



Inexpensive, General-purpose Coriolis Flowmeter

ALTI_{mass} Type B

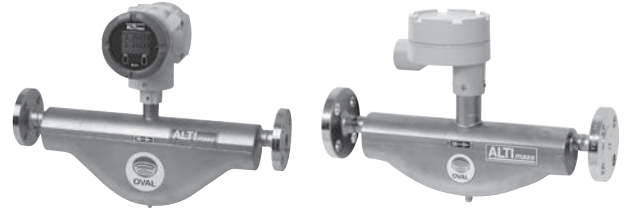
GENERAL SPECIFICATION
GS.No.GBN121E-24

■ GENERAL

Equipped with a sophisticated transmitter (self diagnosis feature, large size display, and field- reconfiguration capability using a touch panel), “ALTI_{mass} Type B” is an inexpensive general-purpose 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), current 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. Rack-mount transmitter available
(refer to GS No.GEJ516E for details)



Remote-mount transmitter



Rack-mount transmitter

■ GENERAL PERFORMANCE

Item		Description					
Model		CB006	CB010	CB015	CB025	CB040	CB050
Flow rate	Guaranteed minimum rate (kg/h)	24	76.8	192	576	1920	
	Minimum setting rate (kg/h)	60	192	480	1440	4800	
	Maximum service rate (kg/h)	600	1920	4800	14400	48000	
	Maximum allowable rate (kg/h)	1200	3840	9600	28800	96000	
	Accuracy	±0.2% of RD (*1)					
	Repeatability	±0.1% of RD (*2)					
	Zero stability (kg/h)	0.09	0.288	0.72	2.16	7.2	
Density (Liquid)	Metering range	0.3 to 2g/mL					
	Accuracy (Option)	±0.003g/mL					
Analog output accuracy		±0.1% of FS added to each accuracy					

*1: ±Zero stability error is applied for flow rates below 7.5% of the maximum service rate. (within guaranteed flow range)

*2: ±1/2 Zero stability error is applied for flow rates below 7.5% of the maximum service rate. (within guaranteed flow range)

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

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

■ GENERAL SPECIFICATIONS

● Sensor unit

Item		Description					
Model		CB006	CB010	CB015	CB025	CB040	CB050
Nominal size		10mm or 1/2"	15mm or 1/2"	15mm or 1/2"	25mm or 1"	40mm or 1-1/2"	50mm or 2"
Materials	Wetted parts	SUS316L					
	Housing	SUS304					
Process connection		JIS 10, 20, 30K, RF/ASME (JPI) 150, 300, 600RF, IDF Ferrule					
Applicable fluid		Liquid					
Density range		0.3 to 2.0g/mL					
Measurable temperature range		-40 to +130°C (*1)					
Heatproof temperature		Maximum 150°C (*2)					
Maximum operating pressure		Depends on process connection					
Flow direction		Bidirectional					
Explosionproof configuration		TIIS, ATEX, IECEx, KOSHA/KTL, CSA, GOST, NEPSI, ITRI Refer to page 10, 11 for details.					
Dusttight, waterproof configuration		IP66 / 67					

*1: Refer to page 10, 11. In case of non-explosionproof model, up to 130°C is permitted. However, the product must be used within the maximum ambient temperature of 45°C.

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

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● Transmitter (For the rack-mount transmitter, refer to GS No.GEJ516E.)

Item	Description	
Model	PA0K	
Power supply	85 to 264VAC 50/60Hz or 20 to 30VDC (Safety rated 100 to 240VAC 50/60Hz)	
Power consumption	Maximum 15W	
Ambient temperature	-40 to +55°C (*1)	
Transmission length (Remote-mount type)	Maximum 50m (dedicated 9-core cable used) (*2)	
Applicable EU directive	EMC Directive: 2014/30/EU ATEX Directive: 2014/34/EU LVD Directive: 2014/35/EU	
Applicable EN standards	EMC : EN61326-1: 2013 ClassA ATEX: EN60079-0: 2012+A11: 2013 EN60079-1: 2014 EN60079-11: 2012 IECEX: IEC60079-0: 2011 IEC60079-1: 2014-06 IEC60079-11: 2011 LVD: EN61010-1: 2010	
Explosionproof configuration	TIIIS, ATEX, IECEx, KOSHA/KTL, CSA, GOST, NEPSI, ITRI Refer to page 10, 11 for details.	
Maritime certification	DNV GL Refer to page 11 for details.	
Dusttight, waterproof configuration	IP66 / 67	
Transmitter configuration	Integral or Remote-mount	
Painting	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	Integral-mount type 3.6kg approx., Remote-mount type 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 (Standard) 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 1.0% of maximum service flow rate	
Pulse output (*5)	Open drain (equivalent to open collector) [Minimum 10V to Maximum 30V, 50mADC, ON resistance 0.6Ω or less] or Voltage pulse (Low level: 1.5V maximum, High level: 13V minimum Output impedance: 2.2kΩ) Setting range: 0.1 to 10000Hz (Maximum output 11000Hz)	
Analog output (*5)	4 to 20mADC (maximum load 600Ω) Select two outputs from instant flowrate (mass or volume) temperature, and density.	
Status output (*5)	Open drain (equivalent to open collector) [Maximum 30V, 50mADC, ON resistance 0.6Ω or less] Select one output from error (*4), flow direction, or high/low alarm (default is error)	
Status input (*5)	Contact-closure input (Form "a" contact) Short: 200Ω maximum, Open: 100kΩ minimum Select one output 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 maximum length, Please consult OVAL sales office or nearest representative.

