

PRESSURE TRANSMITTER

DATA SHEET

FKG, FDG...4

The FCX-AII pressure transmitter accurately measures gauge pressure and transmits a proportional 4 to 20mA signal. The transmitter utilizes a unique micromachined capacitive silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

FEATURES

1. High accuracy

0,07% accuracy for all calibrated spans is a standard feature for pressure transmitter covering 1,3 to 50000kPa {0,013 to 500 bar}. 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 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 FCA-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 includes :

- Analog indicator at either the electronics side or terminal side
- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- 5 digits LCD meter with engineering unit
- Stainless steel electronics housing

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

Type :

FKG : Pressure transmitter

FDG : FOUNDATION™ Fieldbus & Profibus™

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	
F□G□01	1,3 {0,013}	130 {1,3}	-100 {-1}	130 {1,3}	1 {10}
F□G□02	5 {0,05}	500 {5}	-100 {-1}	500 {5}	1,5 {15}
F□G□03	30 {0,3}	3000 {30}	-100 {-1}	3000 {30}	9 {90}
F□G□04	100 {1}	10000 {100}	-100 {-1}	10000 {100}	15 {150}
F□G□05	500 {5}	50000 {500}	-100 {-1}	50000 {500}	75 {750}

Remark :

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

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 = 10³ kPa = 10 bar = 10.19716 kgf/cm² = 145.0377psi

1kPa=10mbar=101.9716mmH₂O =4.01463inH₂O

Output signal :

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

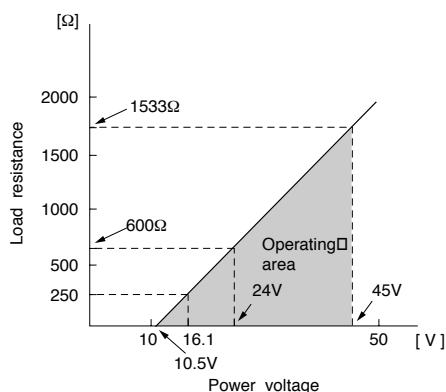
Digital signal based on FOUNDATION™ Fieldbus or Profibus™.

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 250Ω 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 by hand held communicator in Hart® or Fuji protocol. Local adjustment of zero are possible from outside screw on the electronic housing.

Damping : adjustable from HHC.

A damping of the output signal is possible between 0 and 32 sec with the hand held communicator HHC. Local adjustment possibilities with LCD indicator (refer to optional indicator).

Zero elevation/suppression :

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

Normal/reverse action : Selectable from HHC.

Indicator :

A plug-in analog indicator can be mounted on the electronics unit or the terminal block.

The local LCD indicator (5 digits) is assembled on the electronics unit.

Additional local adjustment facilities are possible by the integrated switches in the LCD indicator :

- "Local/comm" switch gives the possibilities to make local adjustments of zero/span, damping or to configure the transmitter with a hand held communicator.
- The "mode" switch with 7 positions gives local adjustment possibilities for zero/span, 4/20mA, enable or inhibit the local adjustments.
- Local damping adjustment is possible via the "damp" switch.

Burnout direction : selectable 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" :

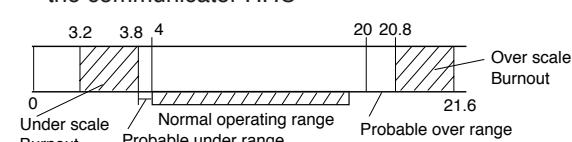
Output signal is hold as the value just before failure happens.

"Output Overscale" :

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

"Output Underscale" :

Adjustable within the range 3,2 mA to 3,8 mA from the communicator 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 (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-A3), for FCX-AII.

