

# REMOTE SEAL TYPE PRESSURE TRANSMITTER

DATA SHEET

FKB...4

The FCX-AII 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.

Totally welded construction of the seals assures excellent reliability in high temperature and highly corrosive process conditions.

## FEATURES

### 1. High accuracy

0.2% accuracy for all calibrated spans is a standard feature for all GP models covering 1.3kPa {0.013bar} range to 50000kPa {500bar} high 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, 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
- Full range of hazardous area approvals
- 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 seals

### 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.		
FKB□□1	1.3 {0.013}	130 {1.3}	-100 to +130 {-1 to +1.3}	1 {10}
FKB□□2	5 {0.05}	500 {5}	-100 to +500 {-1 to +5}	1.5 {15}
FKB□□3	30 {0.3}	3000 {30}	-100 to +3000 {-1 to +30}	9 {90}
FKB□□4	100 {1}	10000 {100}	-100 to +10000 {-1 to +100}	15 {150}
FKB□□5	500 {5}	50000 {500}	-100 to +50000 {-1 to +500}	75 {750}

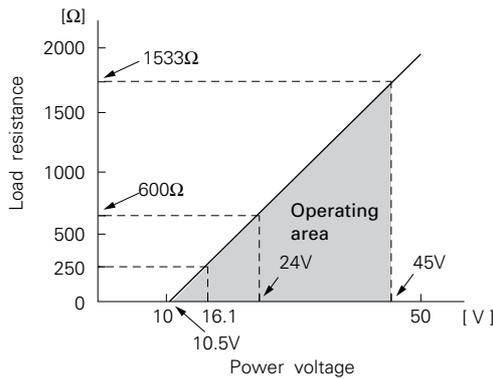
Remark: To minimize environmental influence, span should be greater than 1/40 of the max. span in most applications.

- Lower range limit (vacuum limit) ;  
Silicone fill sensor: See Fig. 1, Fig. 2  
Fluorinated fill sensor: Atmospheric pressure
- 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.

**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<sup>(1)</sup> (Model: FXW), min. of 250Ω is required.

**Hazardous locations:**

Authorities	Flameproof
ATEX	Ex II 2 GD EEx d IIC T6 IP66/67 T85°C Tamb = -40°C to +65°C EEx d IIC T5 IP66/67 T100°C Tamb = -40°C to +85°C
Factory Mutual	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	Class I Div.1 Groups C, D Class II Div.1 Groups E, F, G Class III Div.1  Note) "Seal Not Required" enclosure is allowed.
TIIS	Ex do IIB+H <sub>2</sub> T4 Tamb max = +55°C Maximum process temp. = +120°C
IECEX Scheme /SAA	Ex d IIC T5 IP66/67 <b>pending</b> Tamb = -40°C to +85°C Ex d IIC T6 IP66/67 <b>pending</b> Tamb = -40°C to +65°C

Authorities	Intrinsic safety																					
ATEX	Ex II 1 GD EEx ia IIC T5 Tamb = -40°C to +40°C EEx ia IIC T4 Tamb = -40°C to +80°C  Entity Parameters: Ui=28V, li=93.3mA, Pi=0.66W, Ci=27nF (Without Arrester), Ci=34.2nF (With Arrester), Li=1.134mH																					
Factory Mutual	Class I II III Div.1 Groups A, B, C, D, E, F, G T4 Entity Type 4X <table border="1"> <thead> <tr> <th colspan="2">Model code</th> <th>Tamb</th> </tr> <tr> <th>9th digit</th> <th>13th digit</th> <th></th> </tr> </thead> <tbody> <tr> <td>A,B,D</td> <td>Y,G,H,J,S,T,K</td> <td>-40°C to +85°C</td> </tr> <tr> <td>L,P,1,2</td> <td>Y,G,H,J,S,T,K</td> <td>-20°C to +80°C</td> </tr> <tr> <td>Q,S,4,5</td> <td>Y,G,H,J,S,T,K</td> <td>-20°C to +60°C</td> </tr> <tr> <td>E,F,H</td> <td>Y,G,H,J,S,T,K</td> <td>-40°C to +60°C</td> </tr> <tr> <td>-</td> <td>W,A,D</td> <td>-10°C to +60°C</td> </tr> </tbody> </table> Entity Parameters: Vmax=42.4V, Imax=113mA, Pi=1W, Ci=34.2nF, Li=1.134mH	Model code		Tamb	9th digit	13th digit		A,B,D	Y,G,H,J,S,T,K	-40°C to +85°C	L,P,1,2	Y,G,H,J,S,T,K	-20°C to +80°C	Q,S,4,5	Y,G,H,J,S,T,K	-20°C to +60°C	E,F,H	Y,G,H,J,S,T,K	-40°C to +60°C	-	W,A,D	-10°C to +60°C
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CSA	Class I Div.1 Groups A, B, C, D Class II Div.1 Groups E, F, G Class III Div.1 Temp Code T4 Tamb max = +40°C Temp Code T3C Tamb max = +85°C Entity Parameters: Vmax=28V, Imax=93mA, Ci=27nF (Without Arrester), Ci=34.2nF (With Arrester), Li=1.4mH																					
TIIS	Ex ia IIC T4 Tamb max = +60°C Entity Parameters: Ui=28V, li=94.3mA, Pi=0.66W, Ci=32.6nF, Li=1.134mH																					
IECEX Scheme /SAA	Ex ia IIC T4 IP66/67 Tamb = -40°C to +70°C Ex ia IIC T5 IP66/67 Tamb = -40°C to +50°C Entity Parameters: Ui=28V, li=93.3mA, Pi=0.66W, Ci=0.033μF, Li=1.034mH																					