The operating temperature range of the dedicated cable (PVC: model code CBP2) is -15 to +80°C.

To use in an environment that exceeds the above temperature range, use dedicated cable (PTFE: model code CBT2) instead.

*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.

*: 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)

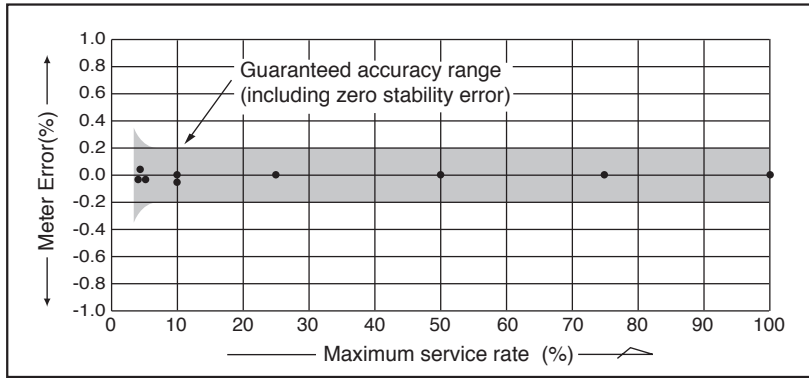
Communication interfaces FOUNDATION fieldbus, PROFIBUS PA display different contents. For further information, refer to the instruction manuals of respective communication interfaces.

※ 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.

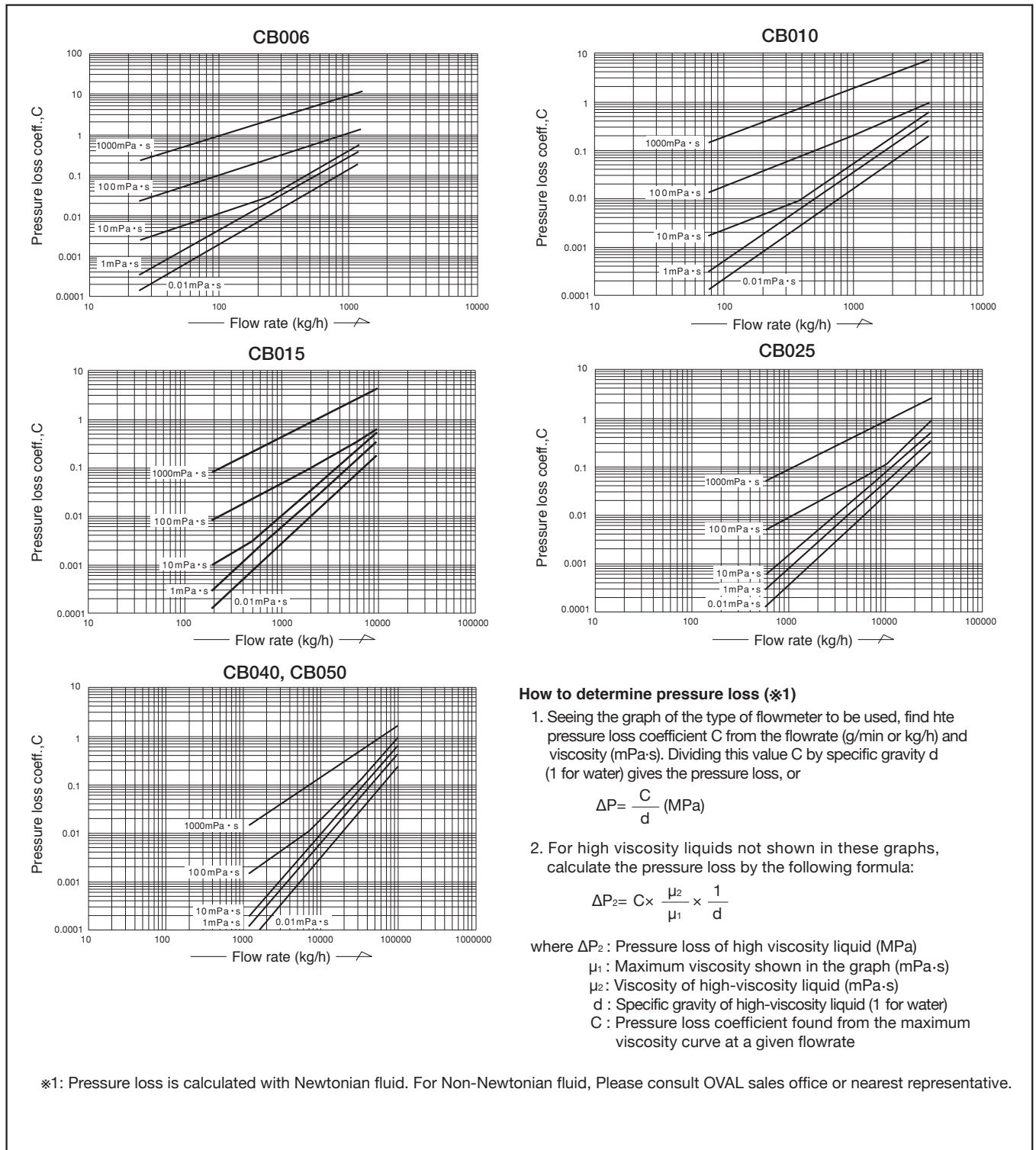
※ Backlight duration is selectable.

