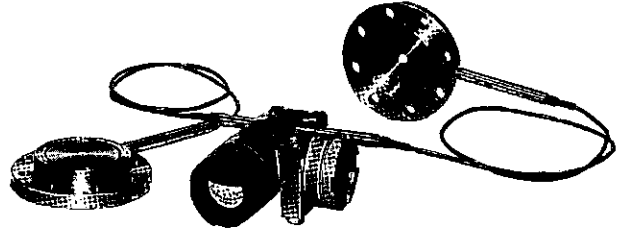


# FCX SERIES REMOTE SEAL TYPE DIFFERENTIAL PRESSURE TRANSMITTER

DATA SHEET

FHD, FKD

The FCX series differential pressure transmitter accurately measures differential pressure, liquid level or 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. Totally welded construction of the seals assures excellent reliability in high temperature and highly corrosive process.



## FEATURES

- Outstanding accuracy**  
0.2% accuracy for all calibrated spans is the standard feature for all DP models covering 3.2kPa(32mbar) range to 500kPa(5bar) high differential. Fuji's Micro-capacitance silicon sensor assures this feature for all elevated or suppressed calibration ranges without additional adjustment.
- Minimum environment influence**  
"Advanced Floating Cell" design which protects the pressure sensor against changes in temperature, static pressure, and overpressure substantially reduces total measurement error in actual field applications.
- Smart / Traditional convertible**  
Fuji micro-electronics manufacturing technology offers free selection of Smart/Traditional transmitters. A small plug-in communication module (accessory) upgrades your model FHD to smart type model FKD, which has full remote communication capabilities. A Hand Held Communicator (HHC; accessory), model FXW can remotely display or reconfigure all transmitter parameters at any point on the loop without affecting the transmitter signal.
- 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
  - High temperature, high vacuum seals

## SPECIFICATIONS

### Functional specifications

Type:

Model FHD: 4 to 20mA, Traditional type

Model FKD: 4 to 20mA with digital signal, Smart type

Service: Liquid, gas, or vapour

Static pressure, span, and range limit:

Type	Static pressure	Span limit [kPa] (m bar)			Range limit [kPa] (m bar)
		Min.		Max.	
		FHD	FKD	FHD/FKD	
F□D□□3	Up to flange rating	3.2	0.32	32	+/- 32
F□D□□4		{ 32 }	{ 3.2 }	{ 320 }	{ +/- 320 }
F□D□□5		{ 64 }	{ 6.4 }	{ 640 }	{ +/- 640 }
F□D□□6		13	1.3	130	+/- 130
F□D□□6		{130}	{ 13 }	{ 1300 }	{ +/- 1300 }
		50	5	500	+/- 500
		{500}	{ 50 }	{ 5000 }	{ +/- 5000 }

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

— Lower limit of static pressure (vacuum limit) is, Silicone fill sensor: See Fig. 1

Fluorinated fill sensor: Atmospheric pressure

— The maximum span of each sensor can be converted to in different units using below factors.

$$1 \text{ MP} = 10^3 \text{ KPa} = 10 \text{ bar} = 10.19716 \text{ kgf/cm}^2 = 145.0377 \text{ psi}$$

$$1 \text{ KPa} = 10 \text{ mbar} = 101.976 \text{ mmH}_2\text{O} = 4.01463 \text{ H}_2\text{O}$$

Overrange limit: To maximum static pressure limit

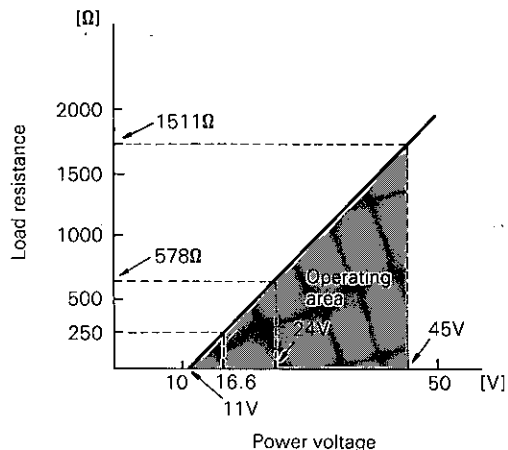
Output signal:

Model FHD: 4 to 20mA DC 2-wire, linear signal

Model FKD: 4 to 20mA DC (linear of square root) 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 is required.