Authorities	Type n Nonincendive																					
ATEX	Ex II 3 GD EEx nL IIC T5 Tamb = -40°C to +40°C EEx nL IIC T4 Tamb = -40°C to +80°C Specific Parameters: Model without arrester: Ui=42.4V, Ii=113mA, Pi=1W, Ci=27nF, Li=1.134mH Model with arrester: Ui=32V, Ii=113mA, Pi=1W, Ci=34.2nF, Li=1.134mH  EEx nAL IIC T5 Tamb = -40°C to +40°C EEx nAL IIC T4 Tamb = -40°C to +80°C Specific Parameters: Model without arrester: Umax=42.4V, Imax=113mA, Pmax=1W Model with arrester: Umax=32V, Imax=113mA, Pmax=1W																					
Factory Mutual	Class I II III Div.2 Groups A, B, C, D, F, G T4 Entity Type 4X  <table border="1"> <thead> <tr> <th colspan="2">Model code</th> <th>Tamb</th> </tr> <tr> <th>9th digit</th> <th>13th digit</th> <th></th> </tr> </thead> <tbody> <tr> <td>A,B,D</td> <td>Y,G,H,J,S,T,K</td> <td>-40°C to +85°C</td> </tr> <tr> <td>L,P,1,2</td> <td>Y,G,H,J,S,T,K</td> <td>-20°C to +80°C</td> </tr> <tr> <td>Q,S,4,5</td> <td>Y,G,H,J,S,T,K</td> <td>-20°C to +60°C</td> </tr> <tr> <td>E,F,H</td> <td>Y,G,H,J,S,T,K</td> <td>-40°C to +60°C</td> </tr> <tr> <td>-</td> <td>W,A,D</td> <td>-10°C to +60°C</td> </tr> </tbody> </table>	Model code		Tamb	9th digit	13th digit		A,B,D	Y,G,H,J,S,T,K	-40°C to +85°C	L,P,1,2	Y,G,H,J,S,T,K	-20°C to +80°C	Q,S,4,5	Y,G,H,J,S,T,K	-20°C to +60°C	E,F,H	Y,G,H,J,S,T,K	-40°C to +60°C	-	W,A,D	-10°C to +60°C
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-	W,A,D	-10°C to +60°C																				
CSA	Class I Div.2 Groups A, B, C, D Class II Div.2 Groups E, F, G Class III Div.2 Temp Code T4 Tamb max = +40°C Temp Code T3C Tamb max = +85°C Entity Parameters: Vmax=28V, Ci=27nF (Without Arrester), Ci=34.2nF (With Arrester), Li=1.4mH																					
TIIS	-																					
IECEX Scheme /SAA	-																					

**Zero/span adjustment:**

Zero and span are adjustable from the HHC<sup>(1)</sup>. 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<sup>(1)</sup>.

**Indication:**

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

**Burnout direction:** Selectable from HHC<sup>(1)</sup>

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

**"Output Hold":**

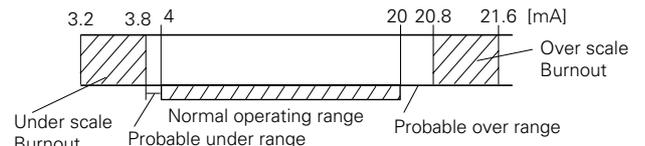
Output signal is hold as the value just before failure happens.

