

# PRESSURE TRANSMITTER

## DATA SHEET

**FKG...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.

## FEATURES

- High accuracy  $\pm 0.07\%$**   
0.07% accuracy is a standard feature. Fuji's micro-capacitance silicon sensor assures this accuracy for all elevated or suppressed calibration ranges without additional adjustment.
- 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.
- 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.
- 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
- 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.
- 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.	Lower limit	Upper limit	
FKG□01	1.3 {0.013}	130 {13}	-100 {-1}	130 {0.13}	1 {10}
FKG□02	5 {0.05}	500 {5}	-100 {-1}	500 {5}	1.5 {15}
FKG□03	30 {0.3}	3000 {30}	-100 {-1}	3000 {30}	9 {90}
FKG□04	100 {1}	10000 {100}	-100 {-1}	10000 {100}	15 {150}
FKG□05	500 {5}	50000 {500}	-100 {-1}	50000 {500}	75 {750}

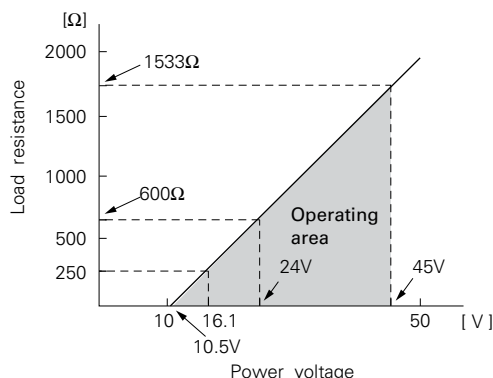
Remark: To minimize environmental influence, span should be greater than 1/40 of the max. span in most applications.

- 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=10<sup>3</sup> kPa=10bar=10.19716kgf/cm<sup>2</sup>= 145.0377psi  
1 kPa=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 250 Ω required.

#### Hazardous locations:

Authorities	Flameproof	Intrinsic safety	Type n Nonincendive
ATEX	Ex II 2 GD - EExd IIC T5/T6 Class I II III Div. 1	Ex II 1 GD - EExia IIC T4/T5 Class I II III Div. 1	Ex II 3 GD - EExn IIC T4/T5 Class I II III Div. 2
Factory Mutual	Groups B thru. G Class I II III Div. 1	Groups A thru. F Class I II III Div. 1	Groups A thru. G Class I II III Div. 2
CSA	Groups C thru. G Ex do IIB+H <sub>2</sub> T4	Groups A thru. G Ex ia IIC T4 (*)	Groups A thru. G —
TIIS			

(\*) Approval pending

#### 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":

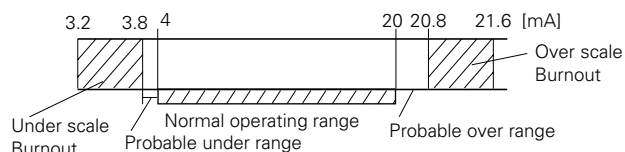
Output signal is hold as the value just before failure happens.

"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



(Note) (1) HHC: Hand Held Communicator

#### 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

0 to 100% RH

#### Humidity limit:

**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	✓	✓

## 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)

**Max span below 10000kPa model:**

For spans greater than 1/10 of URL:  $\pm 0.07\%$  of span

For spans below 1/10 of URL:

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

**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 6 month.

**Temperature effect:**

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

$$\text{Zero shift: } \pm (0.075 + 0.0125 \frac{\text{URL}}{\text{span}}) \%$$

$$\text{Total effect: } \pm (0.095 + 0.0125 \frac{\text{URL}}{\text{span}}) \%$$

**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)

**Step response:**

Time constant: 0.2s \*)

Dead time: approximately 0.2s \*)  
(without electrical damping)

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

**Mounting position effect:**

Zero shift, less than 0.1kPa {1m bar} 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:**

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:**

1/4-18 NPT or Rc1/4 on 54mm centers, as specified.

Meet DIN 19213

**Process-wetted parts material:**

Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	316 stainless steel(*1)	316L stainless steel	316 stainless steel	316 stainless steel
J	316 stainless steel(*1)	316L stainless steel	316 stainless steel	316 stainless steel
H	316 stainless steel(*1)	+Au coating Hastelloy-C	Hastelloy-C lining	316 stainless steel
M	316 stainless steel(*1)	Monel	Monel lining	316 stainless steel
T	316 stainless steel(*1)	Tantalum	Tantalum lining	316 stainless steel
B	Hastelloy-C lining	Hastelloy-C	Hastelloy-C lining	Hastelloy-C
L	Monel lining	Monel	Monel lining	Monel
U	Tantalum lining	Tantalum	Tantalum lining	Hastelloy-C

Note: \*(1) SCS14 per JIS G 5121

Remark: Sensor O-rings: Viton O-ring and teflon gasket selectable

Availability of above material design depends on ranges. 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.

