OPTICAL LEVEL TRANSMITTER

DATA SHEET FPK···3

The Model FPK 3 Optical Level Transmitter measures pressures of various fluids accurately, converts them into optical digital signals and outputs them. This is an intelligent transmitter providing excellent performance and functions due to incorporation of electrostatic capacitance type silicon sensor and microprocessor.

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

FEATURES

1. Resistive to noise and lightning
   Optical signal ensures a reliable signal transmission, because it is not be affected by external noise and inductive lightning. Use of a nonmetallic optical (fiber) cable prevents propagation of inductive lightning through the cable, so a signal transmission immune to lightning can be realized.
2. Reliability due to redundant configuration
   Host system can be duplicated by using two optical cable trunk lines (between an optical star coupler and host system). This enhances reliability of users' systems.
3. Intrinsic safety type explosion-proof
   Each equipment with a built-in battery can be constructed so as to be an intrinsic safety type individually (intrinsic safety type barrier unnecessary).

SPECIFICATIONS

Functional specifications

Fluids measured: Liquid, gas or steam

Measuring range:

Type	Span [kPa]		Range limits [kPa]	
	Minimum value	Maximum value	Lower range limit	Upper range limit
FPK□□3	0.8	32	–32	32
FPK□□5	3.25	130	–130	130
FPK□□6	12.5	500	–500	500

Operating pressure:
Up to maximum operating pressure of flange

Process temperature, Allowable pressure limit:

Fill-fluid	13th code digit	Process temperature	Allowable pressure limit
Fluorolube oil	W, A, D	–20 to +80˚C	Atmospheric pressure or more
Silicon oil	H	–15 to +250˚C	
Silicon oil	J	85 to +300˚C	
Silicon oil	Y, G	–40 to +120˚C	2.7 kPa abs or more. See Fig. 1.
Silicon oil	S	–15 to +250˚C	
Silicon oil	T	85 to +300˚C	
Silicon oil	K	–15 to +150˚C	0.13 kPa abs or more. See Fig. 2.

Note: Process temperature on low pressure side is 120˚C or less.

For small bore 40A, 50A, 1-1/2B or 2B

Fill-fluid	13th code digit	Process temperature	Allowable pressure limit
Fluorolube oil	W, A, D	–20 to +80˚C	Atmospheric pressure or more
Silicon oil	H	0 to +250˚C	
Silicon oil	Y, G	–40 to +120˚C	2.7 kPa abs or more. See Fig. 1.
Silicon oil	S	0 to +250˚C	

Note: Process temperature on low pressure side is 120˚C or more.

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

Diagnosis item	Host system	Indication unit
Measuring range abnormal	○	○
Detecting unit failure	○	○
Amplifier abnormal	○	○
Battery voltage	○	—
Battery voltage low alarm	○	○

Remote control function:
See Table 1.

Output signal: Optical digital signal

Power supply: Built-in lithium battery (expected life: about 4 years)

Optical cable: Code set type, silica fiber ... core/clad diameter 100/140 μm

Optical connector:
FC connector

Transmission distance:
1.5 km max. (when transmission loss of optical cable is 4 dB/km)

Damping: Variable from 0.2 to 32 sec (time constant)

Zero elevation and suppression:
Possible within ±100% of maximum span.

Explosion-proof: Intrinsic safety type, JIS ib IIC T3

Ambient temperature:
–30 to +70°C
–10 to +60°C for intrinsic safety explosion-proof type
–20 to +70°C when provided with indicator
–10 to +60°C when filled with fluorolube oil
–10 to +70°C for silicon oil H, S or K
+20 to +70°C for silicon oil J or T

For small bore 40A, 50A, 1-1/2B or 2B
–15 to +65°C
–10 to +60°C for intrinsic safety explosion-proof type
–15 to +65°C when provided with indicator
–10 to +60°C when filled with fluorolube oil
–10 to +60°C for silicon oil H or S

Storage temperature:
–40 to +80°C

Performance specifications

Accuracy rating (Note)

±0.2% when measuring span is 1/10 or more of maximum span.

$$\pm \left(0.1 + 0.01 \frac{\text{max. span}}{\text{measuring span}}\right)\%$$ when measuring span is less than 1/10 of maximum span.

