

FC SERIES FLOW TRANSMITTER

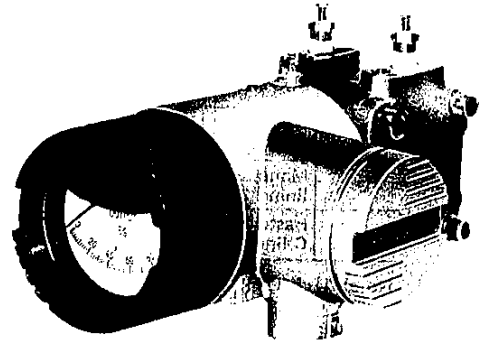
DATA SHEET

FJQ

FC SERIES capacitance type flow transmitters provide precise measurement of flow rate 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 ($\sqrt{\Delta P}$) in the electronics circuit for two-wire system transmission.

Explosionproof, field indicator, corrosion resistant materials, built-in arrester and other specifications are fully filled up.



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 0.25% of flow linear output. The influence of static pressure, overload 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 locate 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.
 Automatic changeover from the flow to the differential pressure linear output at 7% flow rate (0.5% differential pressure) assures a stabilized zero point and easy adjustment.
- Changeover to differential pressure linear characteristic**
 The transmitter can be switched from the flow to differential pressure linear characteristic by simply changing the position of the short bar on the front panel. Best suitable for a replace instrument.

- Full range specifications**
 To meet any process requirements, a wide choice of explosionproof, large indicator with linear scale, arrester, corrosion resistant materials, various treatments, integral orifice, equalizing valve etc. are available.
- Wide rangeability**
 Each transmitter is available with 5 to 1 turndown for application flexibility. FC SERIES transmitters are offered in five ranges; 0 to 10 to 0 to 32000 mm H₂O with the same structure and size.

SPECIFICATIONS

Measuring range and working pressure :

| Type | Working pressure (kg/cm ²) | Measuring range (mmH ₂ O) |
|-----------|--|--------------------------------------|
| F J Q 1 1 | -1 to 10 | 0 to 20... 100 |
| F J Q 2 2 | -1 to 30 | 0 to 50... 250 |
| F J Q □ 3 | -1 to 63·100 | 0 to 250... 1300 |
| F J Q □ 4 | -1 to 63·100·420 | 0 to 1300... 6400 |
| F J Q □ 5 | -1 to 63·100·420 | 0 to 6400... 32000 |

Material:
Detecting unit;

| Material code | Process cover | Measuring element | | Pressure rating (kg/cm ²) |
|---------------|--------------------|-------------------|--------------------|---------------------------------------|
| | | Seal diaphragm | Other wetted parts | |
| W | SUS 316 | SUS 316L | SUS 316 | 100 |
| E | Carbon steel | SUS 316L | SUS 316 | 420 |
| H | SUS 316 | Hastelloy C | Hastelloy C | 100 |
| M | SUS 316 | Monel | Monel | 100 |
| T | SUS 316 | 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) 1) FJQ11, 22 are available for code "W" only.
2) For details of the relationship between measuring range, pressure rating and material, refer to Code Symbols.

O-Ring: Viton
(Teflon for material codes B, L, R)
Fill: Silicone or Daifloil (fluorinated fluid for oxygen measurement)

Electronics casing:
Aluminum alloy
Epoxy-polyurethane double coating, silver
Field indicator cover, black N3.

Zero shift: Adjustable from -20 to 20% of the maximum span.
(The sum of zero shift and the 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)
(Less than DC 30V for CSA approved flameproof)
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: Detecting unit time constant at room temperature
FJQ11, 22; Faster than 0.8 sec.
Others; Faster than 0.3 sec.

Damping (after square-root extraction): 4 steps selectable; no damping, and time constants of 2, 3 and 5 sec.

Waterproof: IEC IP65 or NEMA4
Explosionproof:

| Flameproof (Explosionproof) | Certifying authority | Area classification | Temperature classification |
|-----------------------------|--------------------------------|-----------------------------------|----------------------------|
| | FM | Class I, Division 1 Group B, C, D | T6 |
| CSA | Class I, Division 1 Group C, D | T6 | |

CSA approved flameproof (explosionproof) is not available for 10-50mA output option.