Bolts and nuts: Cr-Mo alloy (standard), or 304 stainless steel (630 stainless steel for 50MPa unit).

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, 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 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:** The fill fluid is fluorinated oil.
- Degreasing:** Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.
- NACE specification:** Metallic materials for all pressure boundary parts comply with NACE MR-01-75. ASTM B7M or L7M bolts and 2HM nuts (Class II) are available.
- Vacuum service:** Special silicone oil and filling procedure are applied.  
See Fig.1.
- 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.

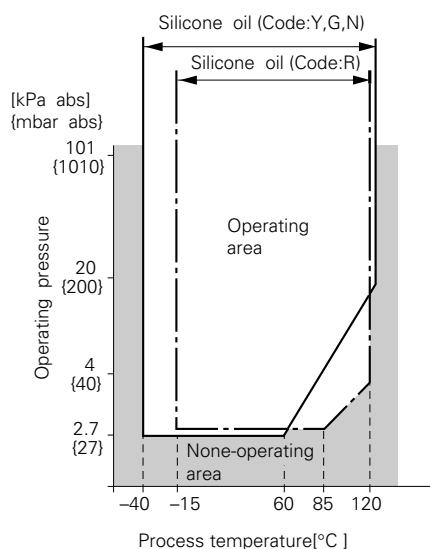


Fig. 1 Relation between process temperature and operating pressure

## 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. 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.

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	← Digit No. of code
4	<Connections>				F	K	G	0												
	Process connection	Oval flange screw	Conduit connection																	
	Rc1/4	7/16-20UNF	G1/2 (×1)	Combination with 12th digit code "C, E, P, Q" are not available.																
	1/4-18NPT	7/16-20UNF	1/2-14NPT (×1)																	
	1/4-18NPT	M10 (or M12)(*1)	Pg13.5 (×1)																	
	1/4-18NPT	M10 (or M12)(*1)	M20×1.5 (×1)																	
	1/4-18NPT	7/16-20UNF	Pg13.5 (×1)																	
	Rc1/4	7/16-20UNF	G1/2 (×2)																	
	1/4-18NPT	7/16-20UNF	1/2-14NPT (×2)																	
	1/4-18NPT	M10 (or M12)(*1)	Pg13.5 (×2)	Note 1																
	1/4-18NPT	M10 (or M12)(*1)	M20×1.5 (×2)	Note 1																
	1/4-18NPT	7/16-20UNF	Pg13.5 (×2)																	
6, 7	<Span and materials>																			
	Span limit [kPa]{bar}{*2}	Process cover	Diaphragm	Wetted cell body	Note 2															
	1.3...130 {0.013...1.3}	316 stainless steel	316L stainless steel	316 stainless steel									1V							
		316 stainless steel	316L stainless steel	316 stainless steel									1J							
			+Au coating																	
		316 stainless steel	Hast. C	Hast. C lining									1H							
		316 stainless steel	Monel	Monel lining									1M							
		316 stainless steel	Tantalum	Tantalum lining									1T							
		Hast. C lining	Hast. C	Hast. C lining									1B							
		Monel lining	Monel	Monel lining									1L							
		Tantalum lining	Tantalum	Tantalum lining									1U							
	5...500 {0.05...5}	316 stainless steel	316L stainless steel	316 stainless steel									2V							
		316 stainless steel	316L stainless steel	316 stainless steel									2J							
			+Au coating																	
		316 stainless steel	Hast. C	Hast. C lining									2H							
		316 stainless steel	Monel	Monel lining									2M							
		316 stainless steel	Tantalum	Tantalum lining									2T							
		Hast. C lining	Hast. C	Hast. C lining									2B							
		Monel lining	Monel	Monel lining									2L							
		Tantalum lining	Tantalum	Tantalum lining									2U							
	30...3000 {0.3...30}	316 stainless steel	316L stainless steel	316 stainless steel									3V							
		316 stainless steel	316L stainless steel	316 stainless steel									3J							
			+Au coating																	
		316 stainless steel	Hast. C	Hast. C lining									3H							
		316 stainless steel	Monel	Monel lining									3M							
		316 stainless steel	Tantalum	Tantalum lining									3T							
		Hast. C lining	Hast. C	Hast. C lining									3B							
		Monel lining	Monel	Monel lining									3L							
		Tantalum lining	Tantalum	Tantalum lining									3U							
	100...10000 {1...100}	316 stainless steel	316L stainless steel	316 stainless steel									4V							
		316 stainless steel	316L stainless steel	316 stainless steel									4J							
			+Au coating																	
		316 stainless steel	Hast. C	Hast. C lining									4H							
		316 stainless steel	Monel	Monel lining									4M							
		316 stainless steel	Tantalum	Tantalum lining									4T							
		Hast. C lining	Hast. C	Hast. C lining									4B							
		Monel lining	Monel	Monel lining									4L							
		Tantalum lining	Tantalum	Tantalum lining									4U							
	500...50000 {5...500}	316 stainless steel	316L stainless steel	316 stainless steel									5V							
9	<Indicator and arrester>																			
	Indicator		Arrester																	
	None		None	Z/S board attached.									A							
	Analog, 0 to 100% linear scale		None										B							
	Analog, custom scale		None										D							
	None		Yes	Approval pending for 10th digit code "G, H, J, K, P"									E							
	Analog, 0 to 100% linear scale		Yes										F							
	Analog, custom scale		Yes										H							
	Digital, 0 to 100%		None	Approval pending for 10th digit code "D, E, G, H, J, K, P"									L							
	Digital, custom scale		None										P							
	Digital, 0 to 100%		Yes										Q							
	Digital, custom scale		Yes	Approval pending for 10th digit code "D, E, G, H, J, K, P"									S							
	Digital, 0 to 100%		None										1							
	(Local adjustment unit with LCD display)		None										2							
	Digital, custom scale		None	Approval pending for 10th digit code "D, E, G, H, J, K, P"									4							
	(Local adjustment unit with LCD display)		None																	
	Digital, 0 to 100%		Yes																	
	(Local adjustment unit with LCD display)		Yes	Approval pending for 10th digit code "D, E, G, H, J, K, P"									5							
	Digital, custom scale		Yes																	
	(Local adjustment unit with LCD display)		Yes																	