**Hazardous locations:**

Designed to meet international intrinsic safety and flameproof (explosionproof) standards.

Authorities	Flameproof	Intrinsic safety	Type N Nonincendive
BASEEFA Factory Mutual	Ex ds IIC T5, T6 Class I II III Div. 1 Groups B thru. G	EEx ia IIC T4, T5 Class I II III Div. 1	Ex N II T5 Class I II III Div. 2
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 SAA NEPSI	ds 2 G4 Exd IIB T6 d IIC T5	i 3a G4 Ex ia IIC T5, T6 ia IIC T4	— — —

**Zero/span adjustment:**

**Model FHD:** 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 FKD:** Zero and span are adjustable either from the HHC or by the external push buttons. (one-push function)

**Damping:** Adjustable electrical damping

**Model FHD:** The time constant is adjustable to 0, 0.3, 1.2, 4.8, or 19.2 seconds.

**Model FKD:** The time constant is adjustable between 0 to 38.4 seconds.

**Zero elevation/suppression:**

-100% to +100% of URL

**Normal/reverse action:**

**Model FHD:** Selectable by moving a jumper pin located on the electronics unit.

**Model FKD:** Selectable from HHC.

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

**Burnout direction:**

Output hold  
Output 21.6mA } selectable  
Output 3.8mA

**Model FHD:** Unless otherwise specified, the output is in hold position.

**Model FKD:** Selectable from HHC.

**Loop-check output:**

**Model FHD:** Transmitter can output constant signal of 4mA, 12mA, or 20mA if MODE SWITCH is set to the loop check mode.

**Model FKD:** 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)  
(-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 operating press
Fluorinated oil	W, A and D	-20 to 120°C	Atmospheric pressure
Silicone oil	H	-15 to 250°C	
	J	85 to 300°C	
	Y and G	-40 to 120°C	
	S	-15 to 250°C	2.7kPa abs (20.3mmHg abs)
	T	85 to 300°C	
	K	-15 to 200°C	0.13kPa abs (0.98mmHg abs)

**Storage:** -40 to +90°C

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

**Communication:** (Model FKD only)

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

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

## Performance specifications

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

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

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

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

**Linearity:** 0.1% of calibrated span

**Stability:**  $\pm 0.2\%$  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:  $\pm 0.8\%$  of URL

Total effect:  $\pm 1.5\%$  of URL ( $\pm 0.8\%$  of URL, as specified)

Note: \* Excluding effect by temperature difference between the seals.

**Static pressure effect:**

Zero shift:  $\pm 0.2\%$  of URL/1MPa{10bar}

Double the zero shift for material code.

"H", "F", "G", "K", "L", "M", "T", "P" and "R"

Span shift:  $-0.2^{+0.2}_{-0.1} \%$  of calibrated span for flange nominal pressure

**Overrange effect:** Zero shift, % of URL

$\pm 0.3\%$  for flange nominal pressure

Double the effect for material code.

"H", "F", "G", "K", "L", "M", "T", "P" and "R"

**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 10V/m when electronics covers on.

(Classification: 2-abc: 0.2% span per SAMA PMC 33.1)

**Step response:** (without electrical damping)

Range code	Time constant(*)	Dead time
"3"	2 s	approx. 0.3 s
"4"	1.7 s	
"5"	1.7 s	
"6"	1.7 s	

Note: \* Capillary length: 1.5m

**Dielectric strength:**

500V AC, 50/60Hz 1 min., between circuit and earth (For the type with arrester, remove earthing plate.)

