TECHNICAL GUIDANCE

NEW GENERATION OF TORQUE TUBE

FST4000 Series

DISPLACER TYPE LEVEL TRANSMITTER

GENERAL

FST4000 is a torque tube displacement type level indicating transmitter with intelligent data processing function. Through 18 years of field proven experiences accumulated by the existing model FST-3000, FST4000 has intensified its reliability by adding such features as SIL2 compatible functional safety, ATEX flameproof and field bus communication of FOUNDATION Fieldbus .
Varieties of materials and wide range of pressure ratings are available to meet various applications such as high pressure and temperature boilers as well as low temperature down to minus 196℃ of liquefied gases.

STANDARD SPECIFICATION

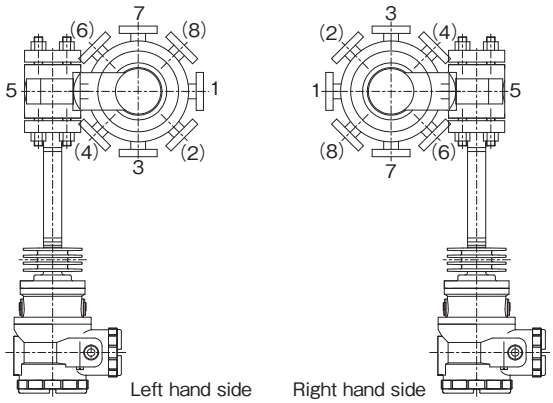
1) Detection method : Torque tube type displacer
2) Measuring range : Min. 0 to 300 mm, Max. 0 to 3000 mm
3) Liquid density
   ① Level measurement : 0.2 to 1.5 g/cm^3
   ② Interface measurement : Density difference between 2 liquids is more than 0.1 g/cm^3
   ③ Density measurement : Min. density span is 0.2 g/cm^3 Consult TOKYO KEISO Co. Ltd. for the services not mentioned above.
   ✻ Measurements ② and ③ cannot be performed accurately unless the displacer is fully submerged in the liquid.
4) Available pressure class : ASME class 150, 300, 600, 1500 and 2500
5) Fluid temperature range : −196 to +450℃
6) Installation : Tank top or tank side installation
7) Connection size : External chamber type : 1-1/2 or 2 inch flange Internal chamber type : 3 or 4 inch flange See Fig.2 and Fig.3.
8) Ambient temperature : −40 to +70℃ during operation Allowable temperature is subject to the applicable explosionproof standards.
   : −45 to +80℃ during storage
9) Ambient humidity : 0 to 95% R.H. during operation
   : 0 to 85%R.H. during storage
10) Available material
   ① Torque tube : NCF600(standard), SUS316L, NW0276
   ② Bonnet : SCPH2, SCS13A, SCS14A, SCS16A, NW0276
   ③ Chamber : Carbon steel, SUS304, SUS316, SUS316L, NW0276
   ④ Displacer : SUS304, SUS316, SUS316L, NW0276, MONEL, Others
   ⑤ Transmitter housing : ADC12
11) Local indication : LCD display
   Line 1 Function indication in 4 digits
   Line 2 Data indication in 4 digits
   Line 3 Bar graph in percent
12) Output, Power supply, Communication
   ・Output 4 to 20 mA DC, 2 wire system with HART (version 6)
   Supply voltage (UB) and Max. Load (Ra)
   UB : 8 to 40 V DC
   Max. load (Ra) : Ra = (UB − 8 V)/0.0248 A (Ω)
   4 to 20 mA DC signal : conforms to NAMUR NE43
   Operating range : 3.9 to 20.5 mA DC
   Burn-out : The output is selectable from "less than 3.5 mA" or "more than 21.6 mA" or "remain stationary
   Communication :
   HART : Version 6 single drop or multi drop (Ra shall be Ra ≧ 250Ω)
   ・FOUNDATION Fieldbus
   Supply voltage : 9 to 32 V DC ✻1
   Base Current : 27 mA DC or less
   Input and output signals : conform to IEC 61158-2

