

# OPTICAL PRESSURE TRANSMITTER

The Model FBL 3 Optical Pressure 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 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, operating pressure and maximum allowable over-pressure:

Type	Operating pressure [MPa]	Span [kPa]		Range limits [kPa]		Max. allowable over-pressure [MPa]
		Minimum value	Maximum value	Lower range limit	Upper range limit	
FBL□01	-0.1 to 0.13	3.25	130	Determined by allowable operating pressure limit of particular fill fluid (See table below.)	130	1
FBL□02	-0.1 to 0.5	12.5	500		500	1.5
FBL□03	-0.1 to 3	75	3000		3000	9
FBL□04	-0.1 to 10	250	10000		10000	15
FBL□05	-0.1 to 50	1250	50000		50000	75

**Process temperature, Allowable pressure limit:**

For details, refer to Fig. 1.

Fill-fluid	Code	Process temperature	Allowable pressure limit
Silicon oil	Y, G, N	-40 to +100°C	2.7kPa abs
Fluorolube oil	W, A, D	-20 to +80°C	Atmospheric pressure
Silicon oil	R	-15 to +100°C	2.7kPa abs

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

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 a range from -0.1 MPa to 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

**Storage temperature:**

-40 to +80°C

**Performance specifications**

Accuracy rating	(Note) ±0.1% when measuring span is 1/10 or more of maximum span ±(0.05 + 0.005 × maximum span/measuring span)% when measuring span is less than 1/10 of maximum span
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Note: Percent value with respect to measuring span (including linearity, hysteresis and repeatability in standard 23°C status)

**Ambient temperature effect:**

Zero shift: ±(0.1 + 0.05 × URL/x)%/28°C  
 Overall shift: ±(0.15 + 0.05 × URL/x)%/28°C

Where; URL: Maximum span  
 x: Measuring span

3 times as large as above when the 7th digit (material) is other than V.

**Maximum allowable pressure effect:**

Zero shift at maximum span  
 ±0.2% to maximum allowable pressure

**Inclination effect:**

0.1 kPa/10° or, when 13th digit code (processing, fill fluid) is W, D or A, double the above, at maximum span

**Measurement period:**

0.2 sec

**Response time:** Time constant 0.2 sec (at 23°C)

Dead time; About 0.2 sec

**Physical specifications**

**Material:**

Material code	Process cover	Detecting unit	
		Seal diaphragm	Other wetted parts
V	SCS14	SUS316L	SUS316
J	SCS14	SUS316L · Gold-plated	SUS316
H	SCS14	Hastelloy-C	Hastelloy-C
M	SCS14	Monel	Monel
T	SCS14	Tantalum	Tantalum
B	Hastelloy-C lining	Hastelloy-C	Hastelloy-C
L	Monel lining	Monel	Monel
U	Tantalum lining	Tantalum	Tantalum

} Except for FBL□05

**Environmental protection:**

Meets JIS C0920, immersion-proof (equivalent to IEC IP67 or NEMA 6/6P)

**Process connection:**

Rc1/4 or 1/4-18NPT (whichever selected by code symbol)  
 Oval flange threads 7/16-20UNF

**Optical cable connection:**

G1/2 or 1/2 -14NPT (whichever selected by code symbol)

**Mounting method:**

Mounted on the 50A (2B) pipe with U-bolt

**Finish:**

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

**External dimensions:**

See OUTLINE DIAGRAM.

**Mass:**

4.5 to 5 kg

**Orientation of transmission unit:**

Indicator unit turnable 90° upward/downward relative to detection unit.

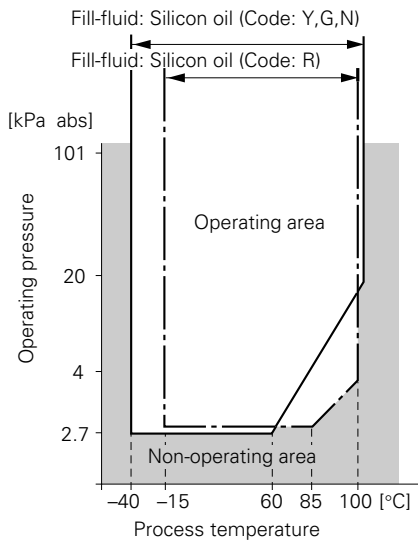
### Optional specifications

- 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 filled.  
 Wetted parts degreased and cleaned.
- Chlorine service:** Fluorolube oil filled.
- NACE specification:**  
 H2S-proof treatment in accordance with NACE specification
- } Varies with material.  
 } Refer to CODE SYMBOLS.

