



Single Straight-Tube Coriolis Flowmeter

ALTI_{mass} Type S

Titanium Tube Type

GENERAL SPECIFICATION

GS.No.GBN123E-6

■ GENERAL

Equipped with a sophisticated transmitter (self diagnosis feature, large size display, and field-reconfiguration capability using a touch panel), "ALTI_{mass} Type S" is a single straight-tube design Coriolis flowmeter capable of mass flow measurement at a high degree of accuracy.

■ FEATURES

1. Increased self-diagnostic capabilities: checking for cable faults, pipeline vibration, and monitoring transmitter temperatures, to name a few.
2. You can reconfigure transmitter parameters using a finger touch on the touch panel (also through communication).
3. Fast response: 10 times improved from conventional models.
4. Two alarm indicators provided
5. Increased output signals:
Pulse output (dual output), analog output (dual output), and status output (single output)
6. Enhanced maintenance functions:
Error logging, storing factory shipping data, and downloading programs
7. Compatible with various communication protocols
(HART communication, FOUNDATION fieldbus communication, PROFIBUS communication, Modbus communication)
8. Polished wetted parts available



■ GENERAL PERFORMANCE

Item		Description				
Model		CS010	CS015	CS025	CS040	CS050/CSR50
Flow rate	Guaranteed min. rate (kg/h)	36	120	360	900	1800
	Min. setting rate (kg/h)	72	240	720	1800	3600
	Max. service rate (kg/h)	1220	4080	12200	30600	61200
	Max. allowable rate (kg/h)	1830	6120	18300	45900	91800
	Accuracy	±0.15% ± zero stability error of RD				
Repeatability		±0.075% ± 1/2 zero stability error of RD				
Zero stability (kg/h)		0.12	0.41	1.22	3.06	6.12
Density	Metering range	0.5 to 1.0g/mL, 0.7 to 1.3g/mL, 1.0 to 1.5g/mL (*1)				
(Liquid)	Accuracy (Option)	±0.002g/mL				
Analog output accuracy		±0.1% of FS added to each accuracy				

*1: The density range varies depending on the fluid to be measured.

*2: The general performance is based on factory calibration accuracy.

*3: When measuring the density at fluid temperature of 40°C or higher, heat retention measures must be taken.

$$\text{Zero stability error} = \frac{\text{Zero stability}}{\text{Flow rate at the moment}} \times 100\% \quad *4: \text{Zero stability and flowrate during the test should read in the same measurement unit.}$$

■ GENERAL SPECIFICATIONS

● Sensor unit

Item		Description					
Model		CS010	CS015	CS025	CS040	CS050	CSR50
Nominal size		10mm or 1/2"	15mm or 1/2"	25mm or 1"	40mm or 1 1/2"	50mm or 2"	80mm or 3"
Materials	Wetted parts	Titanium alloy					
	Housing	SB338 Grade-9 + TB480H					
Process connection		JIS 10, 20K/ASME (JPI) 150/IDF ferrule (*1)					
Applicable fluid		Liquid					
Density range		0.5 to 1.0g/mL, 0.7 to 1.3g/mL, 1.0 to 1.5g/mL (*2)					
Measurable temperature range		-40 to +130°C (*3)					
Heatproof temperature		Max. 150°C (*4)					
Max. Operating pressure		Up to 2.45MPa (Depends on process connection)					
Sensor housing withstands		2.8MPa					
Flow direction		Bidirectional					
Explosionproof configuration		TIIS, ATEX, IECEx, KOSHA/KTL, CSA, GOST, NEPSI Refer to page 10, 11 for details.					
Dusttight, waterproof configuration		IP66 / 67					

*1: Loose flange is applied. Ferrule connections of CS010 or CS015 comply with ISO2852.

*2: The density range varies depending on the fluid to be measured.

*3: If temperature of the fluid exceeds 80°C for the measurement with integrally mounted type, make sure to keep the ambient temperature at 45°C or below.

*4: CIP/SIP procedures must be performed within the heatproof temperature range.

● Transmitter

Item	Description	
Model	PA0K	
Power supply	85 to 264VAC 50/60Hz or 20 to 30VDC (Safety rated 100 to 240VAC 50/60Hz)	
Power consumption	Max. 15W	
Ambient temperature	-40 to +55°C (*1)	
Transmission length (separate type)	Max. 100m (Dedicated cable used) (*2)	
Applicable EU directive	EMC Directive: 2004/108/EC, ATEX Directive: 94/9/EC	
Applicable EN standards	EMC: EN55011: 1998/A1: 1999/A2: 2002 Group 1, Class B EN61000-6-2: 2001/EN61326-1: 2006 ATEX: EN60079-0: 2012 EN60079-1: 2007 EN60079-11: 2012 IECEX: IEC60079-0: 2011 IEC60079-1: 2007-04 IEC60079-11: 2011	
Explosionproof configuration	TIIIS, ATEX, IECEx, KOSHA/KTL, CSA, GOST, NEPSI Refer to page 10, 11 for details.	
Dusttight, waterproof configuration	IP66 / 67	
Transmitter configuration	Integral or separately mounted	
Finish	Sensor: Munsell 10B8/4, Covers (front and rear): 2.5PB4/10	
Display	LCD display (128×64 dots), backlight (white, orange) Infrared sensors: 2, LED: 2 (green, red)	
Weight	Integrally mounted model 3.6kg approx., Separately mounted model 5.0kg approx.	
Communication interface *Optional except for HART	HART (Standard)	HART protocol version 7, Bell202 (*3)
	Modbus	RS-485 Modbus protocol, Baudrate : 9600bps, 19200bps, 38400bps RTU or ASCII, Response time : 25 to 50 ms
	FOUNDATION fieldbus	AI block×4, IT block×2, with Link Master function
	PROFIBUS PA	AI block×4, TOT block×2
Damping (default)	Flow rate 0.8sec, density 4sec, temperature 2.5sec.	
Low flow cutoff (default)	Under 1.5% of max. service flow rate	
Pulse output (*5)	Open drain (equivalent to open collector) [Min. 10V to Max. 30V, 50mADC, ON resistance 0.6Ω or less] or Voltage pulse (Low level: 1.5V max., High level: 13V min. Output impedance: 2.2kΩ) Setting range: 0.1 to 10000Hz (Max. output 11000Hz)	
Analog output (*5)	4 to 20mADC (max. load 600Ω) Select two outputs from instant flowrate (mass or volume) temperature, and density.	
Status output (*5)	Open drain (equivalent to open collector) [Max. 30V, 50mADC, ON resistance 0.6Ω or less] Select one from error (*4), flow direction, or high/low alarm (default is error)	
Status input (*5)	Contact-closure input (Form "a" contact) Short: 200Ω max., Open: 100kΩ min. Select one from remote zero, total reset, 0% signal lock, or function off (default is function off).	