A touch of a finger on the touch panel through the front glass (infrared optical sensor) selects the mode.

METER ERROR



PRESSURE LOSSES



How to determine pressure loss (※1)

1. Seeing the graph of the type of flowmeter to be used, find the pressure loss coefficient C from the flowrate (g/min or kg/h) and viscosity (mPa·s). Dividing this value C by specific gravity d (1 for water) gives the pressure loss, or

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

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

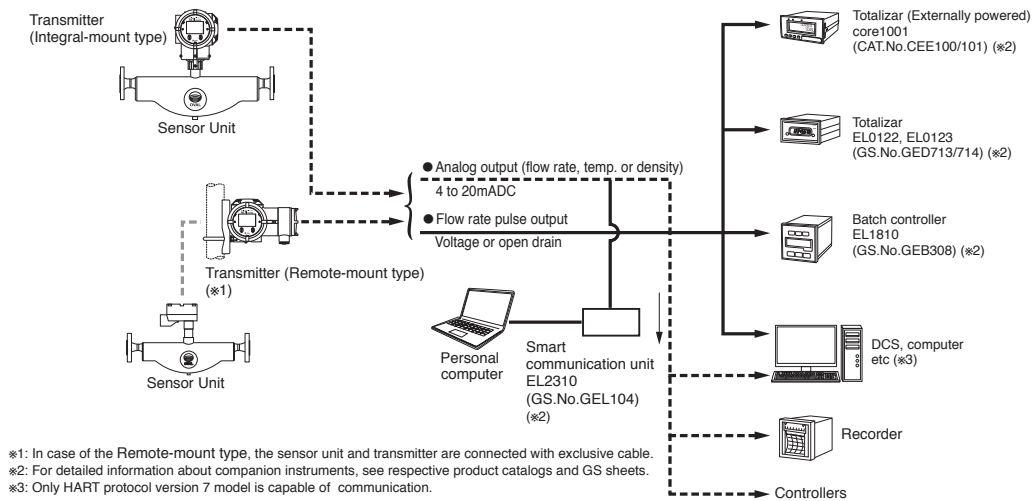
$$\Delta P_2 = C \times \frac{\mu_2}{\mu_1} \times \frac{1}{d}$$

where ΔP_2 : Pressure loss of high viscosity liquid (MPa)
 μ_1 : Maximum viscosity shown in the graph (mPa·s)
 μ_2 : Viscosity of high-viscosity liquid (mPa·s)
 d: Specific gravity of high-viscosity liquid (1 for water)
 C: Pressure loss coefficient found from the maximum viscosity curve at a given flowrate

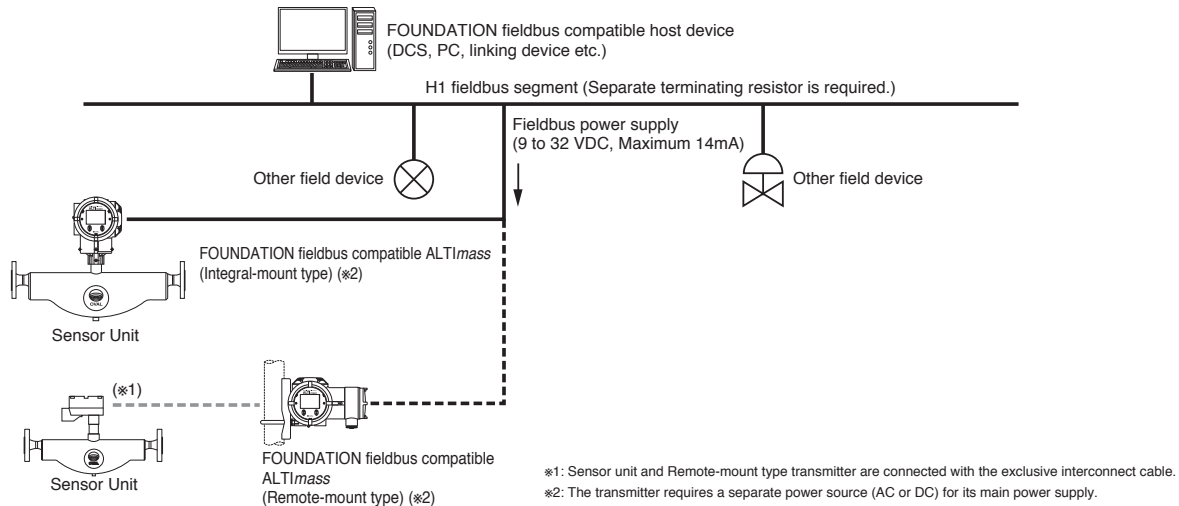
※1: Pressure loss is calculated with Newtonian fluid. For Non-Newtonian fluid, Please consult OVAL sales office or nearest representative.

