FUJI ELECTRIC

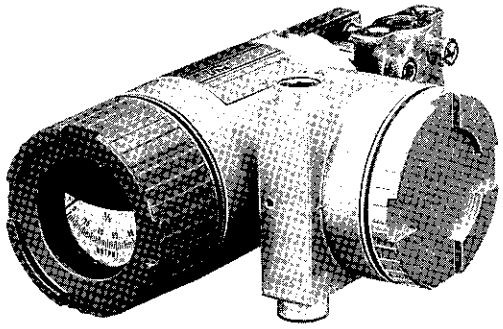
FCX

FCX SERIES PRESSURE TRANSMITTER

DATA SHEET FHG, FKG

The FCX series 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. Outstanding accuracy
   0.1% accuracy for all calibrated spans is the standard feature for pressure transmitter covering 6.4 to 50000kPa {0.064 to 500bar}. Fuji's micro-capacitance silicon sensor assures this feature for all elevated or suppressed calibration ranges without additional adjustment.
2. Minimum environment influence
   "Floating Cell" design which protects the pressure sensor against changes in temperature, and overpressure substantially reduces total measurement error in actual field applications.
3. Smart/Traditional convertible
   Fuji micro-electronics manufacturing technology offers free selection of Smart/Traditional transmitters.
   A small plug-in communication module upgrades your model FHG to smart type model FKG, which has full remote communication capabilities. A Hand Held Communicator (HHC), model FXW can remotely display or reconfigure all transmitter parameters at any point on the loop without affecting the transmitter signal.
4. Application flexibility
   Example features that render the FCX series 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
   — 4-digits LCD meter
   — Stainless steel electronics housing
   — Wide selection of materials

SPECIFICATIONS

Functional specifications

Type:
Model FHG: 4 to 20mA, Traditional type
Model FKG: 4 to 20mA with digital signal, Smart type

Service: Liquid, gas, or vapour

Span, range and overrange limit:

Type	Span limit [kPa] {bar} Min. FHG	Min. FKG	Max. FHG/FKG	Range limit [kPa] {bar}	Overrange limit [MPa] {bar}
F□G□01	6.4 {0.64}	0.64 {0.0064}	64 {0.64}	−64 to + 64 {−0.64 to +0.64}	1 {10}
F□G□02	50 {0.5}	5 {0.05}	500 {5}	−98 to +500 {−0.98 to +5}	1.5 {15}
F□G□03	300 {3}	30 {0.3}	3000 {30}	−98 to +3000 {−0.98 to +30}	9 {90}
F□G□04	980 {10}	98 {1}	9800 {100}	−98 to +9800 {−0.98 to +100}	15 {150}
F□G□05	5000 {50}	500 {5}	50000 {500}	−98 to +50000 {−0.98 to +500}	74 {740}

Remark: To minimize environment influence, span should be greater than 1/25 of the max. span in most applications.

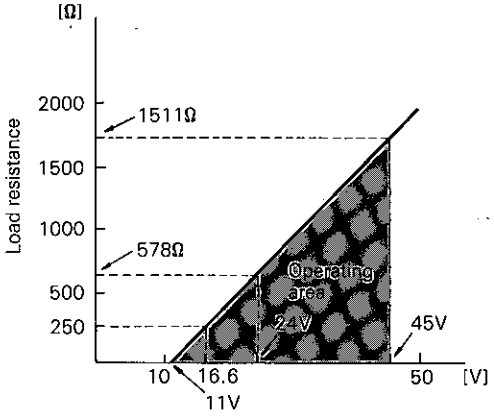
— Lower range limit (vacuum limit) is;
Silicone fill sensor: See Fig. 1
Fluorinated fill sensor: 66kPa abs (500mmHg abs) at below 60°C

— Conversion factors to different units;
1 MPa=10^3 KPa=10bar=10.19716kgf/cm^2= 145.0377psi
1KPa=10mbar=101.9716mmH_2O =4.01463inH_2O

Output signal:
Model FHG: 4 to 20mA DC 2-wire
Model FKG: 4 to 20mA DC with digital signal superimposed on the 4 to 20mA signal.

Power supply: Transmitter operates on 11V to 45V DC at transmitter terminals.
11V to 27V 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.

