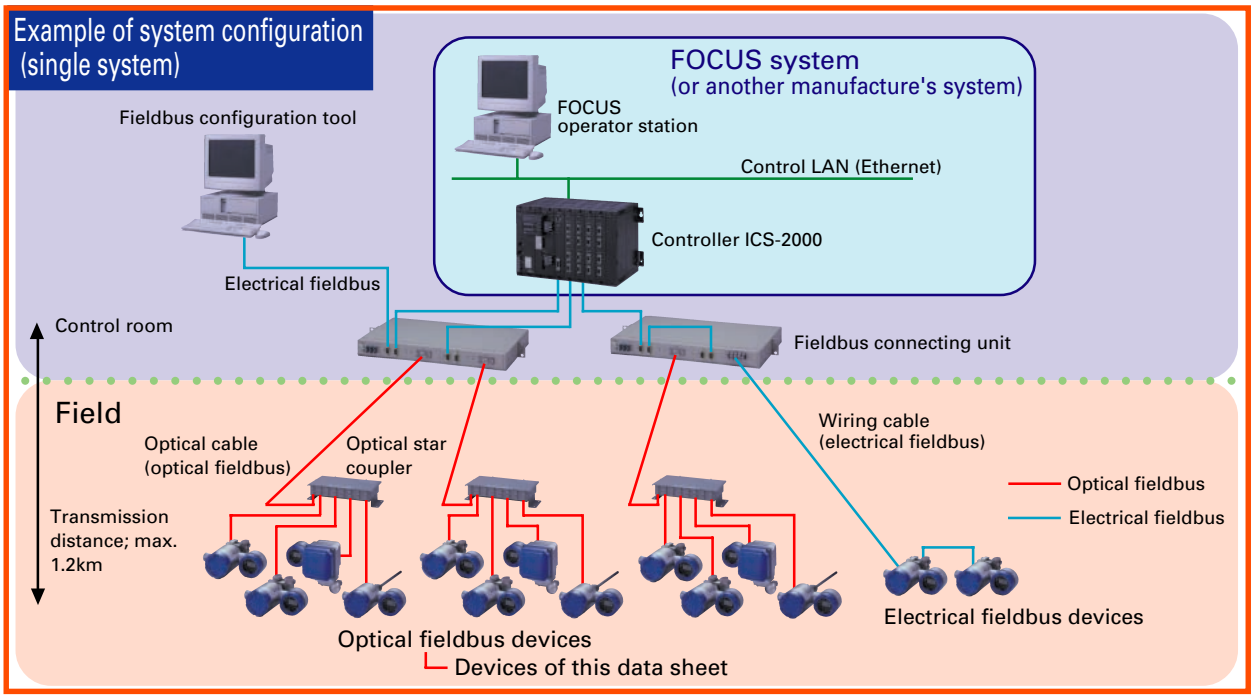
Optical Fieldbus System System Composition Devices

DATA SHEET

Fieldbus is used for digital transmission of the next generation, which takes over the conventional 4 to 20mA analog current transmission. The optical fieldbus using optical fiber as a fieldbus signal transmission line, has features of optical transmission such as noise-resistance and thunder-resistance, in additions to the features of fieldbus.

The optical fieldbus system is composed of field devices, such as a pressure transmitter, a differential pressure transmitter, temperature transmitter, and optical star coupler for blanching optical signals, and a host control system.



FEATURES

1. Noise-resistance, thunder-resistance

   Optical signals are free from effects of external noise and inductive thunder, providing highly reliable transmission. The use of non-metallic cables eliminates the propagation of inductive thunder, ensuring excellent thunder-proof transmission.

2. Reliability with redundancy

   Duplex host devices are available by using 2 optical cables (between star coupler and control room) to improve the system reliability.

3. Intrinsic safety explosion-proof

   Built-in power (battery) devices can be designed for intrinsic safety explosion-proof (intrinsic safety barrier is not required).

   Restriction of current flowing into the signal bus need not be taken into account, so any number of devices can be connected to one bus.

Common specifications for system

Regulations: Specifications of Fieldbus Foundation

Transmission speed:
31.25kbps

Transmission cycle (macro-cycle):
Standard; 1sec (400ms, min.)

Optical cable: Composite cord, non-metallic cable
Silica fiber... Core/cladding dia. 100/140µm or PCF fiber ... Core/cladding dia. 200/230µm

Optical connector:
FC connector or ST connector

Transmission distance:
Silica; 1.2 km (at transmission loss of optical cable, 4dB/km)
PCF; 0.7km (at transmission loss of optical cable, 6dB/km)

Ambient temperature:
Silica; -30 to +70˚C, PCF: -20 to +60˚C, as noted in specifications for each devices

Number of units connected:
Up to 16 units including host and field devices (for 1 unit of star coupler)

Contents

FFX-P SERIES TRANSMITTERS

DATA SHEET

These transmitters are capacitance type high accuracy transmitters used for measuring the pressure, etc. of various fluids. The transmission unit incorporates a microprocessor for digitizing signals, thereby achieving

a high accuracy and an intelligent transmitter.

The signal transmission path adopts an optical fiber and composes an optical fieldbus system in combination with an optical star coupler and host system.

Model Configuration

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SPECIFICATIONS

(1) Common specifications

Function and Performance

- **Service:** Liquid, gas or vapor
- **Output:** Optical digital signal, Fieldbus Foundamation specification
- **Power supply:** Built-in lithium battery
  Service life: Approx. 2 years under the following conditions
  { Macro cycle; 1 sec
  Status read cycle; 4 sec
  Token go-round; 0.25 sec
  Voltage read cycle; 1 hr }
- **Explosion protection:**
  Intrinsic safety type, JIS ib II C T3 (under application)
  CENELEC ib II C T4 (under application)
- **Ambient temperature:**
  -30 to +70˚C
  -10 to +60˚C for intrinsic safety type
  -10 to +60˚C for fluorinated oil specification
- **Storage temperature:**
  -40 to +80˚C
- **Ambient humidity:**
  95% RH max.
- **Self-diagnosis:** Display on indicator and transmission to host system

Item	Host system	Indicator
Measuring range error	○	○
Detection unit error	○	○
Amplifier error	○	○
Battery voltage	○	—
Battery voltage drop alarm	○	○

- **Remote setting:** The following items can be read and set from the host system.

Item	Reading	Setting
Tag No.	○	○
Serial No.	○	—
Range limit	○	—
Measuring range	○	○
Damping constant	○	○
Low cut point	○	○
Unit of measured value	○	○
Measured value	○	—

- **Zero point deviation:**
  Zero point can be shifted within -100 to +100% of span limit.
- **Response time:** Same as communication cycle ... at damping 0 (zero)
- **Standard:** Fieldbus Foundation specification (basic device, device type 411, AI function block)

Structure and Material

- **Casing structure:**
  Immersion-proof type JIS C 0920
  (IEC IP67, NEMA 4X or equivalent)
- **Process connections:**
  Rc1/4 or 1/4-18NPT (as specified in code symbol)
  Screw for oval flange; 7/16-20UNF
- **Optical cable connections:**
  G1/2 or 1/2-14NPT (as specified in code symbol)
- **Mounting:** On 50A (2B) pipe using U-bolt or wall mounting
- **Coating:** Epoxy/polyurethane double-coating
  Color; silver (Case cover is blue.)
- **External dimensions:**
  Entered in outline diagram.
- **Material:** Refer to code symbols.

Optional Specifications

- **Indicator:** 5-digit LCD, % or real-scale indication (as specified in code symbol)
  Operating temperature range; -20 to +70˚C
- **Oxygen no-oil treatment:**
  Fluorinated oil filled in, process wetted parts cleaned by degreasing
- **For chlorine measurement:**
  Fluorinated oil filled in
- **NACE specification:**
  Treatment against H2S complying with NACE specification

{ Varies with material. So refer to code symbols. }

(2) Individual specifications

Pressure Transmitter

• Span, range and overrange limit:

Type	Range limit [kPa]	Span limit [kPa]		Overrange limit [kPa]
		Min.	Max.	
FBB □ 01	-64 to +64	1.6	64	100
FBB □ 02	-100 to +500	12.5	500	1500
FBB □ 03	-100 to +3000	75	3000	9000
FBB □ 04	-100 to +10000	250	10000	15000
FBB □ 05	-100 to +50000	1250	50000	75000

• Process temperature and negative pressure tolerance limit:
(For details, see Fig. 1.)

Filled oil	13th code	Process temperature	Negative pressure tolerance limit
Silicone oil	Y.G.N	-40 to +120˚C	2.7 kPa abs
Fluorinated oil	W.A.D	-20 to +80˚C	Atmospheric pressure
Silicone oil	R	-15 to +120˚C	2.7 kPa abs

• Accuracy rating:
- 0.1 x URL min.; ±0.1%
- Below 0.1 x URL;
  ±(0.05 + 0.005 x URL/CR)%

URL; Upper range limit, CR; Calibration range

• Temperature effect:
Zero shift; ±(0.2 + 0.05 x URL/CR)%/55˚C
Total effect;
±(0.25 + 0.05 x URL/CR)%/55˚C
Note) Double the effects for material code (7th digit in code symbols) other than V and W.

• Overrange effect:
Zero shift at URL
±0.2%/overrange limit

• Mass: 4.5 to 5 kg

Absolute Pressure Transmitter

• Span, range and overrange limit:

Type	Range limit [kPa abs]	Span limit [kPa abs]		Overrange limit [kPa]
		Min.	Max.	
FBH □ 1	0 to 16	1.6	16	500
FBH □ 2	0 to 130	3.25	130	500
FBH □ 3	0 to 500	12.5	500	1500
FBH □ 4	0 to 3000	75	3000	9000

• Process temperature and negative pressure tolerance limit:
Process temperature; -40 to +85˚C
Negative pressure; Depends on measuring range.

• Accuracy rating:
- 0.1 x URL min.; ±0.2%
- Below 0.1 x URL; ±(0.1 + 0.01 x URL/CR)%

URL; Upper range limit, CR; Calibration range

• Temperature effect:
Zero shift; ±(0.25 + 0.2 x URL/CR)%/55˚C
Total effect; ±(0.3 + 0.2 x URL/CR)%/55˚C
Note) Double the effects for material code (7th digit in code symbols) other than V and W.

• Overrange effect: Zero shift at URL
±0.2% overrange limit

• Mass: 4.5 kg

Differential Pressure/Flow Transmitter

• Static pressure span, and overrange limit:

Type	Static pressure [kPa]	Span limit [kPa]		Overrange limit [kPa]
		Min.	Max.	
FFG □ 11	-100 to +3200	0.1	1	±1
FFG □ 22	-100 to +10000	0.15	6	±6
FFG □ 23		0.8	32	±32
FFG □ 24		1.6	64	±64
FFG □ 25		3.25	130	±130
FFG □ 26		12.5	500	±500
FFG □ 33	-100 to +16000	0.8	32	±32
FFG □ 34		1.6	64	±64
FFG □ 35		3.25	130	±130
FFG □ 36		12.5	500	±500
FFG □ 38		75	3000	±3000
FFG □ 43	-100 to +42000	0.8	32	±32
FFG □ 44		1.6	64	±64
FFG □ 45		3.25	130	±130
FFG □ 46		12.5	500	±500
FFG □ 47		50	2000	±2000

• Process temperature and negative pressure tolerance limit:
(For details, see Fig. 1.)

Filled oil	13th code	Process temperature	Negative pressure tolerance limit
Silicone oil (*1)	Y.G.N	-40 to +120˚C	2.7 kPa abs
Fluorinated oil	W.A.D	-20 to +80˚C	Atmospheric pressure
Silicone oil	R	-15 to +120˚C	2.7 kPa abs

Note(*1): Types FFG□38 and FFG□47 cannot be used at a negative pressure.

• Accuracy rating: Linear output
- 0.1 x URL min.; ±0.1%
- Below 0.1 x URL; ±(0.05 + 0.005 x URL/CR)%

URL; Upper range limit, CR; Calibration range

Square root output
- 0.1 x URL min.;
  Output 50% min. ... ±0.1%
  Output 20% min. and below 50% ... ±0.25%
  Output 10% min. and below 20% ... ±0.5%
- Below 0.1 x URL;
  Output 50% min. ... ±(0.05 + 0.005 x URL/CR)%
  Output 20% min. and below 50% ... ±2.5 x (0.05 + 0.005 x URL/CR)%
  Output 10% min. and below 20% ... ±5 x (0.05 + 0.005 x URL/CR)%

• Temperature effect:

	Linear output	Square root output
URL; 32 kPa min.	Zero shift; ±(0.2 + 0.05 x URL/CR)%/55˚C Total effect; ±(0.25 + 0.05 x URL/CR)%/55˚C	±(0.5 + 0.125 x URL/CR)%/55˚C
URL; 1 kPa, 6 kPa	Zero shift; ±(0.25 + 0.2 x URL/CR)%/55˚C Total effect; ±(0.3 + 0.2 x URL/CR)%/55˚C	±(0.6 + 0.5 x URL/CR)%/55˚C
	Note 1	Change at 20% point

Note 1; Double the effects for material code (7th digit in code symbols) other than V and W.

• Overrange and static pressure effects:

Overrange effect: Zero shift at URL (linear output)
URL; 1, 6kPa...±0.3%/1, 3.2MPa
URL; 32kPa... ±0.3%/10, 16MPa,
±0.5%/42MPa,
Note; Double the effects for material code (7th digit in code symbols) other than V and W.
Static pressure effect (linear output)

	URL; 1, 6kPa	URL; 32kPa ~
Zero	±0.2%/ 1, 3.2MPa	±0.1%/ 10MPa
Span	-0.15±0.15%/3.2MPa	-0.15±0.15%/10MPa

• Mass: 5.3 to 5.5 kg

Remote Seal Type Pressure Transmitter

• Span, range and overrange limit:

Type	Range limit [kPa]	Span limit [kPa] Min.	Span limit [kPa] Max.	Overrange limit [kPa]
FBF □01	Flange rating pressure	1.6	64	100
FBF □02		12.5	500	1500
FBF □03		75	3000	4500
FBF □04		250	10000	15000
FBF □05		1250	50000	75000

• Process temperature and negative pressure tolerance limit:

Filled oil	13th code	Process temperature	Negative pressure tolerance limit
Fluorinated oil	W.A.D	-20 to +120˚C	Atmospheric pressure
Silicone oil	H	-15 to +250˚C	
	J	+85 to +300˚C	
	Y.G	-40 to +120˚C	2.7 kPa abs
	S	-15 to +250˚C	See Fig. 2.
	T	+85 to +300˚C	
	K	-15 to +200˚C	0.13 kPa abs See Fig. 3.

