FUJI ELECTRIC

FFI SYSTEM

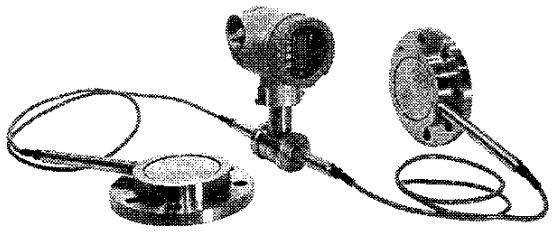
OPTICAL DIFFERENTIAL PRESSURE TRANSMITTER WITH REMOTE SEAL DIAPHRAGM

DATA SHEET FFM···2

The model FFM 2 Optical Differential Pressure Transmitter is a precision electrostatic capacitance type instrument with remote seal diaphragm used for measuring fluids. The transmission unit incorporates a micro-processor for digital signal processing to achieve high accurate measurements.

A fiber optic cable used for the signal transmission line forms an optical field instrumentation system together with an optical star coupler and a master station.

An 6mm dia. optical fiber cable is connected to the instrument.



SPECIFICATIONS

Functional specifications

Fluids measured: Liquid, gas or steam

Measuring range:

Type	Span [kPa] (mH_2O)	Range limits [kPa] (mH_2O)	
		Lower range limit	Upper range limit
FFMS□3	3.2...32 (or 0.32...3.2)	–32 (–3.2)	32 (3.2)
FFMS□4	6.4...64 (or 0.64...6.4)	–64 (–6.4)	64 (6.4)
FFMS□5	13...130 (or 1.3...13)	–130 (–13)	130 (13)
FFMS□6	50...500 (or 5...50)	–500 (–50)	500 (50)

Operating pressure: Flange rating

Process pressure limit:

Sealing liquid	Code	Process temperature	Operating pressure
Fluorolube oil	W, A, D	–20 to 120°C	0kPa {0kgf/cm²} min.
Silicon oil	H	–15 to 250°C	
Silicon oil	J	85 to 300°C	
Silicon oil	Y, G	–40 to 120°C	2.7kPa abs {20.3mmHg abs} min. See Fig.1 on next page
Silicon oil	S	–15 to 250°C	
Silicon oil	T	85 to 300°C	
Silicon oil	K	–15 to 200°C	0.13kPa abs {0.98mmHg abs} min. See Fig.2 on next page

Output: Linear (optical digital)

Power supply: Built-in lithium battery (expected life about 2 years)

Setting:

Item	Remote setting	Direct setting
Detail	1. Measuring range 2. Damping(*1) 3. Read from, write in transmitter inside memory	1. Measuring range 2. Damping(*1)
Setter	By HHC(*2), MS(*2)	By indication unit

Notes: *
(1) Damping 0.2 to 51.2sec
(2) HHC: Hand held communicator
MS: Master station
(see System block diagram on next page)

Zero elevation and suppression:
From –100 to +90% of maximum span

Self-diagnosis: Displayed on indication unit (option) and transmitted to host master station

	HHC, MS	Indication unit
Measuring range abnormal	○	○
Detecting unit failure	○	○
Battery voltage low	○	○
Battery voltage	○	—
Amplifier ambient temperature	○	—

Explosion-proof: JIS i3aG4. Safety barriers are not necessary.

Ambient temperature:
–30 to +70°C
(For intrinsic safety: –10 to +60°C
When filled with Fluorolube oil: –10 to +60°C
Silicon oil H, S, K: –10 to +70°C
Silicon oil J, T: +20 to +70°C)

Storage temperature:
–30 to +70°C

Ambient humidity:
0 to 95%RH

Transmission: Half-duplex bi-directional transmission with one-fiber system (6mm dia. cable)
Transmission distance: 1.2km max.
(free from noise effects and surge)

Indication of measured value:
–100 to 100% or actual value scale, LCD 4-digit

Others: Optical/electric converter is available with transmission distance of 4km max.

Performance specifications

Accuracy rating: ±0.2% at 0 to 100% output signal under reference conditions (inclusive of linearity, hysteresis and repeatability)

Temperature effect:
Zero shift at maximum span
±0.8%/55°C between –30 and +70°C
(±0.5%/55°C optional)
Note:
(1) Output changes when entire transmitter is at same temperature if high and low pressure side flanges and transmitter proper are at the same level.
(2) Error increases if there is difference in temperature between high and low pressure side flanges and capillary.