Authorities	Flameproof	Intrinsic safety	Type N Nonincendive
BASEEFA	Ex ds IIC T5, T6	EEx ia IIC T4, T5	Ex N II T5
Factory Mutual	Class I II III Div. 1 Groups B thru. G	Class I II III Div. 1 Groups A thru. G	Class I II III Div. 2 Groups A thru. G
CSA	Class I II III Div. 1 Groups C thru. G	Class I II III Div. 1 Groups A thru. G	Class I II III Div. 2 Groups A thru. G
RIIS	ds2G4	i3aG4	—
SAA	Exd IIB T6 IP67	Ex ia IIC T5, T6	

Zero/span adjustment:
Model FHG: Zero is adjustable externally from the push buttons (UP and DOWN).
The push buttons can also function to adjust span when MODE SWITCH (located on the front face of electronics unit) is in the span mode. INHIBIT mode to disable the push buttons is also available.
Model FKG: Zero and span are adjustable either from the HHC or by the external push buttons. (one-push function)

Damping: Adjustable electrical damping.
Model FHG: The time constant is adjustable to 0, 0.3, 1.2, 4.8, or 19.2 seconds.
Model FKG: The time constant is adjustable between 0 to 38.4 seconds.

Zero elevation/suppression:
Model FHG: Zero may be elevated or suppressed within the specified range limit of each sensor model.
Model FKG: Selectable from HHC

Normal/reverse action:
Selectable by moving a jumper pin located on the electronics unit.

Indication: Analog indicator or 4-digit LCD meter, as specified.

Burnout direction: Output hold / Output 21.6mA / Output 3.8mA } selectable
Model FHG: Unless otherwise specified, the burnout is in hold position.
Model FKG: Selectable from HHC

Loop-check output:
Model FHG: Transmitter can output constant signal of 4mA, 12mA, or 20mA if MODE SWITCH is set to the loop check mode.
Model FKG: Transmitter can be configured to provide constant signal 4mA or 20mA 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 +100°C for fluorinated oil fill sensor
Storage: –40 to +90°C

Humidity limit: 0 to 100% RH

Communication: (Model FKG only)
With HHC (Model FXW, consult Data Sheet No. EDS8-47), following information can be remotely displayed or reconfigured.

Items	Display	Set
Tag No.	v	v
Model No.	v	v
Serial No.	v	—
Engineering unit	v	v
Range limit	v	—
Measuring range	v	v
Damping	v	v
Output mode	v	v
Burnout direction	v	v
Adjustment	v	v
Output adjust	—	v
Data	v	—
Self diagnoses	v	—
Printer	—	—
External switch lock	v	v

Performance specifications

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

For spans greater than 1/10 of URL: ±0.1% of span

For spans below 1/10 of URL (Model FKG only):

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

Linearity: 0.05% of calibrated span

Stability: ±0.1% of upper range limit (URL) for 6 months

Temperature effect:

Effects per 55°C change between the limits of –40°C and +85°C

Zero shift: ±0.25% of URL

Total effect: ±0.5% of URL

Overrange effect: Zero shift, 0.2% 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 10 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: about 0.3s
(without electrical damping)

Mounting position effect:

Zero shift, less than 0.1kPa {10.2mmH₂O} 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 (For the type with arrester, remove earthing plate.)

Insulation resistance:

More than 100MΩ at 500V DC (For the type with arrester, remove earthing plate.)

Turn-on time: 4 sec.

Physical specifications

Electrical connections:

G1/2, 1/2-14 NPT, Pg13.5, or M20×1.5 conduit, as specified.

Process connections:

1/4-18 NPT or Rc1/4 as specified.
Meets DIN 19213.

Process-wetted parts material:

Material code (7th digit in Code symbols)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
W	316 SS(*1)	Hastelloy-C	316 SS	316 SS
V	316SS(*1)	316L SS	316 SS	316 SS
H	316 SS(*1)	Hastelloy-C	Hastelloy-C lining	316 SS
M	316 SS(*1)	Monel	Monel lining	316 SS
T	316 SS(*1)	Tantalum	Tantalum lining	316 SS
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

Note: *(1) SCS14 per JIS G 5121

Remark: Sensor O-rings: Viton for material code "W", "V", "H", "M", and "T"
Teflon for material code "B", "L", and "U"
Availability of above material design depends on ranges.
Refer to "Code symbols".

Non-wetted parts material:

Electronics housing: Low copper die-cast aluminum alloy (standard), finished with epoxy/polyurethane double coating, or 304 SS, as specified.