• Accuracy rating: • 0.1 x URL min.; ±0.2%
• Below 0.1 x URL; ±(0.1 + 0.01 x URL/CR)%
URL; Upper range limit, CR; Calibration range

• Temperature effect:
Zero shift; ±(0.7 x URL/CR)%/55˚C
Total effect; ±(1.0 x URL/CR)%/55˚C
Note) Double the effects for material code (7th digit in code symbols) other than W, A, B and C.

• Overrange effect:
Zero shift at URL
±0.2%/flange rating pressure

• Mass: 10.5 to 13.5 kg

Remote Seal Type Differential Pressure Transmitter and Level Transmitter

• Span, range and overrange limit:
Level transmitter (FPL), remote seal type differential pressure transmitter (FFH)

Type	Range limit [kPa]	Span limit [kPa] Min.	Span limit [kPa] Max.	Overrange limit [kPa]
FPL □□3 FFH □□3	Flange rating pressure	0.8	32	±32
FPL □□4 FFH □□4		1.6	64	±64
FPL □□5 FFH □□5		3.25	130	±130
FPL □□6 FFH □□6		12.5	500	±500

• Process temperature and negative pressure tolerance limit:

Filled oil	13th code	Process temperature	Negative pressure tolerance limit
Fluorinated oil	W.A.D	-20 to +120˚C	Atmospheric pressure
Silicone oil	H	-15 to +250˚C	
	J	+85 to +300˚C	
	Y.G	-40 to +120˚C	2.7 kPa abs
	S	-15 to +250˚C	See Fig. 2.
	T	+85 to +300˚C	
	K	-15 to +200˚C	0.13 kPa abs See Fig. 3.

• Accuracy rating: • 0.1 x URL min.; ±0.2%
• Below 0.1 x URL; ±(0.1 + 0.01 x URL/CR)%
URL; Upper range limit, CR; Calibration range

• Temperature effect:
Zero shift; ±(0.7 x URL/CR)%/55˚C
Total effect; ±(1.0 x URL/CR)%/55˚C
Notes) 1. Level transmitter; Double the effects for material code (7th digit in code symbols) other than V and W.
2. Remote seal type differential pressure transmitter; Double the effects for material code (7th digit in code symbols) other than W, A, B, C and D.

• Overrange effect:
Zero shift at URL
±0.3%/flange rating pressure
Note; Double the effects for material code (7th digit in code symbols) other than V (level transmitter), W, A, B, C and D (remote seal type differential transmitter).

• Static pressure effect:
Zero shift; ±0.2%/1 MPa
Span shift; -0.15 ±0.15%/flange rating pressure
Note; Zero shift is a change in URL.
Span shift is a change in CR.

• Mass: Remote seal type differential pressure transmitter; 15 to 33 kg
Level transmitter; 10.5 to 19.5 kg

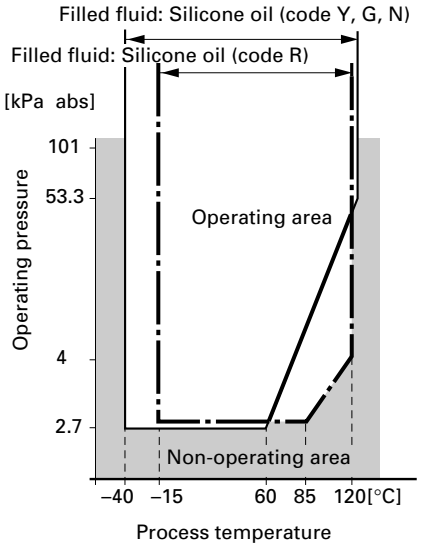


Fig. 1 Relation between process temperature and operating pressure (pressure and differential pressure/flow transmitters)

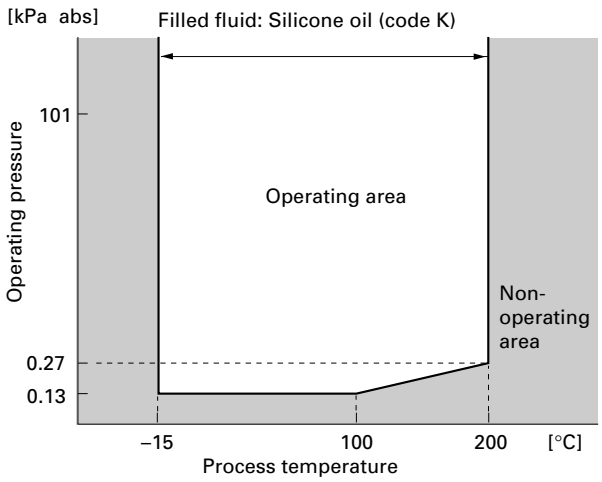


Fig. 3 Relation between process temperature and operating pressure (remote seal type pressure, remote seal type differential pressure and level transmitters)

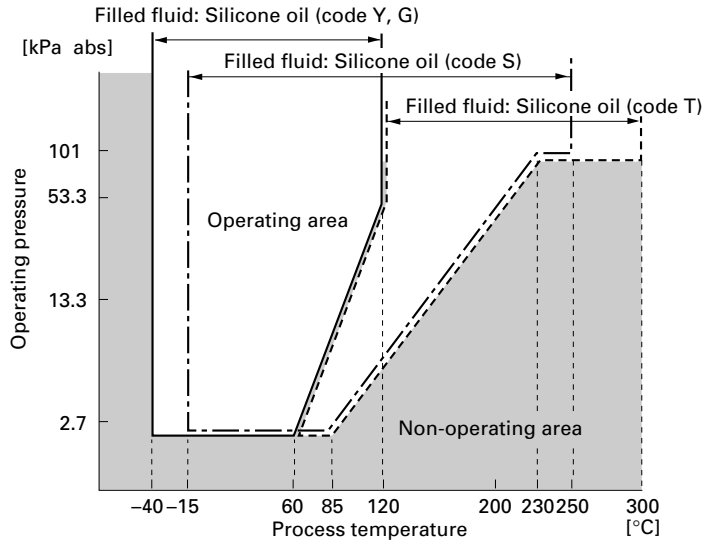


Fig. 2 Relation between process temperature and operating pressure (remote seal type pressure, remote seal type differential pressure and level transmitters)

SCOPE OF DELIVERY

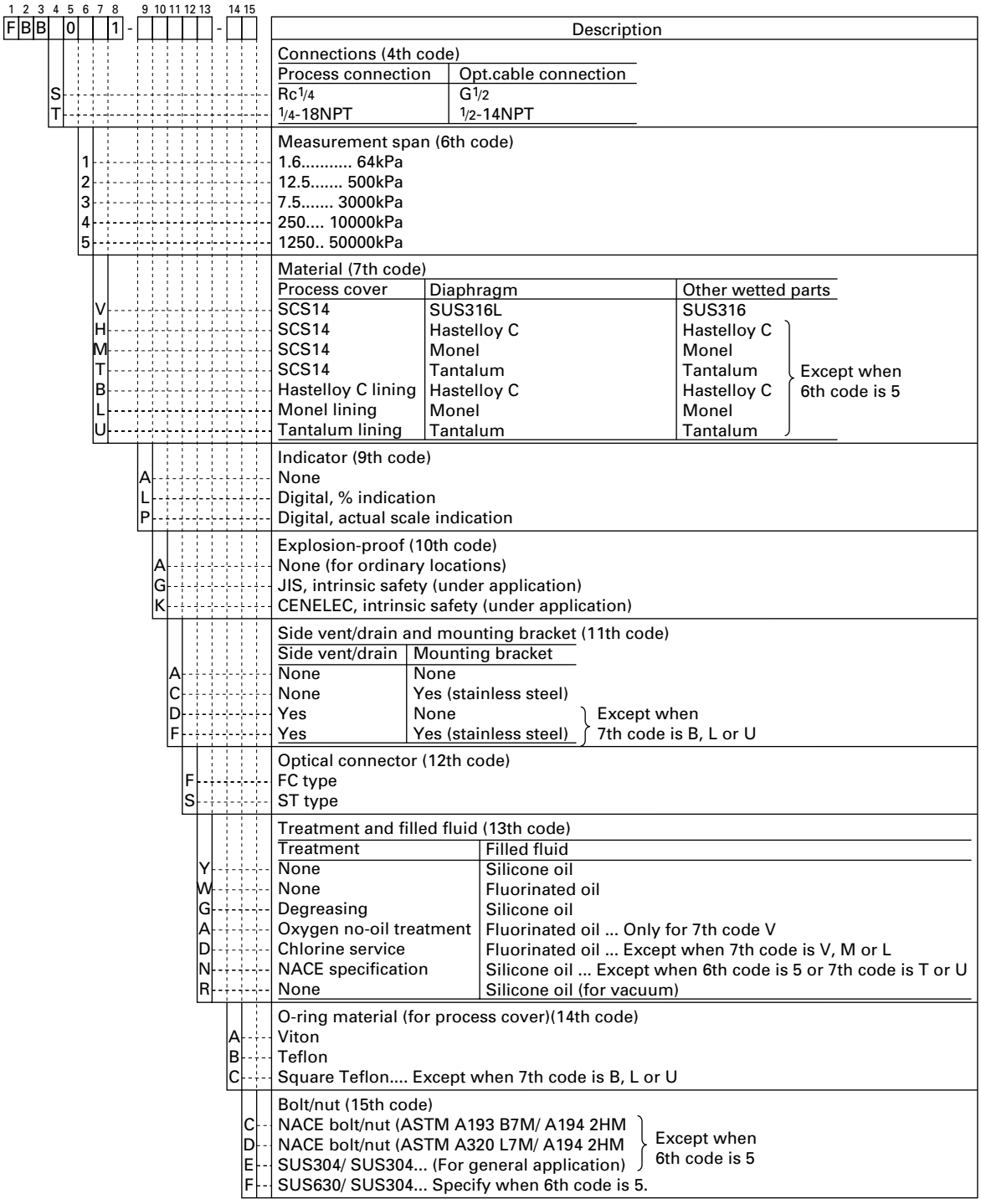
Transmitter main frame and bracket for pipe mounting (as specified)

ACCESSORIES

- Oval flange: Used as a connection flange of pressure leading pipe connection port. For details, refer to DATA SHEET (EDS6-10) of the oval flange.
- Equalizing valve: Refer to DATA SHEET (EDS6-10).

CODE SYMBOLS

1) Pressure transmitter



Description

Connections (4th code)

	Process connection	Opt.cable connection
S	Rc1/4	G1/2
T	1/4-18NPT	1/2-14NPT

Measurement span (6th code)

1	1.6..... 64kPa
2	12.5..... 500kPa
3	7.5..... 3000kPa
4	250.... 10000kPa
5	1250.. 50000kPa

Material (7th code)

	Process cover	Diaphragm	Other wetted parts	
V	SCS14	SUS316L	SUS316	
H	SCS14	Hastelloy C	Hastelloy C	Except when 6th code is 5
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	

Indicator (9th code)

A	None
L	Digital, % indication
P	Digital, actual scale indication

Explosion-proof (10th code)

A	None (for ordinary locations)
G	JIS, intrinsic safety (under application)
K	CENELEC, intrinsic safety (under application)

Side vent/drain and mounting bracket (11th code)

	Side vent/drain	Mounting bracket	
A	None	None	
C	None	Yes (stainless steel)	
D	Yes	None	Except when 7th code is B, L or U
F	Yes	Yes (stainless steel)	

Optical connector (12th code)

F	FC type
S	ST type

Treatment and filled fluid (13th code)

	Treatment	Filled fluid
Y	None	Silicone oil
W	None	Fluorinated oil
G	Degreasing	Silicone oil
A	Oxygen no-oil treatment	Fluorinated oil ... Only for 7th code V
D	Chlorine service	Fluorinated oil ... Except when 7th code is V, M or L
N	NACE specification	Silicone oil ... Except when 6th code is 5 or 7th code is T or U
R	None	Silicone oil (for vacuum)

O-ring material (for process cover)(14th code)

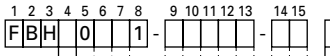
A	Viton
B	Teflon
C	Square Teflon.... Except when 7th code is B, L or U

Bolt/nut (15th code)

C	NACE bolt/nut (ASTM A193 B7M/ A194 2HM	Except when 6th code is 5
D	NACE bolt/nut (ASTM A320 L7M/ A194 2HM	
E	SUS304/ SUS304... (For general application)	
F	SUS630/ SUS304... Specify when 6th code is 5.	