REMOTE MEASURING SYSTEM

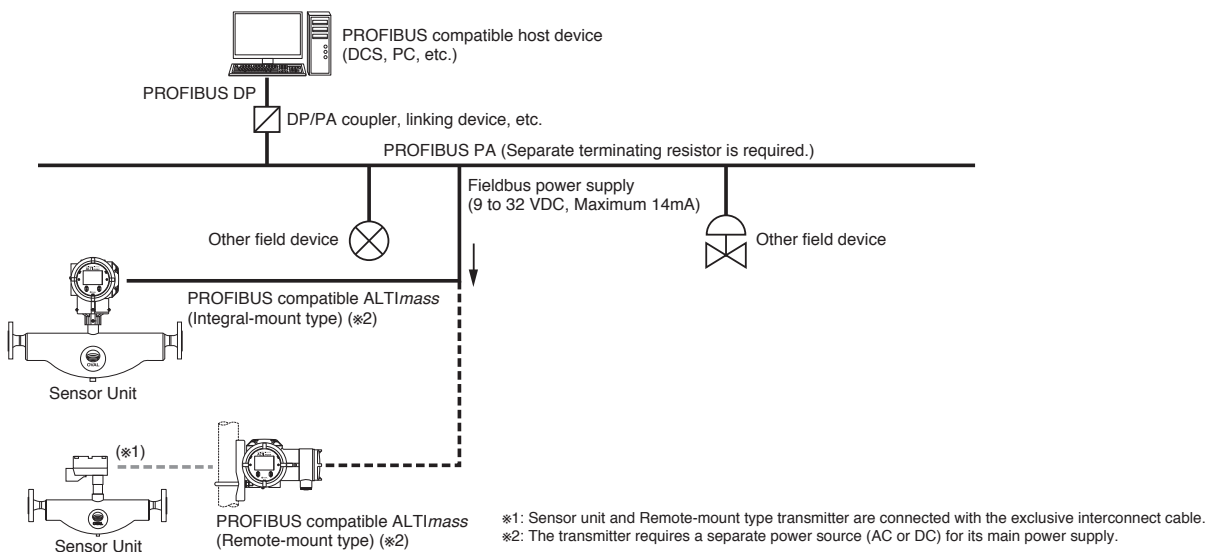
● HART protocol



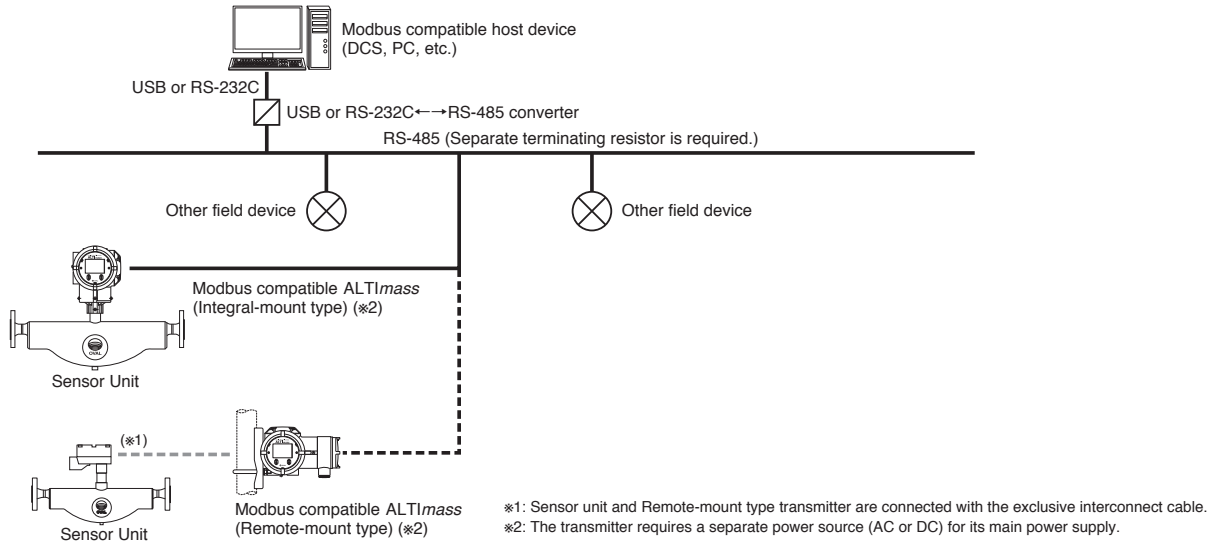
● FOUNDATION fieldbus



● PROFIBUS



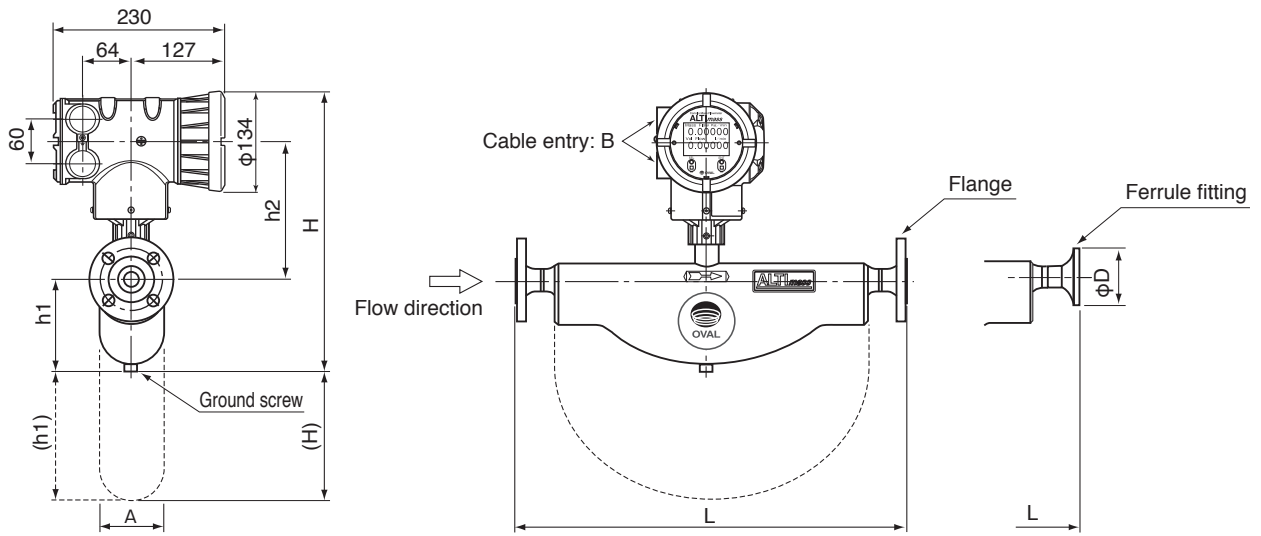
● Modbus



■ DIMENSIONS [Unit in mm]

● Transmitter Integral-mount Type

NOTE★: For non-explosionproof models, pressure-tight packing assembly is not furnished.



*: Dotted lines show the envelope of CB040, CB050.

Model	Nominal size	JIS			ASME/JPI			H	h1	h2	A	Approx. Weight (kg) (JIS 10K)
		10 K	20K	30K	150	300	600					
		L			L							
CB006	10 (1/2")	343	343	361	369	378	390.5	354	94	192	59	7.3
CB010	15 (1/2")	380	380	400	406	415	427.5	350	94	189	59	7.6
