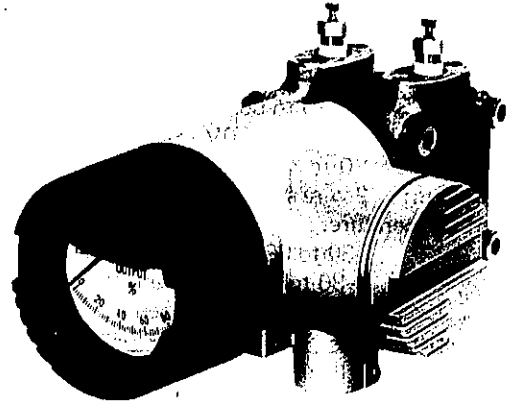


# FC SERIES DIFFERENTIAL PRESSURE TRANSMITTER

DATA SHEET

FFC

FC SERIES capacitance type differential pressure transmitters provide precise measurement of flow rate, differential pressure, pressure and liquid level of various liquids, gases and steam. Process high and low pressures act on the flat diaphragm through metal seal diaphragms and change capacitance by deflection of the flat diaphragm or a moving electrode. This change is measured and converted to a signal current in the electronics circuit for transmission to receiving instruments. Explosionproof, field indicator, corrosion resistant materials, built-in arrester and other specifications are fully provided.



## FEATURES

- High accuracy:**  
The simple measuring principle to detect the capacitance change by a very small deflection of the flat diaphragm and the unique Floating Cell system assures high accuracy of 0.2%. The influence of static pressure, overpressure and temperature is smaller than any other transmitters on the market.
- High reliability and long-term stability**  
All welded, simple mechanism with few parts causes little failure and drift.
- Excellent environmental adaptability**  
Minimal influence of vibration, weather and radio frequency interference enables this transmitter to be located in almost all circumstances.
- Easy maintenance and handling**  
Compact and lightweight design ensures speedy installation. Zero, span and damping are easily and independently adjusted on the front panel. The detecting unit and the electronics unit are interchangeable and easily replaceable because of the three block structure.
- Full range specifications**  
To meet any process requirements, a wide choice of flameproofing, intrinsically safe explosionproofing, large indicator, arrester, corrosion-resistant materials, various treatments, integral orifice, equalizing valve etc. are available.
- Wide rangeability**  
Each transmitter is available with 10 to 1 turndown for application flexibility. FC SERIES transmitters are offered in wide ranges; from low to high differential pressure, with the same structure and size.

## SPECIFICATIONS

Measuring range and working pressure:

Type	Working pressure range (kg/cm <sup>2</sup> )	Measuring range (mmH <sub>2</sub> O)
FFC□3	-1 to 63, 100	0 to 130 ..... 1,300
FFC□4	-1 to 63, 100 420	0 to 640 ..... 6,400

Note) Working pressure is decided according to materials. Refer to the following table.

Material:  
Detecting unit;

Material code	Process cover	Measuring element		Pressure rating (kg/cm <sup>2</sup> )
		Seal diaphragm	Other wetted part	
W	SUS 316	SUS 316L	SUS 316	100
E	Carbon steel	SUS 316L	SUS 316	420
H	SUS316	Hastelloy C	Hastelloy C	100
M	SUS316	Monel	Monel	100
T	SUS316	Tantalum	Tantalum	100
B	Hastelloy C lining	Hastelloy C	Hastelloy C	63
L	Monel lining	Monel	Monel	63
R	Hastelloy C lining	Tantalum	Tantalum	63

Note) For details of measuring range, working pressure and material, refer to "Code Symbols".

- O-Ring; Viton  
(Teflon for material code B, L, R)
- Fill; Silicone or Daifloil (fluorinated fluid for oxygen measurement)
- Electronics casing;  
Aluminium alloy  
Epoxy-polyurethane double coating, silver  
Field indicator cover, black N3