CODE SYMBOLS

2) Absolute pressure transmitter



Description

Connections (4th code)

	Process connection	Opt.cable connection
S	Rc1/4	G1/2
T	1/4-18NPT	1/2-14NPT

Measurement span (6th code)

1	1.6..... 64kPa abs
2	32.5..... 130kPa abs
3	12.5..... 500kPa abs
4	75..... 3000kPa abs

Material (7th code)

	Process cover	Pressure receiving diaphragm	Other wetted parts
V	SCS14	SUS316L	SUS316
H	SCS14	Hastelloy C	Hastelloy C
M	SCS14	Monel	Monel
T	SCS14	Tantalum	Tantalum...Except when 6th code is 1

Indicator (9th code)

A	None
L	Digital, % indication
P	Digital, actual scale indication

Explosion-proof (10th code)

A	None (for ordinary locations)
G	JIS, intrinsic safety (under application)
K	CENELEC, intrinsic safety (under application)

Side vent/drain and mounting bracket (11th code)

	Side vent/drain	Mounting bracket
A	None	None
C	None	Yes (stainless steel)
D	Yes	None
F	Yes	Yes (stainless steel)

Optical connector (12th code)

F	FC type
S	ST type

Treatment and filled fluid (13th code)

	Treatment	Filled fluid
Y	None	Silicone oil
G	Degreasing	Silicone oil
N	NACE specification	Silicone oil ... Except when 7th code is T

O-ring material (for process cover)(14th code)

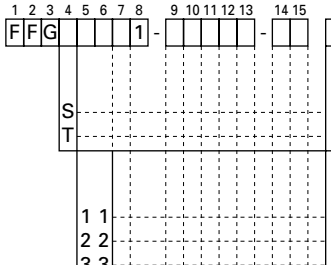
A	Viton

Bolt/nut (15th code)

C	NACE bolt/nut (ASTM A193 B7M/ A194 2HM)
D	NACE bolt/nut (ASTM A320 L7M/ A194 2HM)
E	SUS304/ SUS304... (For general application)

CODE SYMBOLS

3) Differential pressure/flow transmitter



Description

Connections (4th code)

	Process connection	Opt. cable connection
S	Rc1/4	G1/2
T	1/4-18NPT	1/2-14NPT

Static pressure and measurement span (5th and 6th codes)

	Static pressure	Measurement span
1 1	-0.1~+3.2 MPa	0.1..... 1 kPa
2 2	-0.1~+10 MPa	0.15..... 6 kPa
3 3	-0.1~+3.2 MPa	0.8..... 32 kPa
3 4		1.6..... 64 kPa
3 5		3.25.... 130 kPa
3 6		12.5..... 500 kPa
3 8		75..... 3000 kPa
4 3	-0.1~+4.2 MPa	0.8..... 32 kPa
4 4		1.6..... 64 kPa
4 5		3.25..... 130 kPa
4 6		12.5..... 500 kPa
4 7		50..... 2000 kPa
2 3	-0.1~+10 MPa	0.8..... 32 kPa
2 4		1.6..... 64 kPa
2 5	For material codes B, L and U	3.25..... 130 kPa
2 6		12.5..... 500 kPa

Material (7th code)

	Process cover	Diaphragm	Other wetted parts	Application (5/6th codes)
V	SCS14 or SUS316	SUS316L	SUS316	11, 22, 33, 34, 35, 43, 44, 45
H	SCS14 or SUS316	Hastelloy C	Hastelloy C	11, 22, 33, 34, 35, 36, 43, 44, 45, 46
M	SCS14 or SUS316	Monel	Monel	33, 34, 35, 36, 43, 44, 45, 46
T	SCS14 or SUS316	Tantalum	Tantalum	33, 34, 35, 36
W	SCS14 or SUS316	Hastelloy C	SUS316	36, 38, 46, 47
B	Hastelloy C lining	Hastelloy C	Hastelloy C	23, 24, 25, 26
L	Monel lining	Monel	Monel	
U	Tantalum lining	Tantalum	Tantalum	

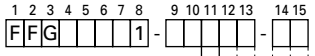
Indicator and output (9th code)

	Indicator	Output
V	None	Linear
A	None	Square root
L	Digital, % indication	Linear
P	Digital, actual scale indication	Linear
Q	Digital, % indication	Square root
S	Digital, actual scale indication	Square root

Explosion-proof (10th code)

A	None (for ordinary locations)
G	JIS, intrinsic safety (under application)
K	CENELEC, intrinsic safety (under application)

CODE SYMBOLS



	Description		
	Side vent/drain and mounting bracket (11th code)		
	Side vent/drain	Mounting bracket	
A	None	None	
C	None	Yes (stainless steel)	
D	Yes	None	Except when 7th code is B, L or U
F	Yes	Yes (stainless steel)	Except when 7th code is B, L or U
	Optical connector (12th code)		
F	FC type		
S	ST type		
	Treatment and filled fluid (13th code)		
	Treatment	Filled fluid	
Y	None	Silicone oil	
W	None	Fluorinated oil	
G	Degreasing	Silicone oil	
A	Oxygen no-oil treatment	Fluorinated oil ... Only for 7th codes V and W	
D	Chlorine service	Fluorinated oil ... Except when 7th code is V, M or L	
N	NACE specification	Silicone oil ... Except when 7th code is T or U	
R	None	Silicone oil (for vacuum)	
	O-ring material (for process cover) (14th code)		
A	Viton		
B	Teflon		
C	Square Teflon ... Except when 7th code is B, L or U		
	Bolt/nut (15th code)		
C	NACE bolt/nut (ASTM A193 B7M/ A194 2HM)		Note 1
D	NACE bolt/nut (ASTM A320 L7M/ A194 2HM)		Note 1
E	SUS304/ SUS304..... (For general application) ... Note 2		
F	SUS630/ SUS304..... Specify when 5th code is 3 or 4		

Note 1; Static pressure is limited to 10 MPa at maximum.
Note 2; Allowed for 5th codes 1, 2 and 3. However, static pressure is limited to 10 MPa at maximum.

CODE SYMBOLS

4) Remote seal type pressure transmitter

1 2 3 4 5 6 7 8	9 10 11 12 13	Description
F B F	1 -	
		Opt.cable connection (4th code)
S		G1/2
T		1/2-14NPT
		Flanges (5th code)

	Material	Rating	Applicable 6th code
0	SUS304	JIS 10K 80A	1, 2
1		JIS 10K 100A	1, 2
2		JIS 30K 50A	3
3		ANSI/JPI 150LB 3B	1, 2
4		ANSI/JPI 150LB 4B	1, 2
5		ANSI/JPI 600LB 2B	3
P	None (wafer type)	For JIS 80A, ANSI/JPI 3B	1, 2
Q		For JIS 100A, ANSI/JPI 4B	1, 2
R		For JIS 50A, ANSI/JPI 2B	3
K	Screw-in type	JIS G1 thread	4, 5

Measurement span (6th code)

1	1.6..... 64kPa	
2	12.5..... 500kPa	
3	75..... 3000kPa.....	Available only with 7th codes W, A, B, C, D, H, M and T
4	250..... 10000kPa	Applicable to 5th code K
5	1250... 50000kPa	Specify W as 7th code.

Material and diaphragm extension (7th code)

	Seal diaphragm	Other wetted parts	Diaphragm extension (mm)	
W	SUS316L	SUS316	0	
A	SUS316L	SUS316	50	When these codes are used in combination with 13th code S, T or K, only 5th codes 1, 4 and Q are available.
B	SUS316L	SUS316	100	
C	SUS316L	SUS316	150	
D	SUS316L	SUS316	200	
H	Hastelloy C	Hastelloy C	0	
F	Hastelloy C	Hastelloy C	50	
G	Hastelloy C	Hastelloy C	100	
K	Hastelloy C	Hastelloy C	150	
L	Hastelloy C	Hastelloy C	200	
M	Monel	Monel	0	
T	Tantalum	Tantalum	0	
P	Titanium	Titanium	0	Available only with 6th code 2 and 5th code 0, 3 or P
R	Zirconium	Zirconium	0	

Indicator (9th digit)

A	None
L	Digital, % indication
P	Digital, actual scale indication

Explosion-proof (10th code)

A	None (for ordinary locations)
G	JIS, intrinsic safety (under application)
K	CENELEC, intrinsic safety (under application)

Capillary length (11t code)

A	1.5m	
B	3m	
G	5m	
C	6m	
H	7m	Available for 5th code 0, 1, 3, 4, P or Q and 13th code Y, W, G, A or D
J	8m	
K	10m	

Optical connector (12th code)

F	FC type
S	ST type

Treatment and filled fluid (13th code)

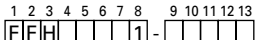
	Treatment	Filled fluid	
Y	None	Silicone oil	
W	None	Fluorinated oil	
G	Degreasing	Silicone oil	
A	Oxygen no-oil treatment	Fluorinated oil ... Available for 7th code W, A, B, C or D	
D	Chlorine service	Fluorinated oil ... Available for 7th code H, F, G, K, L or T	
H	None	Silicone oil (for high temperature)	*1
J	None	Silicone oil (for high temperature)	
S	None	Silicone oil (for high temperature and vacuum)	*2
T	None	Silicone oil (for high temperature and vacuum)	
K	None	Silicone oil (for high temperature and high vacuum)	

*1: Available for 6th code 1, 2 or 3 and 7th code W, A, B, C or D

*2: Available for 6th code 2 and 7th code W, A, B, C or D

CODE SYMBOLS

5) Remote seal type differential pressure transmitter



Description

Opt.cable connection (4th code)
- S: G1/2
- T: 1/2-14NPT

Flanges (5th code)

	Material	Rating
0	SUS304	JIS 10K 80A
1		JIS 10K 100A
2		JIS 30K 80A
3		JIS 30K 100A
4		ANSI/JPI 150LB 3B
5		ANSI/JPI 150LB 4B
6		ANSI/JPI 300LB 3B
7		ANSI/JPI 300LB 4B
P	None (wafer type)	For JIS 80A, ANSI/JPI 3B
Q		For JIS 100A, ANSI/JPI 4B

Measurement span (6th code)
- 3: 0.8..... 32kPa
- 4: 1.6..... 64kPa
- 5: 3.25..... 130kPa
- 6: 12.5..... 500kPa

Material and diaphragm extension (7th code)

	Seal diaphragm	Other wetted parts	Diaphragm extension (mm)	
W	SCS316L	SUS316	0	
A	SCS316L	SUS316	50	When these codes are used in combination with 13th code S, T or K, only 5th codes 1, 3, 5, 7 and Q are available.
B	SCS316L	SUS316	100	
C	SCS316L	SUS316	150	
D	SCS316L	SUS316	200	
H	Hastelloy C	Hastelloy C	0	
F	Hastelloy C	Hastelloy C	50	
G	Hastelloy C	Hastelloy C	100	
K	Hastelloy C	Hastelloy C	150	
L	Hastelloy C	Hastelloy C	200	
M	Monel	Monel	0	
T	Tantalum	Tantalum	0	
P	Titanium	Titanium	0	Available only with 5th code 0, 2, 4, 6 or P
R	Zirconium	Zirconium	0	

Indicator (9th digit)
- A: None
- L: Digital, % indication
- P: Digital, actual scale indication

Explosion-proof (10th code)
- A: None (for ordinary locations)
- G: JIS, intrinsic safety (under application)
- K: CENELEC, intrinsic safety (under application)

Capillary length (11t code)
- A: 1.5m
- B: 3m
- G: 5m
- C: 6m
- H: 7m
- J: 8m
- K: 10m

Available for 13th code Y, W, G, A or D

Optical connector (12th code)
- F: FC type
- S: ST type

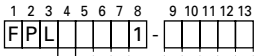
Treatment and filled fluid (13th code)

	Treatment	Filled fluid	
Y	None	Silicone oil	
W	None	Fluorinated oil	
G	Degreasing	Silicone oil	
A	Oxygen no-oil treatment	Fluorinated oil ... Available for 7th code W, A, B, C or D	
D	Chlorine service	Fluorinated oil ... Available for 7th code H, F, G, K, L or T	
H	None	Silicone oil (for high temperature)	*1
J	None	Silicone oil (for high temperature)	
S	None	Silicone oil (for high temperature and vacuum)	
T	None	Silicone oil (for high temperature and vacuum)	
K	None	Silicone oil (for high temperature and high vacuum)	

*1: Available for 7th code W, A, B, C or D

CODE SYMBOLS

6) Level transmitter



Description

Connections (4th code)

	Low pressure connection	Opt.cable connection
S	RC1/4	G1/2
T	1/4-18NPT	1/2-14NPT

Flanges (5th code)

	Material	Rating
0	SUS304	JIS 10K 80A
1		JIS 10K 100A
2		JIS 30K 80A
3		JIS 30K 100A
4		ANSI/JPI 150LB 3B
5		ANSI/JPI 150LB 4B
6		ANSI/JPI 300LB 3B
7		ANSI/JPI 300LB 4B

Measurement span (6th code)

3	0.8..... 32kPa
4	1.6..... 64kPa
5	3.25..... 130kPa
6	12.5..... 500kPa

Material (7th code)

	High pressure side (flange side)		Low pressure side	
	Diaphragm	Other wetted part	Diaphragm	Process cover
V	SCS316L	SUS316	SCS316L.....*1	SCS14
H	Hastelloy C	Hastelloy C	Hastelloy C	SCS14
M	Monel	Monel	Monel	SCS14
T	Tantalum	Tantalum	Tantalum	SCS14

Indicator (9th digit)

A	None
L	Digital, % indication
P	Digital, actual scale indication

Explosion-proof (10th code)

A	None (for ordinary locations)
G	JIS, intrinsic safety (under application)
K	CENELEC, intrinsic safety (under application)

Diaphragm extension (mm)(11th code)

Y	0..... For any 7th code	
A	50	7th code V only
B	100	
C	150	
D	200	
E	50	7th code H only
F	100	
G	150	
H	200	

Optical connector (12th code)

F	FC type
S	ST type

Treatment and filled fluid (13th code)

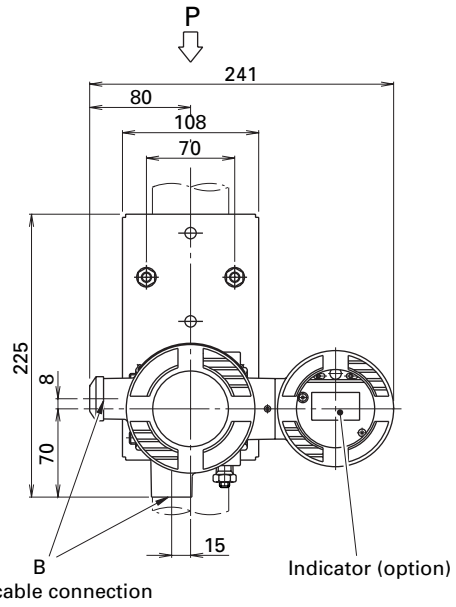
	Treatment	Filled fluid	
Y	None	Silicone oil	
W	None	Fluorinated oil	
G	Degreasing	Silicone oil	
A	Oxygen no-oil treatment	Fluorinated oil ... Available for 7th code V	
D	Chlorine service	Fluorinated oil ... Available for 7th code H or T	
H	None	Silicone oil (for high temperature)	*2
J	None	Silicone oil (for high temperature)	
S	None	Silicone oil (for high temperature and vacuum)	
T	None	Silicone oil (for high temperature and vacuum)	
K	None	Silicone oil (for high temperature and high vacuum)	

*1: Hastelloy C for 6th code 6

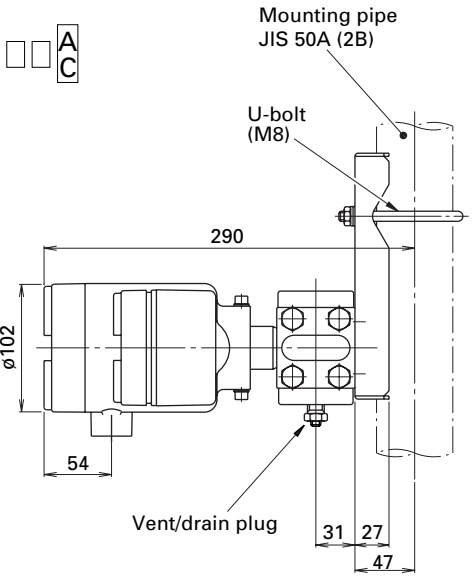
*2: Available for 7th code V

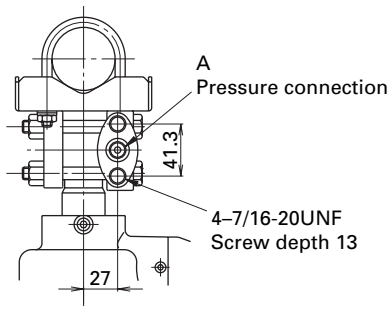
OUTLINE DIAGRAM (Unit: mm)

