



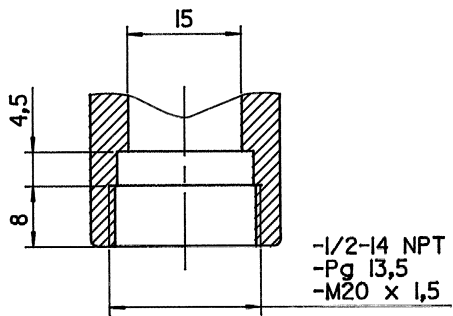
**G 1"A flush diaphragm**



**Détail "A"- Process connection :**

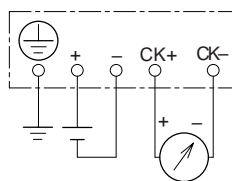


**Détail "B" (conduit conn.)**

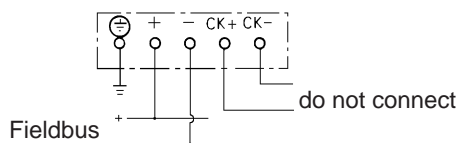


## CONNECTION DIAGRAMS

FKP unit



FDP unit




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