CB015	15 (1/2")	486	486	506	512	521	533.5	441	168	206	91	11.6
CB025	25 (1")	569	569	589	601	613	626	436	175	194	91	14.2
CB040	40 (1-1/2")	626	626	654	660	673	688.5	588	323	197	125	32.8
CB050	50 (2")	626	636	674	663	676	695	588	323	197	125	33.2

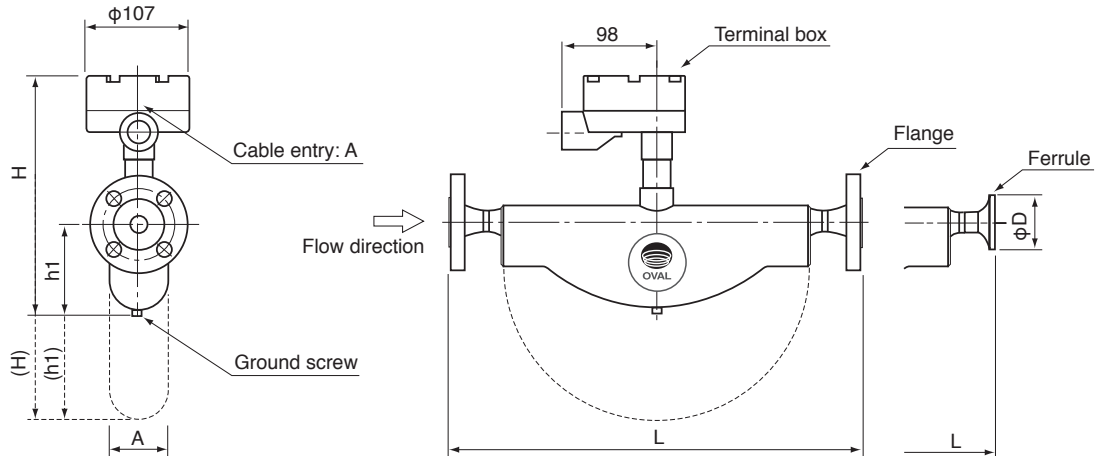
Model	Ferrule			Approx. Weight (kg)
	Connection	L	φD	
CB006	Ferrule 10A	333	34	5.2
CB010	Ferrule 15A	380	34	6.1
CB015	Ferrule 15A	476	34	9.9
CB025	Ferrule 25 (ISO), IDF 1S	559	50.5	11.1
CB040	Ferrule 38 (ISO), IDF 1.5S	606	50.5	29.3
CB050	Ferrule 51 (ISO), IDF 2S	606	64	29.3

*: As long as flange O.D. and bolt holes remain the same while flange rating may differ, the flange thickness with the higher rating is chosen in the above.