1) Pressure transmitter

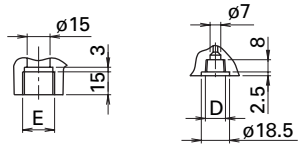


FBB S T 0 □ V H M T 1– □ □ A C





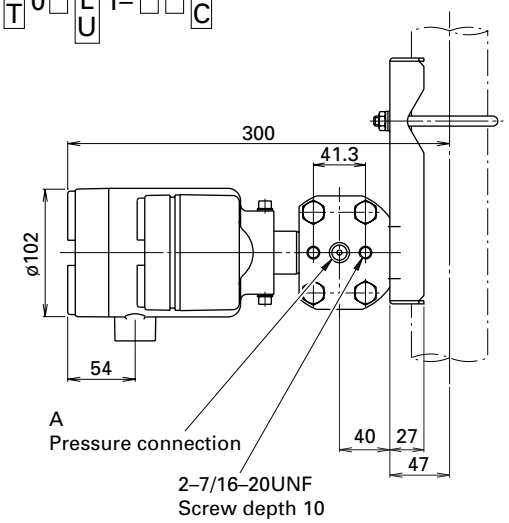
View from arrow P

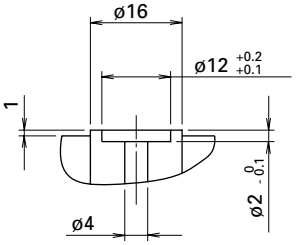


Details of area B Details of area A

Type	FBBS	FBBT
D	Rc1/4	1/4–18NPT
E	G1/2	1/2–14NPT

FBB S T 0 □ B L U 1– □ □ A C



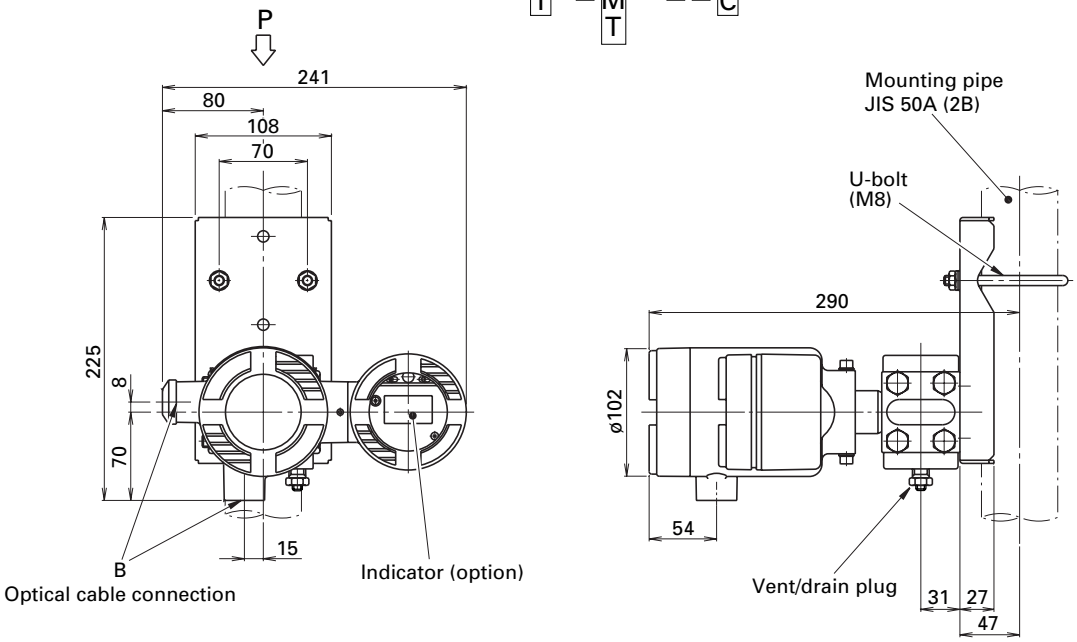


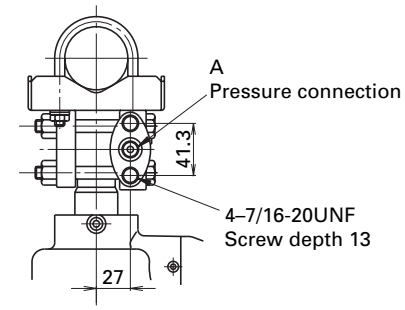
Details of area A

OUTLINE DIAGRAM (Unit: mm)

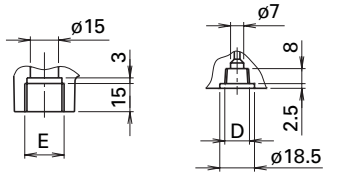
2) Absolute pressure transmitter

FBH [S/T] 0□ [V/H/M/T] 1– □□ [A/C]





View from arrow P

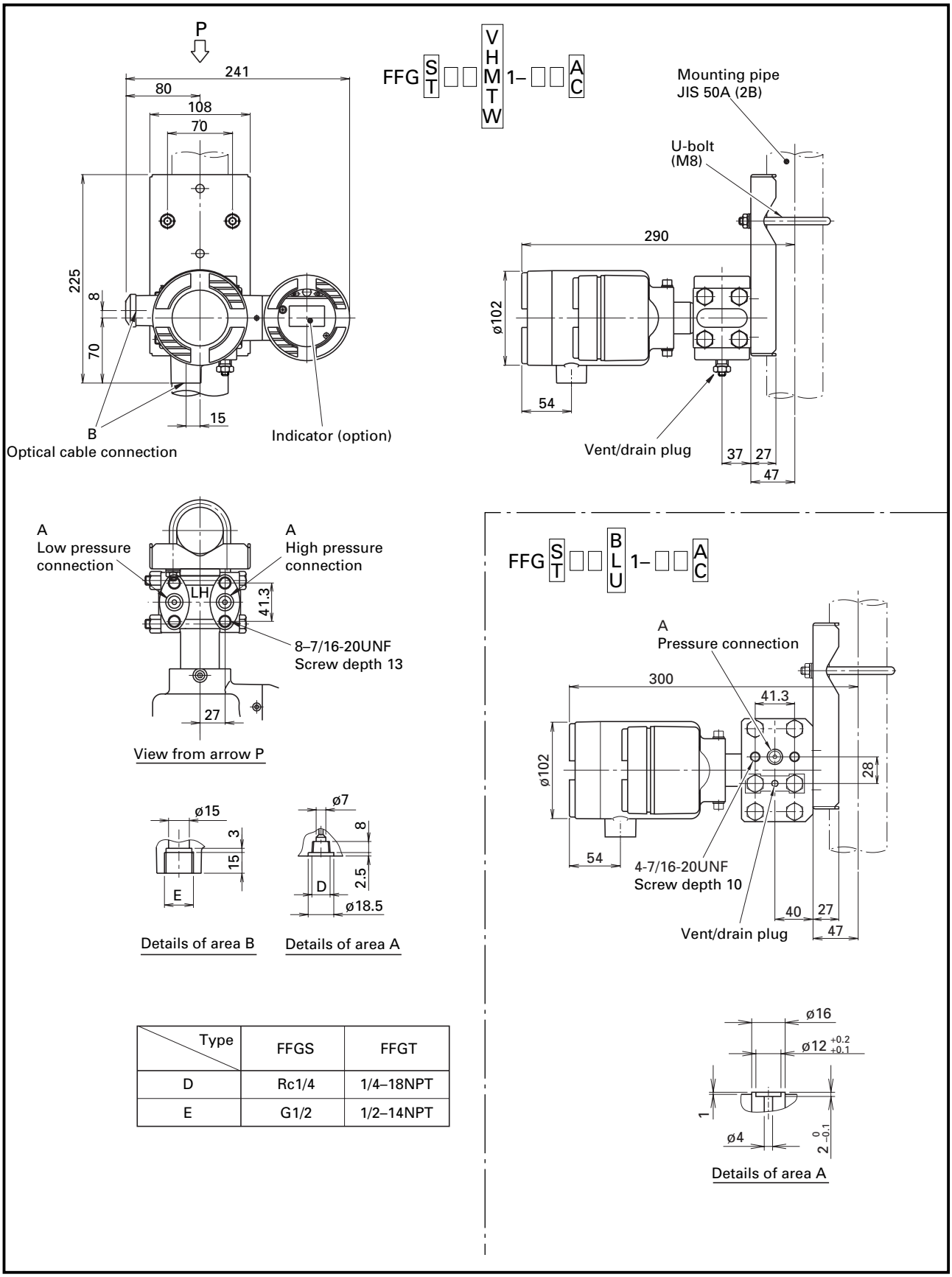


Details of area B Details of area A

Type	FBHS	FBHT
D	Rc1/4	1/4–18NPT
E	G1/2	1/2–14NPT

OUTLINE DIAGRAM (Unit: mm)

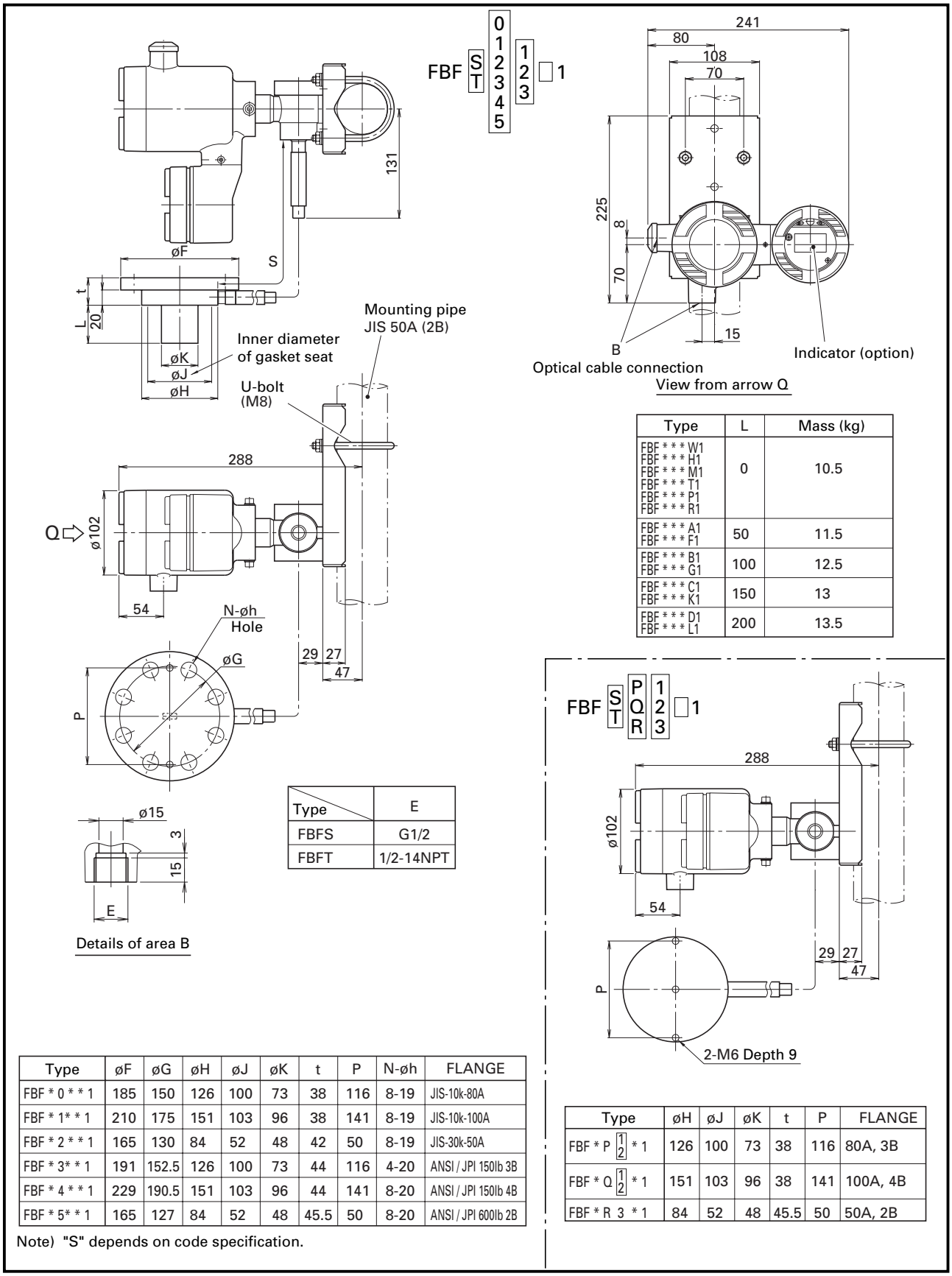
3) Differential pressure/flow transmitter



Type	FFGS	FFGT
D	Rc1/4	1/4–18NPT
E	G1/2	1/2–14NPT

OUTLINE DIAGRAM (Unit: mm)

4) Remote seal type pressure transmitter



Type	L	Mass (kg)
FBF * * * W1 FBF * * * H1 FBF * * * M1 FBF * * * T1 FBF * * * P1 FBF * * * R1	0	10.5
FBF * * * A1 FBF * * * F1	50	11.5
FBF * * * B1 FBF * * * G1	100	12.5
FBF * * * C1 FBF * * * K1	150	13
FBF * * * D1 FBF * * * L1	200	13.5

Type	E
FBFS	G1/2
FBFT	1/2-14NPT

Type	øF	øG	øH	øJ	øK	t	P	N-øh	FLANGE
FBF * 0 * * 1	185	150	126	100	73	38	116	8-19	JIS-10k-80A
FBF * 1* * 1	210	175	151	103	96	38	141	8-19	JIS-10k-100A
FBF * 2 * * 1	165	130	84	52	48	42	50	8-19	JIS-30k-50A
FBF * 3* * 1	191	152.5	126	100	73	44	116	4-20	ANSI / JPI 150lb 3B
FBF * 4 * * 1	229	190.5	151	103	96	44	141	8-20	ANSI / JPI 150lb 4B
FBF * 5* * 1	165	127	84	52	48	45.5	50	8-20	ANSI / JPI 600lb 2B