**Insulation resistance:**

More than 100M $\Omega$  at 500V DC (For the type with arrester, remove earthing plate.)

**Turn-on time:** 4 sec.

## Physical specifications

**Electrical connections:**

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

**Process connections:**

JIS, ANSI, or DIN raised face flanges.

JIS: 10K80A, 10K100A, 30K80A, or 30K100A

ANSI: 150LB3", 150LB4", 300LB3", or 300LB4"

DIN: PA40 DN80 or PN16 DN100

**Diaphragm extension:**

0, 50, 100, 150, or 200mm as specified.

(See model code. Extended diaphragm is available only with 316L SS(\*) or Hastelloy-C diaphragm)

**Process-wetted parts material:**

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

Flange face: 316 SS, Hastelloy-C lining Monel lining, or Tantalum lining

Extension: 316 SS or Hastelloy-C

**Non-wetted parts material:**

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

Capillary: PVC armored SS

Mounting flange: (option) 304 SS or CS(\*)

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 Transmitter approximately 15kg without options.

**Mass{weight}:**

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

Note : (\*) SS : Stainless steel

CS : Carbon steel

**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. Material code "W", "A", "B", "C" and "D" are available.
- Chlorine service:** The fill fluid is fluorinated oil.  
Material code "H", "F", "G", "K", "L" and "T" are available.
- Degreasing:** Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use for oxygen or chlorine measurement.
- Vacuum service:** Special silicone oil and filling procedure are applied.  
See below figure.

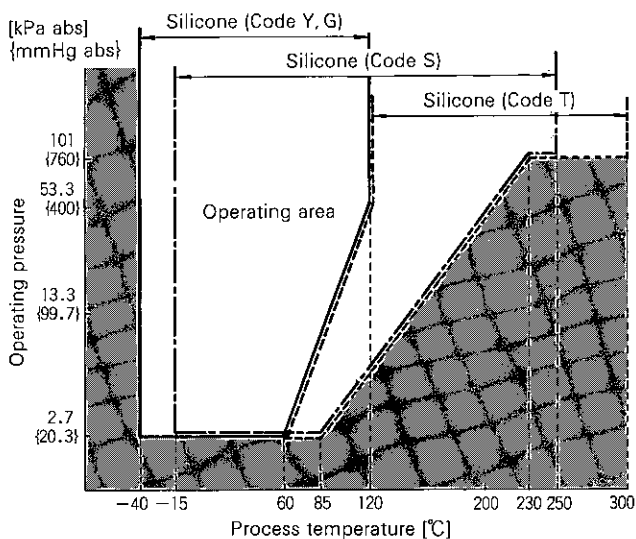


Fig. 1 Relation between process temperature and operating pressure

**ACCESSORIES**

- Hand held communicator:**  
(Model FXW, refer to Data Sheet No. EDS 8-47)
- Communication module:** (Standard for model FKD)  
When using this module for model FHD, 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.