FM : Factory Mutual Research
CSA : Canadian Standards Association

External dimensions (HxWxD) and weight:

FJQ1, 2, 3; 143x164x237 (267)* mm, approx. 6.5 kg
FJQ4; 169x183x246 (276)* mm, approx. 12 kg
FJQ6; 113x204x235 (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

Field indicator: Built in the electronics casing, class 1.5
0 to 100% linear

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 alkaliproof treatment: Detecting unit casing bolts; 17-4PH SS
U-bolt, nuts and washers; 304 SS

Oval flange: 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% at 20 to 100% flow, better than ±0.5% at 10 to 20% flow (under reference operating conditions, includes conformity, hysteresis, and repeatability)

Low flow cut: Flow cut at about 7% (0.5% differential pressure)
Switched to differential pressure linear characteristic at the cut point of 7% (no square-root extraction).

Repeatability: Better than ±0.1% at 20 to 100% flow
Sensitivity: Better than 0.05% at 20 to 100% flow

Temperature effect: *1, *2

At maximum span, between -30 to +80°C and 20 to 100% flow range;
Total effect (zero and span)
measuring range code "1" and "2"
 $\pm 4\%/55^\circ\text{C}$
measuring range code "3", "4" and "5"
 $\pm 2\%/55^\circ\text{C}$

Static pressure effect: *1, *2

At maximum span and 25% flow;
0.4%/max. working pressure
(0.4%/100 kg/cm² for pressure rating code "4")

Allowable differential overpressure:

Up to the max. working pressure

Effect of differential over pressure:

At maximum span and 25% flow;
 $\pm 0.6\%/ \pm \text{max. working pressure}$
($\pm 1.6\%/ \pm \text{max. working pressure}$ for pressure rating code "4")

Power fluctuation:

Zero shift; 0.005%/V

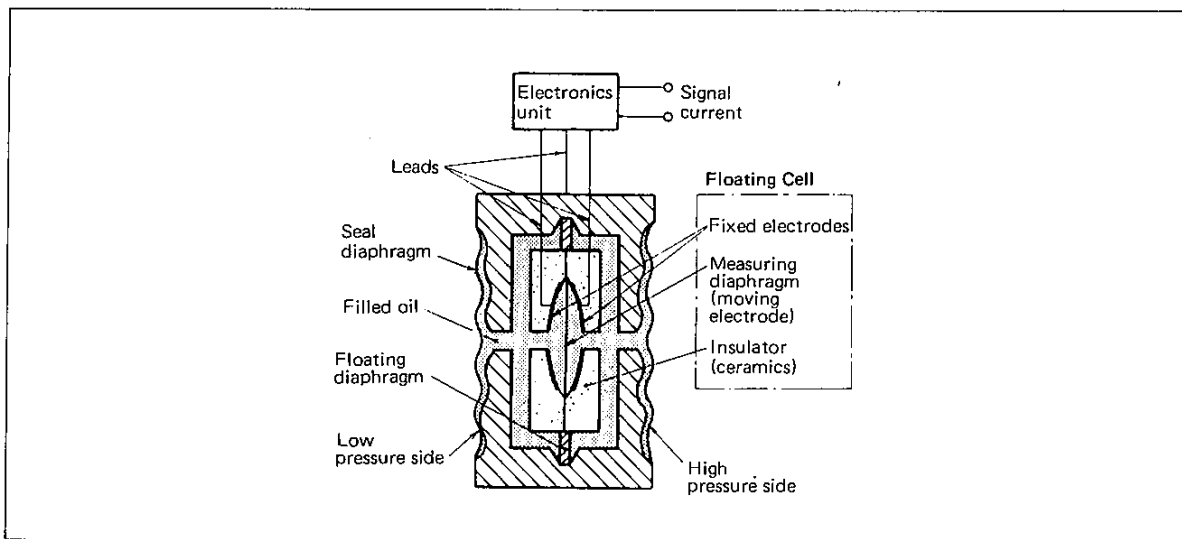
Effect of position: *2

Zero shift 10 mmH₂O/10°

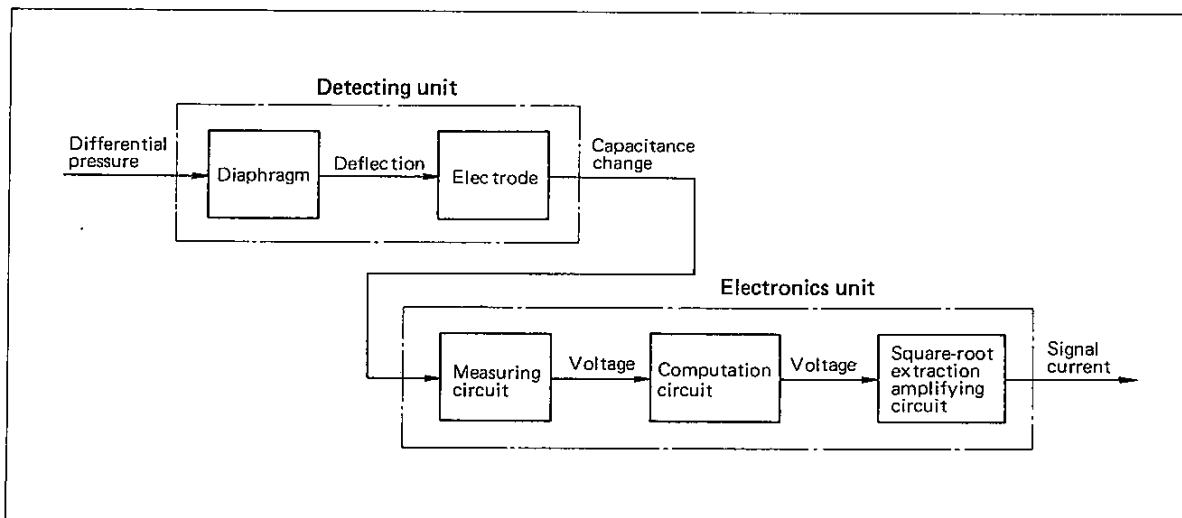
Note) *1) This is doubled for corrosion resistance materials (code; H, M, T, B, L and R)

*2) This is doubled for oxygen measurement.