Note: Percent value with respect to measuring span (including linearity, hysteresis and repeatability in standard 23˚C status)

For small bore 40A, 50A, 1-1/2B or 2B

±0.25% when measuring span is 1/10 or more of maximum span.

$$\pm \left(0.17 + 0.008 \frac{\text{max. span}}{\text{measuring span}}\right)\%$$ when measuring span is less than 1/10 the max. span.

Ambient temperature effect:
Zero shift: ±(0.5 x URL/x)% / 28°C
Overall shift: ±(0.7 x URL/x)% / 28°C
Where; URL: Maximum span
x: Measuring span
Twice as large as above when 7th digit (material) is other than V.

Remarks:
(1) Output change is shown for when the temperature is the same at the process pressure receiving unit and transmitter.
(2) The error increases if there is a temperature difference between the process pressure receiving unit and transmitter.

Ambient temperature effect:
For small bore 40A, 50A, 1-1/2B or 2B

Zero shift : ±0.7% / 28°C when x is 1/2 URL or more.

Zero shift : $\pm \left(0.7 \frac{\text{URL}}{2x}\right)\%$ / 28°C when x is less than 1/2 URL.

overall shift : ±0.9% / 28°C when x is 1/2 URL or more.

overall shift : $\pm \left(0.4+0.5 \frac{\text{URL}}{2x}\right)\%$ / 28°C when x is less than 1/2 URL.

Note 1: Conditions ... Capillary length up to 3 m.
If capillary length is 5 m, performance is 1.5 times that given above.
Note 2: 2.5 times as large as above when 7th digit (material) is other than V.

Overrange effect:

Zero shift at max. span
±0.1% / flange nominal pressure
Twice as large as above when 7th digit (material) is other than V
(2.5 times for small bore 40A, 50A, 1-1/2B or 2B)

Static pressure effect:

Zero shift at max. span
±0.2% / 1MPa
Twice as large as above when 7th digit (material) is other than V
(2.5 times for small bore 40A, 50A, 1-1/2B or 2B)

Span shift at measuring span
–0.2 ±0.2% / 1MPa
±0.2% / 1MPa for small bore 40A, 50A, 1-1/2B or 2B

Measurement period: 0.2 sec

Response time

Type	*Time constant [sec]	Dead time [sec]
FPK□□3	0.55	About 0.2
FPK□□$^{5}_{6}$	0.3	

Note: *Value at 23°C

Physical specifications

Flange material: SUS304

Detecting unit material:

Material code	High pressure side (mounting flange side)		Low pressure side	
	Seal diaphragm	Other wetted parts	Seal diaphragm	Cover
V	SUS316L	SUS316	SUS316L	SCS14
C	Hastelloy-C	SUS316	SUS316L	SCS14
D	Monel	SUS316	SUS316L	SCS14
E	Tantalum	SUS316	SUS316L	SCS14
H	Hastelloy-C	Hastelloy-C	Hastelloy-C	SCS14
M	Monel	Monel	Monel	SCS14
T	Tantalum	Tantalum	Tantalum	SCS14

Note 1: Varies with combination of type codes. Refer to Code symbols.

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

Environmental protection:
Meets JIS C0920 immersion-proof (equivalent to IEC IP67 or NEMA 6/6P).

External dimensions:
See OUTLINE DIAGRAM.

Mass: 10 to 20kg

Optical cable connection:
G1/2 or 1/2-14NPT (whichever selected by code symbol)

Low pressure connection:
Rc1/4 or 1/4-18NPT (as specified by code symbol)

Process connection:
JIS specification:
10K, 20K, 30K - 40A, 50A
10K, 30K - 80A,100A
ANSI/JPI specification:
150BL, 300LB - 1-1/2B, 2B, 3B, 4B

Diaphragm standout length:
(As specified) 0, 50, 100, 150 or 200 mm

Mounting method:
Mounting by flange

Orientation of transmission unit:
Indicator unit turnable 90° upward/downward relative to detection unit

Optional specifications

Indication unit: 5-digit LCD indication, % or real scale indication (as specified by code symbol)
Operating temperature range: –20 to +70°C

Oxygen oil-proof processing: Fluorolube oil filled, wetted parts degreased and cleaned.
Chlorine service: Fluorolube oil filled.

} Varies with material. Refer to CODE SYMBOLS.