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

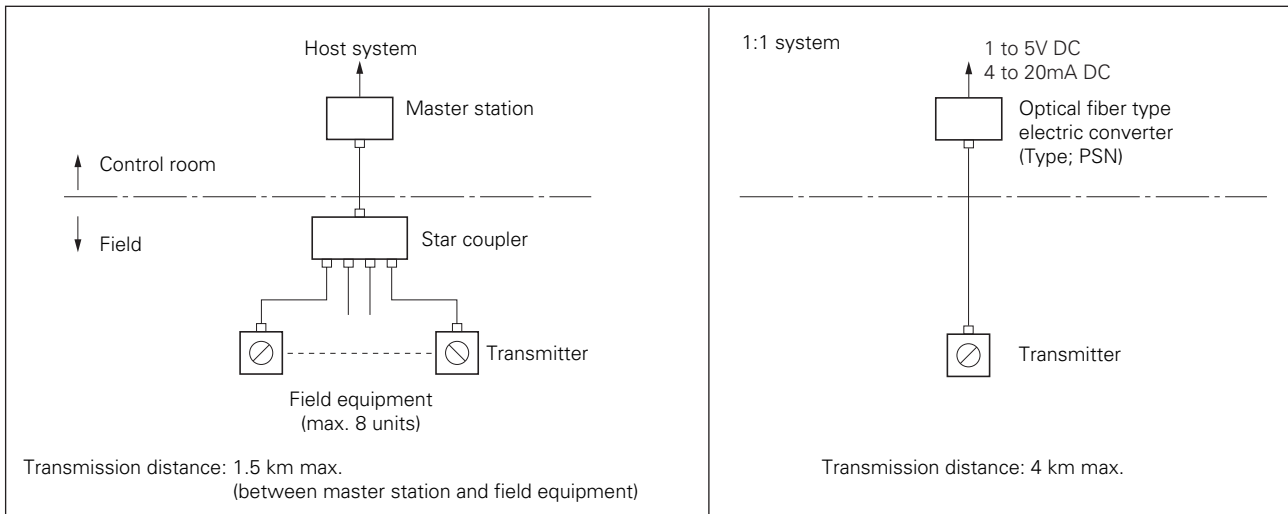
Item	Reading	Setting	Description
Maximum range	○	—	Maximum measuring range of equipment
Measuring range	○	○	Actual measuring range
Damping	○	○	Variable within 0.2 to 32 sec.
Real scale indication	○	○	Indication in industrial value
Battery voltage	○	—	Battery voltage of equipment
Error indication	○	—	Errors of detection 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**

