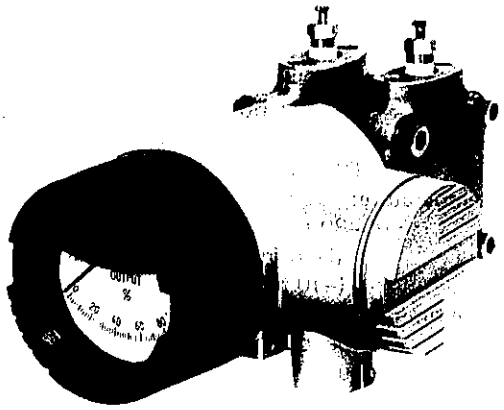
FUJI ELECTRIC

FC SERIES HIGH DIFFERENTIAL PRESSURE TRANSMITTER

DATA SHEET FFF

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 filled up.



FEATURES

1. **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 0.25%. The influence of static pressure, overload and temperature is smaller than any other transmitters on the market.
2. **High reliability and long-term stability**
   All welded, simple mechanism with few parts causes little failure and drift.
3. **Excellent environmental adaptability**
   Minimal influence of vibration, weather and radio frequency interference enables this transmitter to locate in almost all circumstances.
4. **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.
5. **Full range specifications**
   To meet any process requirements, a wide choice of explosionproof, large indicator, arrester, corrosion resistant materials, various treatments, integral orifice, equalizing valve etc. are available.
6. **Wide rangeability**
   Each transmitter is available with 10 to 1 turndown for application flexibility. FC SERIES transmitters are offered in six ranges; 0 to 10 mmH_2O to 0 to 30 kg/cm_2 with the same structure and size.

SPECIFICATIONS

Measuring range: FFF□5; 0 to 3,200...32,000 mmH_2O
FFF□6; 0 to 30,000...300,000 mmH_2O

Working pressure:
– 1 to 63, 100, 420 kg/cm^2
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^2)
		Seal diaphragm	Other wetted part	
W	SUS316	SUS316L	SUS316	100
E	Carbon steel	SUS316L	SUS316	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
Expoxy-polyurethane double coating, silver
Field indicator cover, black N3

Zero shift: Adjustable from –32% to +100% of 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 0.1 sec. (time constant of the detecting unit at room temperature)

Adjustable damping:

Four 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

FM : Factory Mutual Research (USA)
CSA : Canadian Standards Association
SAA : Standards Association of Australia
PTB : Physikalisch-Technische Bundesanstalt

Dimensions (HxWxD) and weight:

FFF3; 143x164x237(267)*mm, Approx. 6.5 kg
FFF4; 169x183x246(276)*mm, Approx. 12 kg
FFF6; 109x204x235(265)*mm, Approx. 8 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:

Daifloil (fluorinated fluid) filled and special cleaning (not available for material code "E")

Acid and alkali-proof treatment:

Detecting unit bolts: 17-4 PH SS
U-bolt, nuts and washers: SUS 304

Oval falange: Available for process connection flange. For details, refer to the oval flange data sheet EDS 6−10.

CHARACTERISTICS

(indicated by % of span with stainless steel diaphragm and silicone fill)

Accuracy: Better than ±0.25%
(under reference operating conditions, includes linearity, hysteresis and repeatability)

Repeatability: Better than ±0.1%

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/cm²

Allowable differential overpressure:

Up to the max. working pressure

Effect of differential overpressure:

At maximum span:
Zero shift 0.3%/±100 kg/cm²
0.8%/±420 kg/cm²

Power fluctuation:

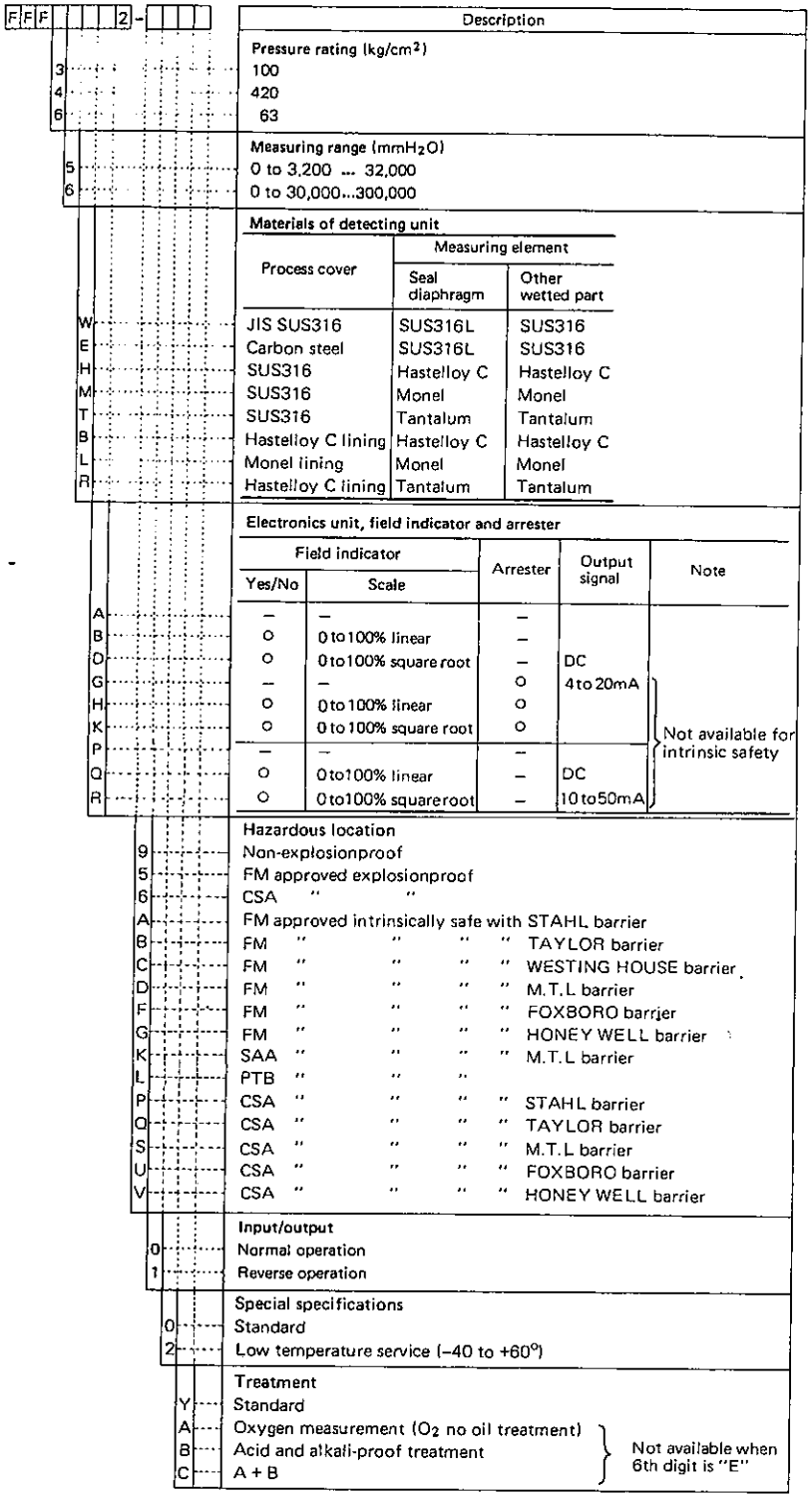
Zero shift 0.005%/V

Effect of position:

Zero shift 10 $mmH_2O/10°$ *2)

Note *1) This is doubled for corrosion resistance materials (Code: H, M, T, B, L and R)
*2) This is doubled for oxygen measurement.