Over-pressure effect:
Zero shift at maximum span
±0.3%/nominal pressure of flange

Static pressure effect:
Zero shift at maximum span
±0.2%/1MPa {10.2kgf/cm²}
Span change at maximum span
$-0.2\ ^{+0.2}_{-0.1}$ %/nominal pressure of flange

Physical specifications

Flange material: Carbon steel or SUS304
Process-wetted part material:

Seal diaphragm	Other wetted parts
SUS316L	SUS316
Hastelloy-C	Hastelloy-C
Monel	Monel
Tantalum	Tantalum
Titanium	Titanium
Zirconium	Zirconium
Fill-fluid.....	Silicon oil
Amplifier case	Aluminum alloy

Finish: Epoxy-polyurethane double coat, silver (blue for amplifier case cover)

Environmental protection:
Meets JIS C0920, immersion-proof (equivalent to IEC IP65 and NEMA4)

External dimensions (H x W x D) and mass(weight) (without mounting plate):
132 x 124 x 287mm, approx. 10 to 32kg

Mounting method:
Mounted on horizontal or vertical 50A {2B} pipe with U-bolt

Cable and connection:
Optical fiber cable per our specification (separately available)
Used with optical connector

Process connection:
By following flange standard designated:
JIS: 10K80A, 10K100A, 30K80A, 30K100A
ANSI/JP1: 150LB 3B, 150LB 4B,
300LB 3B, 300LB 4B

Diaphragm extension length:
0, 50, 100, 150, 200mm
(as specified)

Optional specifications

Indication unit: 4-digit LCD unit
Setting unit (4 pushbutton switches)
Operating temperature range –20 to +70°C

Material: Stainless steel fixture

Oxygen oil-proof processing:
Fluorolube filled. Wetted parts degreased and cleaned. Available for material code W, A, B, C or D.

Fill-fluid: Fluorolube oil

Chlorine service: Fluorolube oil filled (for material code H, F, G, K, L or T)

Acid/alkali-proof treatment:
Depends on Code symbol of pipe fixture (stainless steel) and bolt/nut (stainless steel)

Scope of delivery

Instrument body and mounting fixture

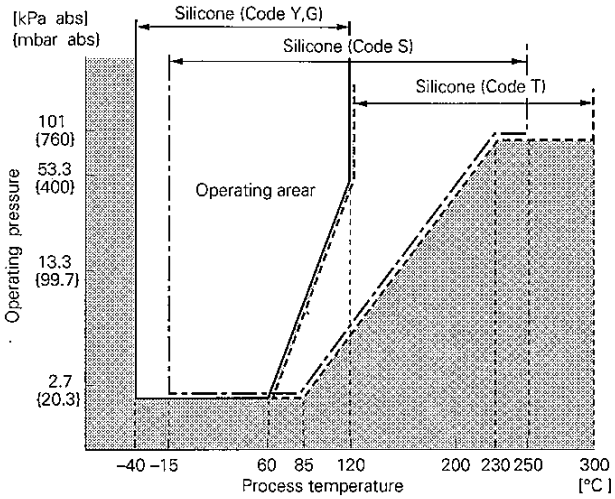


Fig. 1 Relation between process temperature and operating pressure

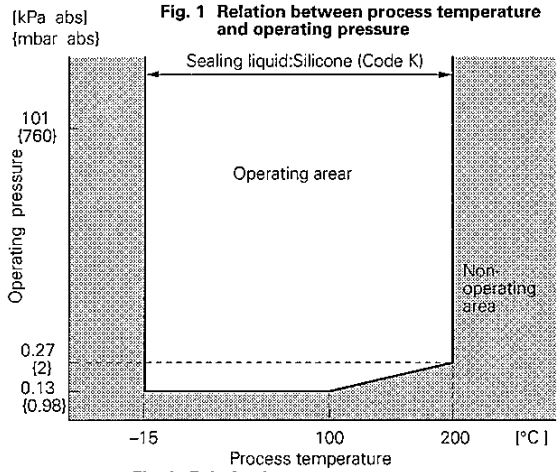
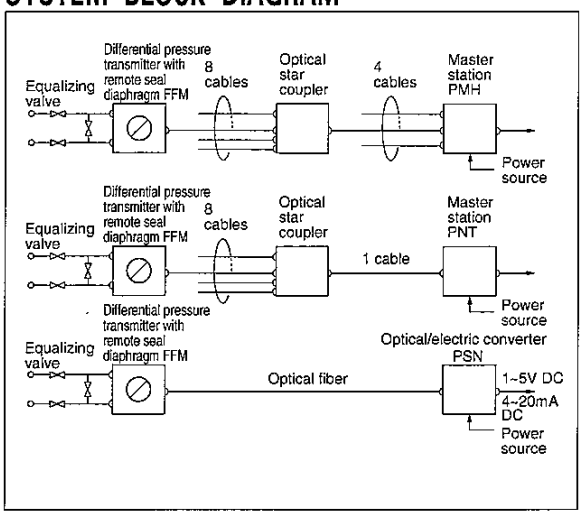


Fig. 2 Relation between process temperature and operating pressure

Note: When operating under vacuum, install the transmitter body lower than the flange mounting position.