*1: Below -20°C, the display loses its visibility due to weakened contrast. Both the display and infrared sensor may exhibit slow responses below -20°C.

*2: If signal transmission length exceeds the max. length, consult the factory.

*3: Of the two analog output systems, only analog output 1 is available for HART communication.

*4: Of error outputs, "zero is in progress" status output can also be set up.

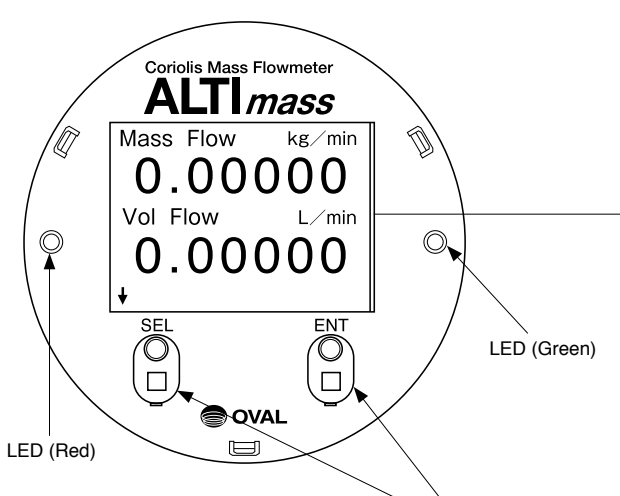
*5: When FOUNDATION fieldbus, PROFIBUS PA is selected as the communication interface, all input and output signals will be turned off.

*6: Denoising parts are embedded in the lines between power source, output, communication, and the chassis.

Lower the applied voltage to the following levels in order to conduct insulation test or withstand voltage test on these lines.

AC: 200V, DC: 250V

■ DISPLAY



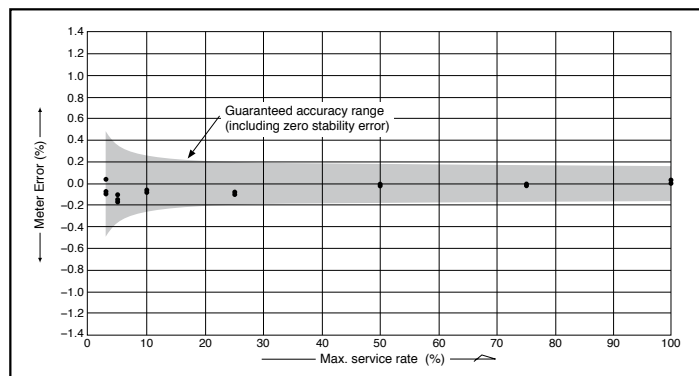
Display modes

- ① Mass instant flowrate
- ② Volume instant flowrate
- ③ Density
- ④ Temperature
- ⑤ Pulse count 1 (mass or volume)
- ⑥ Pulse count 2 (mass or volume)
- ⑦ Total 1 (mass or volume)
- ⑧ Total 2 (mass or volume)
- ⑨ Analog 1 (% instant)
- ⑩ Analog 2 (% instant)
- ⑪ Status information
- ⑫ Mode select (parameter setup)

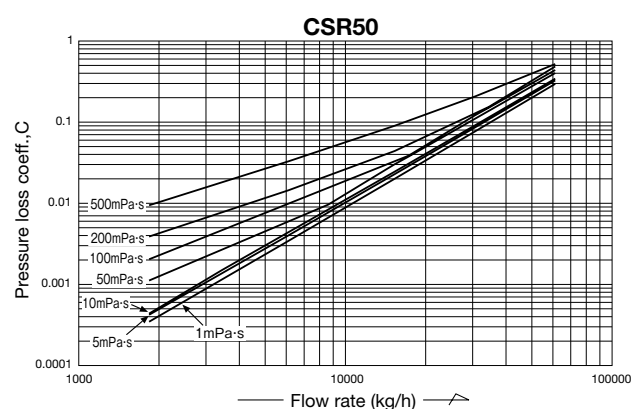
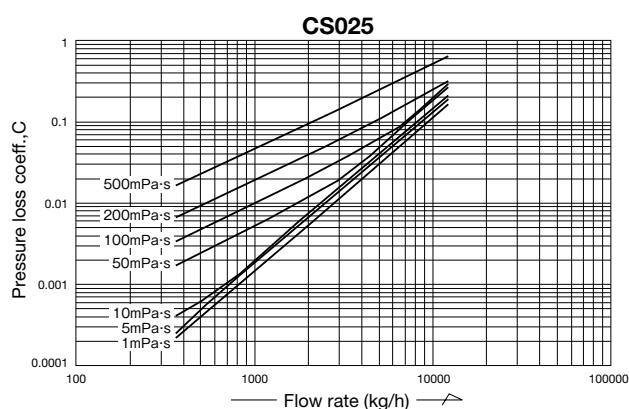
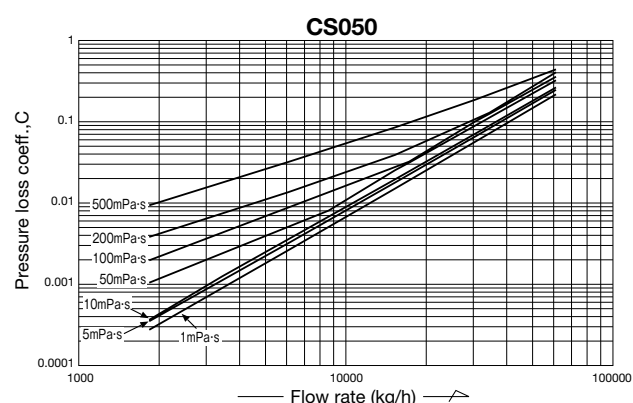
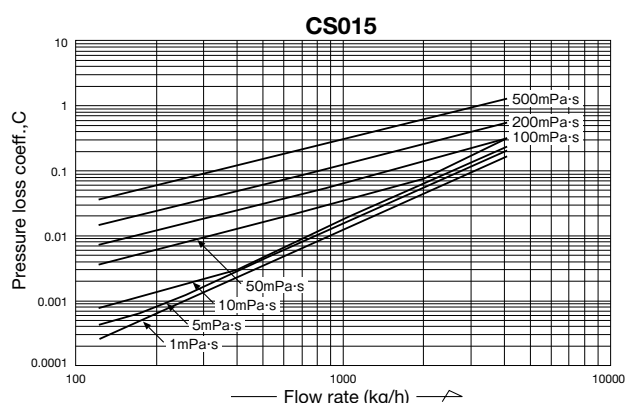
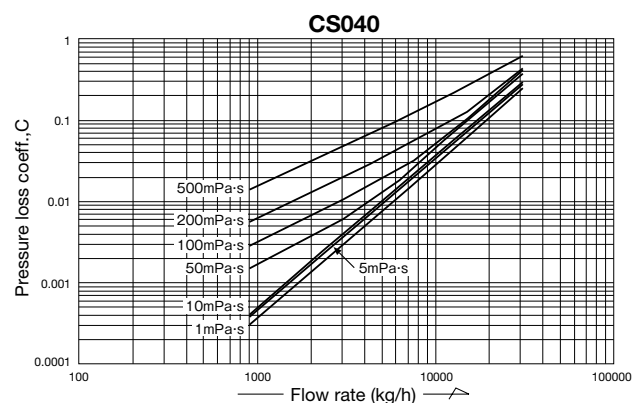
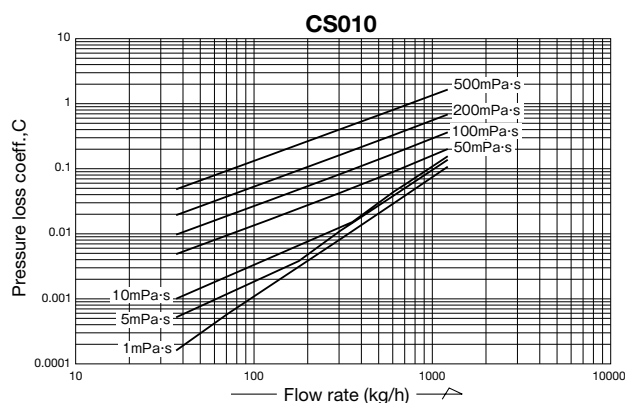
Communication interfaces FOUNDATION fieldbus, PROFIBUS PA display different contents.
For further information, refer to the instruction manuals of respective communication interfaces.