CODE SYMBOLS



FFF□□2-□□□	Description
	Pressure rating (kg/cm²)
3	100
4	420
6	63
	Measuring range (mmH_2O)
5	0 to 3,200 ... 32,000
6	0 to 30,000...300,000

Materials of detecting unit

	Process cover	Measuring element: Seal diaphragm	Measuring element: Other wetted part
W	JIS SUS316	SUS316L	SUS316
E	Carbon steel	SUS316L	SUS316
H	SUS316	Hastelloy C	Hastelloy C
M	SUS316	Monel	Monel
T	SUS316	Tantalum	Tantalum
B	Hastelloy C lining	Hastelloy C	Hastelloy C
L	Monel lining	Monel	Monel
R	Hastelloy C lining	Tantalum	Tantalum

Electronics unit, field indicator and arrester

	Field indicator: Yes/No	Field indicator: Scale	Arrester	Output signal	Note
A	–	–	–		
B	O	0 to 100% linear	–		
O	O	0 to 100% square root	–	DC	
G	–	–	O	4 to 20mA	Not available for intrinsic safety
H	O	0 to 100% linear	O		
K	O	0 to 100% square root	O		
P	–	–	–		
Q	O	0 to 100% linear	–	DC	
R	O	0 to 100% square root	–	10 to 50mA	

Hazardous location

9	Non-explosionproof
5	FM approved explosionproof
6	CSA " "
A	FM approved intrinsically safe with STAHL barrier
B	FM " " " " TAYLOR barrier
C	FM " " " " WESTING HOUSE barrier
D	FM " " " " M.T.L barrier
F	FM " " " " FOXBORO barrier
G	FM " " " " HONEY WELL barrier
K	SAA " " " " M.T.L barrier
L	PTB " " "
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°)

Treatment

Y	Standard
A	Oxygen measurement (O_2 no oil treatment)
B	Acid and alkali-proof treatment
C	A + B

Not available when 6th digit is "E"