- Zero shift:** Adjustable from -32% to 100% of the maximum span.  
(The sum of zero shift and calibrated span should not exceed the upper range limit.)
- Output signal:** DC 4 to 20mA or DC 10 to 50mA
- Power supply and Allowable load resistance:**  
DC 4 to 20mA output  
DC 12 to 45V  
(Less than DC 27V; with arrester)  
0 to 600Ω (at DC 24V power supply)  
DC 10 to 50mA output  
DC 25 to 70V  
0 to 450Ω (at DC 48V power supply)
- Wiring system:** 2-wire system
- Ambient temperature:**  
-30 to 80°C  
(-30 to 60°C; with arrester)  
(-10 to 60°C; Oxygen measurement)
- Weather resistance:**  
DIN 40040 HQC
- Fluid temperature:**  
-30 to 100°C  
(Non-freezing condition)  
(-10 to 60°C; oxygen measurement)
- Response time:** Faster than 0.3 sec.  
(time const. of the detecting unit at room temp.)
- Adjustable damping:**  
4 steps selectable; no damping, and time constants of 0.2, 1 and 3 sec.
- Waterproof:** IEC IP65 or NEMA4
- Explosionproof:**

	Certifying authority	Area classification	Temperature classification
Flameproof (Explosionproof)	FM	Class I, Division 1 Group B, C, D	T6
	CSA	Class I, Division 1 Group C, D	T6
Intrinsically safe	FM	Class I, Division 1 Group A, B, C, D*	T6
	CSA	Class I, Division 1 Group A, B, C, D*	T6
	SAA	Exia II C	T6
	PTB	Exib II C	T5, T6

\* depend on the barriers to be connected.  
FM : Factory Mutual Research (USA)  
CSA : Canadian Standards Association  
SAA : Standards Association of Australia  
PTB : Physikalisch-Technische Bundesanstalt

- External dimensions (HxWxD) and weight:**  
FFC3; 143x164x237 (267)\* mm,  
Approx. 8 kg  
FFC4; 169x183x246 (276)\* mm,  
Approx. 12 kg  
FFC6; 109x204x235 (265)\* mm,  
Approx. 6.5 kg  
\*: with field indicator

- Mounting method:**  
On a horizontal or vertical 2" pipe by using a U-bolt
- Process connection:**  
1/4-18NPT internal thread  
(1/2-14NPT; with oval flange)
- Conduit connection:**  
1/2-14NPT internal thread

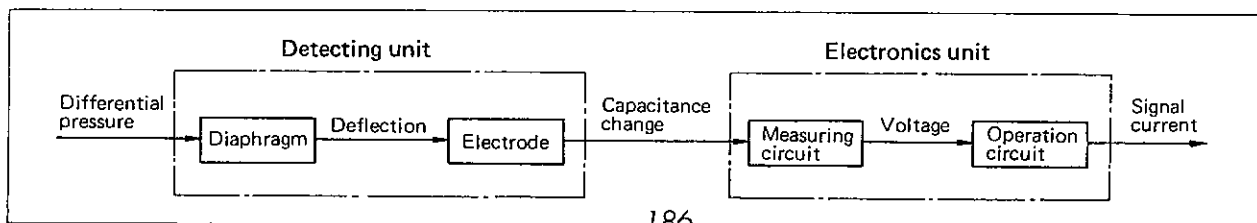
**OPTIONAL SPECIFICATIONS**

- Field indicator:** Built in the electronics casing, class 1.5  
0 to 100% linear, square root
- Arrester:** Built in the electronics casing (DC 4 to 20mA output only)
- Oxygen measurement:**  
Daiffoil (fluorinated fluid) filled and special cleaning.  
(not available for material code "E")
- Acid and alkali-proof treatment:**  
Detecting unit bolts: 17-4PH SS  
U-bolt, nuts and washers: SUS 304
- Oval flange:** Available for process connection flange.  
For details, refer to the oval flange data sheet EDS6-10.

**CHARACTERISTICS**

- (Indicated by % of span with stainless steel diaphragm and silicone fill)
- Accuracy:** Better than ±0.2%  
(under reference operating conditions, includes linearity, hysteresis and repeatability)
- Linearity (independent):** Better than ±0.1%
- Repeatability:** Better than ±0.05%
- Sensitivity:** Better than 0.05%
- Temperature effect: \*1), \*2)**  
At maximum span and between -30 to 80°C  
Total effect (Zero and span) ±1%/55°C
- Static pressure effect: \*1), \*2)**  
At maximum span;  
Zero shift 0.2%/100 kg/cm<sup>2</sup>
- Allowable differential overpressure:**  
Up to the max. working pressure
- Effect of differential overpressure:**  
At maximum span;  
Zero shift 0.3%/±100 kg/cm<sup>2</sup>  
0.8%/±420 kg/cm<sup>2</sup>
- Power fluctuation:**  
Zero shift 0.005%/V
- Effect of position:**  
Zero shift 10mmH<sub>2</sub>O/10° \*2  
\*1 This is doubled for corrosion resistance materials (Code: H, M, T, B, L and R)  
\*2 This is doubled for oxygen measurement.