* LCD backlight comes in two colors: white and orange.
Color changes according to the status of flowmeter.
Backlight usually comes off automatically if the optical sensor does not respond for a certain period of time.
* Backlight duration is selectable.

METER ERROR



PRESSURE LOSS



How to determine pressure loss

1. Find the pressure loss factor C from flow rate (kg/h) and viscosity (mPa·s) of parameter.
Dividing the obtained value C by specific gravity d (1 for water) gives the pressure loss. That is,

$$\Delta P = \frac{C}{d} \text{ (MPa)}$$

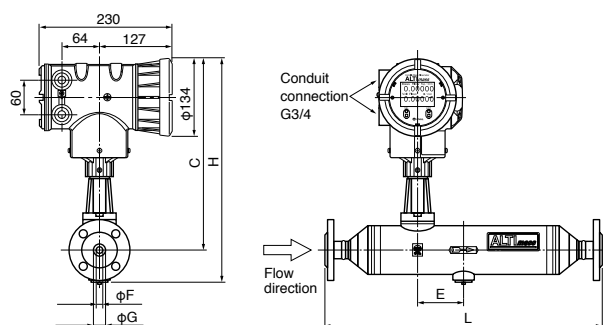
2. For high viscosity liquids not shown in these graphs, calculate the pressure loss by the following formula:

$$\Delta P_2 = C \times \frac{\mu_2}{\mu_1} \times \frac{1}{d}$$

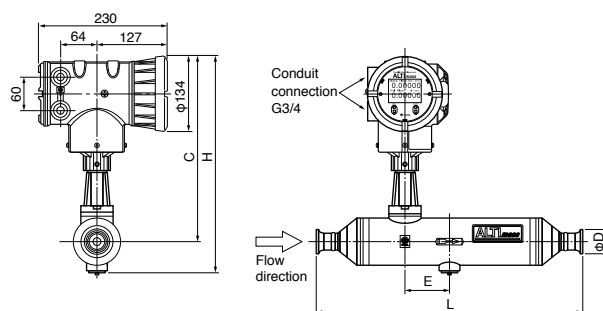
- where ΔP_2 : Pressure loss of high viscosity liquid (MPa)
 μ_2 : Viscosity of high viscosity liquid (mPa·s)
 d : Specific gravity of high viscosity liquid (1 for water)
 μ_1 : Max. viscosity shown in the graph (mPa·s)
 C : Pressure loss factor found from the max. viscosity curve at a given flow rate (kg/h).

■ DIMENSIONS [Unit in mm]

● Transmitter, Integrally Mounted Type Flange connection



Ferrule connection



Model	Nominal Size	L			H	C	φF	φG	E	Approx. Weight (kg) (JIS10K)
		JIS		ASME/JPI						
		10K	20K	150						
CS010	10 (1/2")	426	452	458	390	340	6.3	11.4	69	10
CS015	15 (1/2")	464	490	496	390	340	9.3	16.8	80	11
CS025	25 (1")	529	555	570	423	353	15.4	26.6	88	18
CS040	40 (1-1/2")	716	733	749	439	359	22.3	40.4	112	28
CS050	50 (2")	882	906	919	474	372	30.5	52.6	153	38
CSR50	80 (3")	1032	1046	1073	474	372	30.5	77.8	153	40

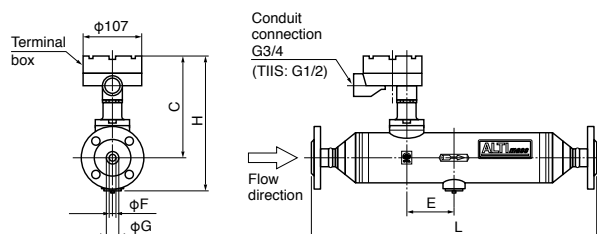
※ Loose flange is applied.

Model	Nominal Size	L	H	C	E	ΦD	Approx. Weight (kg)
CS010	10mm	426	390	340	69	34	8
CS015	15mm	464	390	340	80	34	9
CS025	1-1/2S	529	423	353	88	50.5	16
CS040	2S	716	439	359	112	64	24
CS050	2-1/2S	882	474	372	153	77.5	36
CSR50	3-1/2S	1032	474	372	153	106	38

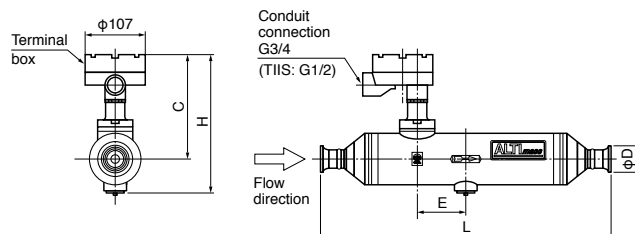
※ Ferrule connections of CS010 or CS015 comply with ISO2852.