Note 1 : (\*1) For 50MPa {500bar} units, M12 is provided rather than M10.

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

Digit	Description	Note	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Digit No. of code
10	<Approvals for hazardous locations> None (for ordinary locations) TIIS, Flameproof (Conduit seal) (Available for 4th digit code "A", "S") TIIS, Flameproof (Cable gland seal) (Available for 4th digit code "A", "S") FM, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") CSA, Flameproof (or explosionproof) (Available for 4th digit code "B", "T") ATEX, Flameproof TIIS, Intrinsic safety (Approval pending) FM, Intrinsic safety and Nonincendive CSA, Intrinsic safety and Nonincendive ATEX, Intrinsic safety ATEX, Type n		F	K	G	0			4									
11	<Vent/ drain and mounting bracket> Vent/drain      Mounting bracket Standard      None } Specify "A", or "C" for the 7th Standard      Yes, stainless steel } digit code "B", "L", or "U" Side      None Side      Yes, stainless steel																	
12	<Options> Extra SS tag plate      Stainless steel elec. housing      Coating of cell None      None      None Yes      None      None None      Yes      None Yes      Yes      None None      None      Yes Yes      None      Yes None      Yes      Yes Yes      Yes      Yes	Note3																
13	<Special applications and fill fluid> Treatment      Fill fluid Standard      Silicone oil Standard      Fluorinated oil Degreasing      Silicone oil Oxygen service      Fluorinated oil (7th digit code "V", "J" only) Chlorine service      Fluorinated oil (7th digit code "H", "T", "B", "U") NACE specification      Silicone oil (Not available for 6th digit code "5", 7th digit code "T", "U", 15th digit code "A", "B") Vacuum service      Silicone oil for vacuum use																	
14	<Sensor O-ring / Gasket> Viton (O-ring) Teflon (gasket)																	
15	<Bolt/nut> Cr-Mo alloy hexagon socket head cap screw/carbon steel nut Cr-Mo alloy hexagon bolt/nut NACE bolt/nut (ASTM A193 B7M/A194 2HM) NACE bolt/nut (ASTM A320 L7M/A194 2HM) 304 stainless steel bolt/304 stainless steel nut 630 stainless steel bolt/304 stainless steel nut	Not available for 6th digit code "5" Available for 6th digit code "5"																

Note 3 : (\*3) Customer tag number can be engraved on standard stainless steel name plate. If extra tag plate is required, select "Yes".