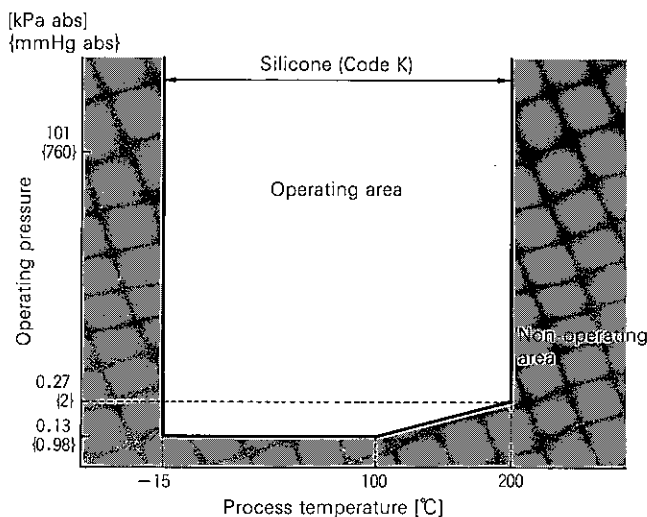
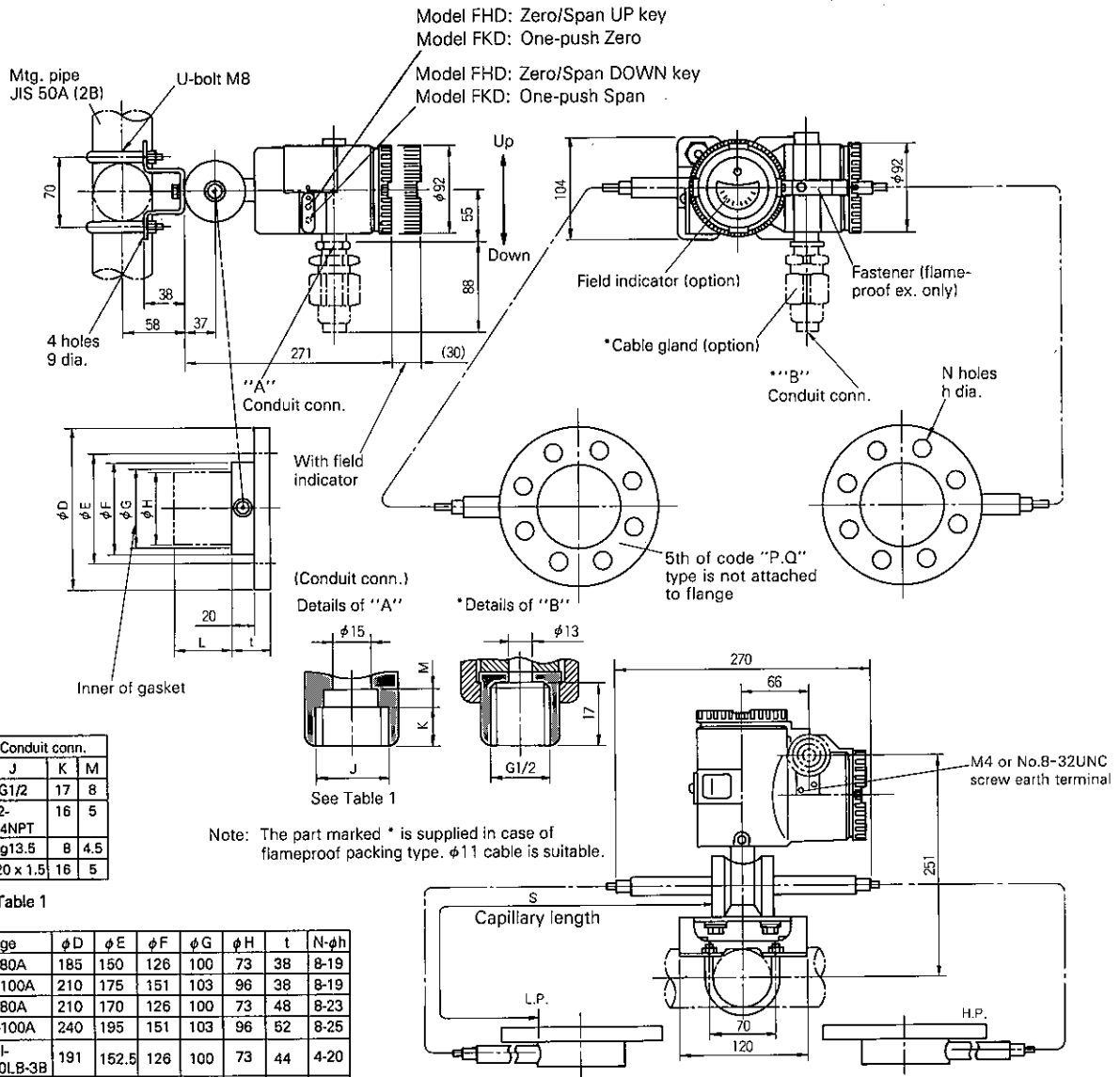


Fig. 2 Relation between process temperature and operating pressure

- Customer tag:** A stainless steel tag for customer tag data is wired to the transmitter.