※ Nominal size : S :Inch Sanitary version

● Transmitter, Separately Mounted Type Flange connection



Ferrule connection

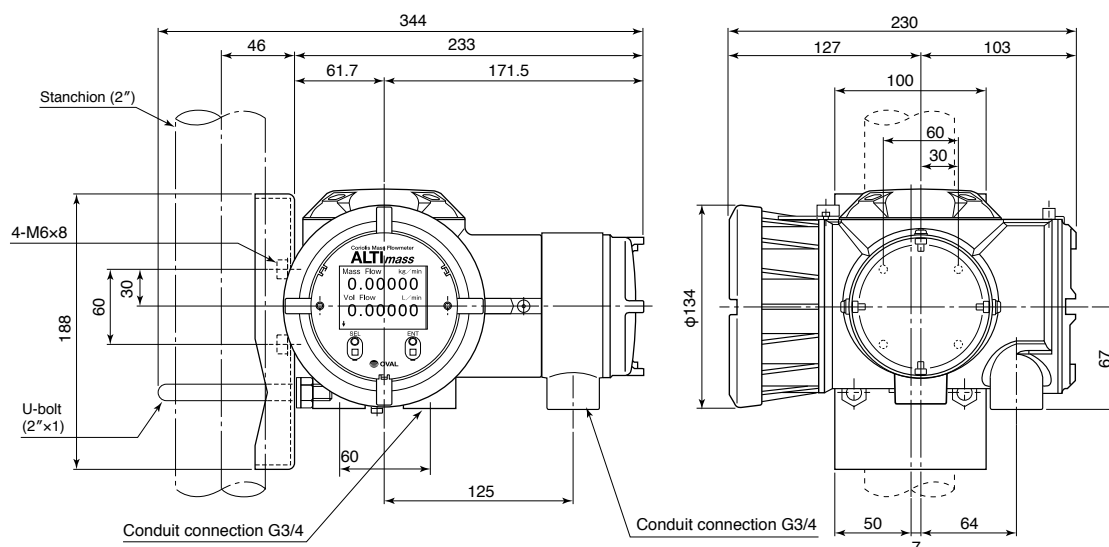


Model	Nominal Size	L			H	C	φF	φG	E	Approx. Weight (kg) (JIS10K)
		JIS		ASME/ JPI						
		10K	20K	150						
CS010	10 (1/2")	426	452	458	246	197	6.3	11.4	69	7
CS015	15 (1/2")	464	490	496	246	197	9.3	16.8	80	8
CS025	25 (1")	529	555	570	280	210	15.4	26.6	88	15
CS040	40 (1-1/2")	716	733	749	296	216	22.3	40.4	112	25
CS050	50 (2")	882	906	919	332	229	30.5	52.6	153	35
CSR50	80 (3")	1032	1046	1073	332	229	30.5	77.8	153	37

Model	Nominal Size	L	H	C	E	ΦD	Approx. Weight (kg)
CS010	10mm	426	246	197	69	34	5
CS015	15mm	464	246	197	80	34	6
CS025	1-1/2S	529	280	210	88	50.5	13
CS040	2S	716	296	216	112	64	21
CS050	2-1/2S	882	332	229	153	77.5	33
CSR50	3-1/2S	1032	332	229	153	106	35

■ DIMENSIONS [Unit in mm]

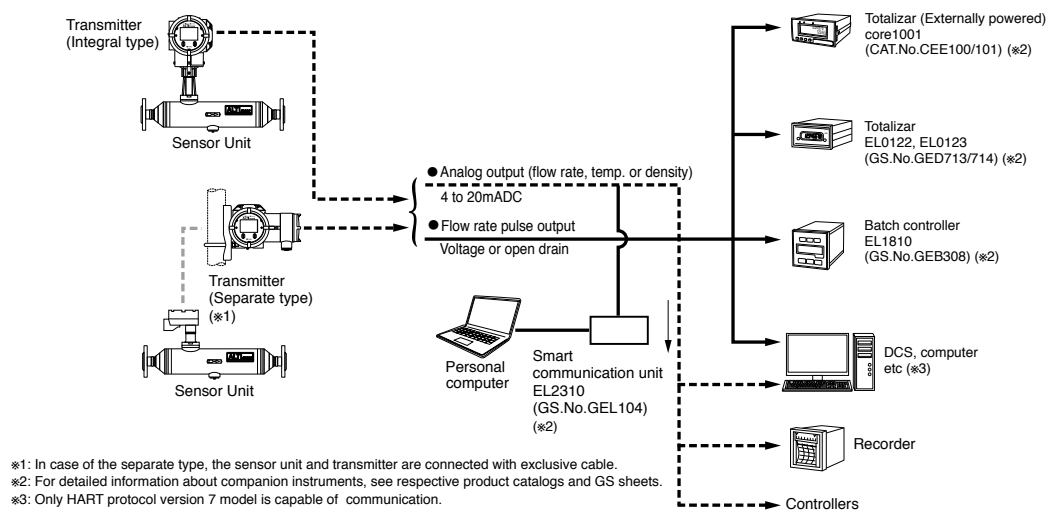
● Separately mounted transmitter



* : While stanchion mounting hardware are furnished as standard accessories, the customer is to furnish the stanchion.