Table 1 Remote Control Function
(Items readable and setting from hand-held communicator)

Item	Reading	Setting	Description
Maximum range	○	—	Maximum measuring range of equipment
Measuring range	○	○	Actual measuring range
Damping	○	○	Variable within 0.2 to 32 sec
Real scale indication	○	○	Indication in industrial value
Battery voltage	○	—	Battery voltage of equipment
Error indication	○	—	Errors of detectiing unit and amplifier
Measured value	○	—	Measured data
Adjustment	○	○	Zero and span adjustment

Note: For operation of the "3" type transmitter ("3" at the 8th digit of product code), a hand-held communicator is required to have a version 1.6 or higher, but a communicator before version 1.6 can be operated with memory data updated. (Refer to the instruction manual of transmitter.)

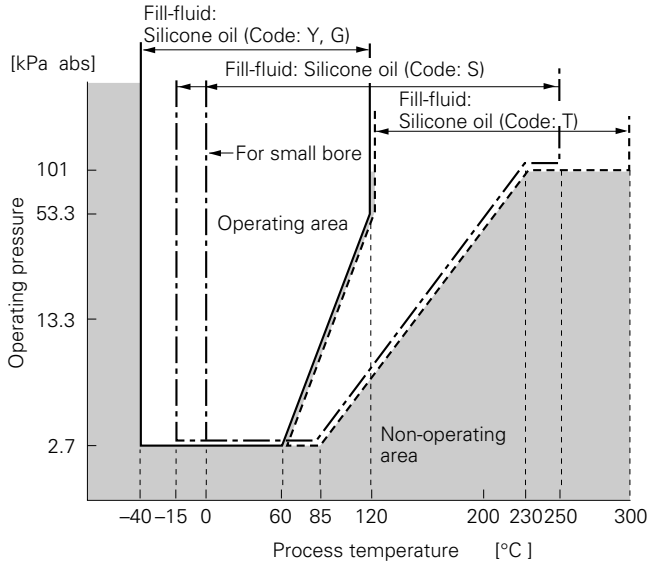


Fig. 1 Relation between process temperature and operating pressure

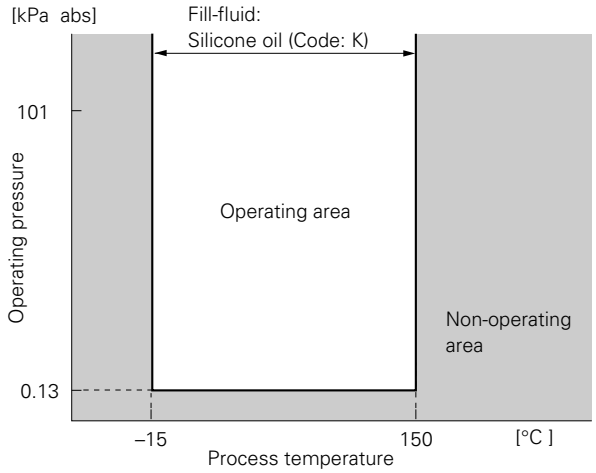
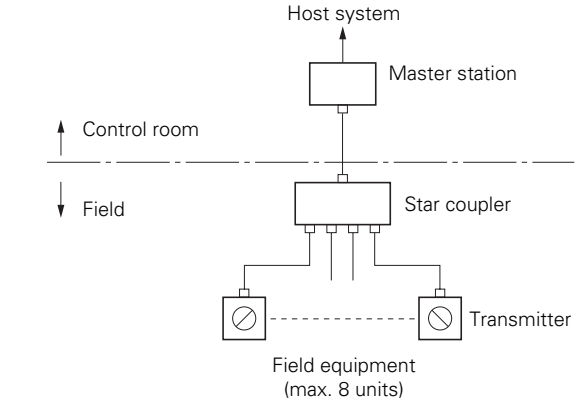
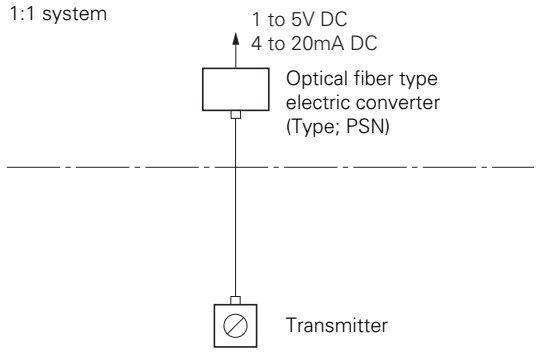


Fig. 2 Relation between process temperature and operating pressure

SYSTEM BLOCK DIAGRAM

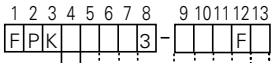


Transmission distance: 1.5 km max.
(between master station and field equipment)



Transmission distance: 4 km max.