   Communication protocol : FOUNDATION Fieldbus H1
   H1 Profile Class : 31PS, 32L
   H1 Device class : Link Master
   Function block : 1-RB2, 1-AI, 1-TB
   Device type : 0002 (Hex) (FST4000FB)
   ITK version : 6.0.1
   ✻1 When a safety barrier is used in intrinsically safe circuit, the supply voltage is 9 to 24 V DC. FISCO explosionproof 9 to 17.5 V DC
13) Accuracy : ±0.5%F.S (Based on mass conversion correction at factory calibration)
14) Protection class : IP66&IP67 (IEC 60529/JIS C0920)
15) Explosionproof classification
   ① Flameproof : TIIS Exd IIC T6...T1
   ATEX & IECEx Ex db h IIC T6...T1Ga/Gb ✻2
   KOSHA, NEPSI
   ② Intrinsically safe : ATEX & IECEx Ex ia IIC T6...T1Ga ✻2
   KOSHA, NEPSI
   ✻2 Refer to instruction manual
16) Cable entry : G1/2, 1/2NPT, M20 x P1.5
   The TIIS flameproof with HART (explosionproof and communication code: 1) comes with a dedicated flameproof packing type grand cable.
   Cable outer diameter: φ6 to 8 (standard)
   Spare gasket: φ8 to 10 type, φ10 to 12 type
17) Painting : Transmitter Munsell 7.5BG4/1.5
   Chamber silver
   No painting on stainless steel components
18) Related standards referred : IECEx, ATEX, TIIS, EMC
19) Functional safety : SIL2 compatible with IEC61508
20) RoHS Directive : Complied with
21) Product mass : Pressure rating class 150 approx. 30 kg
   Pressure rating class 600 approx. 35 kg
22) Setting : Following operation and settings are available either remotely through HART or locally by the magnet key operation. Zero adjustment, Span adjustment, Output simulation test, Damping adjustment, Setting of burn-out, Density.

MODEL CODE

FST4					-				-			DESCRIPTION
Measuring range	1				-				-			300 mm or less
	2				-				-			301 to 500 mm inclusive
	3				-				-			501 to 700 mm inclusive
	4				-				-			701 to 1000 mm inclusive
	5				-				-			1001 to 1500 mm inclusive
	6				-				-			1501 to 2000 mm inclusive
	7				-				-			2001 to 2500 mm inclusive
	8				-				-			2501 to 3000 mm inclusive
	9				-				-			Special
Installation method		1			-				-			SIDE −SIDE
		2			-				-			BOTTOM −SIDE
		3			-				-			SIDE −TOP
		4			-				-			BOTTOM −TOP
		5			-				-			Top mount
		6			-				-			Side mount
		9			-				-			Special
Material: Bonnet/ Displacer/ Chamber			1		-				-			SCPH2 / SUS304 / Carbon steel
			2		-				-			SCS13A/ SUS304 / SUS304
			3		-				-			SCS14A/ SUS316 / SUS316
			4		-				-			SCS16A/ SUS316L/ SUS316L
			9		-				-			Special
Enclosure					-				-			General purpose
				E	-				-			Flameproof type
				S	-				-			Intrinsically safe type
Pressure rating						1			-			ASME(JPI)Class 150
						2			-			ASME(JPI)Class 300
						3			-			ASME(JPI)Class 600
						4			-			JIS 10K
						5			-			JIS 30K
						6			-			JIS 63K
						7			-			ASME(JPI)Class 1500
						8			-			ASME(JPI)Class 2500
						9			-			Special
						A			-			JIS 20K
						B			-			ASME (JPI) Class900
Process connection							1		-			1-1/2 inch flange
							2		-			2 inch flange
							3		-			3, 4 inch flange (used only for the installation "5" top mount) ∗2
							9		-			Special
Torque tube material								1	-			SUS316L −196 to 200℃
								2	-			INCONEL −196 to 450℃ (standard)
								3	-			NW0276 −196 to 200℃
								9	-			Special
Cable entry									1	-		G1/2(F)
									2	-		1/2NPT(F)
									3	-		M20x1.5(F)
									9	-		Special
Orientation(rotation angle)Refer to the below diagram. ∗1											L1 to L8	Left hand side
											R1 to R8	Right hand side
Explosionproof and communication												1 TIIS Flameproof with HART Ex d IIC T6...T1
												3 ATEX & IECEx Flameproof with HART Ex db h IIC T6...T1 Ga/Gb
												4 ATEX & IECEx Intrinsic safety with HART Ex ia IIC T6...T1 Ga
												5 ATEX & IECEx Flameproof with FOUNDATION Fieldbus Ex db h IIC T6...T1 Ga/Gb
												6 ATEX & IECEx Intrinsic safety with FOUNDATION Fieldbus Ex ia IIC/IIB T6...T1 Ga
												7 KOSHA Flameproof with HART Exd IICT6...T1
												8 KOSHA Intrinsic safety with HART Ex ia IICT6...T1
												A NEPSI Flameproof with HART Ex db IIC T1...T6 Ga/Gb
												B NEPSI Intrinsic safety with HART Ex ia IIC T1...T6 Ga
												C NEPSI Flameproof with FOUNDATION Fieldbus Ex db IIC T1...T6 Ga/Gb
												D NEPSI Intrinsic safety with FOUNDATION Fieldbus Ex ia IIC/IIB T1...T6 Ga