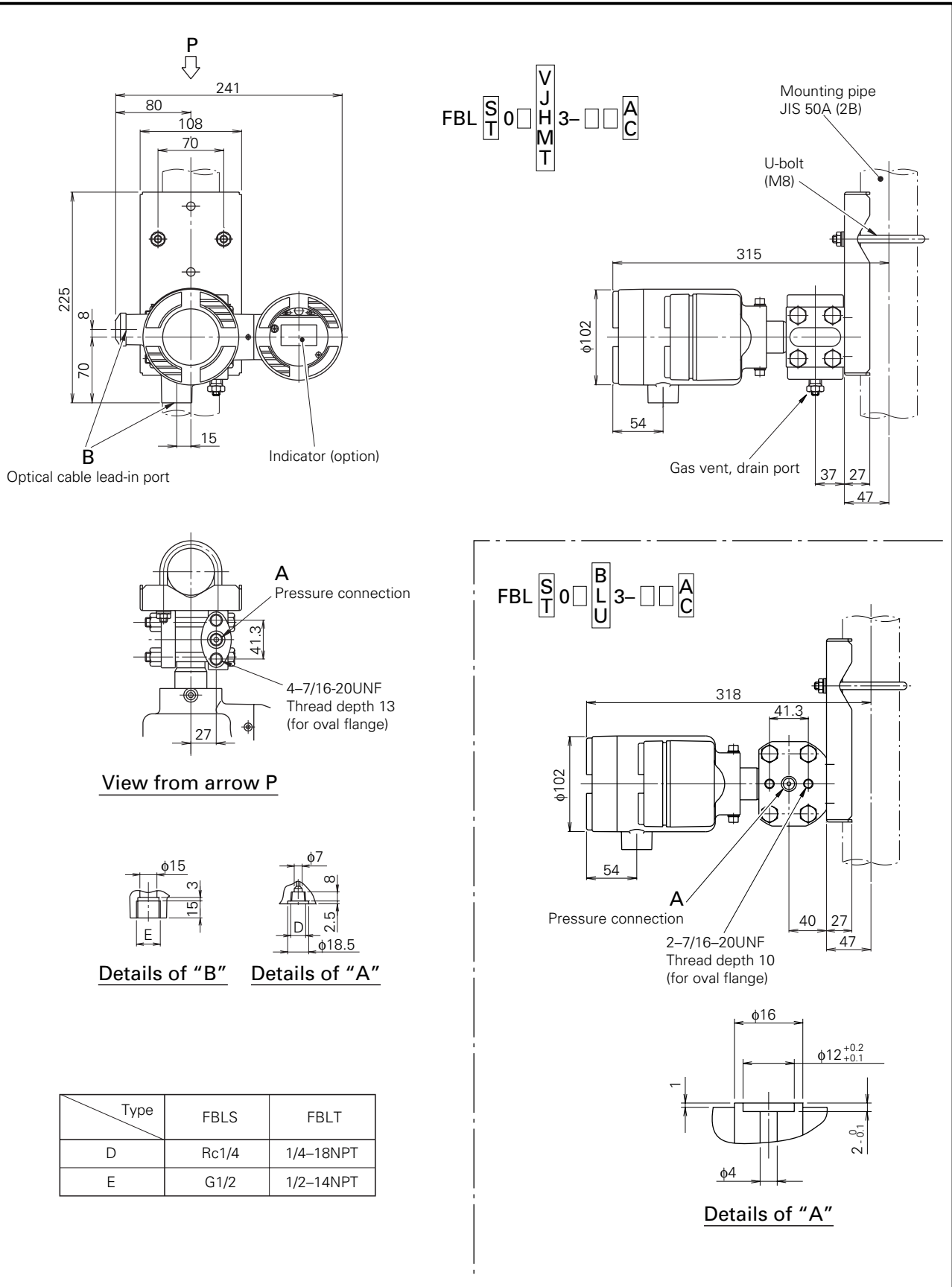
# SYSTEM BLOCK DIAGRAM



# CODE SYMBOLS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15														
F	B	L	0		3	-				F	-			
Description														
<b>Process cover (4th digit)</b>														
Process connection   Cable lead-in port														
Rc1/4   G1/2														
1/4-18NPT   1/2-14NPT														
<b>Measuring span (6th digit)</b>														
3.25..... 130kPa														
12.5..... 500kPa														
75..... 3000kPa														
250.....10000kPa														
1250.. 50000kPa														
<b>Material (7th digit)</b>														
Process cover   Seal diaphragm   Other wetted parts														
V   SCS14   SUS316L   SUS316														
J   SCS14   SUS316L · Gold-plated   SUS316														
H   SCS14   Hastelloy-C   Hastelloy-C														
M   SCS14   Monel   Monel														
T   SCS14   Tantalum   Tantalum														
B   Hastelloy-C lining   Hastelloy-C   Hastelloy-C														
L   Monel lining   Monel   Monel														
U   Tantalum lining   Tantalum   Tantalum														
} Not available when 6th digit is "5".														
<b>Indicator (9th digit)</b>														
A   Not provided														
L   Digital, % indication														
P   Digital, real scale indication														
<b>Explosion-proof (10th digit)</b>														
A   Non-explosion proof														
G   Intrinsic safety, JIS														
<b>Side vent/drain and fixture (11th digit)</b>														
Side vent/drain   Fixture														
A   None   None														
C   None   Yes (stainless steel)														
D   Yes   None														
F   Yes   Yes (stainless steel)														
} Cannot be specified when 7th digit is "B", "L" or "U".														
<b>Treatment and Fill-fluid (13th digit)</b>														
Treatment   Fill-fluid														
Y   None   Silicon oil														
W   None   Fluorolube oil														
G   Degreasing   Silicon oil														
A   Oxygen oil-proof processing   Fluorolube oil (when 7th digit is "V")														
D   Chlorine service   Fluorolube oil (unavailable when 7th digit is "V", "M" or "L")														
N   NACE specification   Silicon oil (unavailable when 6th digit is "5", or 7th digit is "T" or "U")														
R   None   Silicon oil (for vacuum)														
<b>O-ring material (for process cover)(14th digit)</b>														
A   Viton														
B   Teflon														
<b>Bolt/nut (15th digit)</b>														
C   NACE bolt/nut (ASTM A193 B7M/A194 2HM)														
D   NACE bolt/nut (ASTM A320 L7M/A194 2HM)														
E   SUS304/SUS304.... (For general use)														
F   SUS630/SUS304.... Specify when 6th digit is "5".														
} Cannot be specified when 6th digit is "5".														

OUTLINE DIAGRAM (Unit:mm)



## **SCOPE OF DELIVERY**

Instrument body and pipe fixture (as specified)

## **ITEM TO BE PREPARED SEPARATELY**

**Oval flange:** To be used as a flange of connecting pipe port.  
For details, refer to the DATA SHEET of oval flange (EDS6-10).

## **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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