Process connection: A in mm; S (sanitary) in inches.

■ DIMENSIONS [Unit in mm]

● Transmitter Remote-mount Type



※: Dotted lines show the envelope of CB040, CB050.

Model	Nominal size	JIS			ASME/JPI			H	h1	A	Approx. Weight (kg) (JIS 10K)
		10 K	20K	30K	150	300	600				
CB006	10 (1/2")	343	343	361	369	378	390.5	257	94	59	4.7
CB010	15 (1/2")	380	380	400	406	415	427.5	254	94	59	5.0
CB015	15 (1/2")	486	486	506	512	521	533.5	345	168	91	9.0
CB025	25 (1")	569	569	589	601	613	626	340	175	91	11.6
CB040	40 (1-1/2")	626	626	654	660	673	688.5	491	323	125	30.2
CB050	50 (2")	626	636	674	663	676	695	491	323	125	30.6

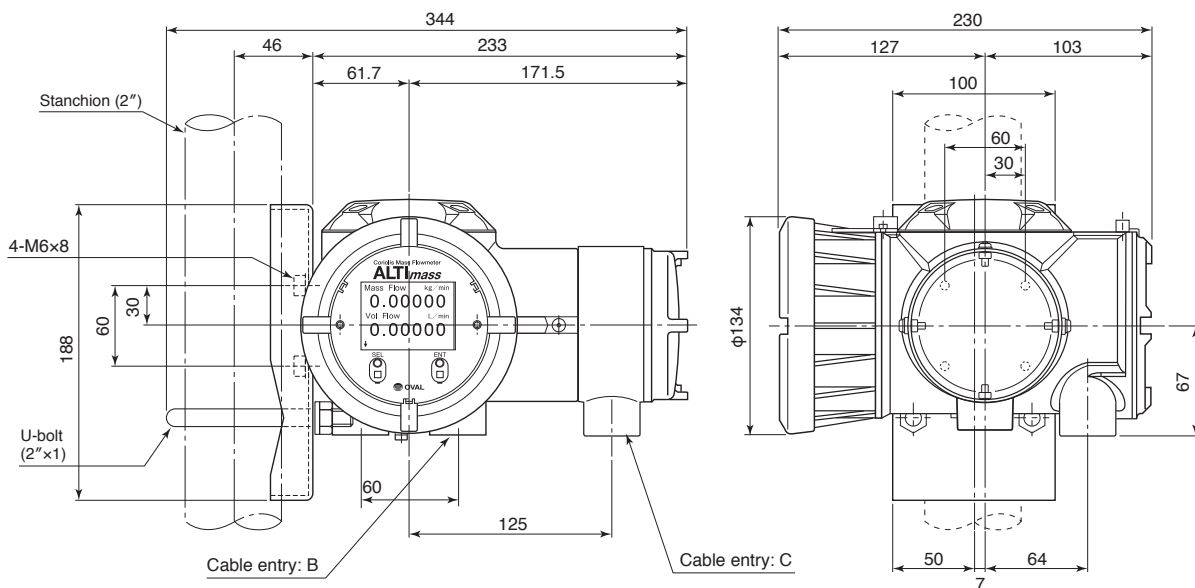
Model	Ferrule			Approx. Weight (kg)
	Connection	L	φD	
CB006	Ferrule 10A	333	34	2.6
CB010	Ferrule 15A	380	34	3.5
CB015	Ferrule 15A	476	34	7.3
CB025	Ferrule 25 (ISO), IDF 1S	559	50.5	8.5
CB040	Ferrule 38 (ISO), IDF 1.5S	606	50.5	26.7
CB050	Ferrule 51 (ISO), IDF 2S	606	64	26.7

※: As long as flange O.D. and bolt holes remain the same while flange rating may differ, the flange thickness with the higher rating is chosen in the above.

※: Terminal box materials: SCS13A adds approximately +1kg.

Process connection: A in mm; S (sanitary) in inches.

● Remote-mount transmitter (For the rack-mount transmitter, refer to GS No.GEJ516E.)



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

■ LIST OF TRANSMITTER AND SENSOR CONDUIT CONNECTIONS

〈Cable entry: A〉

Remote-mount sensor

Explosionproof specifications	Connection thread specifications	Note
Non-explosionproof	Domestic: G3/4, Overseas: G3/4	
TIIS	G3/4	Adapter is connected (※1)
ATEX, IECEx	G3/4	Adapter is connected (※2)
KCs	G3/4	
CSA	G3/4	Adapter is connected (※3)
EAC	G3/4	Adapter is connected (※2)
NEPSI	G3/4	Adapter is connected (※2)
ITRI	G3/4	Adapter is connected (※2)

※1: An adapter to convert G3/4 to "G1/2" is connected.

※2: An adapter to convert G3/4 to "M20×1.5" is connected.

※3: You can choose an adapter to convert G3/4 to "1/2"NPT," or to "M20×1.5."