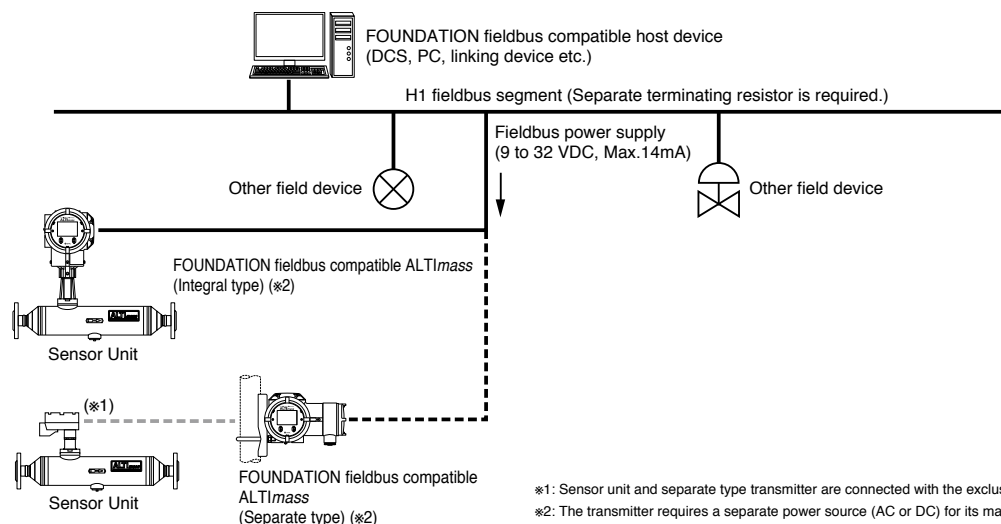
■ REMOTE MEASURING SYSTEM

● HART protocol



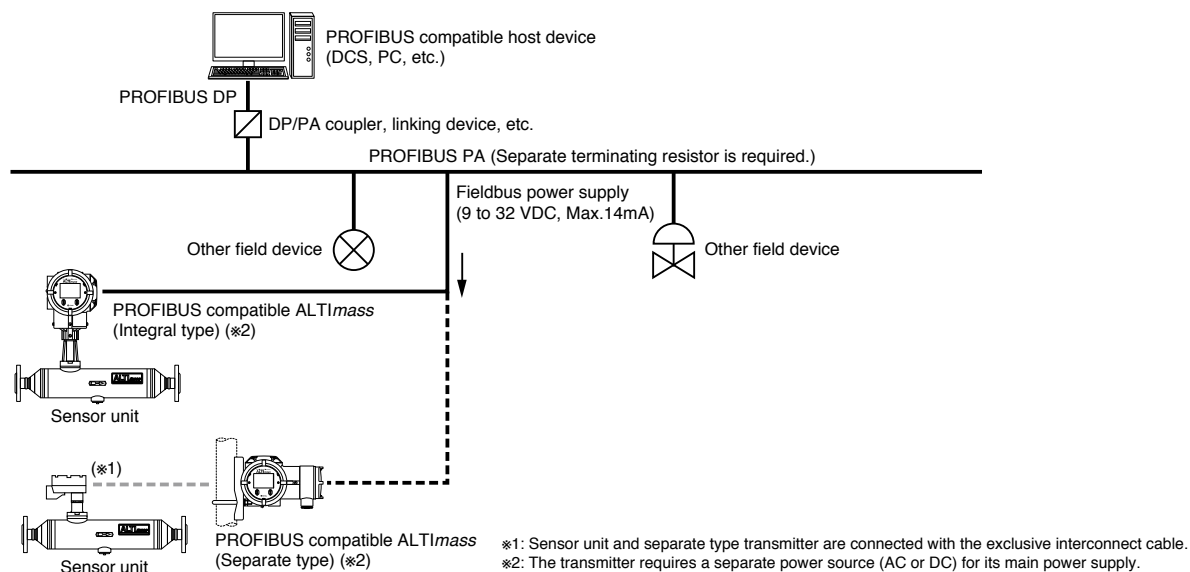
*1: In case of the separate type, the sensor unit and transmitter are connected with exclusive cable.
 *2: For detailed information about companion instruments, see respective product catalogs and GS sheets.
 *3: Only HART protocol version 7 model is capable of communication.

● FOUNDATION fieldbus

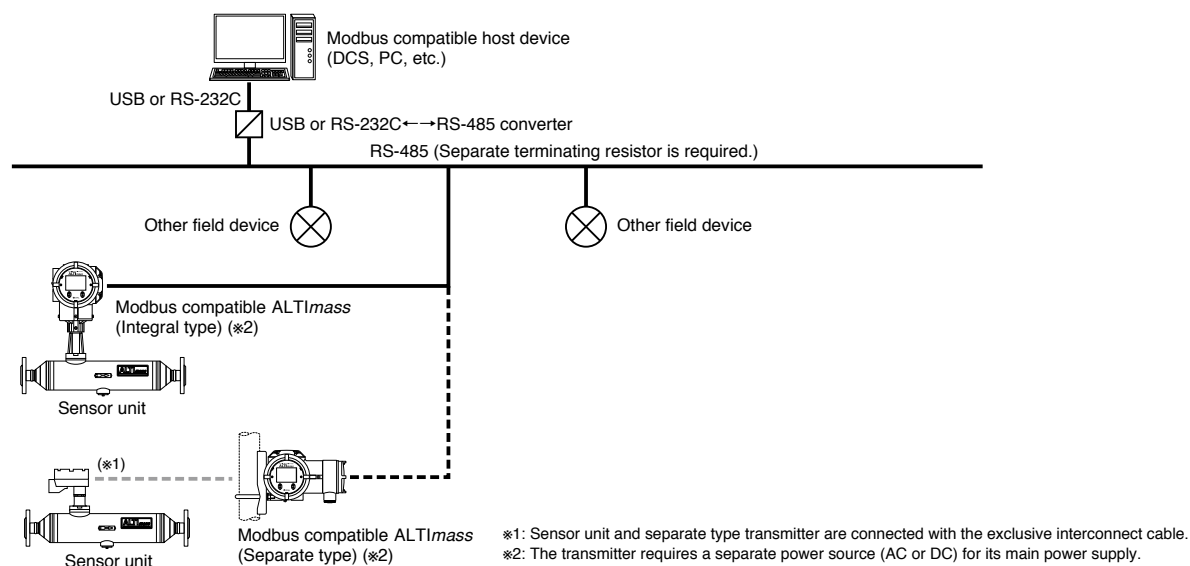


*1: Sensor unit and separate type transmitter are connected with the exclusive interconnect cable.
 *2: The transmitter requires a separate power source (AC or DC) for its main power supply.