# OUTLINE DIAGRAM (Unit: mm)

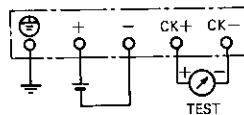


4th of code	Conduit conn.		
	J	K	M
S	G1/2	17	8
T	1/2-14NPT	16	5
V	Pg13.5	8	4.5
W	M20 x 1.5	16	5

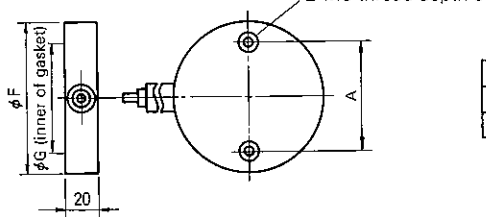
Table 1

Flange	φD	φE	φF	φG	φH	t	N-φh
JIS-10K-80A	185	150	126	100	73	38	8-19
JIS-10K-100A	210	175	151	103	96	38	8-19
JIS-30K-80A	210	170	126	100	73	48	8-23
JIS-30K-100A	240	195	151	103	96	52	8-25
ANSI/JPI-150LB-3B	191	152.5	126	100	73	44	4-20
ANSI/JPI-150LB-4B	229	190.5	151	103	96	44	8-20
ANSI/JPI-300LB-3B	210	168	126	100	73	49	8-23
ANSI/JPI-300LB-4B	254	200	151	103	96	52	8-23
DIN PN40 DN80	200	160	126	100	73	44	8-18
DIN PN16 DN100	220	180	151	103	96	40	8-18

## CONNECTION DIAGRAM

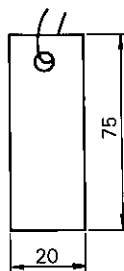


### < Wafer type >



Wafer type flange	A	F	G
3 inch wafer	116	126	100
4 inch wafer	141	151	103

### < Optional stainless steel tag >



7th of code	L (mm)	Mass approx. (kg)
W, M	0	14.5 to 20
H, T		
A, F	50	15.5 to 31
B, G	100	16 to 31.5
C, K	150	16.5 to 32
D, L	200	17 to 32.5

S
T
V
W
0
1
-
0
0
0
0

CODE SYMBOLS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15														
							2							0
F H D														
F K D														
S														
T														
V														
W														
0														
1														
2														
3														
4														
5														
6														
7														
8														
9														
A														
B														
C														
D														
E														
F														
G														
H														
J														
K														
P														
Q														
Description														
Type														
4 to 20mA, Traditional type														
4 to 20mA with digital signal, Smart type														
Conduit connection														
G1/2														
1/2-14NPT														
Pg 13.5														
M20 x 1.5														
Flange														
Mounting flange      Flange size and rating														
304 SS														
JIS 10K 80A														
JIS 10K 100A														
JIS 30K 80A														
JIS 30K 100A														
ANSI/JPI 150LB *3"														
ANSI/JPI 150LB *4"														
ANSI/JPI 300LB *3"														
ANSI/JPI 300LB *4"														
DIN PN16/40 DN80														
DIN PN16 DN100														
CS														
JIS 10K 80A														
JIS 10K 100A														
JIS 30K 80A														
JIS 30K 100A														
ANSI/JPI 150LB *3"														
ANSI/JPI 150LB *4"														
ANSI/JPI 300LB *3"														
ANSI/JPI 300LB *4"														
DIN PN16/40 DN80														
DIN PN16 DN100														
None (wafer type)														
3 inch wafer														
4 inch wafer														
Span limit (*) [kPa] (m bar)														
FHD/FKD														
3.2/0.32...32/32														
{32/3.2...320/320}														
6.4/0.64...64/64														
{64/6.4...640/640}														
13/1.3...130/130														
{130/13...1300/1300}														
50/5...500/500														
{500/50...5000/5000}														
Material/diaphragm extension														
Diaphragm      Flange face      Diaph. extension [mm]														
316L SS      316 SS      0														
50														
100														
150														
200														
Hastelloy-C      Hastelloy-C      0														
50														
100														
150														
200														
Monel      Monel      0														
Tantalum      Tantalum      0														
Titanium      Titanium      0														
Zirconium      Zirconium      0														