STRUCTURAL PRINCIPLE



FUNDAMENTAL BLOCK DIAGRAM



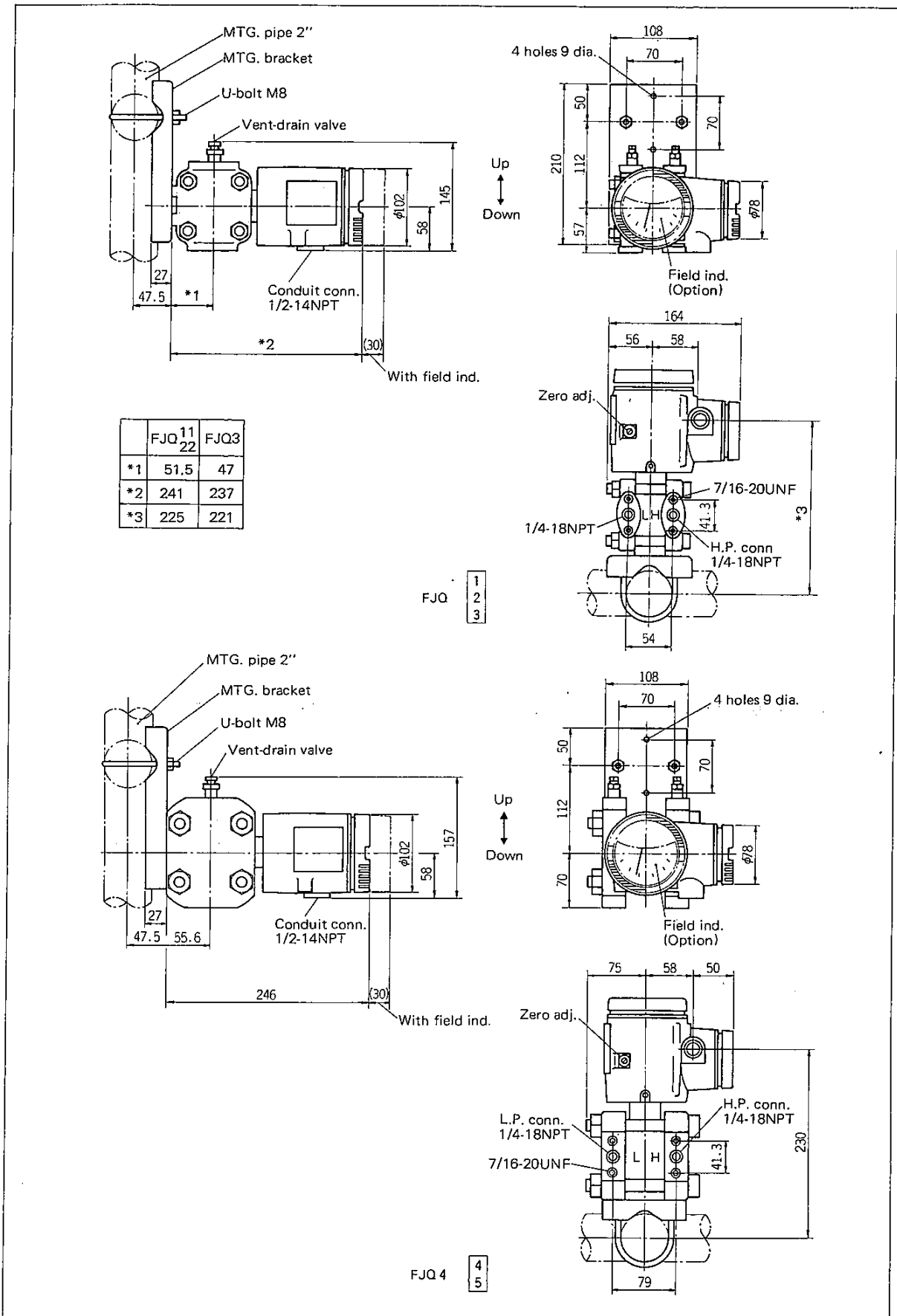
CODE SYMBOLS

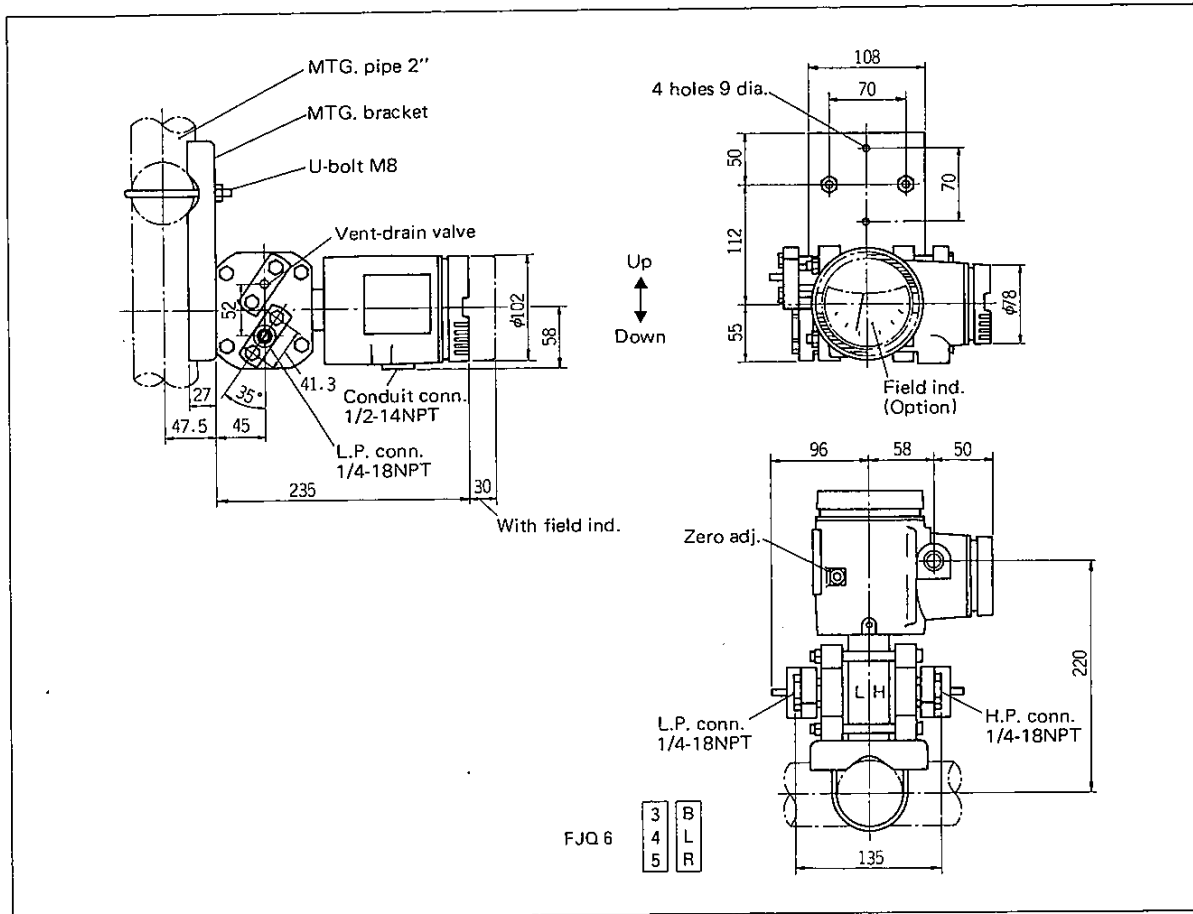
| FJQ | | 1 | | Description | |
|---|--|---|--------------------|---------------------------------------|----------------|
| 1 | | | | Pressure rating (kg/cm ²) | |
| 2 | | | | 10 | |
| 3 | | | | 30 | |
| 4 | | | | 100 | |
| 5 | | | | 420 | |
| 6 | | | | 63 | |
| Measuring range (mmH ₂ O) | | | | | |
| 1 | | | | 0 to 20 100 | |
| 2 | | | | 0 to 50 250 | |
| 3 | | | | 0 to 250 1300 | |
| 4 | | | | 0 to 1300 6400 | |
| 5 | | | | 0 to 6400 32000 | |
| Materials of detecting unit | | | | | |
| | | Measuring elements | | | |
| | | Seal diaphragm | Other wetted parts | | |
| W | | 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 | |
| Field indicator, arrester | | | | | |
| | | Field indicator | | Arrester | Signal current |
| | | Yes/No | Scale | | |
| A | | — | — | — | |
| B | | ○ | 0 to 100% linear | — | DC |
| G | | — | — | ○ | 4 to 20mA |
| H | | ○ | 0 to 100% linear | ○ | |
| P | | — | — | — | DC |
| Q | | ○ | 0 to 100% linear | — | 10 to 50mA |
| Hazardous location | | | | | |
| 9 | | Non-explosion proof | | | |
| 5 | | FM approved explosionproof | | | |
| 6 | | CSA " " " | | | |
| (not available for 10-50mA output option) | | | | | |
| Input/output | | | | | |
| 0 | | Normal operation | | | |
| Special specifications | | | | | |
| 0 | | Standard | | | |
| 2 | | Low temperature service (-40 to +60°C) | | | |
| Treatment | | | | | |
| Y | | Standard | | | |
| A | | Oxygen measurement (O ₂ no oil treatment) | | | |
| B | | Acid and alkaliproof treatment (not applicable to material "E") | | | |
| C | | A + B | | | |