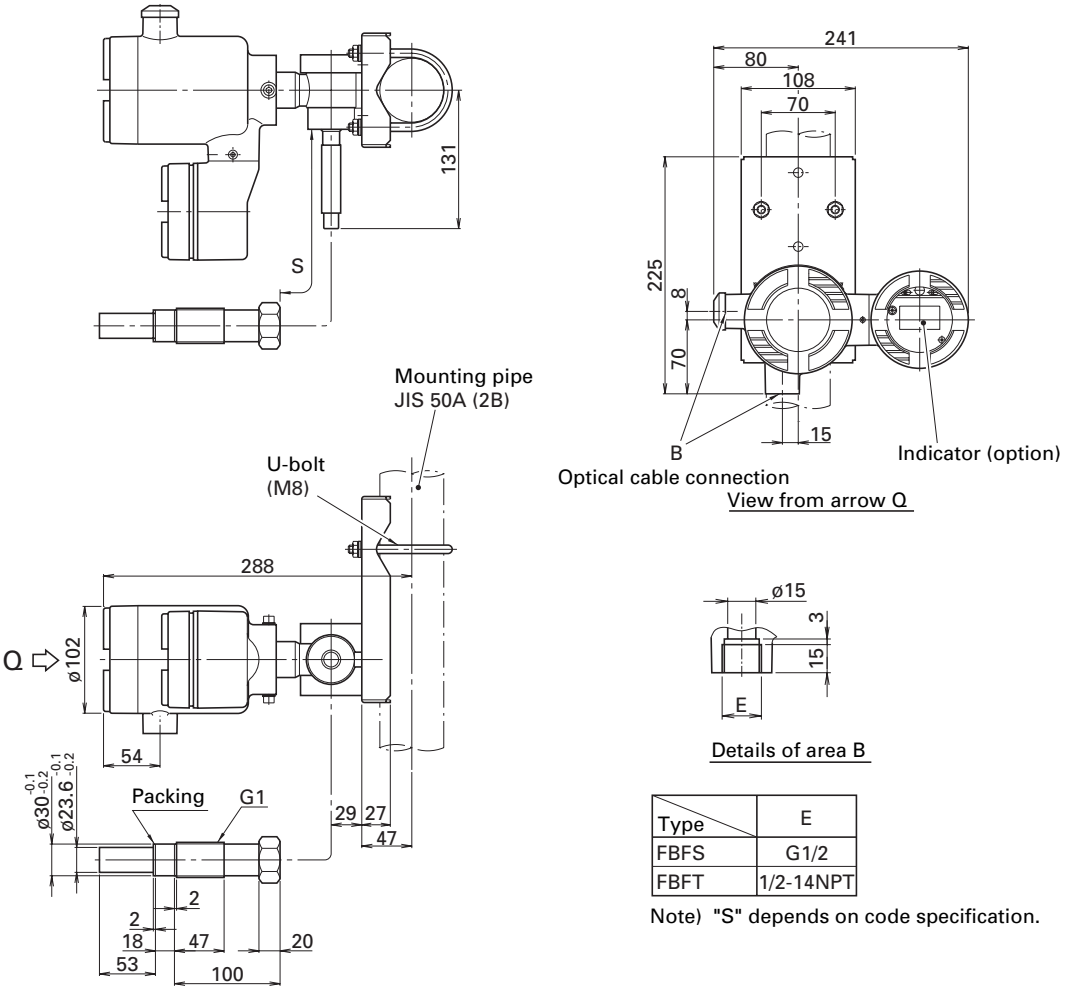
Note) "S" depends on code specification.

Type	øH	øJ	øK	t	P	FLANGE
FBF * P 1/2 * 1	126	100	73	38	116	80A, 3B
FBF * Q 1/2 * 1	151	103	96	38	141	100A, 4B
FBF * R 3 * 1	84	52	48	45.5	50	50A, 2B

OUTLINE DIAGRAM (Unit: mm)

4) Remote seal type pressure transmitter

FBF [S/T] K [4/5] W1

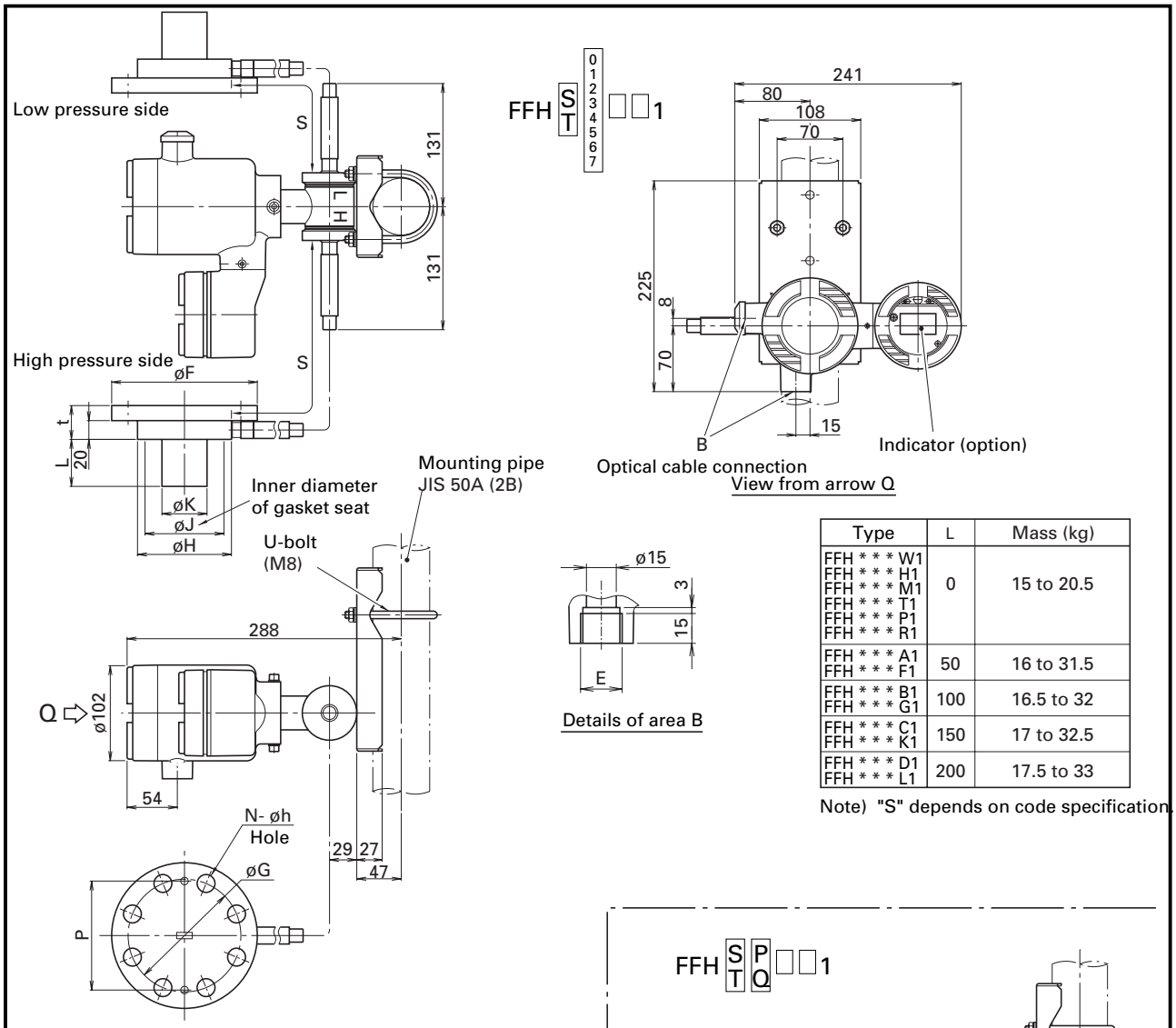


Type	E
FBFS	G1/2
FBFT	1/2-14NPT

Note) "S" depends on code specification.

OUTLINE DIAGRAM (Unit: mm)

5) Remote seal type differential pressure transmitter

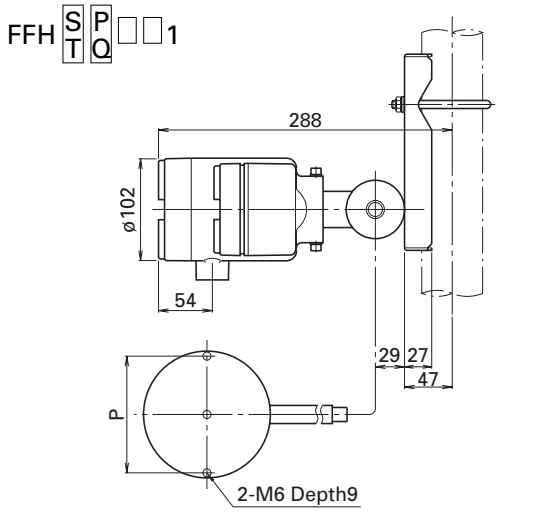


Type	L	Mass (kg)
FFH * * * W1 FFH * * * H1 FFH * * * M1 FFH * * * T1 FFH * * * P1 FFH * * * R1	0	15 to 20.5
FFH * * * A1 FFH * * * F1	50	16 to 31.5
FFH * * * B1 FFH * * * G1	100	16.5 to 32
FFH * * * C1 FFH * * * K1	150	17 to 32.5
FFH * * * D1 FFH * * * L1	200	17.5 to 33

Note) "S" depends on code specification.

Type	øF	øG	øH	øJ	øK	t	P	N-øh	FLANGE
FFH * 0 * * 1	185	150	126	100	73	38	116	8-19	JIS-10k-80A
FFH * 1 * * 1	210	175	151	103	96	38	141	8-19	JIS-10k-100A
FFH * 2 * * 1	210	170	126	100	73	48	116	8-23	JIS-30k-80A
FFH * 3 * * 1	240	195	151	103	96	52	141	8-25	JIS-30k-100A
FFH * 4 * * 1	191	152.5	126	100	73	44	116	4-20	ANSI / JPI 150lb 3B
FFH * 5 * * 1	229	190.5	151	103	96	44	141	8-20	ANSI / JPI 150lb 4B
FFH * 6 * * 1	210	168	126	100	73	49	116	8-23	ANSI / JPI 300lb 3B
FFH * 7 * * 1	254	200	151	103	96	52	141	8-23	ANSI / JPI 300lb 4B

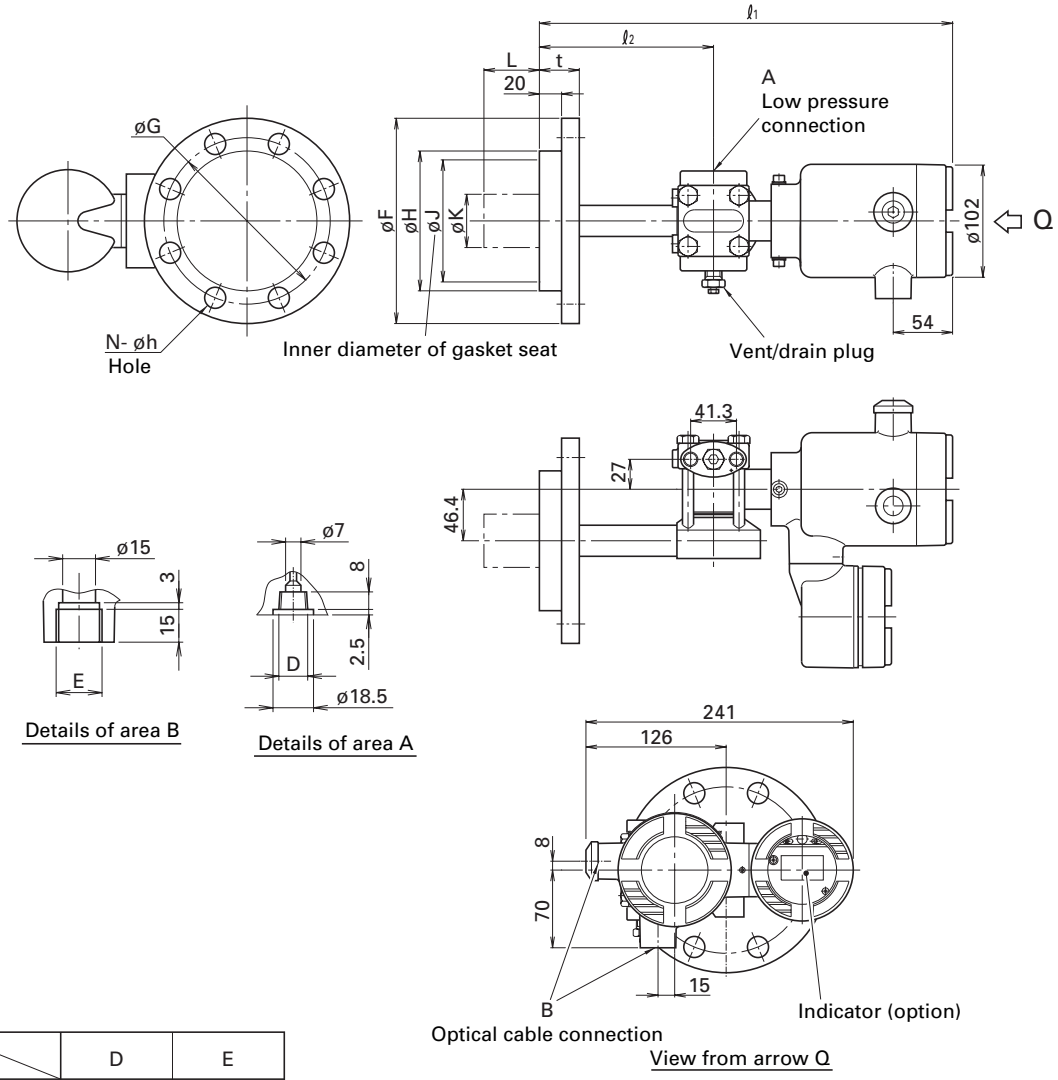
Type	E
FFHS	G1/2
FFHT	1/2-14NPT



Type	øH	øJ	øK	P	FLANGE
FFH * P * * 1	126	100	73	116	For JIS-80A, ANSI/JPI 3B
FFH * Q * * 1	151	103	96	141	For JIS-100A, ANSI/JPI 4B

OUTLINE DIAGRAM (Unit: mm)

6) Level transmitter



Type	D	E
FPLS	Rc1/4	G1/2
FPLT	1/4-18NPT	1/2-14NPT

Type	øF	øG	øH	øJ	øK	t	N-øh	FLANGE
FPL * 0 * * 1	185	150	126	100	73	38	8-19	JIS-10k-80A
FPL * 1 * * 1	210	175	151	103	96	38	8-19	JIS-10k-100A
FPL * 2 * * 1	210	170	126	100	73	48	8-23	JIS-30k-80A
FPL * 3 * * 1	240	195	151	103	96	52	8-25	JIS-30k-100A
FPL * 4 * * 1	191	152.5	126	100	73	44	4-20	ANSI / JPI 150lb 3B
FPL * 5 * * 1	229	190.5	151	103	96	44	8-20	ANSI / JPI 150lb 4B
FPL * 6 * * 1	210	168	126	100	73	49	8-23	ANSI / JPI 300lb 3B
FPL * 7 * * 1	254	200	151	103	96	52	8-23	ANSI / JPI 300lb 4B

Type	L	ℓ1	ℓ2	Mass (kg)
FPL * * * * 1- * * Y	0	365	150	10.5 to 14
FPL * * * V1- * * A FPL * * * H1- * * E	50	359	144	11 to 18
FPL * * * V1- * * B FPL * * * H1- * * F	100			11.5 to 18.5
FPL * * * V1- * * C FPL * * * H1- * * G	150			12 to 19
FPL * * * V1- * * D FPL * * * H1- * * H	200			12.5 to 19.5

FFX-T Series Temperature Transmitter

DATA SHEET

This temperature transmitter is equipped with a thermocouple and a platinum resistance bulb for measuring temperatures of various kinds of fluids.