〈Cable entry: B〉

Integral-mount transmitter, Remote-mount transmitter

Explosionproof specifications	Connection thread specifications	Note
Non-explosionproof	Domestic: G3/4, Overseas: G3/4	
TIIS	G3/4	Cable gland is supplied.
ATEX, IECEx	M25×1.5	(※1)
KCs	M25×1.5	
CSA	M25×1.5	Adapter is connected (※2)
EAC	M25×1.5	(※1)
NEPSI	M25×1.5	
ITRI	M25×1.5	

※1: A cable gland can be supplied. Please consult OVAL sales office or nearest representative.

※2: You can choose an adapter to convert M25×1.5 to one of "3/4"NPT", "1/2"NPT", or "M20×1.5".

〈Cable entry: C〉

Remote-mount transmitter

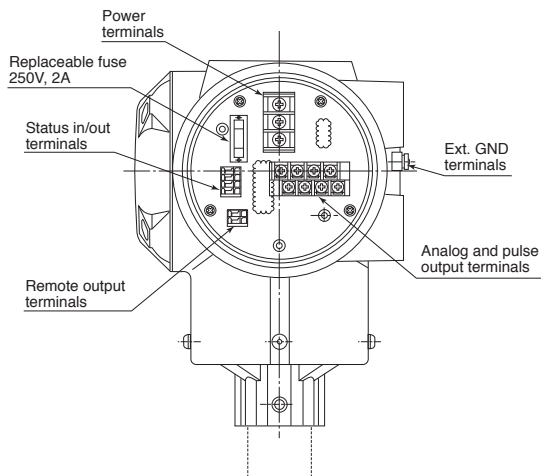
Explosionproof specifications	Connection thread specifications	Note
Non-explosionproof	G3/4	
TIIS	G3/4	Cable gland is supplied.
ATEX, IECEx	G3/4	Adapter is connected (※1)
KCs	G3/4	
CSA	G3/4	Adapter is connected (※2)
EAC	G3/4	Adapter is connected (※1)
NEPSI	G3/4	Adapter is connected (※1)
ITRI	G3/4	Adapter is connected (※1)

※1: An adapter to convert G3/4 to "M20×1.5" is connected.

※2: You can choose an adapter to convert G3/4 to "1/2"NPT," or to "M20×1.5."

■ WIRING

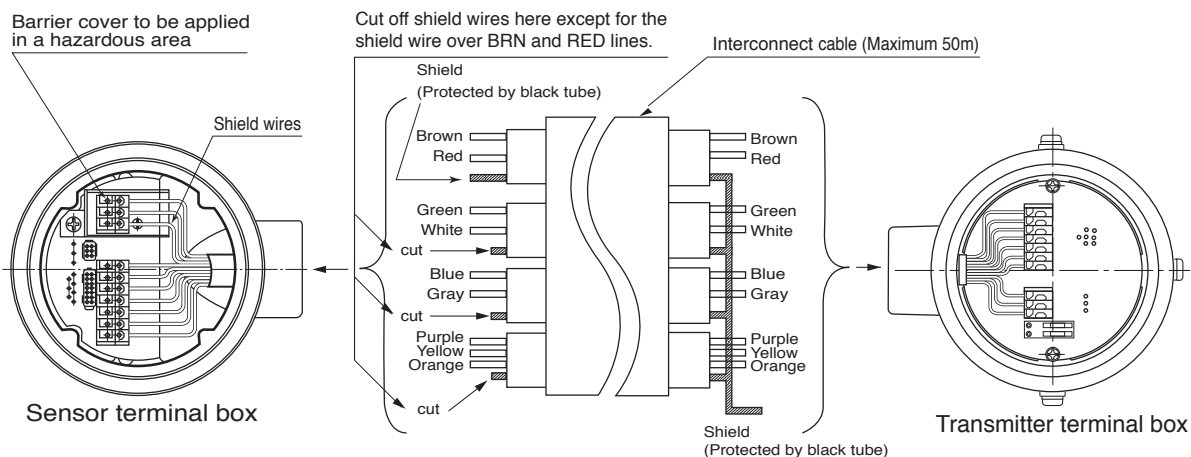
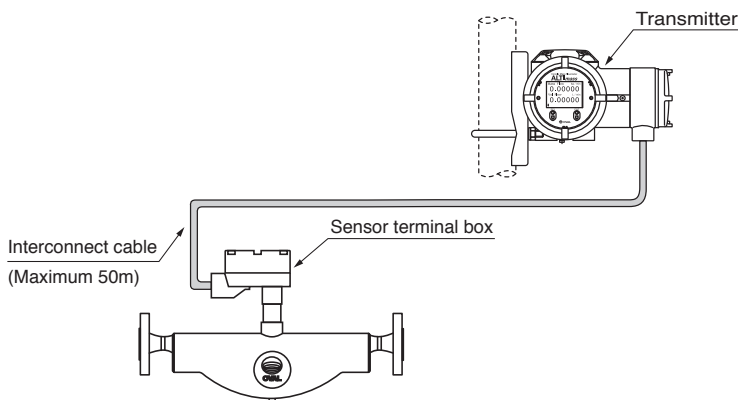
● Transmitter power and input/output signal wiring