CODE SYMBOLS



Description

Connection (4th digit)

	Low pressure connection	Cable lead-in port
S	Rc1/4	G1/2
T	1/4-18NPT	1/2-14NPT

Flange (5th digit)

	Material	Rating	6th digit specification code
0	SUS304	JIS 10K 80A	3,5,6
1		JIS 10K 100A	3,5,6
2		JIS 30K 80A	3,5,6
3		JIS 30K 100A	3,5,6
4		ANSI/JPI 150LB 3B	3,5,6
5		ANSI/JPI 150LB 4B	3,5,6
6		ANSI/JPI 300LB 3B	3,5,6
7		ANSI/JPI 300LB 4B	3,5,6
A		JIS 10K 40A	5,6
B		JIS 10K 50A	5,6
C		JIS 20K 40A	5,6
D		JIS 20K 50A	5,6
E		JIS 30K 40A	5,6
F		JIS 30K 50A	5,6
J		ANSI/JPI 150LB 1 1/2B	5,6
L		ANSI/JPI 150LB 2B	5,6
M		ANSI/JPI 300LB 1 1/2B	5,6
N		ANSI/JPI 300LB 2B	5,6

Measuring span (6th digit)

3	0.8..... 32kPa
5	3.25..... 130kPa
6	12.5..... 500kPa

Material (7th digit)

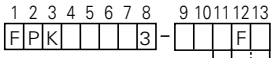
	High pressure side (flange side)		Low pressure side	
	Seal diaphragm	Other wetted parts	Seal diaphragm	Process cover
V	SCS316L	SUS316	SUS316L	SCS14
C	Hastelloy-C	Hastelloy-C	SUS316L	SCS14
D	Monel	Monel	SUS316L	SCS14
E	Tantalum	Tantalum	SUS316L	SCS14
H	Hastelloy-C	Hastelloy-C	Hastelloy-C	SCS14
M	Monel	Monel	Monel	SCS14
T	Tantalum	Tantalum	Tantalum	SCS14

Indicator (9th digit)

A	Not provided
L	Digital, % indication
P	Digital, real scale indication

Explosion-proof (10th digit)

A	Non-explosion proof
G	Intrinsic safety, JIS



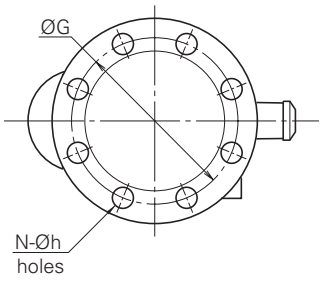
		Description
Diaphragm standout length (11th digit)		
Y	0	
A	50	Can be specified when 7th code digit is V. Cannot be specified for 40A or 1-1/2B flange.
B	100	
C	150	
D	200	
E	50	Can be specified when 7th code digit is H. Cannot be specified for 40A or 1-1/2B flange.
F	100	
G	150	
H	200	

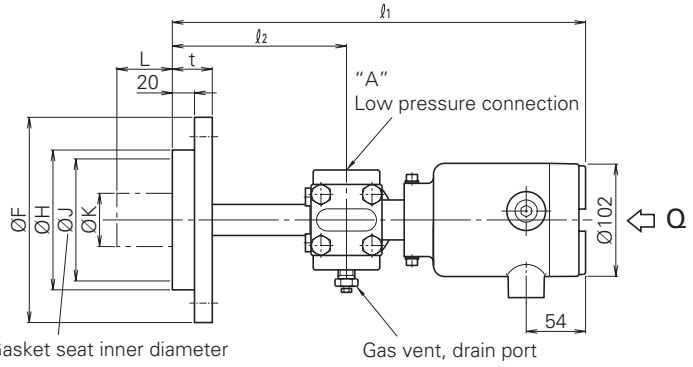
Treatment and Fill-fluid (13th digit)