**FUNDAMENTAL BLOCK DIAGRAM**



# CODE SYMBOLS

FFC		Description										
3		Pressure rating (kg/cm <sup>2</sup> )										
4		100										
6		420										
		63										
3		Measuring range (mmH <sub>2</sub> O)										
4		0 to 130 ..... 1,300										
		0 to 640 ..... 6,400										
Materials of detecting unit												
		Process cover		Seal diaphragm		Measuring element		Other watted part				
W		SUS 316		SUS 316L		SUS 316		SUS 316				
E		Carbon steel		SUS 316L		SUS 316		SUS 316				
H		SUS316		Hastelloy C		Hastelloy C		Hastelloy C				
M		SUS316		Monel		Monel		Monel				
T		SUS316		Tantalum		Tantalum		Tantalum				
B		Hastelloy C lining		Hastelloy C		Hastelloy C		Hastelloy C				
L		Monel lining		Monel		Monel		Monel				
R		Hastelloy C lining		Tantalum		Tantalum		Tantalum				
Electronics unit, field indicator and arrester												
		Field indicator				Arrester	Output signal	Note				
		Yes/No	Scale									
A		—	—			—	DC 4 to 20mA	} Not available for intrinsic safety				
B		○	0 to 100% linear			—						
D		○	0 to 100% square root			—						
G		—	—			○						
H		○	0 to 100% linear			○						
K		○	0 to 100% square root			○						
P		—	—			—	DC 10 to 50mA					
Q		○	0 to 100% linear			—						
R		○	0 to 100% square root			—						
9		Hazardous location										
5		Non-explosionproof										
6		FM approved explosionproof										
A		CSA " "										
B		FM approved intrinsically safe with STAHL barrier										
C		FM " " " " TAYLOR barrier										
D		FM " " " " WESTING HOUSE barrier										
F		FM " " " " M.T.L barrier										
G		FM " " " " FOXBORO barrier										
K		SAA " " " " HONEY WELL barrier										
L		PTB " " " " M.T.L barrier (pending)										
P		CSA " " " " STAHL barrier										
Q		CSA " " " " TAYLOR barrier										
S		CSA " " " " M.T.L barrier										
U		CSA " " " " FOXBORO barrier										
V		CSA " " " " HONEY WELL barrier										
Input/output												
0		Normal operation										
1		Reverse operation										
Special specifications												
0		Standard										
2		Low temperature service (-40 to +60°C)										
Treatment												
Y		Standard										
A		Oxygen measurement (O <sub>2</sub> no oil treatment)										
B		Acid and alkali-proof treatment										
C		A + B										

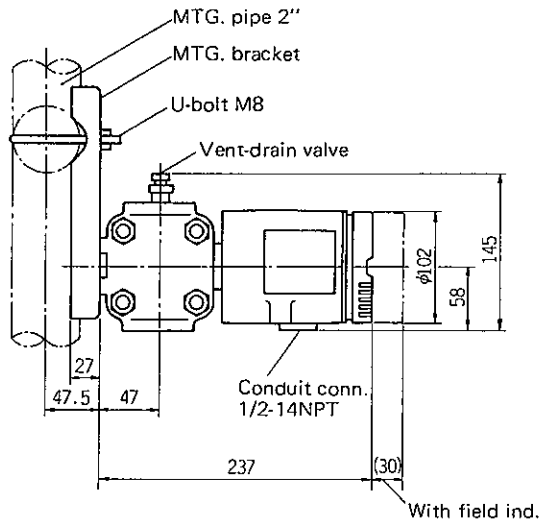
Pressure Rating, Measuring Range and Material