∗1 The numbers indicate the orientation of the side connection flange for installation methods 1, 2, and 3. For methods 4 and 5, please select either L1 or R1.
∗2 If an internal cylinder chamber is present, this will be 4 inches.

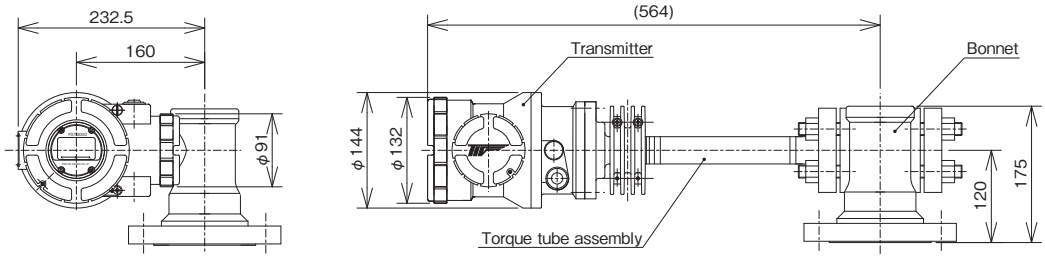


Left hand side Right hand side

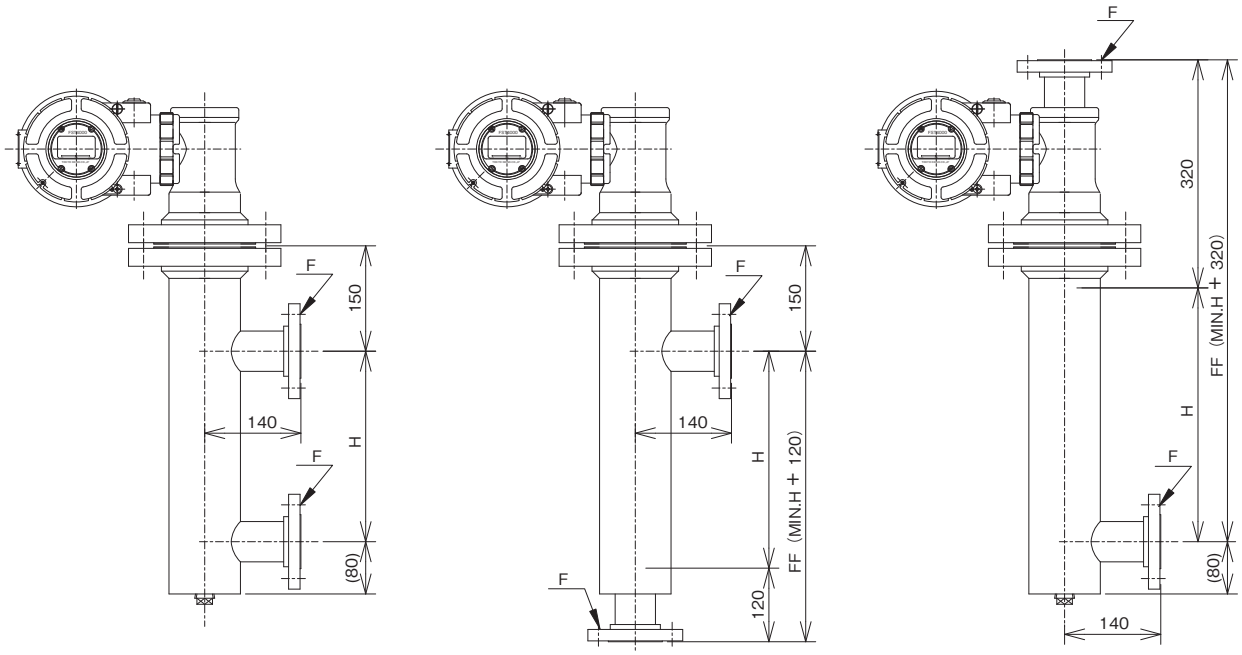
Note: Positions of (2) (4) (6) (8) are not selectable for the pressure rating "1", i.e. ASME class 150.