Notes: \* (1) 100: 1 turn down is possible for model FKD, but should be used at the span greater than 1/25 of the maximum span for better performance.

(2) In case of 7th digit code "A", "B", "C", "D" and 13th digit code "S", "T", "K", 5th digit code "1", "3", "5", "7", "9", "B", "D", "F", "H", "K", "Q" is available.

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

		Description	
<b>Indicator and arrester</b>			
	Indicator	Arrester <sup>(1)</sup>	
A	None	None	
B	Analog, 0 to 100% linear scale	None	
C	Analog, 0 to 100% sq. root scale	None	
D	Analog, custom scale	None	
E	None	Yes	
F	Analog, 0 to 100% linear scale	Yes	
G	Analog, 0 to 100% sq. root scale	Yes	
H	Analog, custom scale	Yes	
L	Digital, 0 to 100%	None	
P	Digital, custom scale	None (Model FKD only)	
Q	Digital, 0 to 100%	Yes	
S	Digital, custom scale	Yes (Model FKD only)	
<b>Approvals for hazardous locations</b>			
A	None (for ordinary locations)		
B	JIS, Flameproof (Conduit seal)		
C	JIS, Flameproof (Cable gland seal)		
D	FM, Flameproof (or explosionproof)		
E	CSA, Flameproof (or explosionproof)		
M	BASEEFA, Flameproof (Conduit seal)		
N	BASEEFA, Flameproof (Cable gland seal) (Conduit connection G1/2 only)		
R	SAA, Flameproof (Conduit seal)		
S	SAA, Flameproof (Cable gland seal) (Conduit connection G1/2 only)		
G	JIS, Intrinsic safety		
H	FM, Intrinsic safety and nonincendive		
J	CSA, Intrinsic safety and nonincendive		
K	BASEEFA, Intrinsic safety		
P	BASEEFA, Intrinsic safety and Type N		
T	SAA, Intrinsic safety		
V	NEPSI, Flameproof (Conduit seal)		
W	NEPSI, Intrinsic safety		
<b>Capillary and mounting bracket</b>			
	Capillary	Mounting bracket	
A	1.5 m	CS	
B	3	CS	
C	6	CS	
D	1.5	SS	
E	3	SS	
F	6	SS	
<b>Stainless steel parts <sup>(2)</sup></b>			
	SS tag plate	SS elec. housing	
Y	None	None	
B	Yes	None	
C	None	Yes	
E	Yes	Yes	
<b>Special applications and fill fluid</b>			
	Treatment	Fill fluid	
Y	None (standard)	Silicone oil	
W	None (standard)	Fluorinated oil	
G	Degreasing	Silicone oil	
A	Oxygen service	Fluorinated oil (Material code "W", "A", "B", "C" and "D")	
D	Chlorine service	Fluorinated oil (Material code "H", "F", "G", "K", "L" and "T")	
H	High temp. 250°C	Silicone oil	
J	High temp. 300°C	Silicone oil	
S	High temp. and vacuum (250°C)	Silicone oil	
T	High temp. and vacuum (300°C)	Silicone oil	
K	High temp. and high vacuum	Silicone oil	
		Material code "W", "A", "B", "C" and "D" <sup>(3)</sup>	

Notes: \* <sup>(1)</sup> Arrester option is not available when intrinsic safety is specified.

<sup>(2)</sup> Not applicable to carbon steel flange material.

<sup>(3)</sup> Treatment; None

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