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

Fill fluid: Silicone oil (standard) or fluorinated oil (Daifloil)

Mounting bracket: Carbon steel with epoxy coating or 304 SS, as specified

Environmental protection:

IEC IP67 and NEMA 4X

Mounting: On 50mm (50A or 2 inches) pipe using mounting bracket, direct wall mounting, or direct process mounting.

Mass (weight): Transmitter approximately 3.7kg 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 turnable analog indicator (1.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing.
An optional 4 digits LCD meter is also available.

Arrester: A built-in arrester protects the electronics from lightning surges.
Not available with intrinsic safety approvals.

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.
Not available with material code "W" and "V".

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. Includes ASTM B7M or L7M bolts and 2HM nuts. (Class II)

Vacuum service: Special silicone oil and filling procedure are applied.
See below figure.

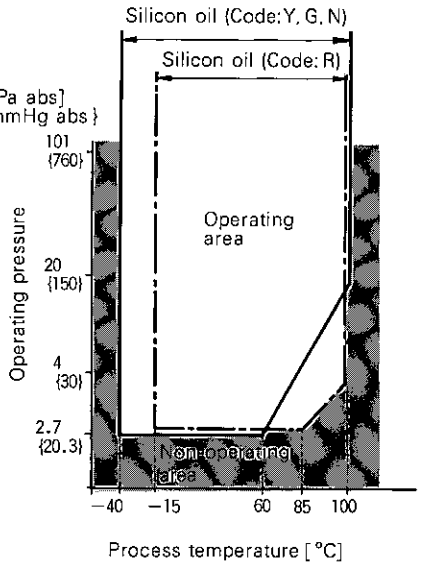


Fig. 1 Relation between process temperature and operating pressure

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

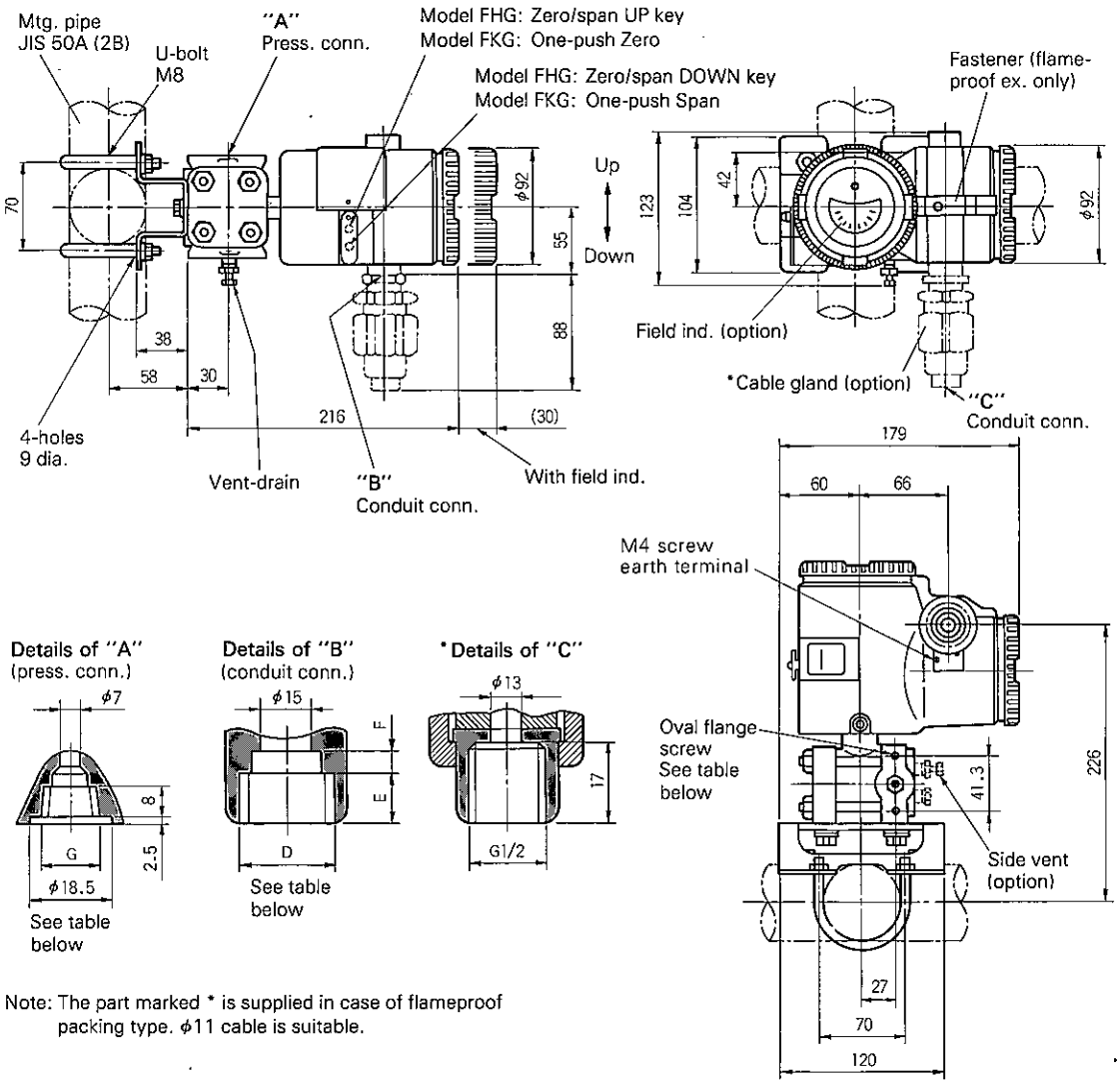
ACCESSORIES

Oval flanges: (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 SS.

Hand-held communicator:
(Model FXW, refer to Data Sheet No. EDS8-47)

Communication module: (Standard for model FKG)
When using this module for model FHG, remote setting function becomes available.
Remark: When the communication module is connected, the operation mode of external zero/span is changed from UP-DOWN to one-push adjustment.

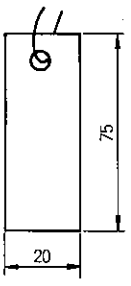
OUTLINE DIAGRAM (Unit: mm)



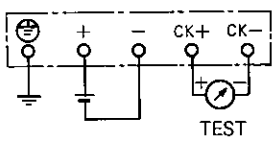
Note: The part marked * is supplied in case of flameproof packing type. ϕ11 cable is suitable.

4th of Code symbols	Conduit conn.			Press. conn.	Oval flange screw
	D	E	F	G	
S	G1/2	17	8	Rc1/4	7/16-20UNF screw depth 13
T	1/2-14NPT	16	5	1/4-18NPT	7/16-20UNF screw depth 13
V	Pg13.5	8	4.5	1/4-18NPT	M10 or M12 screw depth 13
W	M20×1.5	16	5	1/4-18NPT	M10 or M12 screw depth 13
X	Pg13.5	8	4.5	1/4-18NPT	7/16-20UNF screw depth 13

<Optional stainless steel tag>



CONNECTION DIAGRAM



CODE SYMBOLS

1 2 3 4 5 6 7 8 9 10 11 12 13

[ ][ ][ ][ ][0][ ][ ][1] [ ][ ][ ][ ][ ]

	Description
FHG FKG	**Type** 4 to 20mA, Traditional type 4 to 20mA with digital signal, Smart type

Connections

	Process connection	Oval flange screw	Conduit connection
S	Rc1/4	7/16-20UNF	G 1/2
T	1/4-18NPT	7/16-20UNF	1/2-14NPT
V	1/4-18NPT	M10 (or M12)(*1)	Pg 13.5
W	1/4-18NPT	M10 (or M12)(*1)	M20×1.5
X	1/4-18NPT	7/16-20UNF	Pg 13.5