DIMENSIONS

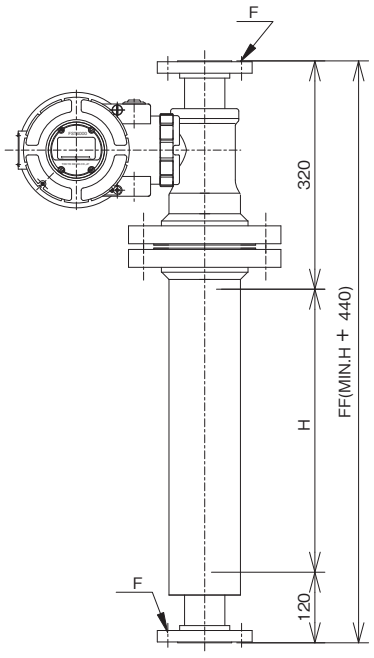
● Fig.1 Transmitter, Torque Tube & Bonnet



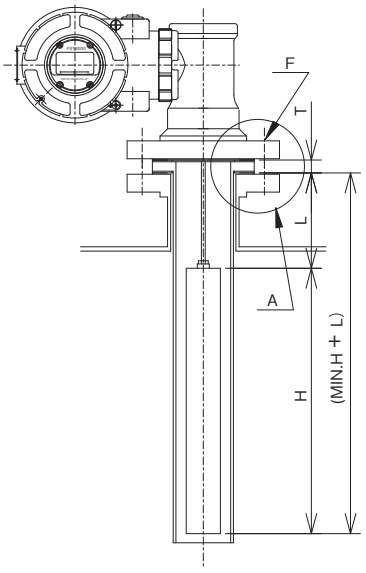
● Fig.2 Assembling of the chamber for class 150 or 300



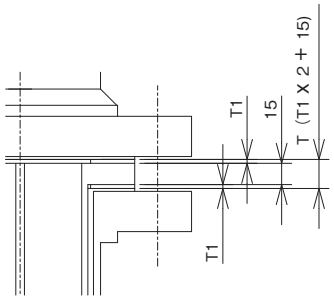
FST4□1□ FST4□2□ FST4□3□



FST4□4□



FST4□5□



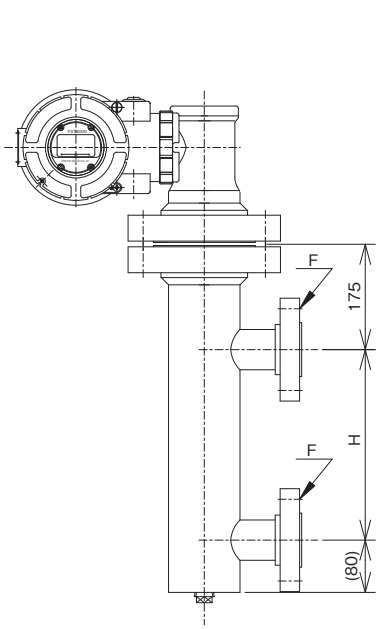
T1 : Thickness of gasket
Details of "A" part

Dimensions
F : Standard connection flange
H : Measuring range
FF : Installation dimension
L : Flange surface to highest position of span. (Min. 50mm)