## 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)/Overscale (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)

< 7th digit code : V, J, H, M, T, J >

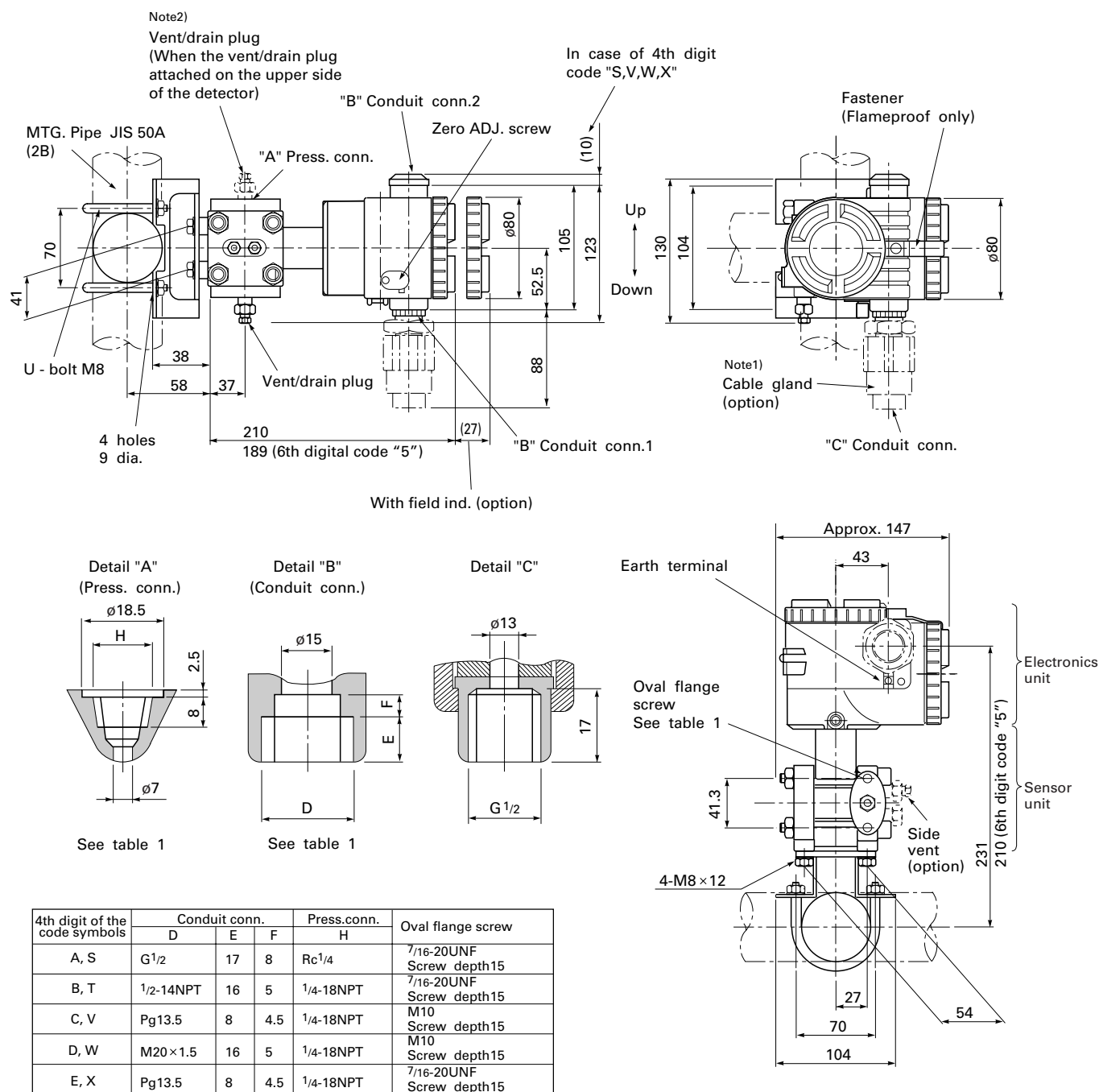
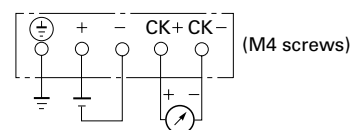