● PROFIBUS

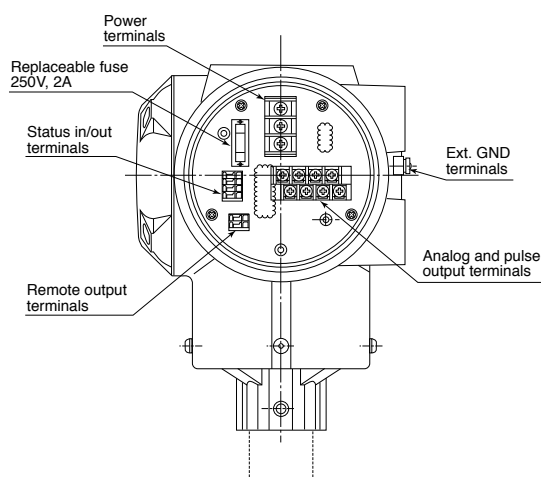


● Modbus



■ WIRING DIAGRAM

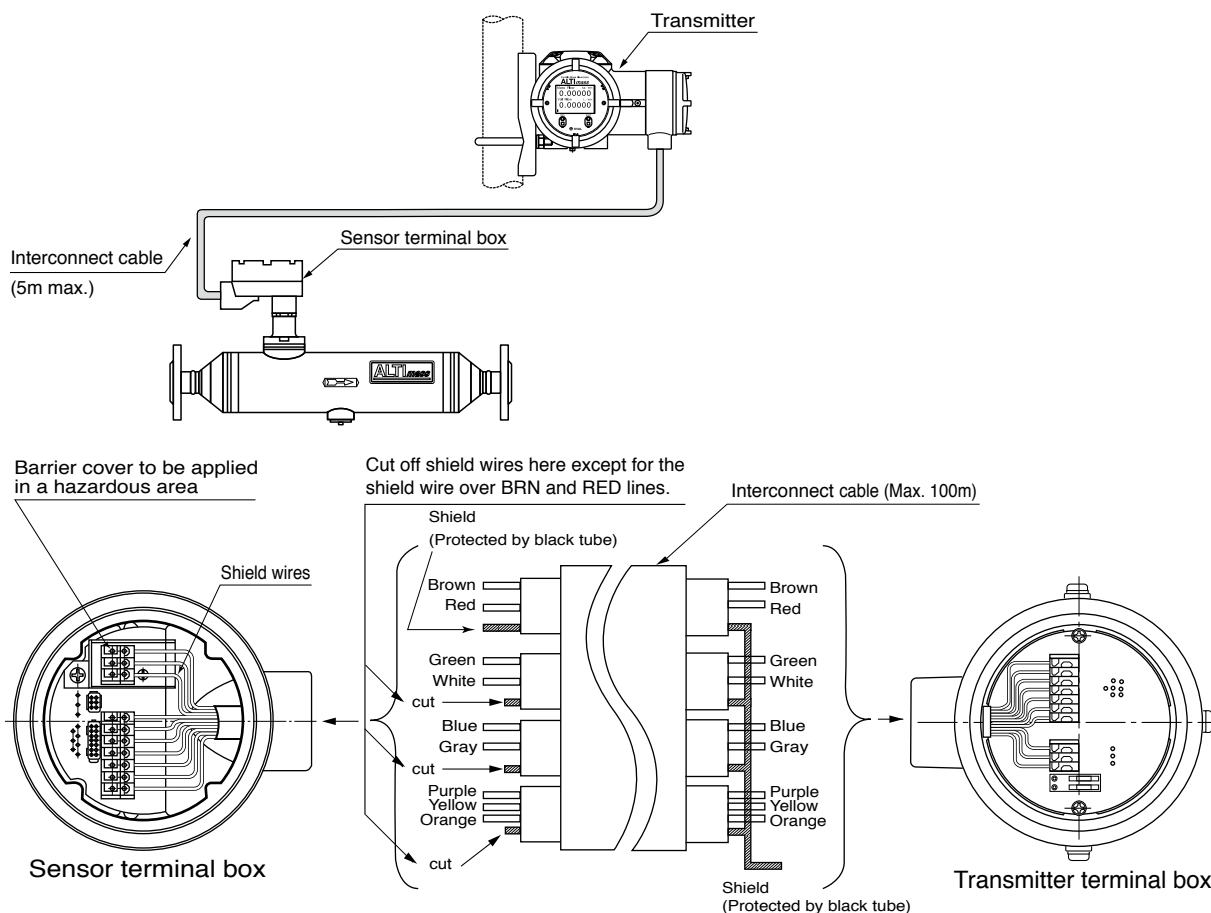
● Transmitter power and input/output signal wiring



● Terminal identification and description

Item	Label	Description	Remarks
Signal	A1 (+)	Analog output 1 (4 to 20mA)	1. Max. load resistance is 600Ω for analog output 1 and 2.
	A1 (-)		
	A2 (+)	Analog output 2 (4 to 20mA)	2. Pulse output (voltage pulse) transmission length is Max. 10m (at 10kHz) Max. 100m (at 1kHz) Max. 1km (at 100Hz) finished O.D: 0.75sq
	A2 (-)		
	P1 (+)	Pulse output 1 (voltage/open drain output)	3. In case of TIIS explosionproof type used under the ambient temperature of 45°C or higher, use a cable resistant to the temperature of 75°C or higher.
	P1 (-)		
	P2 (+)	Pulse output 2 (voltage/open drain output)	4. These input and output signals are invalid for FOUNDATION fieldbus, PROFIBUS PA.
	P2 (-)		
	S.I. (+)	Status input (contact input)	Modbus communication: Max. transmission length 1200m at 0.75sq FOUNDATION fieldbus or PROFIBUS PA communication: Max. transmission length 1900m at 0.8sq
	S.I. (-)		
Power	S.O. (+)	Status output (open drain output)	
	S.O. (-)		
	I/O (+)	Expanded in/out (Modbus communication, etc.)	
	I/O (-)		
Power	L (+)	Power (with DC power: +)	
	GND	Earth ground	
	N (-)	Power (with DC power: -)	

● Wiring between Sensor Unit and Separately Mounted Transmitter



NOTE 1. Do not fail to use dedicated interconnect cable.

2. Shield wire preparation

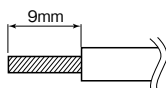
(1) Transmitter end:

As shown in the above figure, bundle shield wires colored in brown/red, green/white, blue/gray and purple/yellow/orange and cover the wires with a black tube. Then connect only one wire to the terminal box (black) taking care to avoid potential contact with the housing or conductive parts.

(2) Sensor end:

As shown in the figure, cover the brown/red shield wire with a black tube and connect it to the terminal box taking care to avoid potential contact with the housing or conductive parts. Clip all shield wires except brown/ red as shown in the above figure.

(3) Recommended cable end treatment:

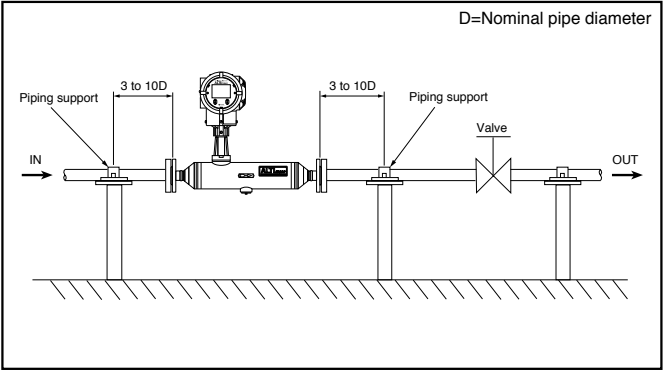


※: Use of a crimp pin terminal is not necessary.

■ STANDARD INSTALLATION

1. Typical Installation (See figure at right.)

- 1) Avoid pipeline stresses on the meter.
- 2) The meter should be supported near and between connections to the process pipelines.
- 3) Avoid supporting the meter body directly.
- 4) Pipeline should be arranged such that the meter is constantly filled with the process fluid. Avoid, however, to install it in a pocket where slurries may build up.
- 5) Provide a valve downstream of the meter to allow zeroing by obtaining a true zero flow. We recommend to provide another valve upstream of the meter for servicing or maintenance.



2. Precautions at Installation

- 1) Locate the meter at least one meter from large transformers, motors, or other sources of electromagnetic induction. Also avoid installation near the sources of excessive vibration, such as motors and pumps.
- 2) The sensor unit is of gastight configuration. To prevent dew condensation inside in a low temperature application, it is filled with argon gas. For this reason, avoid dropping or giving it impact shocks.
- 3) In a horizontal run, install the sensor unit with the transmitter up as shown in the figure.
- 4) A control valve should be located downstream of the meter.
In an arrangement where cavitation may possibly take place, locate it at least 5 meters away.
- 5) When measuring the density at fluid temperature of 40°C or higher, heat retention measures must be taken.
- 6) Heat tracing can be installed directly on the sensor unit. The temperature of heat trace must be 130°C or lower. However, for explosionproof models, heat trace temperature must be kept below their allowable temperature.