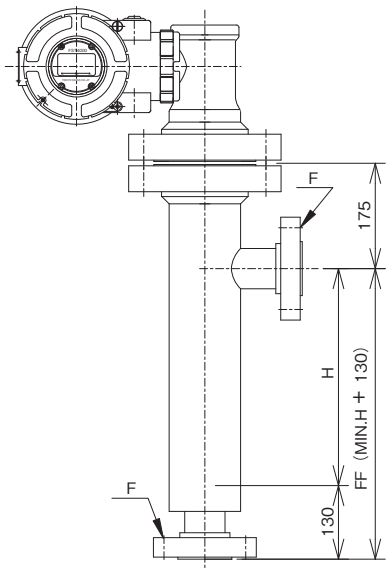
Please specify above dimensions when ordering.

DIMENSIONS

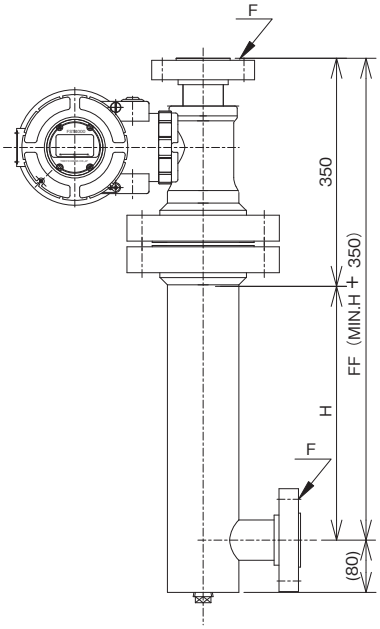
● Fig.3 Assembling of the chamber for class 600 Assembling and mounting dimensions differ with the class 900 and higher classes.



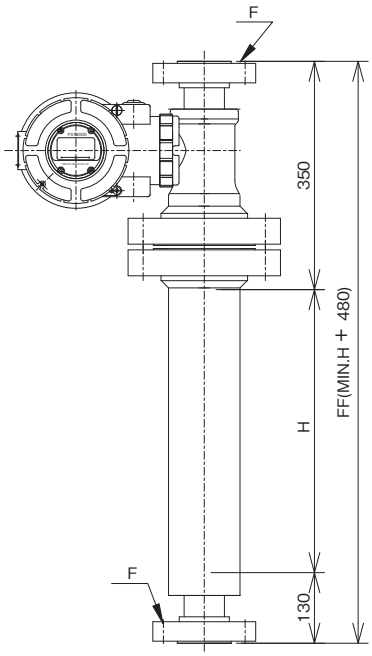
FST4□1□



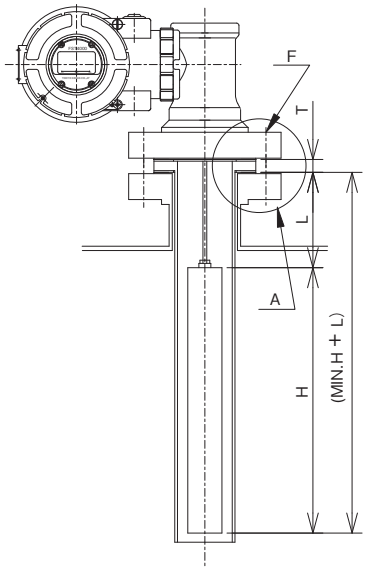
FST4□2□



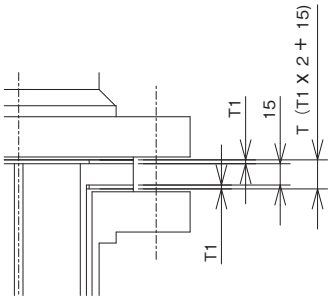
FST4□3□



FST4□4□



FST4□5□



T1 : Thickness of gasket
Details of "A" part

Dimensions
F : Standard connection flange
H : Measuring range
FF : Installation dimension
L : Flange surface to highest position of span. (Min. 50mm)

Please specify above dimensions when ordering.