SYSTEM BLOCK DIAGRAM



CODE SYMBOLS

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

F F M S _ _ _ 2 - _ _ _ _ _

Description		
	Flange material	Flange standard
0	SUS304	JIS 10K 80A
1		JIS 10K 100A
2		JIS 30K 80A
3		JIS 30K 100A
4		ANSI/JP1 150LB 3B
5		ANSI/JP1 150LB 4B
6		ANSI/JP1 300LB 3B
7		ANSI/JP1 300LB 4B
A	Carbon steel	JIS 10K 80A
B		JIS 10K 100A
C		JIS 30K 80A
D		JIS 30K 100A
E		ANSI/JP1 150LB 3B
F		ANSI/JP1 150LB 4B
G		ANSI/JP1 300LB 3B
H		ANSI/JP1 300LB 4B
P	No flange (wafer type)	JIS 80A, ANSI/JP1 3B, For DN80
Q		JIS 100A, ANSI/JP1.4B, For DN100

	Measuring span [kPa] (mH2O)
3	3.2...32 (or 0.32...3.2)
4	6.4...64 (or 0.64...6.4)
5	13...130 (or 1.3...13)
6	50...500 (or 5...50)

	Material/diaphragm extension length		
	Seal diaphragm	Other wetted parts	Diaphragm extension length[mm]
W	SUS316L	SUS316L	0
A			50 *
B			100 *
C			150 *
D			200
H	Hastelloy-C	Hastelloy-C	0
F			50
G			100
K			150
L			200
M	Monel	Monel	0
T	Tantalum	Tantalum	0
P	Titanium	Titanium	0
R	Zirconium	Zirconium	0

Note: *100A or 4B flange size, extension length of 0mm is unavailable

9 10 11 12 13

_ _ _ _ _

Description		
Transmission unit, field indicator		
Field indicator		Remarks
Yes/ No	Scale	
A —	—	
L Yes	0 to 100% digital indication	
P Yes	Actual digital scale indication	

	Explosion-proof
A	Non-explosion proof
G	Intrinsic safety, JIS

	Pipe fixture material	Capillary length [m]
A	Steel	1.5
B		3
C		6
D	Stainless	1.5
E		3
F		6

	Special specification	
	Stainless steel bolt/nut	Optical fiber cable protective adapter for 6mm dia. cable
Y	×	×
A	○	×
B	×	○
C	○	○

Note: 9mm dia. optical fiber cable connecting type is also available as an option.

	Treatment	Fill-fluid	
Y	No	Silicon oil (for general purpose)	
W	No	Fluorolube oil	
G	Degreasing	Silicon oil	
A	Oxygen oil-proof processing	Fluorolube oil (W, A, B, C or D at 7th digit)	
D	Chlorine service	Fluorolube oil (H, F, G, L or T at 7th digit)	
H	No	Silicon oil (for high temperature)	Available when 7th digit is W, A, B, C or D
J	No	Silicon oil (for high temperature)	
S	No	Silicon oil (for high temperature, vacuum)	
T	No	Silicon oil (for high temperature, vacuum)	
K	No	Silicon oil (for high temperature, vacuum)	

Note: * Available when 5th digit is 1, 3, 5, 7, B, D, F, H or Q if 13th digit is S, T or K and if 7th digit is A, B, C or D.