3. Prevention of Cavitation

Cavitation can cause a loss of meter accuracy in measurement. Maintain line pressure that will not cause cavitation upstream and downstream of the meter for this reason. Avoid making such an arrangement as to open the line to the atmosphere immediately downstream of the meter. Care must be taken particularly with high steam pressure liquids. In practice, we recommend to keep the back pressure in the meter (downstream pressure) above the value calculated by the formula below:

$$P_d = 3\Delta P + 1.3P_v \text{ (MPa[absolute])}$$

P_d : Downstream pressure (MPa[absolute])
 ΔP : Pressure loss across the meter (MPa)
 P_v : Steam pressure of the process fluid at measurement (MPa[absolute])

4. Physical Orientation

The sensor can be installed either in a horizontal run or vertical run. Thanks to its unique straight-through design, installation in a vertical run in particular allows this flowmeter to perform to its fullest - in fast replacement of the process fluid and self drainage, for example.

	Horizontal Piping	Vertical Piping
No.	No. 1	No. 2
Installation Position		

Do not forget to specify the physical orientation when you order.

RODUCT CODE EXPLANATION

Item	Product Code																		Description
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	
Model	C	S																	ALTI ^{mass} Type S
Nominal size		0	1	0															10mm connection (1/2")
		0	1	5															15mm connection (1/2")
		0	2	5															25mm connection (1")
		0	4	0															40mm connection (1-1/2")
		0	5	0															50mm connection (2")
		R	5	0															80mm connection (3")
Fluid category						H													High density liquid (1.0 to 1.5g/ml)
						M													Ordinary density liquid (0.7 to 1.3g/ml)
						L													Low density liquids (0.5 to 1.0g/ml)
Temp. category (*1)							1												Standard (130°C or below)
Pressure category								1											Standard
Major parts material (*8)									T										SB338 Grade-9 + TB480H
Process connection										B									Ferrule
										C									JIS 10K
										D									JIS 20K
										H									ASME 150
										L									JPI 150
										Z									Other than above
Transmitter construction (*2)										1									Integrally mounted
										2									Separately mounted
Power source											1								20 to 30VDC
											2								85 to 264VAC (Safety rated 100 to 240VAC), 50/60Hz
Analog output (*3, 4, 5)											A								Output 1: Mass flow Output 2: Mass flow
											B								Output 1: Mass flow Output 2: Density
											C								Output 1: Mass flow Output 2: Temperature
											D								Output 1: Mass flow Output 2: Volume flow (true density)
											E								Output 1: Mass flow Output 2: Volume flow (fixed density)
											F								Output 1: Density Output 2: Temperature
											G								Output 1: Volume flow (true density) Output 2: Density
											H								Output 1: Volume flow (fixed density) Output 2: Density
											J								Output 1: Volume flow (true density) Output 2: Temperature
											K								Output 1: Volume flow (fixed density) Output 2: Temperature
Pulse output (*3, 4, 5)											X								Non-output In the case of FOUNDATION fieldbus, PROFIBUS communication
											A								Output 1: Mass flow
											B								Output 1: Volume flow (true density)
											C								Output 1: Volume flow (fixed density)
											D								Output 1: Mass flow Output 2: Mass flow
											E								Output 1: Mass flow Output 2: Volume flow (true density)
											F								Output 1: Mass flow Output 2: Volume flow (fixed density)
											G								Output 1: Volume flow (true density) Output 2: Volume flow (true density)
											H								Output 1: Volume flow (fixed dens.) Output 2: Volume flow (fixed dens.)
											J								Output 1: Volume flow (true density) Output 2: Mass flow
Pulse output type (*3)											K								Output 1: Volume flow (fixed density) Output 2: Mass flow
											X								Non-output In the case of FOUNDATION fieldbus, PROFIBUS communication
											0								Non-output In the case of FOUNDATION fieldbus, PROFIBUS communication
Communication interface											1								HART communication HART protocol version7, Bell202
											2								FOUNDATION fieldbus H1 communication (*3) ITK version6
											3								PROFIBUS PA communication (*3) Profile version3.02
											4								Modbus communication RS-485 Modbus protocol
Explosionproof specification (*7)											0								Non-explosionproof
											1								TIIS
											2								ATEX, IECEx
											3								KOSHA/KTL (*6)
											4								CSA
											5								GOST (*6)
											7								NEPSI (*6)
Explosionproof temperature class											0								Non-explosionproof
											3								Sensor unit: Temp. class T3, separate transmitter only
											4								Sensor unit: Temp. class T4

*1: Explosionproof specification has restrictions on temperature class.

*2: If temperature of the fluid exceeds 80°C for explosionproof types, only "Separately mounted" type is available for the transmitter construction.

*3: When FOUNDATION fieldbus, PROFIBUS is selected for communication interface, product code categories of analog output and pulse output are "X" (pulse output type:"0").

*4: When "Volume flow (fixed density)" is selected for analog output or pulse output, fixed density will be applied.

*5: Simultaneous output of both "Volume flow (fixed density)" and "Volume flow (true density)" for analog output and pulse output is not available.

*6: "2" and "3" for the product code ⑮ are not available. (in preparation)

*7: For CSR50, applicable explosionproof specifications are TIIS, ATEX, and IECEx only

*8: Existing transmitter may not be compatible with major part material (Product code ⑨) "T". If it is necessary to use the existing transmitter, consult OVAL.

■ Explosionproof specification

(1) TIIS Explosionproof

● Integral type

- Transmitter symbol: Ex d [ib] IIC T4 X
- Transmitter and detector ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Explosionproof applied temperature: $+59^{\circ}\text{C}$
- Detector symbol: Ex ib IIB T4
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Separate type

- Transmitter symbol: Ex d [ib] IIC T6 X
- Transmitter ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Detector symbol: Ex ib IIB T3, T4
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

* Explosion specifications such as, temperature class, ambient temperature, and fluid temperature vary depending on the combination of transmitter and detector.

Refer to the table below for the explosionproof specification of each combination.