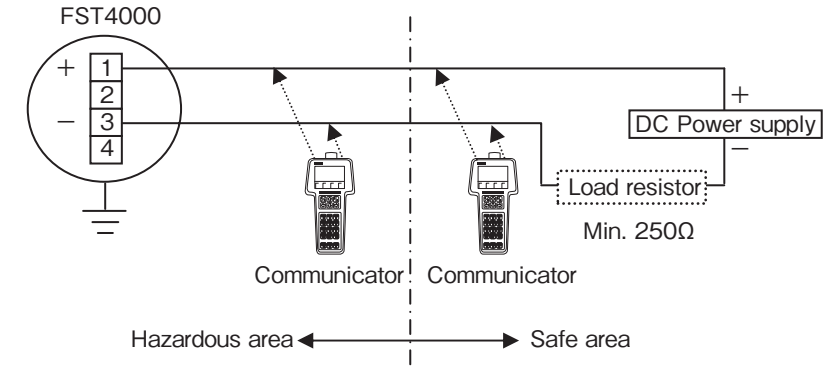
MATERIAL OF GASKET, BOLT & NUT

Code	Gasket
1	V#7020
2	V#8591
3	V#8596
4	V#6596
5	V#7596
9	Special

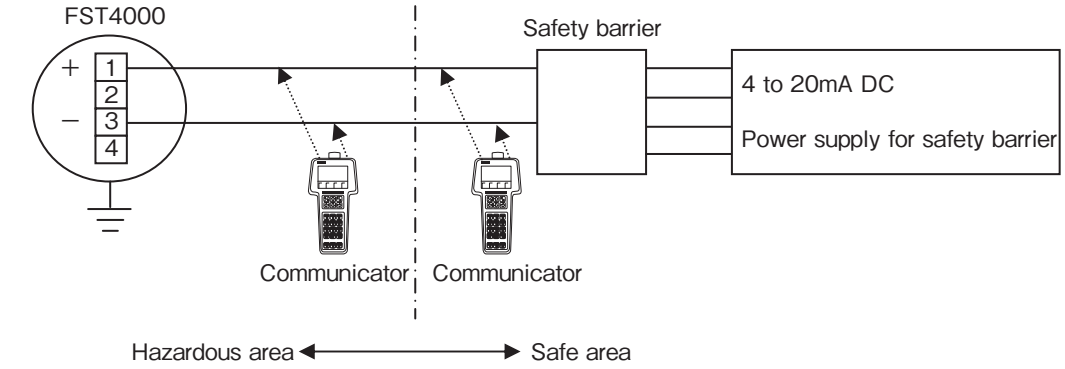
Code	Bolt & Nut	Remarks
1	SS400	Steel
2	SUS304	Stainless steel
3	SNB7 / S45C (A193-B7 / A194-2H)	Carbon steel
4	A320-L7 / A194-4	Carbon steel, For low temperature services
5	A193-B8CL2 / A194-8	Stainless steel, For high temperature services
6	A320-B8CL2 / A194-8	Stainless steel for low temperature services
9	Special	

WIRING

● Flameproof version



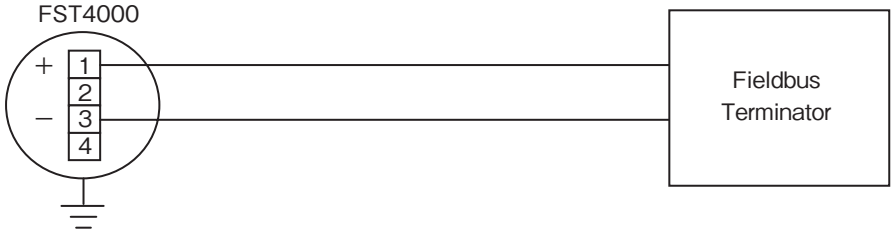
● Intrinsically safe version



Rating values of intrinsic safety

Maximum Voltage	28V
Maximum Current	93mA
Maximum Wattage	651mW
Internal Inductance	100μH
Internal Capacitance	10nF

● FOUNDATION Fieldbus version



ORDERING INFORMATION

Specify the following for order and inquiry:

1. Model	FST4□□□□-□□□□-□□□			
2. Liquid name				
3. Density				
4. Temperature Nor. Max.	NOR.	MIN.	MAX.	□°C
5. Pressure Nor. Max.	NOR.	MAX.	□MPa	□ ( )
6. Connection				
7. Cable entry				
8. Measuring range				
9. Center to center distance				

* Specification is subject to change without notice.

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