Type	Pressure rating (kg/cm <sup>2</sup> )	Measuring range (mmH <sub>2</sub> O)	Material								
			W	E	H	M	T	B	L	R	
FFC33	100	0 to 130...1,300	○	○	○	○	○	○	○	○	○
34	100	0 to 640...6,400	○	○	○	○	○	○	○	○	○
44	420	0 to 640...6,400	○	○	○	○	○	○	○	○	○
63	63	0 to 130...1,300								○	○
64	63	0 to 640...6,400								○	○

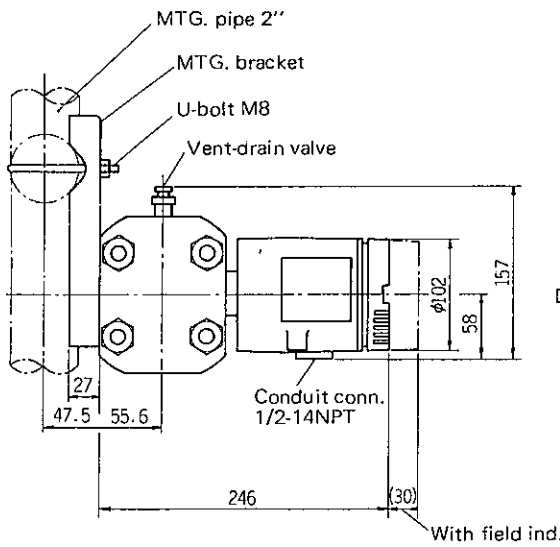
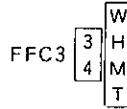
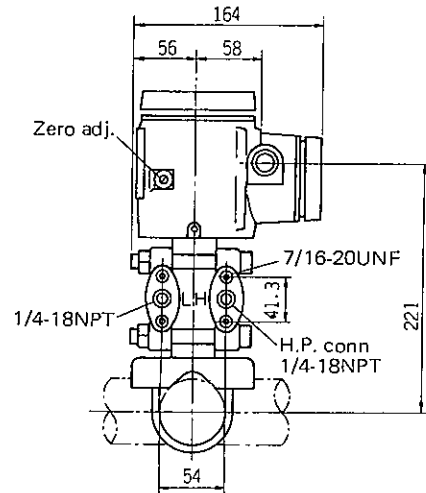
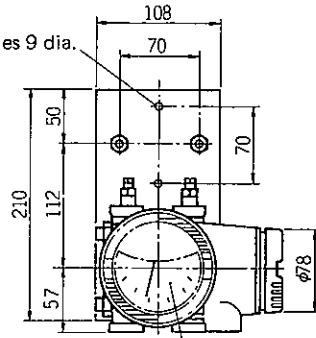
## Barriers and Gas groups

Codes	Certified by	Barrier	Installation drawing	Applicable gas groups
A	FM	STAHL, 8901, 8903	TC 408292	A, B, C, D
B	FM	Taylor, 1130, 1135	TC 408293	C, D
C	FM	Westinghouse, 75SB02	TC 408294	A, B, C, D
D	FM	MTL, 128, 188, 322	TC 408660	A, B, C, D
F	FM	Foxboro,	TC 409102	B, C, D
G	FM	Honeywell, 38545	TC 408625	A, B, C, D
K	SAA	MTL, 128, 188, 322	TD 407370	II C
L	PTB	Ik ≤ 100mA, U ≤ 30V	—	II C
P	CSA	STAHL, 8901, 8903	TC 408628	A, B, C, D
Q	CSA	Taylor, 1130, 1135	TC 408629	C, D
S	CSA	MTL, 128, 188, 322	TC 408661	A, B, C, D
U	CSA	Foxboro,	TC 409101	B, C, D
V	CSA	Honeywell, 38545	TC 408630	A, B, C, D