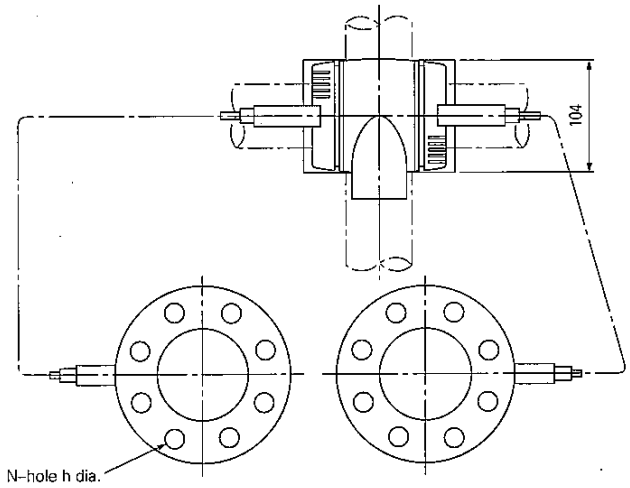
RELATED DEVICES

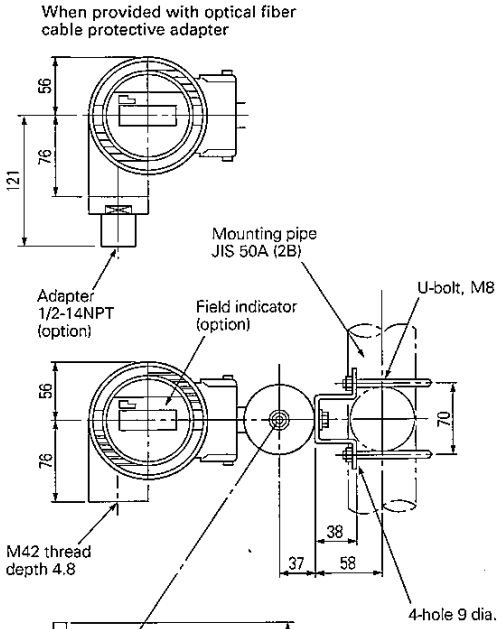
Master station: (Data sheet No. EDS11-86, EDS11-121)
Optical/electric converter:
(Data sheet No. EDS9-45)
Optical star coupler:
(Data sheet No. EDS8-48)
Hand held communicator:
(Data sheet No. EDS8-44)
Connector assembly tool
Optical connector
Cable:

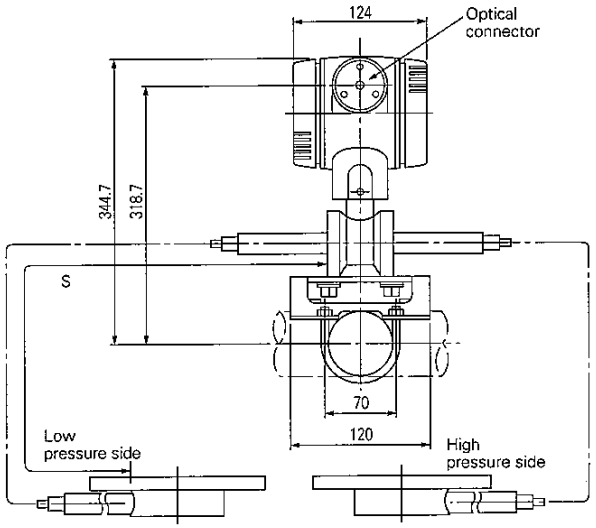
ORDERING INFORMATION

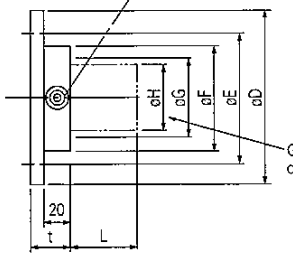
1. Process variable or use
2. Instrument name
3. Model type
4. Operating pressure and measuring range
5. Measuring unit material
6. Options
7. Others

OUTLINE DIAGRAM (Unit:mm)









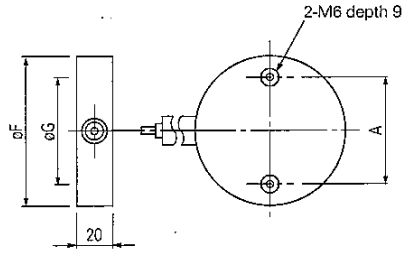
ø:dia.

øD	øE	øF	øG	øg	øH	N-øh	Flange standard
185	150	126	100	73	38	8-19	JIS-10K-80A
210	175	151	103	96	38	8-19	JIS-10K-100A
210	170	126	100	73	48	8-23	JIS-30K-80A
240	195	151	103	96	52	8-25	JIS-30K-100A
191	152.5	126	100	73	44	4-20	ANSI/JPI-150LB-3B
229	190.5	151	103	96	44	8-20	ANSI/JPI-150LB-4B
210	168	126	100	73	49	8-23	ANSI/JPI-300LB-3B
254	200	151	103	96	52	8-23	ANSI/JPI-300LB-4B

Capillary length S	Extension length L
1500	0
3000	50
6000	100
	150
	200

Wafer type	A
For 80A, 3B	116
For 100A, 4B	141

Note : If no flange is necessary, the flange is excluded from the scope.
To install the flange, refer to the figure on right.



Wafer flange mounting dimensions

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