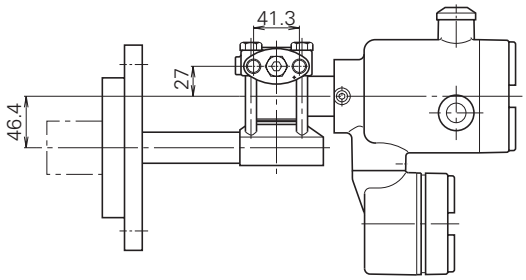
		Treatment	Fill-fluid	
	Y	None	Silicon oil	
	W	None	Fluorolube oil	
	G	Degreasing	Silicon oil	
	A	Oxygen oil-proof processing	Fluorolube oil..... Specifiable when 7th digit is V.	
	D	Chlorine service	Fluorolube oil..... Specifiable when 7th digit is H or T.	
	H	None	Silicon oil (For high temperature)	Specifiable when 7th digit is V.
Note 1	J	None	Silicon oil (For high temperature)	
	S	None	Silicon oil (For high temperature and vacuum)	
Note 1	T	None	Silicon oil (For high temperature and vacuum)	
Note 1	K	None	Silicon oil (For high temperature and high vacuum)	

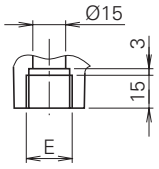
Note 1: Inapplicable for small bores 40A, 50A, 1-1/2B, and 2B.

OUTLINE DIAGRAM (Unit : mm)

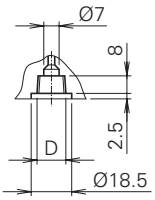




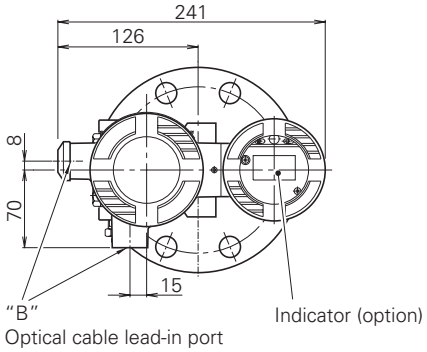




Details of "B"



Details of "A"



View from arrow Q

5th digit of code symbol	ØF	ØG	ØH	ØJ	ØK	t	N-Øh	FLANGE
0	185	150	126	100	73	38	8-19	JIS-10k-80A
1	210	175	151	103	96	38	8-19	JIS-10k-100A
2	210	170	126	100	73	48	8-23	JIS-30k-80A
3	240	195	151	103	96	52	8-25	JIS-30k-100A
4	191	152.5	126	100	73	44	4-20	ANSI/JPI 150LB 3B
5	229	190.5	151	103	96	44	8-20	ANSI/JPI 150LB 4B
6	210	168	126	100	73	49	8-23	ANSI/JPI 300LB 3B
7	254	200	151	103	96	52	8-23	ANSI/JPI 300LB 4B
A	140	105	84	49	48	36	4-19	JIS10k-40A
B	155	120	84	49	48	36	4-19	JIS-10k-50A
C	140	105	84	49	48	38	4-19	JIS20k-40A
D	155	120	84	49	48	38	8-19	JIS20k-50A
E	160	120	84	49	48	42	4-23	JIS30k-40A
F	165	130	84	49	48	42	8-19	JIS30k-50A
J	127	98.4	84	49	48	37.5	4-16	ANSI/JPI 150LB 1 1/2B
L	152	120.6	84	49	48	39.5	4-20	ANSI/JPI 150LB 2B
M	156	114.3	84	49	48	41	4-23	ANSI/JPI 300LB 1 1/2B
N	165	127	84	49	48	42.5	8-20	ANSI/JPI 300LB 2B

Type	D	E
FPKS	Rc1/4	G1/2
FPKT	1/4-18NPT	1/2-14NPT

11th digit of code symbol	L	ℓ1	ℓ2	Mass (kg)
Y	0	365	150	10.5 to 14
A E	50	359	144	11 to 18
B F	100			11.5 to 18.5
C G	150			12 to 19
D H	200			12.5 to 19.5

SCOPE OF DELIVERY

Instrument body

ORDERING INFORMATION

1. Model type
2. Measuring range
3. Indication scale for real scale specification
4. Others

⚠ Caution on Safety

*Before using this product, be sure to read its instruction manual in advance.

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