The electronic unit has a built-in micro-processor for processing signals in digital mode to provide highly accurate and intelligent measurements.

The signal transmission line uses optical fiber cables to realize an optical fieldbus system with optical star coupler and host system.

Composition of models

1) Temperature transmitter (integrated type); Type FUP
2) Temperature transmitter (separated type); Type FUT

Specifications

Functional specifications

• **Measured fluid:** Liquid, gas, vapor

• **Measuring range**

	Integrated type (FUP)	Separated type (FUT)
J Thermocouple	-200 to +400˚C	-200 to +750˚C
E Thermocouple	-200 to +400˚C	-200 to +800˚C
K Thermocouple	-200 to +400˚C	-200 to +1200˚C
R Thermocouple	————	0 to +1600˚C
T Thermocouple	————	-200 to +350˚C
Resistance bulb Pt100	-200 to +400˚C	-200 to +600˚C

Note) When the operating temperature range is not specified at the time of ordering, the transmitter will be adjusted within the maximum measuring range prior to delivery.

• **Operating pressure:**
Flange type...Flange rated pressure
Screw type... 4MPa or less

• **Output:** Optical digital signal, specifications of Fieldbus Foundation

• **Burnout:** Previous output is retained at burnout of sensor. With BAD status

• **Explosion-proof:**
Intrinsic safety explosion-proof, JIS ib II C T3 (under application), CENELEC ib II C T4 (under application)

• **Zero point deviation:**
80% between minimum and maximum temperatures within measuring range

• **Power supply:** Built-in lithium battery
Life: About 2 years ... under the following conditions.
{ Macro-cycle: 1sec
Status read cycle; 4sec
Token go-round; 0.25sec
Voltage read cycle; 1hr }

• **Self-diagnosis:** Display on indicator and transmission to host

Item	Host	Indicator
Measuring range error	○	○
Sensor error	○	○
Amplifier fault	○	○
Battery voltage	○	—
Battery voltage-drop alarm	○	○

• **Remote setting:** Read-out from hose devices and setting items

Item	Read-out	Setting
Tag No.	○	○
Serial No.	○	—
Maximum range	○	—
Measuring range	○	○
Damping constant	○	○
Unit of process variable	○	○
Process variable	○	—

• **Ambient temperature:**
-30 to +70˚C
Intrinsic safety explosion-proof; -10 to +60˚C

• **Storage temperature:**
-40 to +80˚C

• **Ambient humidity:**
95%RH or less

• **Regulation:** Fieldbus Foundation specifications (basic device, device type 411, AI function block)

Performance specifications

1. Sensor (for integrated type)

• **Accuracy rating:**
Thermocouple; JIS C 1604 Class 2
Resistance bulb; JIS C 1604 Class B

• **Response time (time constant):**
Protective tube, ø4.8mm... About 8sec
Protective tube, ø12mm... About 70sec

2. Electronic unit (integrated/separated type)

• Accuracy rating:

Type	Sensor	Temperature range	Accuracy rating
FUP ☐ A (integrated type)	J Thermocouple	-140 to +400˚C	±0.6˚C
FUT ☐ A (separated type)		Under. -140˚C *	±1˚C
FUT ☐ B (separated type)	J Thermocouple	-100 to +750˚C	±1.1˚C
		Under. -100˚C *	±1.9˚C
FUP ☐ C (integrated type)	E Thermocouple	-200 to +400˚C	±0.6˚C
FUT ☐ C (separated type)			
FUT ☐ D (separated type)	E Thermocouple	-80 to +800˚C	±1.2˚C
		Under. -80˚C *	±2˚C
FUP ☐ E (integrated type)	K Thermocouple	-150 to +400˚C	±0.6˚C
FUT ☐ E (separated type)		Under. -150˚C *	±1˚C
FUT ☐ F (separated type)	K Thermocouple	0 to +1200˚C	±1.8˚C
		Under. 0˚C *	±3˚C
FUT ☐ G (separated type)	R Thermocouple	0 to +1600˚C	±4˚C
FUT ☐ G (separated type)	T Thermocouple	-200 to +350˚C	±0.8˚C
FUP ☐ J (integrated type)	Pt100	-200 to +400˚C	±0.6˚C
FUT ☐ L (separated type)			
FUT ☐ K (separated type)		-200 to +600˚C	±0.9˚C
M (separated type)			
FUT ☐ N (separated type)	JPt100	-200 to +400˚C	±0.6˚C
FUT ☐ P (separated type)	JPt100	-200 to +500˚C	±0.7˚C

Note 1. Accuracy with segmented line compensation

2. Reference junction compensation error not included.

• Reference junction compensation accuracy:
±1˚C (for thermocouple)

• Ambient temperature effect:
(Variation at -30 to +70˚C)
±0.5% of Max. measured temperature; ±1% of the above temperature range marked "*"

• Wiring resistance:
(For separated type)
Thermocouple: Less than 100Ω, resistance bulb; less than 10Ω

Structure and material

• Casing: Immersion-proof type, JIS C 0920 (IEC IP67, NEMA4X or equivalent)

• Optical cable connections:
G1/2 or 1/2-14NPT

• Mounting method:
(1) Integrated type (FUP); screw or flange mounting ... according to code symbols
(2) Separated type (FUT); 50A (2B) pipe mounting with U-bolt or wall mounting

• Coating: Epoxy/urethane, double coating
Color; silver (blue for case cover)

• Mass: (1) Integrated type (FUP); 3 to 5kg, depending on the length of sensor
(2) Separated type (FUT); about 2.4kg

• Insertion length:
(Length of integrated type sensor)
100 to 2000 mm ... Refer to the code symbols.

• Minimum bending radius:
(Allowable bend of integrated type sensor)
14.4mm ... Sheath type (ø4.8mm) only

• Dimensions: See outline diagram.

• Material: (Material of integrated type sensor protective tube)
SUS304 or SUS316... according to code symbols

Relation between measured fluid flow velocity and insertion length

When inserting the protective tube into the fluid piping, the temperature sensor receives the stress of the flow of fluid, so the strength of the protective tube to be inserted should be taken into account.

Study the insertion length of the temperature sensor to be used referring to the relation between the flow velocity and insertion length shown in Fig. 1.

When inserting the sheath type into flow, a protective tube should be provided separately.

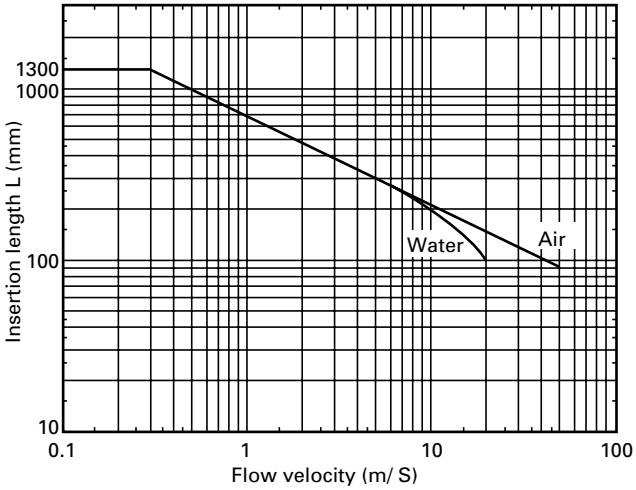


Fig. 1 Relation between flow velocity and insertion length (Protective tube, ø12mm)

Option specifications

• Indicator: 5-digit LCD display, % or scale display
Operating temperature range; -20 to +70 ˚C

Scope of delivery

Instrument main unit, pipe mounting brackets (for separated type)

CODE SYMBOLS

Temperature transmitter (integrated type)

1 2 3 4 5 6 7 8	9 10 11 12 13	14	Description
F U P			Opt. cable connection (4th digit)
S			G1/2
T			1/2-14NPT
			Measuring range (5th digit)
A			J Thermocouple -200 to 400˚C
C			E Thermocouple -200 to 400˚C
E			K Thermocouple -200 to 400˚C
J			3-wire system Pt 100 (1989) -200 to 400˚C
L			3-wire system Pt 100 (1997) -200 to 400˚C
			Explosion-proof (6th digit)
A			For general-use (non-explosion-proof)
G			JIS Intrinsic safety (under application)
K			CENELEC Intrinsic safety (under application)
			Indicator (7th digit)
A			None
L			Digital, % display
P			Digital, actual scale display
			Optical connector (9th digit)
F			FC type
S			ST type
			Type of protective tube (10th digit)
A			ø12
B			ø4.8(sheath type)
			Protective tube material (11th digit)
S			SUS304 (10th digit B not applicable)
W			SUS316
			Insertion length (mm) (12th, 13th digit)
	0 1		100
	0 2		200
	0 3		300
	0 4		400
	0 5		500
	0 6		600
	0 7		700
	0 8		800
	0 9		900
	1 0		1000
	1 1		1100
	1 2		1200
	1 3		1300
	1 4		1400
	1 5		1500
	1 6		1600
	1 7		1700 (10th digit A not applicable)
	1 8		1800
	1 9		1900
	2 0		2000
		0	Mounting method (14th digit)
		1	Flange JIS 10K-25A RF
		2	Flange JIS 20K-25A RF
		3	Flange JIS 30K-25A RF
		4	Flange JIS 63K-25A RF
		5	Screw-in G3/4B
		6	Screw-in R3/4
		7	Screw-in 3/4-14NPT
		8	Flange ANSI 150LB, 1B
		9	Flange ANSI 300LB, 1B
			Flange ANSI 600LB, 1B

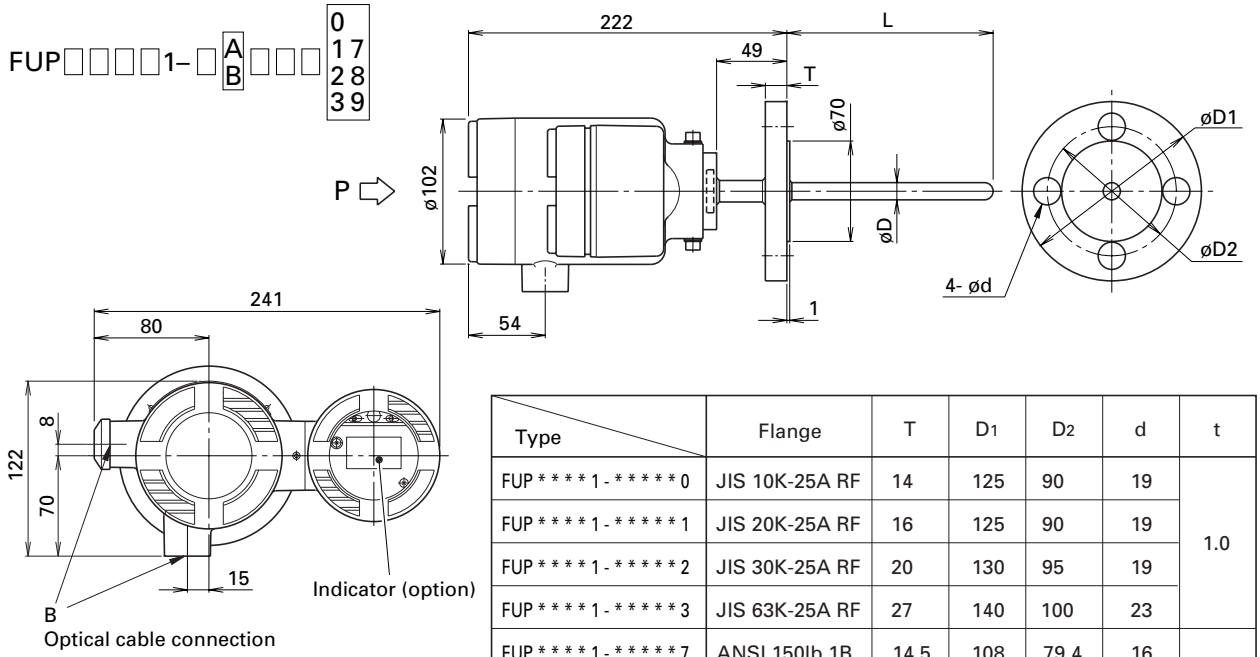
Temperature transmitter (separated type)

1 2 3 4 5 6 7 8	9	Description
F U T		Opt. cable connection(4th digit)
S		G1/2
T		1/2-14NPT
		Input signal, measuring range (5th digit)
A		J Thermocouple -200 to 400˚C
B		J Thermocouple -200 to 750˚C
C		E Thermocouple -200 to 400˚C
D		E Thermocouple -200 to 800˚C
E		K Thermocouple -200 to 400˚C
F		K Thermocouple -200 to 1200˚C
G		R Thermocouple 0 to 1600˚C
H		T Thermocouple -200 to 350˚C
J		3-wire system Pt 100 (1989) -200 to 400˚C
K		3-wire system Pt 100 (1989) -200 to 600˚C
L		3-wire system Pt 100 (1997) -200 to 400˚C
M		3-wire system Pt 100 (1997) -200 to 600˚C
N		3-wire system JPt 100 -200 to 400˚C
P		3-wire system JPt 100 -200 to 500˚C
		Explosion-proof (6th digit)
A		For general-use (non-explosion-proof)
G		JIS Intrinsic safety (under application)
K		CENELEC Intrinsic safety (under application)
		Indicator (7th digit)
A		None
L		Digital, % display
P		Digital, actual scale display
		Optical connector (9th digit)
F		FC type
S		ST type