**"Output Overscale":**

Adjustable within the range 20.8mA to 21.6mA from HHC<sup>(1)</sup>

**"Output Underscale":**

Adjustable within the range 3.2mA to 3.8mA from HHC<sup>(1)</sup>



**Loop-check output:**

Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by HHC<sup>(1)</sup>.

**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)

(-10 to +85°C for silicone oil "H", "S", "K")

(+20 to +85°C for silicone oil "J", "T")

For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

**Process:**

Fill fluid	Code in the 13th digit of "Code symbols"	Process temperature	Lower limit of static press.
Fluorinated oil	W, A and D	-20 to 120°C	Atmospheric pressure
Silicone oil	H	-15 to 250°C	2.7kPa abs {20mmHg abs}
	J	85 to 300°C	
	Y and G	-40 to 120°C	
	S	-15 to 250°C	
	T	85 to 300°C	
K	-15 to 200°C	0.13kPa abs {1mmHg abs} or more	

Storage: -40 to +90°C

(Note) (1) HHC: Hand Held Communicator

**Humidity limit:** 0 to 100% RH

**Communication:** With HHC<sup>(1)</sup> (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.	✓	✓
Model No.	✓	✓
Serial No.	✓	—
Engineering unit	✓	✓
Range limit	✓	—
Measuring range	✓	✓
Damping	✓	✓
Output mode	✓	—
Burnout direction	✓	✓
Calibration	✓	✓
Output adjust	—	✓
Data	✓	—
Self diagnoses	✓	—
Printer	—	—
External switch lock	✓	✓
Transmitter display	✓	✓
Linearize	✓	✓
Rerange	✓	✓

**EMC Conformity:** EN61326 CE

## 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)

(Standard)

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

Not available for Max span 50000kPa model.

For spans greater than 1/10 of URL:  $\pm 0.1\%$  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:**  $\pm 0.1\%$  of upper range limit (URL) for 3 years.

**Temperature effect:**

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

(Standard) Zero shift:  $\pm 0.35\%$  of URL

Total effect:  $\pm 0.5\%$  of URL

(Option) (Code; 21th digit J,K)

Zero shift:  $\pm 0.3\%$  of URL

Total effect:  $\pm 0.4\%$  of URL

**Overrange effect:** Zero shift; 0.2% 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)

**Update period:** 120 msec <sup>\*)</sup>

**Step response:** Time constant: 0.2s<sup>\*)</sup>

Dead time: 0.2s<sup>\*)</sup>

(without electrical damping)

<sup>\*)</sup> Faster response is available as option (maximum update rate: 25 times per second).

**Dielectric strength:**

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

**Insulation resistance:**

More than 100MΩ/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) or 2-port with each conduit, as specified.

### Process connections:

JIS, ANSI, or DIN raised face flanges or screw connection JIS/ISO G1 external thread.

Refer to "Code symbols."

### Process-wetted parts material:

Diaphragm: 316L stainless steel, Hastelloy-C Monel, Tantalum, Titanium or Zirconium

Flange face: 316 stainless steel, Hastelloy-C Monel, Tantalum, Titanium or Zirconium

Extension: 316 stainless steel, Hastelloy-C (Refer to "Code symbols")

### 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.

Capillary: In case of 11th code "D, E, L, F, M, N, P", PVC armored stainless steel. In case of 11th code "Q, R, S, T, V, W, X", stainless steel armored stainless steel.

Mounting flange: 304 stainless steel or carbon steel, 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 60.5mm (JIS 50A) pipe using mounting bracket, direct wall mounting

### Mass {weight}:

Transmitter approximately 10kg without options.

Add; 0.5kg for mounting bracket

0.8kg for indicator option

4.5kg for stainless steel housing option

1.5kg per 50mm extension of diaphragm

## Optional features

### Indicator:

A plug-in analog indicator (2.5% 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:

Oil-free procedures as above. Includes fluorinated oil for fill.

### Degreasing:

Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.

### Vacuum and high temperature service:

Special silicone oil and filling procedure are applied.

See Fig.1 and Fig.2.

### Optional tag plate:

An extra stainless steel tag for 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.