	Temperature class (Xmtr-detector: spec.)	T3 (Xmtr-detector: separate type)	T4 (Xmtr-detector: integral type)	T4 (Xmtr-detector: separate type)
	Group	IIB	IIB	IIB
Model Ambient temp./ Fluid temp.	CS010	-40°C to $+60^{\circ}\text{C}/$ -40°C to $+130^{\circ}\text{C}$	-40°C to $+60^{\circ}\text{C}/$ -40°C to $+80^{\circ}\text{C}$	-40°C to $+60^{\circ}\text{C}/$ -40°C to $+80^{\circ}\text{C}$
	CS015			
	CS025			
	CS040			
	CS050			
	CSR50			

(2) ATEX, IECEx Explosionproof

● Integral type

- Transmitter symbol: II2G Ex d ib IIB T4 Gb
- Transmitter and detector ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Fluid temperature: -40°C to $+80^{\circ}\text{C}$
- Detector symbol: II2G Ex ib IIB T4
- Detector to be connected: CS010 to CSR50
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Separate type

- Transmitter symbol: II2G Ex d [ib] IIC T6 Gb
- Transmitter ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Detector symbol: II2G Ex ib IIB T3, T4
- Detector to be connected: CS010 to CSR50
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Detector ambient temperature (Separate type only)	-40°C to $+60^{\circ}\text{C}$
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Fluid temperature (Separate type only)	Temperature class: T3	-40°C to $+130^{\circ}\text{C}$
	Temperature class: T4	-40°C to $+80^{\circ}\text{C}$

(3) KOSHA/KTL Explosionproof

● Integral type

- Transmitter symbol: Ex d IIC T4
- Transmitter and detector ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Fluid temperature: -40°C to $+80^{\circ}\text{C}$
- Detector symbol: Ex ib IIB T4
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

● Separate type

- Transmitter symbol: Ex d [ib] IIC T6
- Transmitter ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Detector symbol: Ex ib IIB T3, T4
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

Detector ambient temperature (Separate type only)	-40°C to $+60^{\circ}\text{C}$
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Fluid temperature (Separate type only)	Temperature class: T3	-40°C to $+130^{\circ}\text{C}$
	Temperature class: T4	-40°C to $+80^{\circ}\text{C}$

(4) CSA Explosionproof

● Integral type

- Transmitter symbol: Class I, Zone 1, Ex d ib IIB T4 Gb
Class I, Zone 1, AEx d ib IIB T4 Gb
- Transmitter and detector ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Fluid temperature: -40°C to $+80^{\circ}\text{C}$
- Detector symbol: Class I, Zone 1, Ex ib IIB T4 Gb
Class I, Zone 1, AEx ib IIB T4 Gb
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

● Separate type

- Transmitter symbol: Class I, Zone 1, Ex d [ib] IIB T6 Gb
Class I, Zone 1, AEx d [ib] IIB T6 Gb
- Transmitter ambient temperature: -40°C to $+55^{\circ}\text{C}$
- Detector symbol: Class I, Zone 1, Ex ib IIB T3, T4 Gb
Class I, Zone 1, AEx ib IIB T3, T4 Gb
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

Detector ambient temperature (Separate type only)	-40°C to $+60^{\circ}\text{C}$
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Fluid temperature (Separate type only)	Temperature class: T3	-40°C to $+130^{\circ}\text{C}$
	Temperature class: T4	-40°C to $+80^{\circ}\text{C}$

(5) GOST Explosionproof**● Integral type**

- Transmitter symbol: 1 Ex d ib IIB T4X
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C

- Detector symbol: 1 Ex ib IIB T4
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

● Separate type

- Transmitter symbol: 1 Ex d [ib] IIC T6X
- Transmitter ambient temperature: -40°C to +55°C

- Detector symbol: 1 Ex ib IIB T3, T4
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

Detector ambient temperature (Separate type only)	-40°C to +60°C	
Fluid temperature (Separate type only)	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

(6) NEPSI Explosionproof**● Integral type**

- Transmitter symbol: Ex d ib IIB T4 Gb
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C

- Detector symbol: Ex ib IIB T4 Gb
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

● Separate type

- Transmitter symbol: Ex d [ib] IIC T6 Gb
- Transmitter ambient temperature: -40°C to +55°C

- Detector symbol: Ex ib IIB T3, T4 Gb
- Detector to be connected: CS010 to CS050
- Communication: HART, Modbus

Detector ambient temperature (Separate type only)	-40°C to +60°C	
Fluid temperature (Separate type only)	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

■ PLEASE SUPPLY THE FOLLOWING INFORMATION WHEN YOU INQUIRE.

(Fill in the form below to the extent possible. Further details will be finalized in later consultation.)

• Fill in the blanks. Tick the boxes ☐ that apply.

1. Sensor unit	CS ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐		
2. Process fluid (※1)	Name: _____ SP. gr : _____ Viscosity : _____ Concentration : _____ %		
3. Flow range	Max. _____ Normal _____ Full scale _____ ☐ kg/h ☐ Others _____		
4. Fluid temperature	Max. _____ °C Normal _____ °C Min. _____ °C		
5. Operating pressure	Max. _____ MPa Normal _____ MPa Min. _____ MPa		
6. Ambient temperature	Max. _____ °C Min. _____ °C		
7. Fluid flow direction	☐ Left→Right ☐ Right→Left ☐ Bottom→Top (☐ Top→Bottom) Orientation: See sketch on page 8. No. _____		
8. Nominal size	_____ mm or _____ inch		
9. Required accuracy	± _____ % of reading ± _____ % of full scale		
10. Process connection	☐ Flanged connection (Flange rating) _____ ☐ Ferrule connection		
11. Explosionproof	☐ Not required ☐ TIIS ☐ ATEX ☐ IECEx ☐ KOSHA ☐ CSA ☐ GOST ☐ NEPSI		
12. Power supply	_____ V ☐ AC ☐ DC		
13. Output specifications ※ The I/O functions listed on the right are unavailable with communication protocols FOUNDATION fieldbus, PROFIBUS.	Pulse output	☐ Volt. pulse: [0]: 1.5V [1]: 15VDC min. Out. impedance: 2.2kΩ	
		☐ Open drain (equivalent to open collector) [Min. 10V to Max. 30V, 50mADC, ON resistance 0.6Ω or less]	
		☐ Output frequency: Any point from 0.1 to 10000Hz at full scale	
	Analog output	Two outputs from flow rate (mass or volume).	
		4 to 20mADC Max. load: 600Ω	
	Additional damping	2 outputs from instant. flow rate (mass, volume), temp. or density (option)	
14. Communication protocol	Alarm output	0 to 200s. (variable)	
		Slug flow High _____ g/mL Low _____ g/mL	
15. Receiver	☐ HART ☐ FOUNDATION fieldbus ☐ PROFIBUS ☐ Modbus (Address: _____)		
16. Transmission length	☐ Totalizer ☐ Indicator ☐ Recorder ☐ Flow controller ☐ Batch counter		
17. Exclusive cable length	☐ Density computer ☐ Computer ☐ Others		
18. In case of separate type transmitter	Sensor unit (_____) m Transmitter (_____) m Receiving instrument		
19. No. of units required	In case of separately mounted type _____ m (Max. 100m)		
20. Application	☐ Stanchion type w/bracket and 2" U bolts		
21. Other considerations			
22. Pressure-resistant packing	☐ Standard ☐ ATEX directive compliant ☐ ATEX directive compliant for earthed cable		

※1: Special fluids, such as of high viscosity or slurries, should be stated precisely and in detail.

The specification as of June, 2016 is stated in this GS Sheet. Specifications and design are subject to change without notice.