Outline diagram

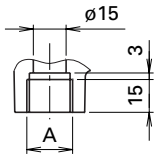
1) Temperature transmitter (integrated type)

FUP□□□□1–□[A/B]□□□[0/1/7/2/8/3/9]



"P" view

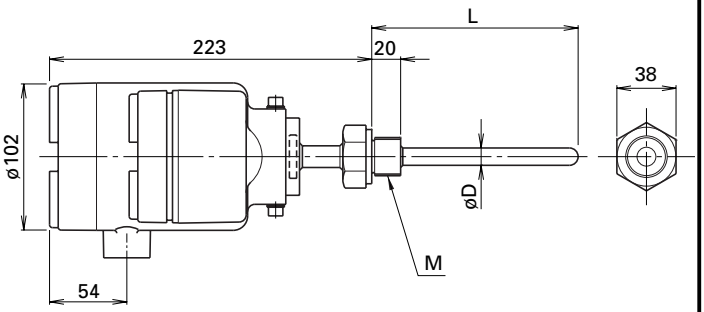
Type	Flange	T	D1	D2	d	t
FUP****1-*****0	JIS 10K-25A RF	14	125	90	19	1.0
FUP****1-*****1	JIS 20K-25A RF	16	125	90	19	
FUP****1-*****2	JIS 30K-25A RF	20	130	95	19	
FUP****1-*****3	JIS 63K-25A RF	27	140	100	23	
FUP****1-*****7	ANSI 150lb,1B	14.5	108	79.4	16	1.6
FUP****1-*****8	ANSI 300lb,1B	17.5	124	88.9	20	
FUP****1-*****9	ANSI 600lb,1B	17.5	124	88.9	20	



"B" detail

Type	A	D	L
FUPS***1-*A***	G1/2	ø12	100 to 1300 (to be specified)
FUPT***1-*A***	1/2-14NPT		
FUPS***1-*B***	G1/2	ø4.8 (sheath type)	100 to 2000 (to be specified)
FUPT***1-*B***	1/2-14NPT		

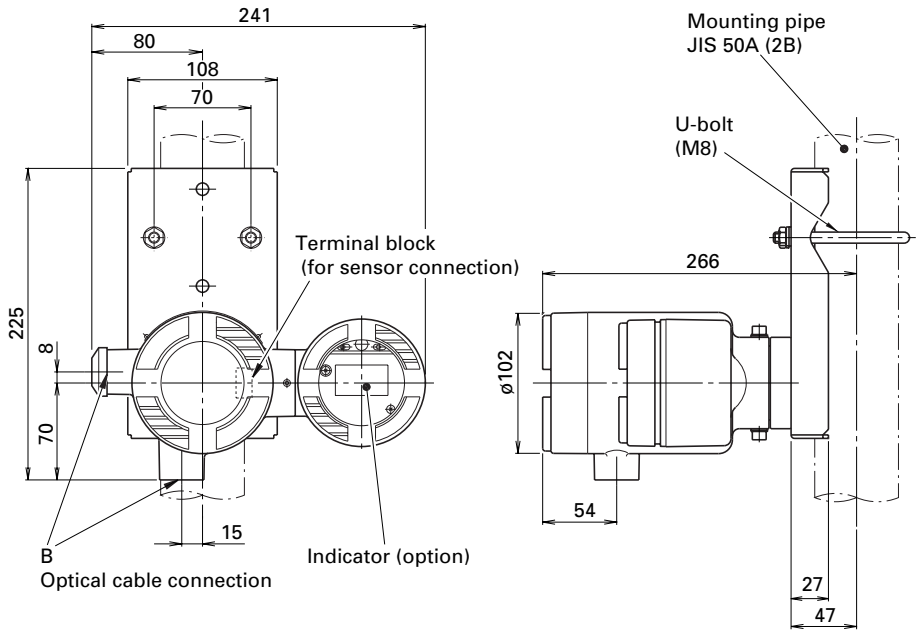
FUP□□□□1–□[A/B]□□□[4/5/6]

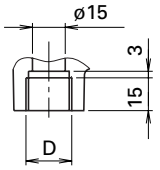


Type	M
FUP****1-*****4	G3/4
FUP****1-*****5	Rc3/4
FUP****1-*****6	3/4-14NPT
FUP****1-*****4	G3/4
FUP****1-*****5	Rc3/4
FUP****1-*****6	3/4-14NPT

Outline diagram

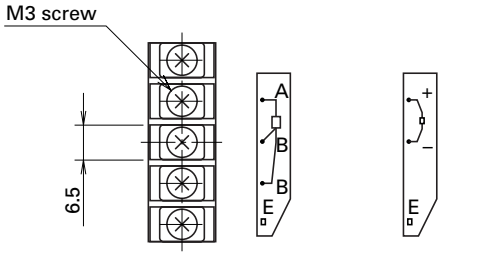
2) Temperature transmitter (separated type)





"B" detail

Type	FUTS	FUTT
D	G1/2	1/2-14NPT



Connection diagram

FFX-T Series Multi-point Temperature Converter

DATA SHEET

This multi-point temperature converter is used to receive input signals from a maximum of 8 points of thermocouple or resistance bulb temperature sensors and convert these signals into optical digital output signals.

The signal transmitter using optical fiber cables configures an optical fieldbus system together with an optical star coupler and a host system.

Specifications

Functional specifications

- **Input:** Thermocouple (J, E, K, R, T type)
  Resistance bulb (Pt100, JPt100, 3-wire system)
- **Input points:** 8 points, max.
  Temperature sensors should be of the same type and the same range.
- **Output:** Optical digital signal, Fieldbus Foundation specifications
- **Power supply:** 24V DC (20 to 30V) or 85 to 264V AC 50/60 Hz, according to code symbols
- **Power consumption:**
  About 1W ... 24V DC
  About 5VA ... 85-264V AC
- **Explosion-proof:** Intrinsic safety explosion-proof,
  JIS ib II C T3 (under application)
  CENELEC ib II C T4 (under application), 24V DC only
  Used in combination with safety barrier (PWXCA001)
- **Zero point deviation:**
  80% of minimum-maximum temperatures within measuring range
- **Remote setting:** Read-out from host system and setting items

Item	Read-out	Setting
Tag No.	○	○
Serial No.	○	—
Maximum range	○	—
Measuring range	○	○
Damping constant	○	○
Unit of process variable	○	○
Process variable	○	—

- **Measuring range:**

Type	Sensor	Temperature range
FRM1A	J Thermocouple	-200 to +400˚C
FRM1B		-200 to +750˚C
FRM1C	E Thermocouple	-200 to +400˚C
FRM1D		-200 to +800˚C
FRM1E	K Thermocouple	-200 to +600˚C
FRM1F		-200 to +1200˚C
FRM1G	R Thermocouple	0 to +1600˚C
FRM1H	T Thermocouple	-200 to +350˚C
FRM1J FRM1L	Resistance bulb Pt100	-200 to +300˚C
FRM1K FRM1M	Resistance bulb Pt100	-200 to +600˚C
FRM1N	Resistance bulb	-200 to +300˚C
FRM1P	JPt100	-200 to +500˚C

- **Burnout:** Previous output value is retained at burnout of sensor. With BAD status
- **Self-diagnosis:** Detection of faults and transmission to host system; measurement error, sensor burnout, amplifier fault
- **Ambient temperature:**
  -30 to +60˚C
  Intrinsic safety explosion-proof; -10 to +60˚C
- **Storage temperature:**
  -40 to +70˚C
- **Ambient humidity:** 95%RH or less
- **Regulation:** Fieldbus Foundation specifications (Basic device, device type 411, AI function block)

Performance specifications

- **Accuracy rating:**

Type	Sensor	Temperature range	Accuracy rating
FRM1A	J Thermocouple	-200 to +400˚C	±1.2˚C
FRM1B		-200 to +75˚C	±2.2˚C
FRM1C	E Thermocouple	-200 to +400˚C	±1.2˚C
FRM1D		-200 to +800˚C	±2.4˚C
FRM1E	K Thermocouple	-200 to +600˚C	±1.8˚C
FRM1F		-200 to +1200˚C	±3.6˚C
FRM1G	R Thermocouple	0 to +1600˚C	±4.8˚C
FRM1H	T Thermocouple	-200 to +350˚C	±1˚C
FRM1[J] FRM1[L]	Resistance bulb Pt100	-200 to +300˚C	±0.9˚C
FRM1[K] FRM1[M]	Resistance bulb Pt100	-200 to +600˚C	±1.8˚C
FRM1N	Resistance bulb	-200 to +300˚C	±0.9˚C
FRM1P	JPt100	-200 to +500˚C	±1.5 ˚C

Note) Accuracy: With linearize, reference junction compensation error not included

- **Reference junction compensation accuracy:**
  ±1˚C (for thermocouple)
- **Measuring cycle:** 2sec (at any input point)
- **Ambient temperature effect:**
  (Variations at -30 to +60˚C)
  ±0.5% of maximum measuring temperature
- **Allowable wiring resistance:**
  Thermocouple; less than 100Ω
  Resistance bulb; less than 10Ω
- **Insulation:** Fully insulated between input and output and between output and power supply by optical interface

Power supply	Withstand-voltage	Insulation resistance
24V DC	500V AC, 1min	More than 100MΩ at 500V DC
85 to 264V AC	2000V AC, 1min	More than 100MΩ at 500V DC

Structure and materials

- Casing: Splash-proof type (IEC IP65 or equivalent)
- Optical/power cable connection port:
  G1/2 or 1/2-14NPT ... according to code symbols
- Sensor cable connection port:
  G1 1/4 or 1 1/4-11NPT ... according to code symbols
- Mounting method:
  Mounting on 50A (2B) pipe with U-bolt or wall mounting .... according to code symbols
- Mass: Approx. 9kg
- Coating: Epoxy/urethane double coating
- Dimensions: See outline diagram.

Scope of delivery

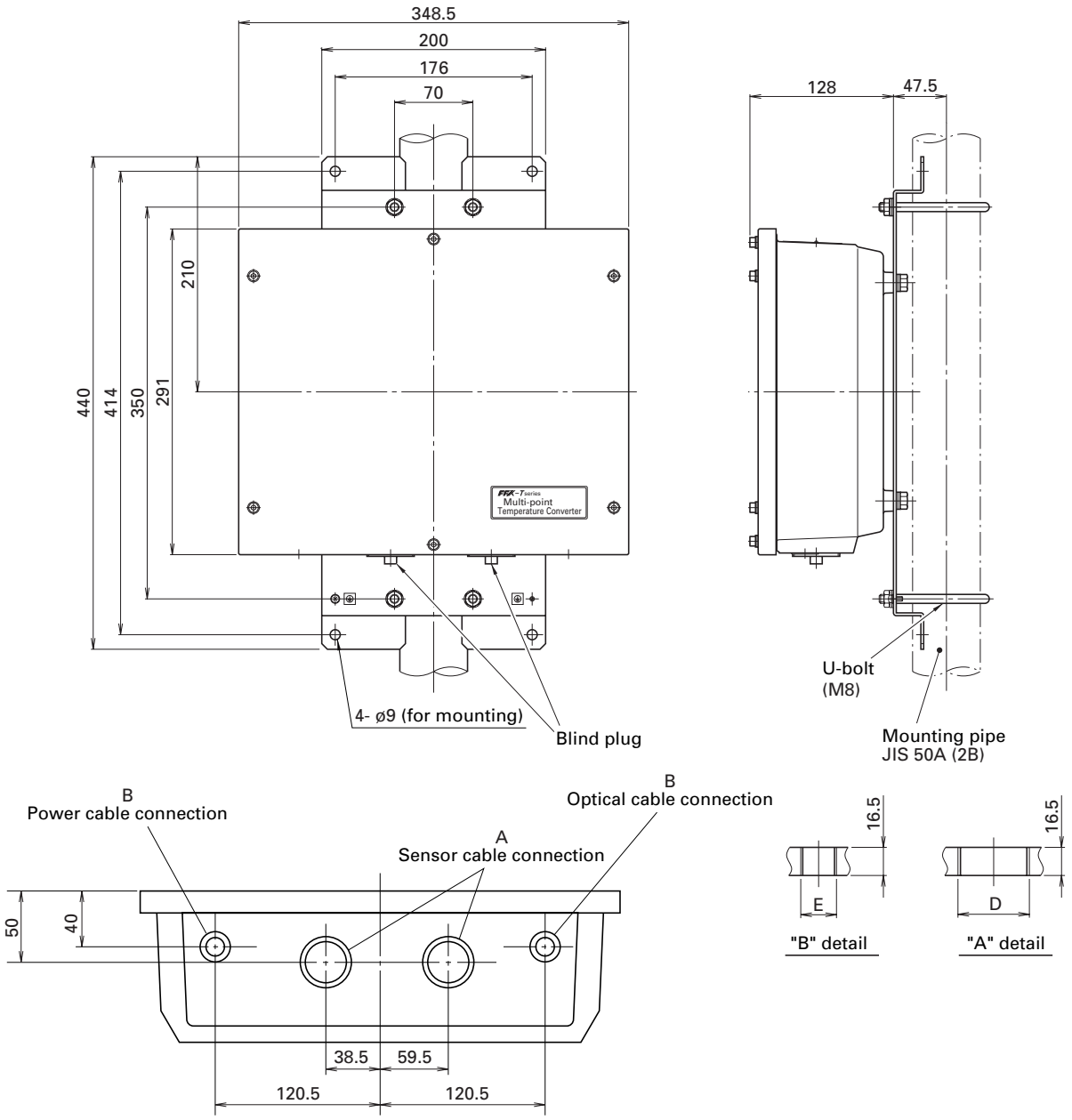
Instrument main unit, U-bolt (for pipe mounting)

CODE SYMBOLS

1 2 3 4 5 6 7 8	9 10	Description	
F R M			
		Input points (4th digit)	
1		8 points	
		Measuring range (5th digit)	
A		J Thermocouple	-200 to +400˚C
B		J Thermocouple	-200 to +750˚C
C		E Thermocouple	-200 to +400˚C
D		E Thermocouple	-200 to +800˚C
E		K Thermocouple	-200 to +600˚C
F		K Thermocouple	-200 to +1200˚C
G		R Thermocouple	0 to +1600˚C
H		T Thermocouple	-200 to +350˚C
J		Resistance bulb 3-wire system Pt 100 (1989)	-200 to +300˚C
K		Resistance bulb 3-wire system Pt 100 (1989)	-200 to +600˚C
L		Resistance bulb 3-wire system Pt 100 (1997)	-200 to +300˚C
M		Resistance bulb 3-wire system Pt 100 (1997)	-200 to +600˚C
N		Resistance bulb 3-wire system JPt 100	-200 to +300˚C
P		Resistance bulb 3-wire system JPt 100	-200 to +500˚C
		Explosion-proof (6th digit)	
A		For general-use (non-explosion-proof)	
G		JIS Intrinsic safety (under application)	*1
K		CENELEC Intrinsic safety (under application)	*1
		Power supply (7th digit)	
1		DC24V	
2		AC85 to 264V 50/60Hz	
		Optical connector (9th digit)	
	F	FC type	
	S	ST type	
		Cable connection and mounting (10th digit)	
	A	G1/2, 1 1/4	Pipe mounting
	B	G1/2, 1 1/4	Wall mounting
	C	NPT1/2, 1 1/4	Pipe mounting
	D	NPT1/2, 1 1/4	Wall mounting

*1: Not applicable for the 7th digit code 2

Outline diagram



Type	D	E
FRM1 * * *1– * A/B	G1 1/4	G1/2
FRM1 * * *1– * C/D	1 1/4–11NPT	1/2–14NPT

FFX-Z Series Optical-Pneumatic Converter

DATA SHEET

This instrument is used to convert optical digital signals into pneumatic signals proportional to the set value given from the host system for operating pneumatic actuatres such as pneumatic positioners, diaphragm valves, etc. The adoption of optical fiber cables to the signal transmission line configures an optical fieldbus system together with an optical star coupler and a host system.