Span and materials

	Span limit [kPa]{bar}(*2) FHG/FKG	Process cover	Diaphragm	Wetted cell body
1W	6.4/0.64...64/64	316SS	Hast. C	316SS
1V	{0.064/0.0064...0.64/0.64}	316SS	316L SS	316SS
1H		316SS	Hast. C	Hast. C lining
1M		316SS	Monel	Monel lining
1T		316SS	Tantalum	Tantalum lining
1B		Hast. C lining	Hast. C	Hast. C lining
1L		Monel lining	Monel	Monel lining
1U		Tantalum lining	Tantalum	Tantalum lining
2W	50/5...500/500	316SS	Hast. C	316SS
2V	{0.5/0.05...5/5}	316SS	316L SS	316SS
2H		316SS	Hast. C	Hast. C lining
2M		316SS	Monel	Monel lining
2T		316SS	Tantalum	Tantalum lining
2B		Hast. C lining	Hast. C	Hast. C lining
2L		Monel lining	Monel	Monel lining
2U		Tantalum lining	Tantalum	Tantalum lining
3W	300/30...3000/3000	316SS	Hast. C	316SS
3V	{3/0.3...30/30}	316SS	316L SS	316SS
3H		316SS	Hast. C	Hast. C lining
3M		316SS	Monel	Monel lining
3T		316SS	Tantalum	Tantalum lining
3B		Hast. C lining	Hast. C	Hast. C lining
3L		Monel lining	Monel	Monel lining
3U		Tantalum lining	Tantalum	Tantalum lining
4W	980/98...9800/9800	316SS	Hast. C	316SS
4V	{10/1...100/100}	316SS	316L SS	316SS
4H		316SS	Hast. C	Hast. C lining
4M		316SS	Monel	Monel lining
4T		316SS	Tantalum	Tantalum lining
4B		Hast. C lining	Hast. C	Hast. C lining
4L		Monel lining	Monel	Monel lining
4U		Tantalum lining	Tantalum	Tantalum lining
5W	5000/500...50000/50000	316SS	Hast. C	316SS
5V	{50/5...500/500}	316SS	316L SS	316SS

Notes: * (1) For 50MPa {500bar} units, M12 is provided rather than M10.
(2) 100: 1 turn down is possible for model FKG, but should be used at the span greater than 1/25 of the maximum span for better performance.

1	2	3	4	5	6	7	8	9	10	11	12	13
F	H	G					1					
F	K	G					1	-				

Description		
Indicator and arrester		
Indicator		Arrester(*3)
A	None	None
B	Analog, 0 to 100% linear scale	None
D	Analog, custom scale	None
E	None	Yes
F	Analog, 0 to 100% linear scale	Yes
H	Analog, custom scale	Yes
L	Digital, 0 to 100%	None
P	Digital, custom scale	None (Model FKG only)
Q	Digital, 0 to 100%	Yes
S	Digital, custom scale	Yes (Model FKG only)
Approvals for hazardous locations		
A	None (for ordinary locations)	
B	JIS, Flameproof (Conduit seal)	
C	JIS, Flameproof (Cable grand seal)	
D	FM, Flameproof (or explosionproof)	
E	CSA, Flameproof (or explosionproof)	
M	BASEEFA, Flameproof (Conduit seal)	
N	BASEEA, Flameproof (Cable grand seal) (Conduit connection G 1/2 only)	
R	SAA, Flameproof (Conduit seal)	
S	SAA, Flameproof (Cable grand seal) (Conduit connection G 1/2 only)	
G	JIS, Intrinsic safety	
H	FM, Intrinsic safety and Nonincendive	
J	CSA, Intrinsic safety and Nonincendive	
K	BASEEFA, Intrinsic safety	
P	BASEEFA, Type N	
T	SAA, Intrinsic safety	
Side vent/ drain and mounting bracket		
Side vent/drain	Mounting bracket	
A	None	None
B	None	Yes, CS
C	None	Yes, stainless steel
D	Yes	None
E	Yes	Yes, CS
F	Yes	Yes, stainless steel