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 Fielbus : FF-890/891

Performance specifications

Accuracy rating :

(including linearity, hysteresis, and repeatability)

Max span below 10000 kPa model :

For spans greater than 1/10 of URL :

±0.07% of span

For spans below 1/10 of URL :

± (0.02+0.05 $\frac{0.1 \times \text{URL}}{\text{Span}}$) % of span

Max span below 50000 kPa model :

For spans greater than 1/10 of URL :

±0.1% of span

For spans below 1/10 of URL :

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

Stability :

±0.1% of upper range limit (URL) for 3 years

Temperature effect :

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

Zero shift :

±(0.075+0.0125 $\frac{\text{URL}}{\text{Span}}$)%

Total effect :

±(0.095+0.0125 $\frac{\text{URL}}{\text{Span}}$)%

Double the effects for material code (7th digit in code symbols) "H", "M", "T", "B", "L" and "U".

Overrange effect :

Zero shift :

0.2% of URL for any overrange to maximum limit

Supply voltage effect :

Less than 0.05% of 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 : 0.2 sec.

Dead time : approximately 0.3 sec.

Response time = 5 x time constant + dead time

Time constant (τ) = 63 % output signal

Note : faster response time is available as option (maximum update rate : 25 times per second).

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.

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 :

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

Process connections :

1/4"-18 NPT meets DIN 19213.

Process-wetted parts material :

Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316SS	316LSS	316SS	316SS
H	316SS or PVDF	Hastelloy-C	Hastelloy-C lining	316SS
M	316SS or PVDF	Monel	Monel lining	316SS
T	316SS or PVDF	Tantalum	Tantalum lining	316SS
B	Hastelloy-C lining	Hastelloy-C	Hastelloy-C lining	Hastelloy-C
L	Monel lining	Monel	Monel lining	Monel
U	Tantalum lining	Tantalum	Tantalum lining	Tantalum

Remark :

Sensor gasket : viton o-ring or PTFE square section gasket.

Availability of above material design depends on ranges and static pressure. Refer to "Code symbols".

Non-wetted parts material :

Electronics housing :

Low copper die cast aluminum alloy (standard), finished with polyester coating, or 316 stainless steel, as specified.

Bolts and nuts :

Cr-Mo alloy (standard), or 316 stainless steel (630 stainless steel for 50MPa unit).

Fill fluid :

Silicone oil (standard) or fluorinated oil (Daiffoil)

Mounting bracket :

Carbon steel with epoxy coating or 304 stainless steel, as specified

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 3.4kg 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 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 50 μs)

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 except oxygen or chlorine application.

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 below figure.

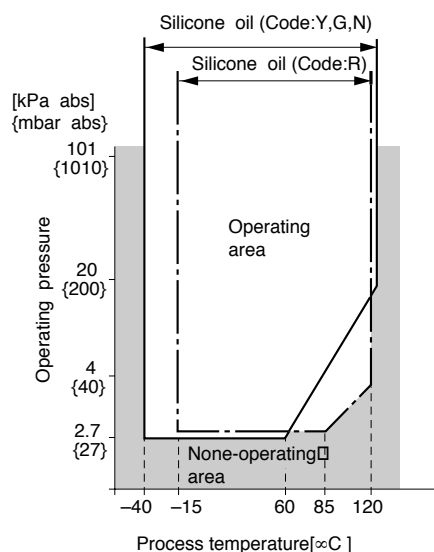


Fig.1 Relation between process temperature and operating pressure

Customer tag :

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

ACCESSORIES

Oval flanges :

Converts process connection to 1/2"-14 NPT; material : 316 ss

Manifolds :

Available in 316 stainless steel and in pressure rating 16MPa or 42MPa.