Relationship between Pressure Rating, Measuring Range and Material

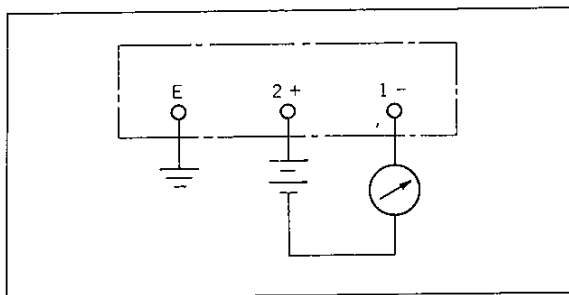
| Type | Pressure rating (kg/cm ²) | Measuring range (mmH ₂ O) | Material | | | | | | | | |
|-------|---------------------------------------|--------------------------------------|----------|---|---|---|---|---|---|---|---|
| | | | W | E | H | M | T | B | L | R | |
| FJQ11 | 10 | 0 to 20... 100 | ○ | | | | | | | | |
| 22 | 30 | 0 to 50... 250 | ○ | | | | | | | | |
| 33 | 100 | 0 to 250... 1300 | ○ | ○ | ○ | ○ | | | | | |
| 34 | 100 | 0 to 1300... 6400 | ○ | ○ | ○ | ○ | | | | | |
| 35 | 100 | 0 to 6400...32000 | ○ | ○ | ○ | ○ | | | | | |
| 44 | 420 | 0 to 1300... 6400 | ○ | | | | | | | | |
| 45 | 420 | 0 to 6400...32000 | ○ | | | | | | | | |
| 63 | 63 | 0 to 250... 1300 | | | | | | ○ | ○ | ○ | |
| 64 | 63 | 0 to 1300... 6400 | | | | | | | ○ | ○ | ○ |
| 65 | 63 | 0 to 6400...32000 | | | | | | | | ○ | ○ |

OUTLINE DIAGRAM (Unit:mm)





CONNECTION DIAGRAM



ORDERING INFORMATION

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

RELATED DEVICES

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