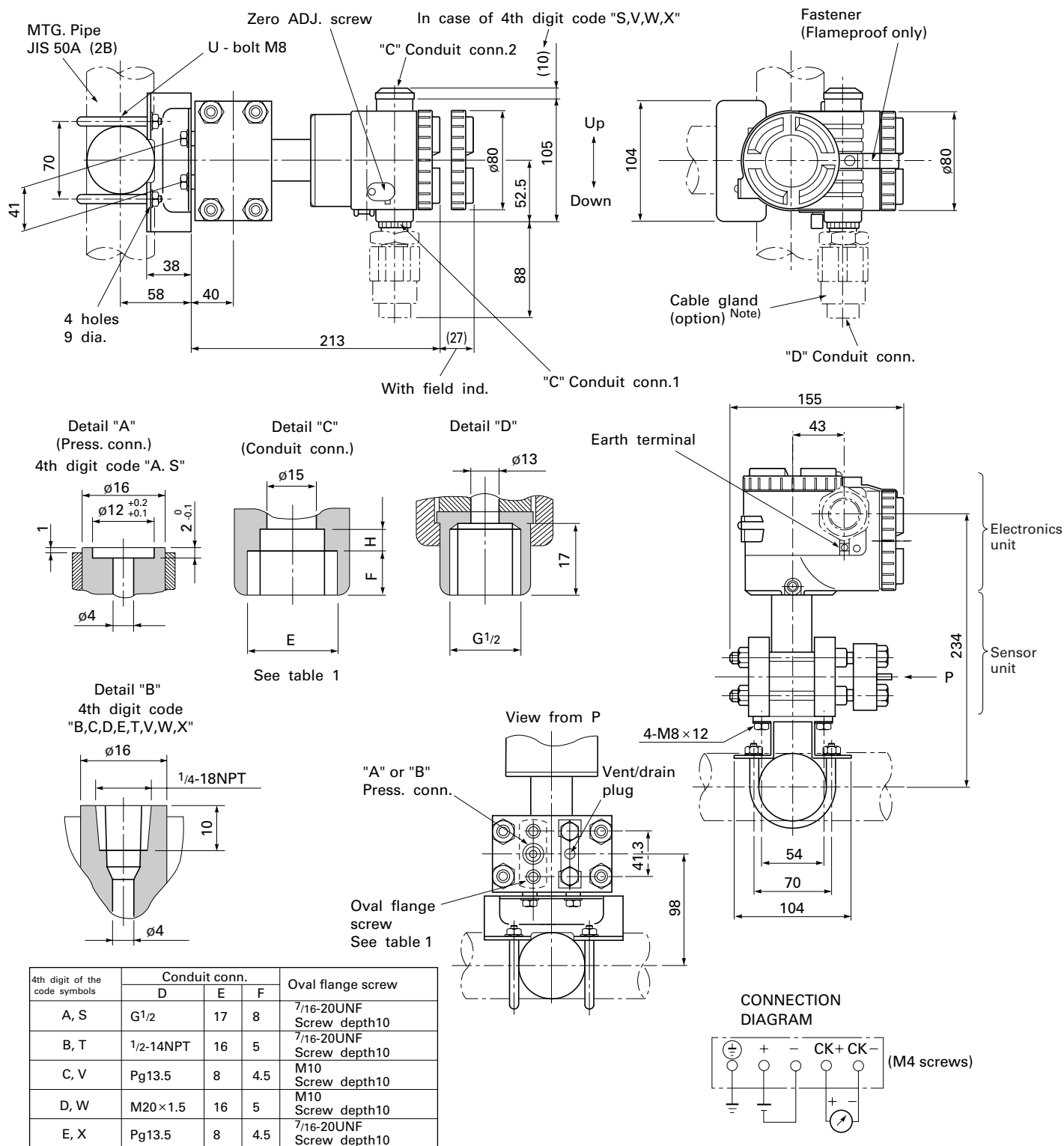
Table 1

- Note1) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.
- Note2) The pressure connector is located on the down side surface of  
the detector, when the vent / drainplug is attached on the upper  
side of the detector

## CONNECTION DIAGRAM



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



Note) Cable gland is supplied in case of 10th digit code "C".  
ø11 cable is suitable.

**Fuji Electric Co.,Ltd.**

**Head office**

11-2 Osaki 1-chome, Shinagawa-ku, Tokyo, 141-0032 Japan  
<http://www.fujielectric.co.jp>

**Fuji Electric Instruments Co.,Ltd.**

**Sales 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.co.jp>