Hand-held communicator :

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

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) EN61326 : 1997

Class A (std for Industrial Location)

Frequency range MHz	Limits	Reference Standard
3 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	

EMS (Immunity) EN61326 : 1997

Annex A (std 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

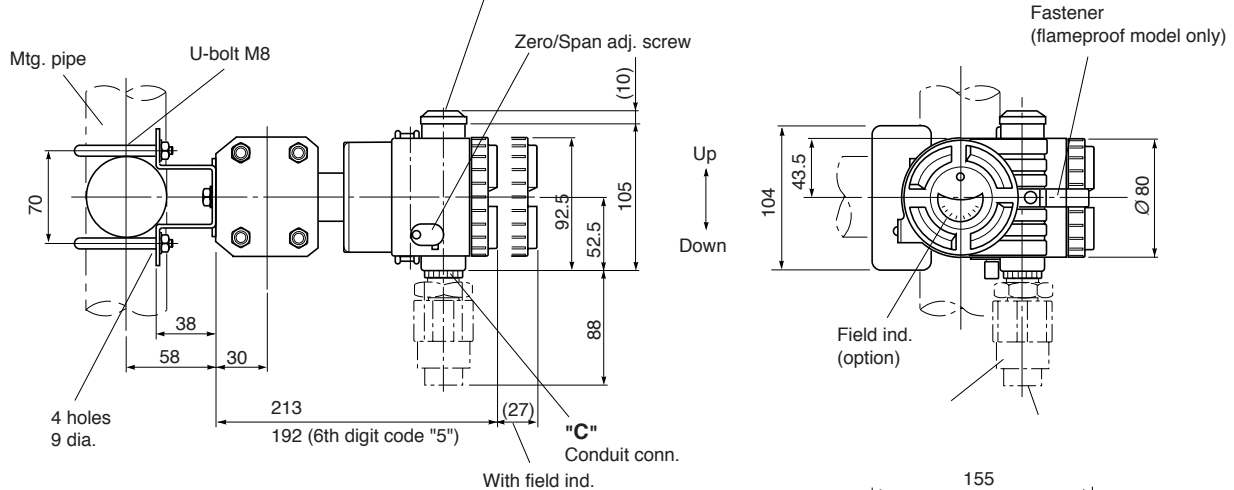
Note) Definition of performance criteria

A : During testing, normal performance within the specification limits

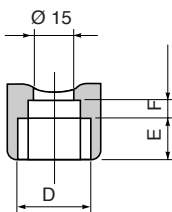
B : During testing, temporary degradation, or loss of function or performance which is self-recovering.

< 7th digit code : B, L, U >

4th of Code symbols
"R, T, V, W, X" type is attached



Details of "C"



Details of "B"

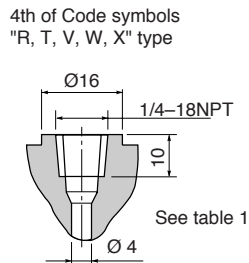
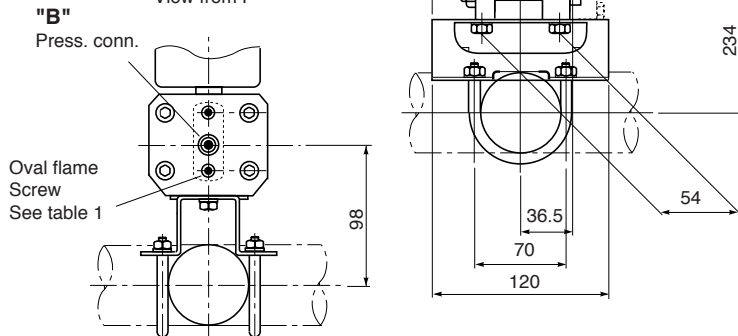


Table 1

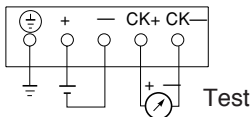
4th of Code symbols	Conduit conn.			Oval flange screw
	D	E	F	
R	M20x1.5	16	5	7/16-20UNF
T	1/2-14NPT	16	5	7/16-20UNF
V	Pg13.5	8	4.5	M10 or M12
W	M20x1.5	16	5	M10 or M12
X	Pg13.5	8	4.5	7/16-20UNF

View from P

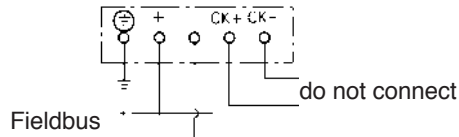


CONNECTION DIAGRAM

FKG unit



FDG unit



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