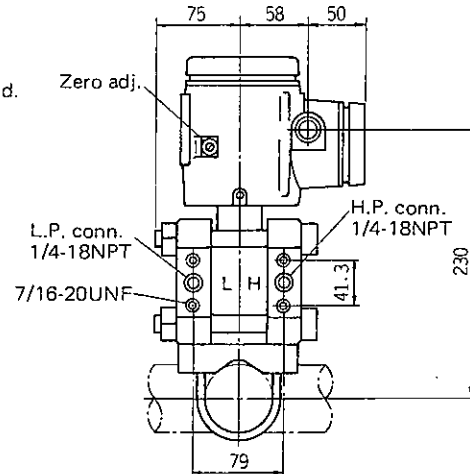
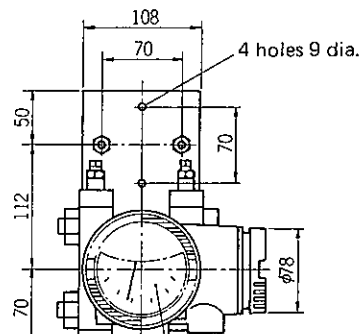
**OUTLINE** (Dimensions : mm  
Third angle projection)



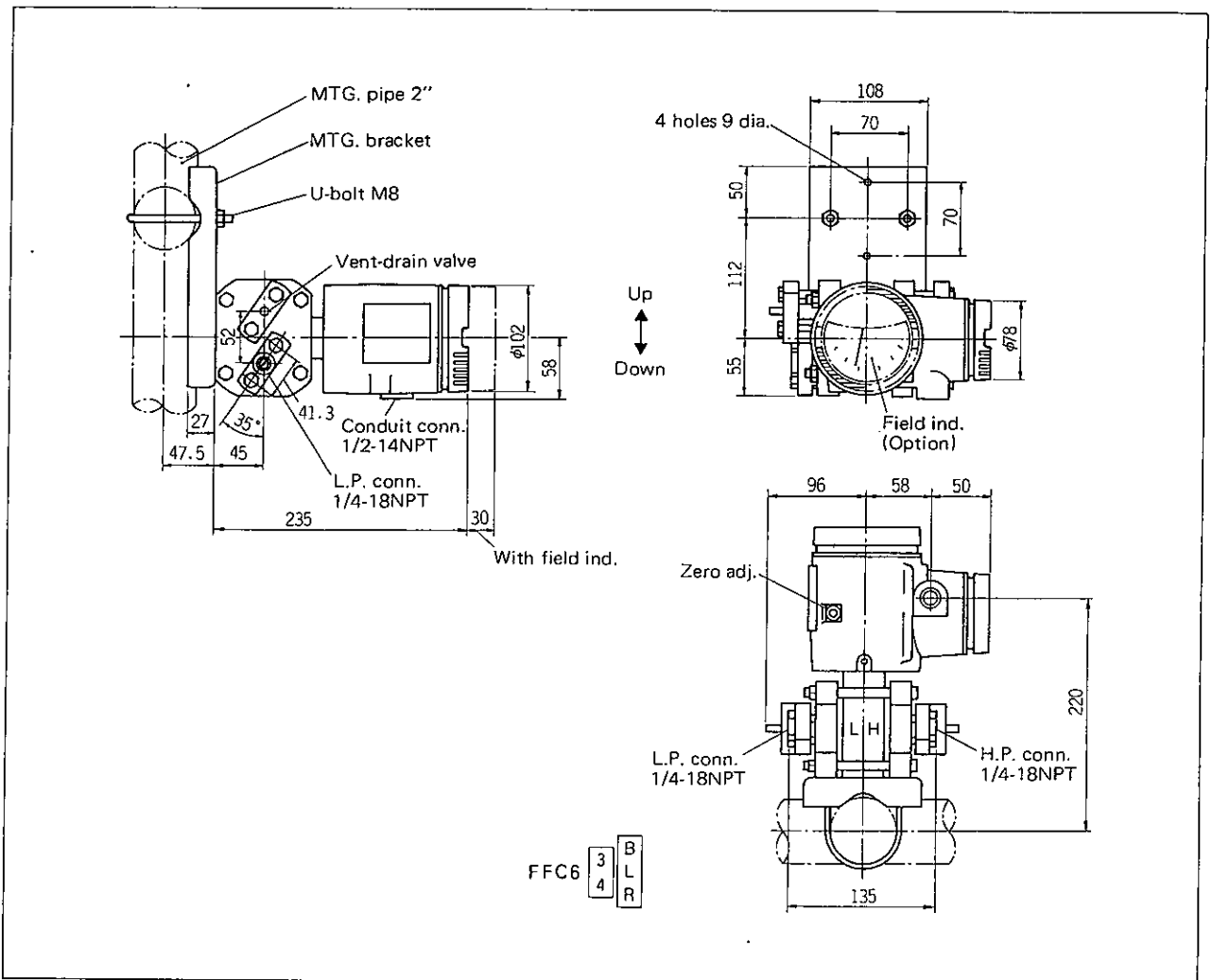
Up  
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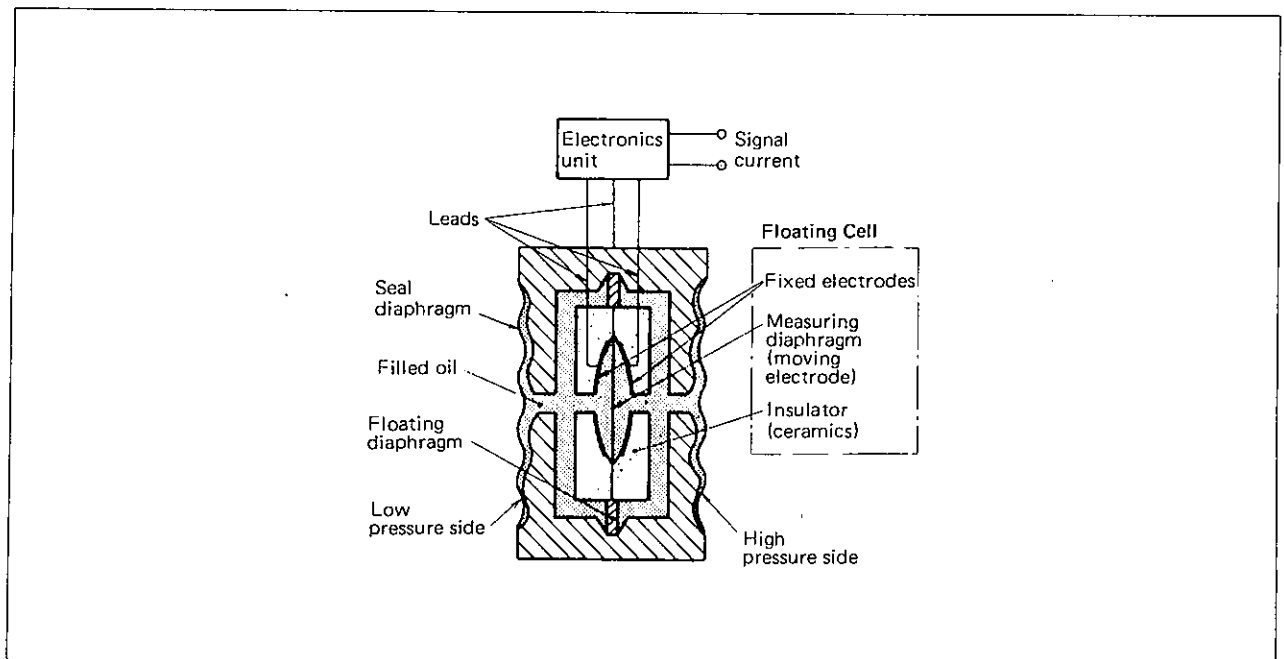
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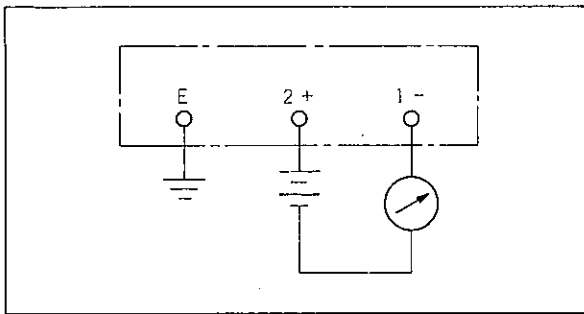
FFC44E



## STRUCTURAL PRINCIPLE OF DETECTING UNIT



## CONNECTION DIAGRAM



## ORDERING INFORMATION

1. Measuring object or application
2. Product name
3. Code symbols
4. Operating pressure and measuring range
5. Material of detecting unit
6. Explosionproof or special specifications
7. Other requirements

## RELATED INSTRUMENTS

- Equalizing valve
- Oval flange
- Integral orifice
- Opener
- Distributor
- Square root extractor (with distributor)
- Zener barrier