Specifications

Functional specifications

- **Input:** Optical digital signal, Fieldbus Foundation specifications
- **Output:** Pneumatic output; 20 to 100kPa
- **Supply air pressure:** 140kPa
- **Power supply:** Built-in lithium battery
  Life: About 1.5 years ... under the following conditions
  { Macro-cycle; 1sec
  Status read cycle; 4sec
  Token go-round; 0.25sec
  Voltage read cycle; 1hr }
- **Explosion-proof:** Intrinsic safety explosion-proof, JIS ib II C T3 (under application)
  CENELEC ib II C T4 (under application)
- **Self-diagnosis:** Display on indicator and transmission to host

Item	Host	Indicator
Measuring range error	○	○
Detector error	○	○
Amplifier fault	○	○
Battery voltage	○	—
Battery voltage-drop alarm	○	○

- **Remote setting:** Read-out from host device and setting items

Item	Read-out	Setting
Tag No.	○	○
Serial No.	○	—
Output value	○	—
Unit of output value	○	○
Direction of emergency operation	○	○

- **Emergency operation:** Direction of output pneumatic operation at input OFF is selected from the following 3 operations ... according to code symbols.
  Previous value hold / Scale-out below 0% (less than 5kPa) / Scale-out above 100% (more than 120kPa)
- **Ambient temperature:** -20 to +60˚C
  Intrinsic safety explosion-proof; -10 to +60˚C
- **Storage temperature:** -30 to +70˚C
- **Ambient humidity:** 95%RH or less
- **Regulation:** Fieldbus Foundation specifications (basic device, device type 411 AO function block)

Performance specifications

- **Accuracy rating:** ±0.5%, full scale (output ripple; about ±0.2%)
- **Response speed:** 3sec or less (90% response time at load capacity 0.5 ℓ)
- **Input/output characteristic:** Linear
- **Air consumption:** Steady time (at steady output); 8N ℓ/min
  Maximum (at sudden change of output); 60N ℓ/min

Structure and materials

- **Casing:** Splash-proof type, JIS C 0920 (IEC IP54 or equivalent)
- **Air piping connection port:** Rc1/4 or 1/4-18NPT (according to code symbols)
- **Optical cable connection:** G1/2 or 1/2-14NPT (according to code symbols)
- **Mounting method:** Mounting on 50A (2B) pipe with U-bolt or wall mounting
- **Coating:** Epoxy/urethane double coating, color; silver (blue for case cover)
- **Mass:** Approx. 5.3kg
- **Dimensions:** See outline diagram.

Option specifications

- **Indicator:** 5-digit LCD display, % or actual scale display

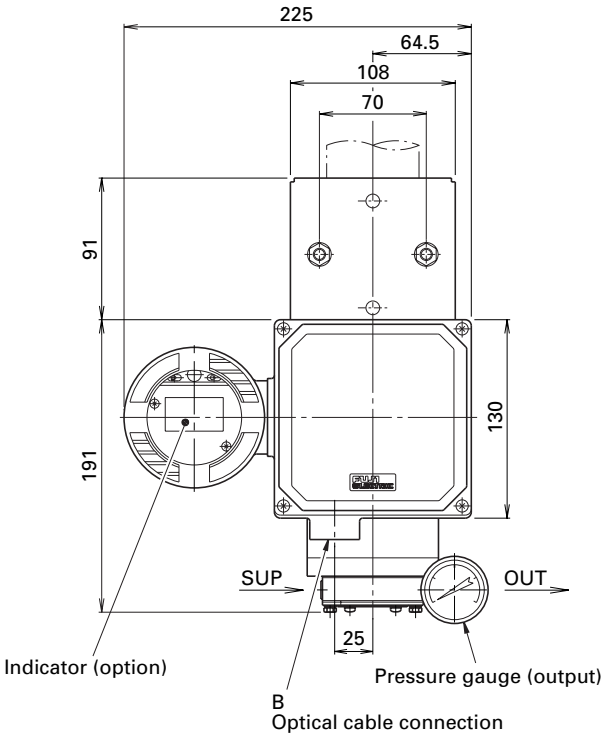
Scope of delivery

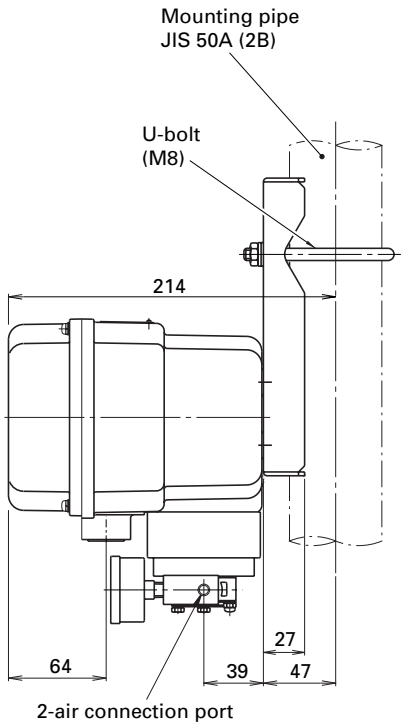
Instrument main unit, pipe mounting brackets

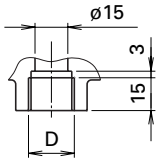
CODE SYMBOLS

1 2 3 4 5 6 7 8	9 10 11	Description
Z L K 1	1 -	
1		Output air pressure/ supply pressure (4th digit) 20 to 100kPa / 140kPa
S		Air piping connection/ opt.cable connection (5th digit) Rc1/4 / G1/2
T		1/4-18NPT / 1/2-14NPT
F		Optical connector (6th digit) FC connector
S		ST connector
A		Indicator (7th digit) None
L		Digital, % display
P		Digital, actual scale display
	A	Explosion-proof (9th digit) For general-use (non-explosion-proof)
	G	JIS Intrinsic safety (under application)
	K	CENELEC Intrinsic safety (under application)
	A	Emergency operation (at input OFF) (10th digit) Previous value hold
	B	Scale-out below 0%
	C	Scale-out above 100%
		Air set (11th digit)
	Y	None
	A	With air regulater

Outline diagram







"B" detail

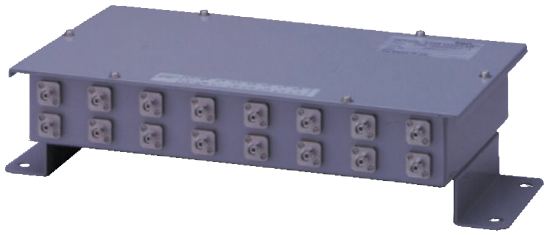
Type	ZLK1S	ZLK1T
Air connection port	Rc 1/4	1/4-18NPT
Optical cable connection D	G 1/2	1/2-14NPT

Optical Star Coupler

DATA SHEET

This optical star coupler is used to branch optical signals; signals from the host system are branched for transmission to each field device, while signals from field devices are transmitted to the host system.

It is a reflection type star coupler capable of communications between field devices, and configures an optical fieldbus system together with field devices and host system.



Specifications

Function/performance

- Number of branches:
  16 branches
- Applicable optical fiber:
  Silica fiber ... core/cladding dia. 100/140 μm
  PCF fiber ... core/cladding dia. 200/230 μm
  ... according to code symbols
- Applicable optical connector:
  FC connector or ST connector ... according to code symbols
- Insertion loss: Silica; Max. 17.5dB
  PCF; Max. 18.5dB
- Ambient temperature:
  Silica; -30 to +70˚C
  PCF; -20 to +60˚C
- Storage temperature:
  Silica; -40 to +80˚C
  PCF; -30 to +70˚C
- Ambient humidity:
  95%RF or less
- Regulation: Fieldbus Foundation specifications
  Silica fiber (A1d) device type 421
  PCF fiber (A3C) device type 422

Structure and materials

- Casing: Dust-proof type JIS C 0920 ... indoor-use (IEC IP50 or equivalent)
- Coating: Melamine coating, color; Munsell 7.5BG6/1.5
- Mounting method:
  Wall mounting
- Dimensions: See outline diagram.
- Mass: Approx. 1.8kg
- Material: Case, steel plate

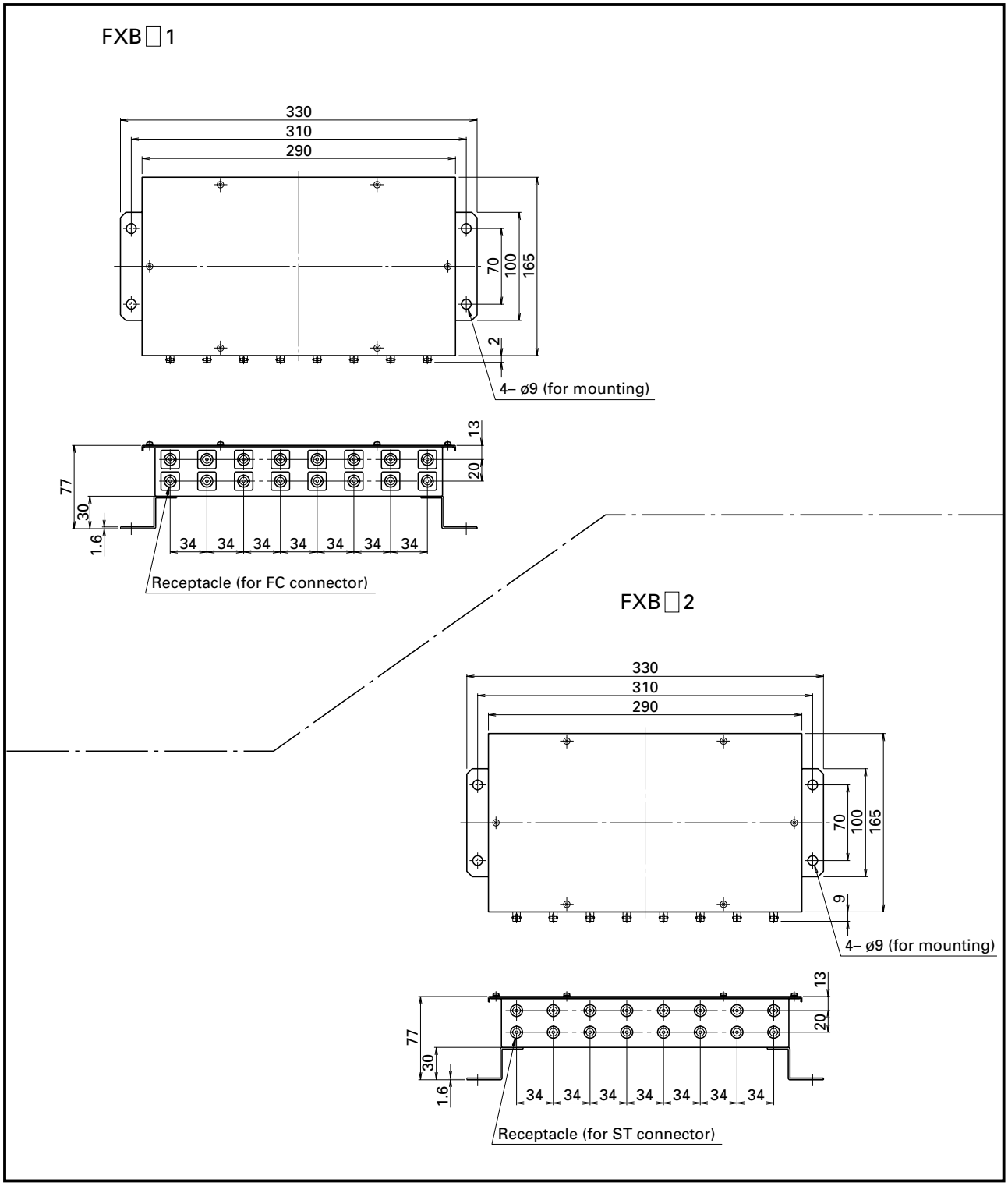
CODE SYMBOLS

1	2	3	4	5	6	7	8	Description
F	X	B			0	0	1	
			1					Applicable optical fiber Silica; (100/140 μm)
			2					PCF; (200/230 μm)
				1				Applicable optical connector FC connector
				2				ST connector

Scope of delivery

Instrument main unit

Outline diagram



⚠ Caution on Safety

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

Fuji Electric Systems Co., Ltd.

Head Office
Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome,
Shinagawa-ku, Tokyo 141-0032, Japan
http://www.fesys.co.jp/eng

Instrumentation Div.
International Sales Dept.
No.1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan
Phone: 81-42-585-6201, 6202 Fax: 81-42-585-6187
http://www.fic-net.jp/eng

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