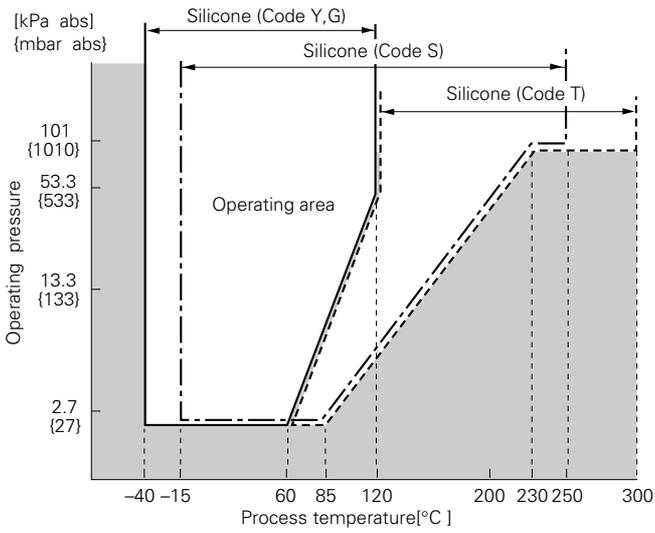


Fig. 1 Relation between process temperature and operating pressure

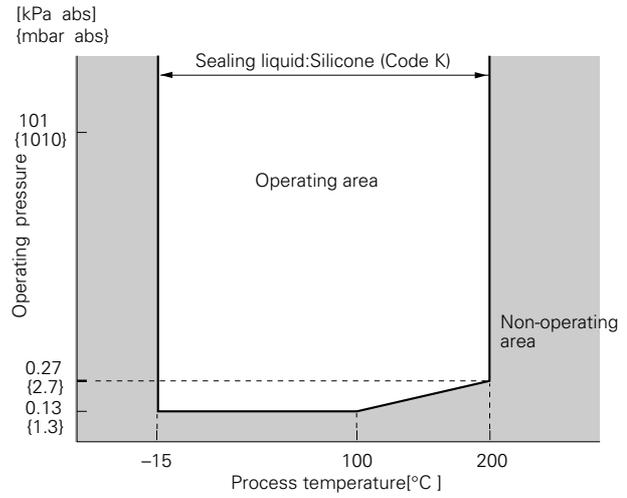


Fig. 2 Relation between process temperature and operating pressure

## ACCESSORIES

### 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.

# 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	B						4																																																																																																																																																																										
4	<Conduit connection> G1/2 (×1) 1/2-14NPT (×1) Pg13.5 (×1) M20 × 1.5 (×1)	Combination with 12th digit code "C, E, P, Q" are not available.																																																																																																																																																																																			
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Note1: (\*1) If range 4 or 5 is selected, specify material "V" in any cases.

Note2: (\*2) 100: 1 turn down is possible, but should be used at a span greater than 1/40 of the maximum span for better performance.

Note3: (\*3) Available for 13th digit code "S", "T", "K" and 5th digit code "1", "4", "7", "B", "E", "H", "Q", "W", "Y".

Note4: (\*4) Available for 6th digit code "2", "3" and 5th digit "0", "3", "6", "9", "A", "D", "G", "P", "M", "S", "T", "U", "V", "X".









## 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.

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 ( $\mu\text{V/m}$ ) quasi peak, measured at 10m distance	CISPR16-1 and CISPR16-2
230 to 1000	47dB ( $\mu\text{V/m}$ ) 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)	EN61000-4-2	B
Electromagnetic field	80 to 1000MHz 10V/m 80%AM (1kHz)	EN61000-4-3	A
Rated power frequency magnetic field	30A/m 50Hz	EN61000-4-8	A
Burst	2kV 5kHz	EN61000-4-4	B
Surge	1.2 $\mu\text{s}$ /50 $\mu\text{s}$ 1kV (Line to line) 2kV (Line to ground)	EN61000-4-5	B
Conducted RF	0.15 to 80MHz 3V 80%AM (1kHz)	EN61000-4-6	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.**

 Caution on Safety

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

## Fuji Electric Systems Co., Ltd.

### Head Office

Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome,  
Shinagawa-ku, Tokyo 141-0032, Japan

<http://www.fesys.co.jp/eng>

### Instrumentation Div.

### International Sales Dept.

No.1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan

Phone: 81-42-585-6201, 6202 Fax: 81-42-585-6187

<http://www.fic-net.jp/eng>

Information in this catalog is subject to change without notice.

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