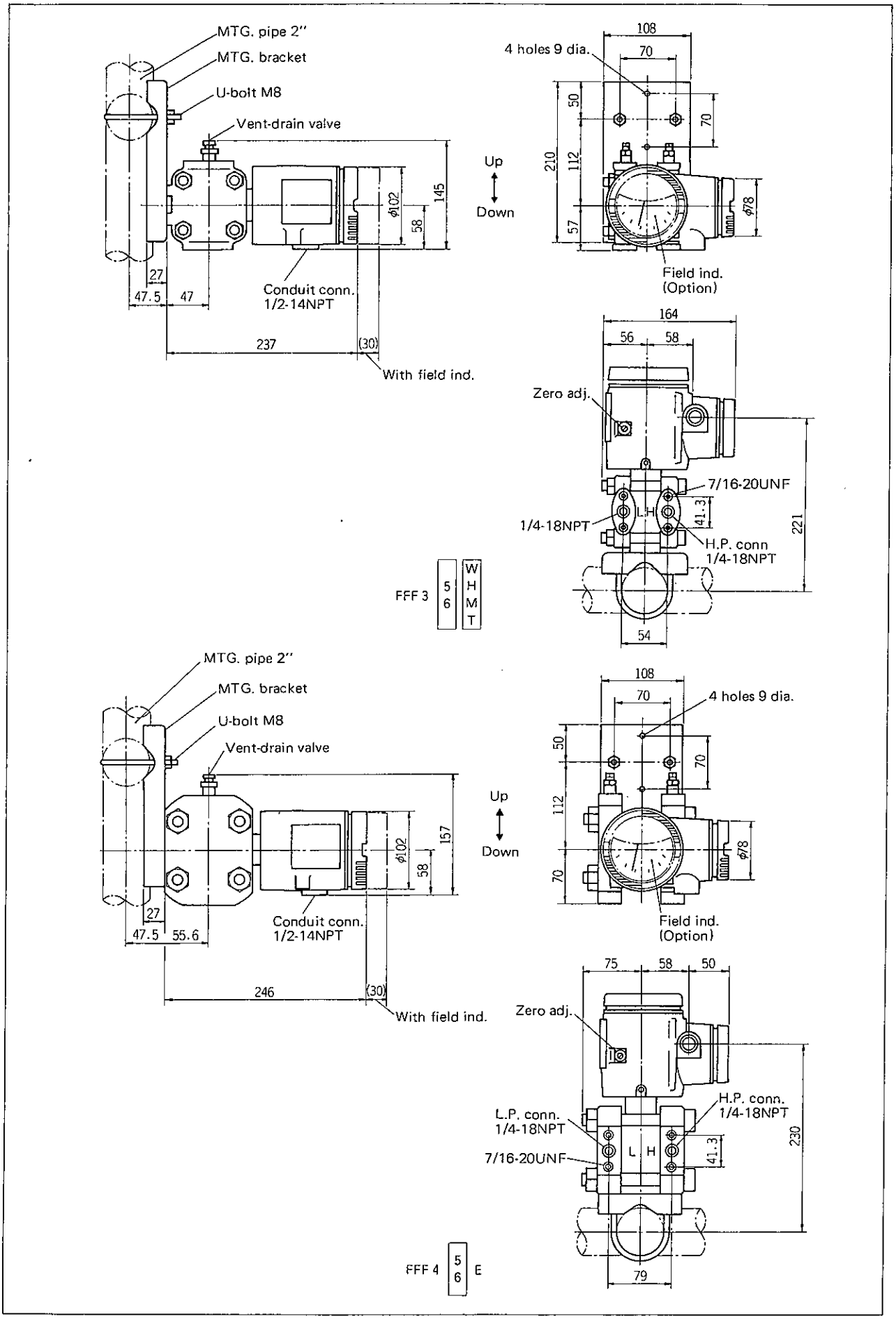
Barriers and Gas groups

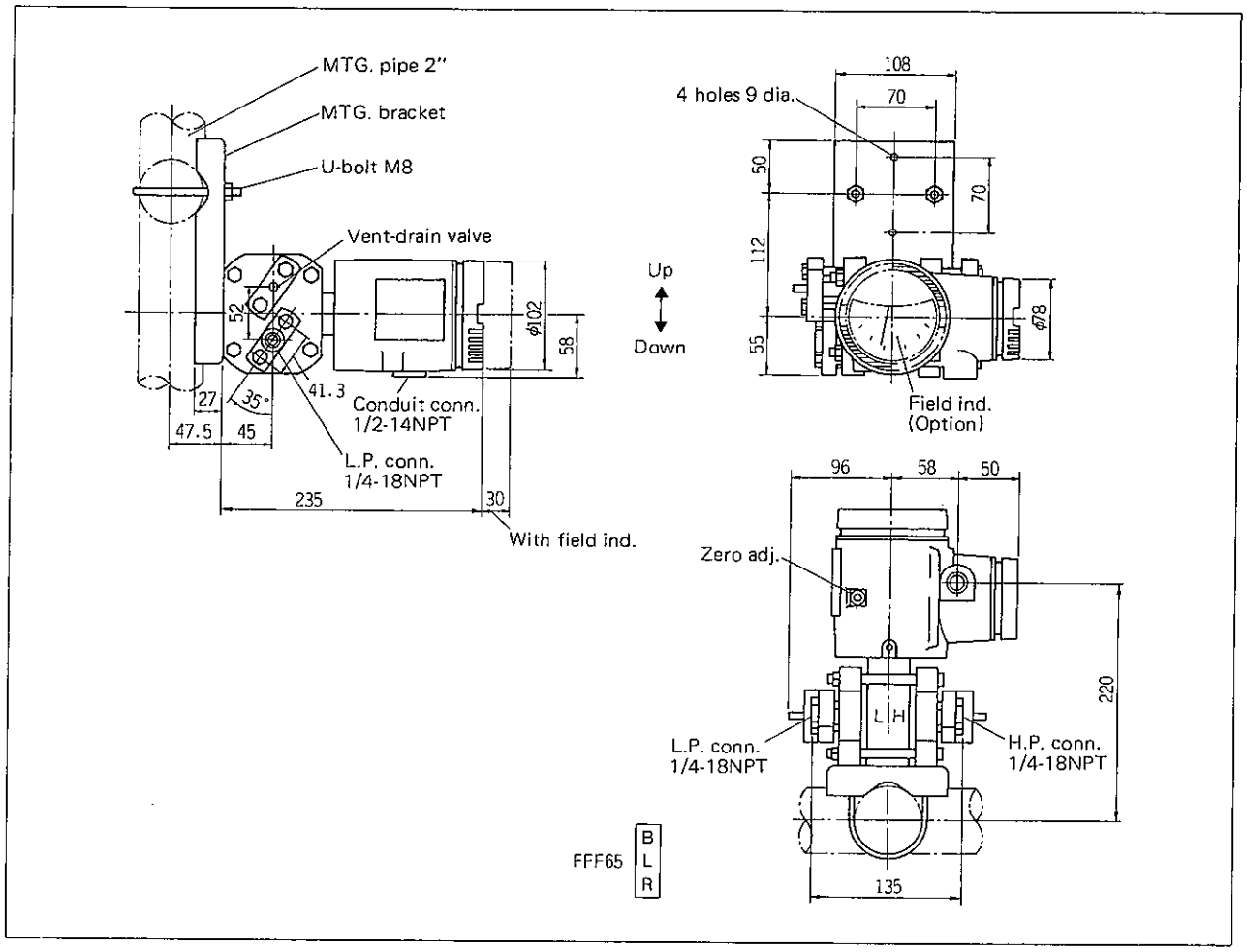
Codes	Certified by	Barrier	Installation drawing	Applicable gas groups
A	FM	STAHL, 8901, 8903	TC 408292	A, B, C, D
B	FM	Taylor, 1130, 1135	TC 408293	C, D
C	FM	Westinghouse, 75SB02	TC 408294	A, B, C, D
D	FM	MTL, 128, 188, 322	TC 408660	A, B, C, D
F	FM	Foxboro,	TC 409102	B, C, D