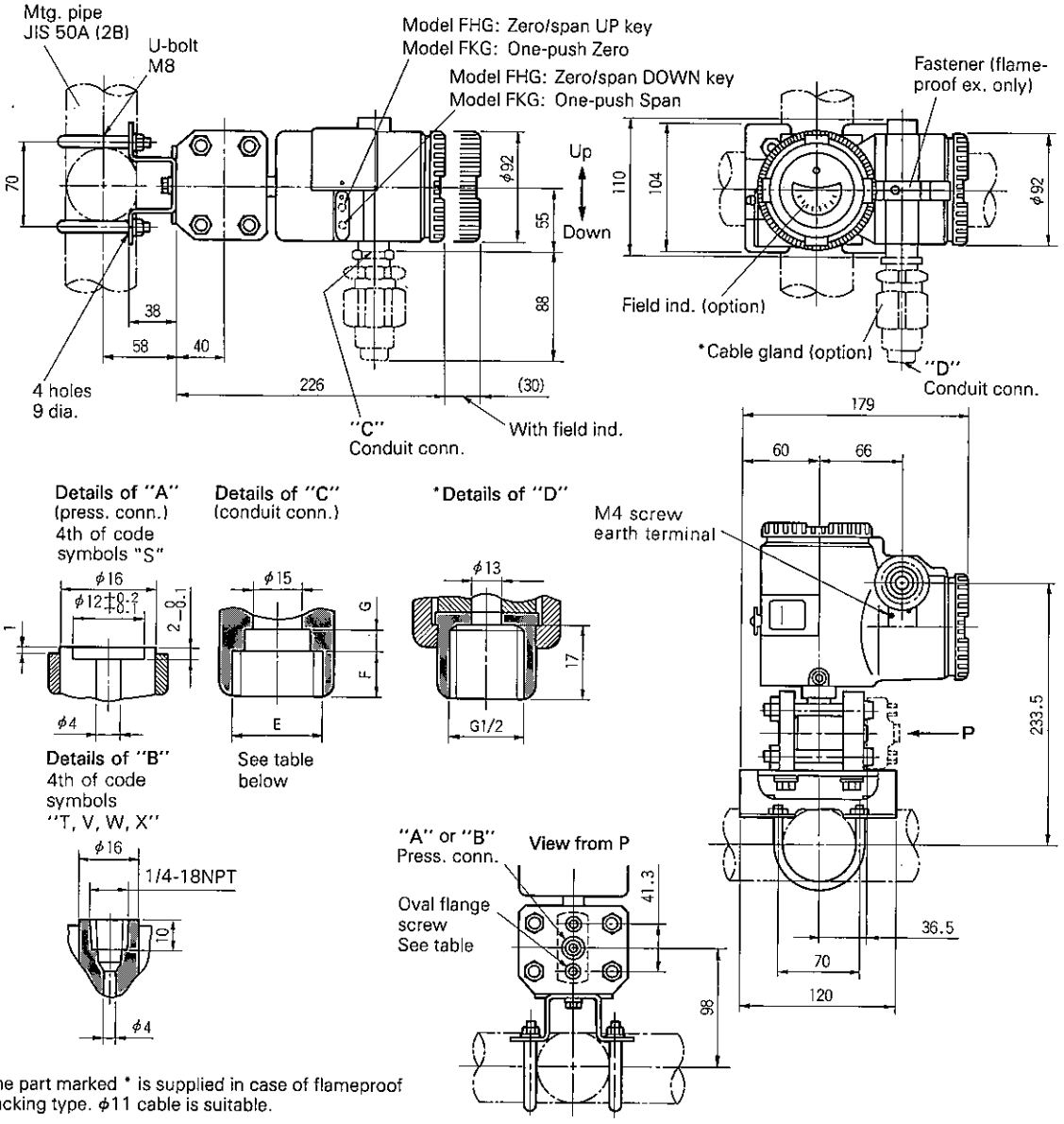
Specify "A", "B", or "C" for the 7th digit code "B", "L", or "U"

Stainless steel parts			
SS bolt/nut	SS tag plate	SS elec. housing	
Y	None	None	None
A	Yes	None	None
B	None	Yes	None
C	None	None	Yes
D	Yes	Yes	None
E	None	Yes	Yes
F	Yes	None	Yes
G	Yes	Yes	Yes

Special applications and fill fluid		
Treatment	Fill fluid	
Y	None (standard)	Silicone oil
W	None (standard)	Fluorinated oil
G	Degreasing	Silicone oil
A	Oxygen service	Fluorinated oil (7th digit code "W", "V" only)
D	Chlorine service	Fluorinated oil (7th digit code "H", "T", "B", "U")
N	NACE specification	Silicone oil (Not available with range code "5")
R	Vacuum service	Silicone oil for vacuum use

Notes: *(3) Arrester option is not available when intrinsic safety is specified.

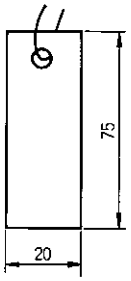
<Models with special material process covers>



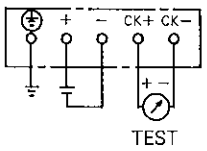
Note: The part marked * is supplied in case of flameproof packing type. ϕ11 cable is suitable.

4th of Code Symbols	Conduit conn.			Oval flange screw
	E	F	G	
S	G1/2	17	8	7/16-20UNF screw depth 13
T	1/2-14NPT	16	5	7/16-20UNF screw depth 13
V	Pg13.5	8	4.5	M10 screw depth 13
W	M20 x 1.5	16	5	M10 screw depth 13
X	Pg13.5	8	4.5	7/16-20UNF screw depth 13

<Optional stainless steel tag>



CONNECTION DIAGRAM



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