G	FM	Honeywell, 38545	TC 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

Pressure rating, Measuring range and Material

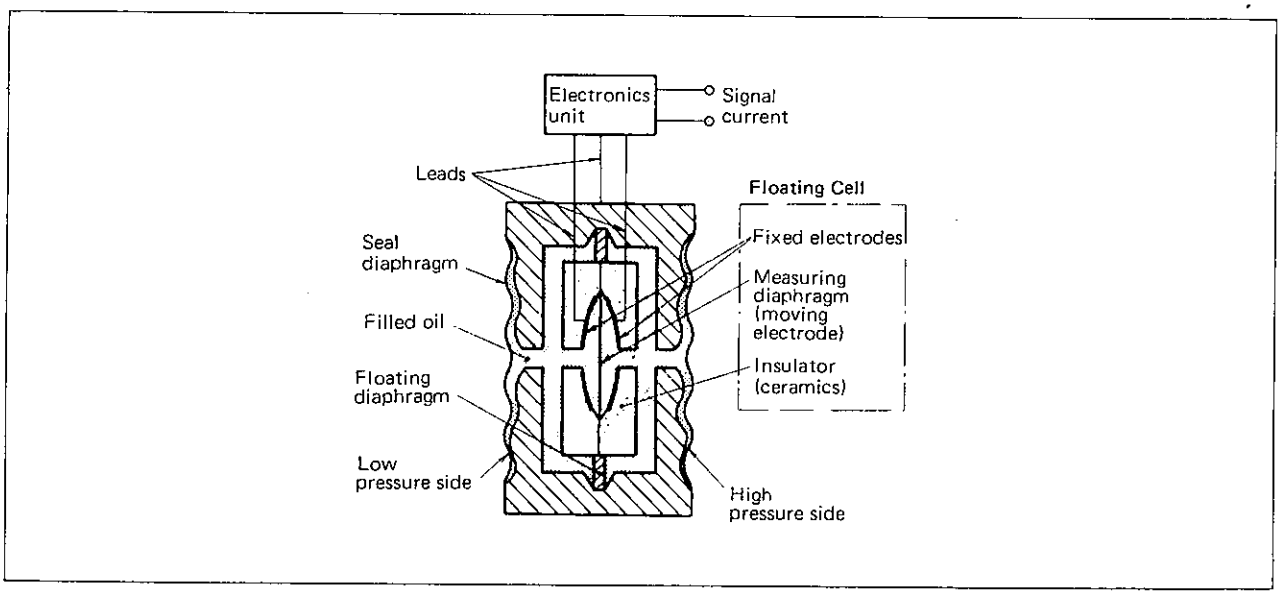
Type	Pressure rating (kg/cm²)	Measuring range (mmH_2O)	Material: W	E	H	M	T	B	L	R
FFF35	100	0 to 3200... 32000	O		O	O	O			
FFF36	100	0 to 30000...300000	O							
FFF45	420	0 to 3200... 32000		O						
FFF46	420	0 to 30000...300000		O						
FFF65	63	0 to 3200... 32000						O	O	O

OUTLINE DIAGRAM (Unit: mm)

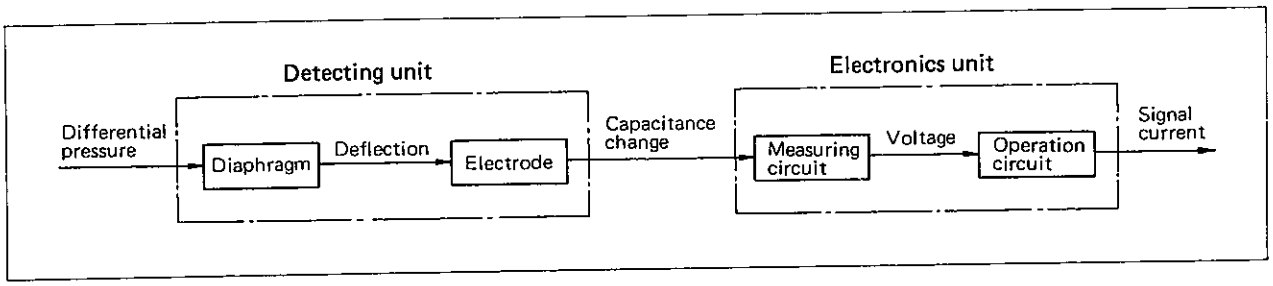




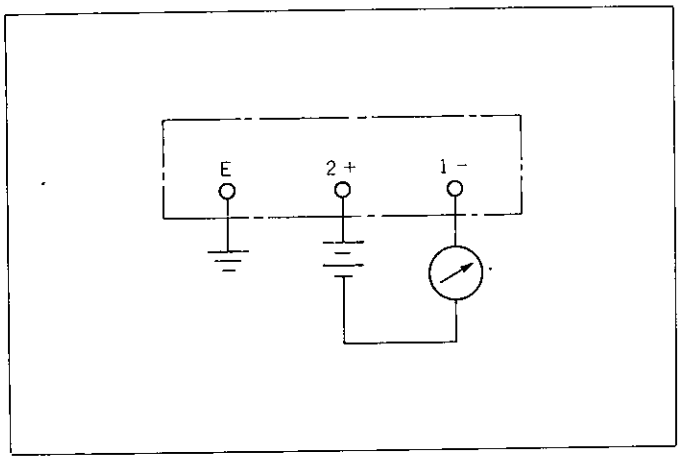
STRUCTURAL PRINCIPLE



FUNDAMENTAL BLOCK DIAGRAM



CONNECTION DIAGRAM



RELATED DEVICES

- Equalizing valve
- Oval flange
- Integral orifice
- Opener
- Distributor

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