● Terminal identification and description

Item	Label	Description	Remarks
Signal	A1 (+)	Analog output 1 (4 to 20mA)	1. Maximum 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 Maximum 10m (at 10kHz) Maximum 100m (at 1kHz) Maximum 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: Maximum transmission length 1200m at 0.75sq FOUNDATION fieldbus or PROFIBUS PA communication: Maximum transmission length 1900m at 0.8sq
	S.I. (-)		
S.O. (+)	Status output (open drain output)		
S.O. (-)			
Power	I/O (+)	Expanded in/out (Modbus communication, etc.)	
	I/O (-)		
	L (+)	Power (with DC power: +)	
GND	Earth ground		
N (-)	Power (with DC power: -)		

● Wiring between Sensor Unit and Remote-mount Transmitter



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

2. Shield wire preparation

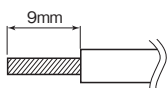
(1) Transmitter end:

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:

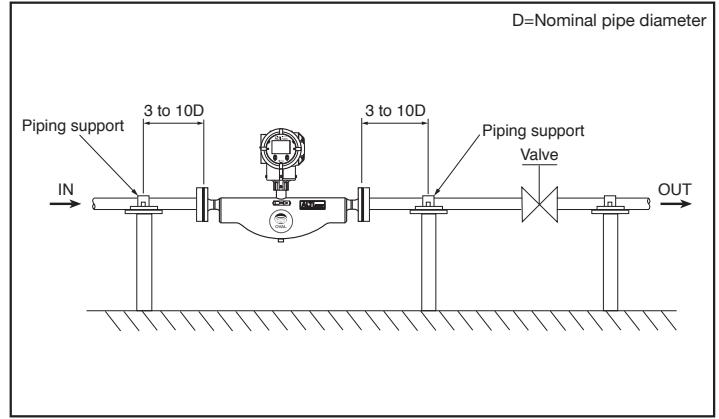


※: Use of crimp pin terminal is not necessary.

■ 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 electro-magnetic induction. Also avoid installation near the sources of excessive vibration, such as motors and pumps.
- 2) If it is desired to make a measurement of a process fluid requiring heat retention, heat trace may be applied directly to the sensor body. Heat trace should be held below 130°C.
- 3) The sensor unit has an airtight construction. To prevent inner dew condensation at low temperature operation, the casing is filled with argon gas. For this reason, please take extra caution not to drop or apply impact on the sensor.
- 4) In a horizontal run, install the sensor having the transmitter placed on top as shown in the figure.
- 5) 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.
- 6) To ensure consistent density measurement, retain heat.

3. Prevention of Cavitation

Cavitation if it takes place during measurement causes loss of meter accuracy, or results in dispersion of obtained measurements. For these reasons, maintain line pressure high enough to prevent cavitation upstream and downstream of the meter during measurement.

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

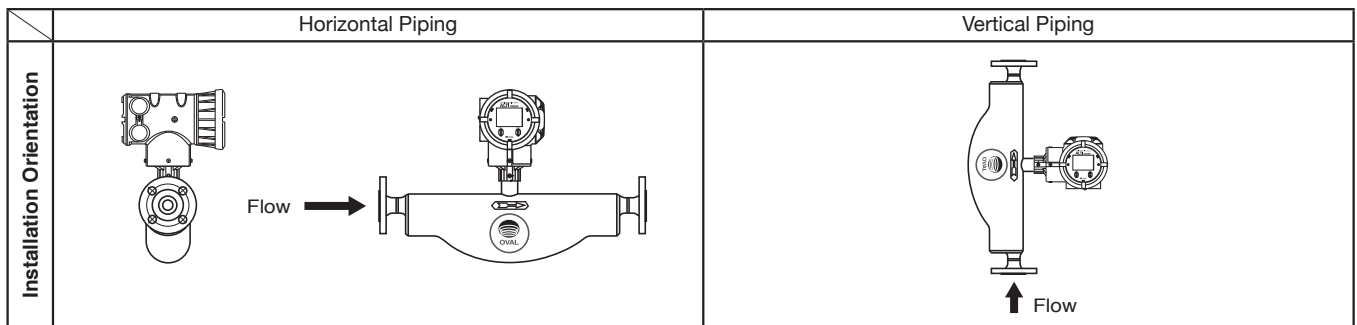
P_d : Downstream pressure (MPa[absolute])

ΔP : Pressure loss across the meter (MPa)

P_v : Steam pressure of the process fluid at measurement (MPa[absolute])

4. Physical Orientation

May be installed in a horizontal or vertical line.



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

■ Explosionproof specification (For the rack-mount transmitter, refer to GS No.GEJ516E.)

1. IIIS Explosionproof

● Integral-mount type

- Transmitter symbol: Ex d [ib] IIC T4 X
- Transmitter and sensor ambient temperature: -40°C to +55°C
- Explosionproof applied temperature: +59°C
- Sensor symbol: Ex ib IIB T4
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Remote-mount type

- Transmitter symbol: Ex d [ib] IIC T6 X
- Transmitter ambient temperature: -40°C to +55°C
- Sensor 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 sensor. Refer to the table below for the explosionproof specification of each combination.

	Temperature class (Xmtr-sensor: spec.)	T3 (Xmtr-sensor: Remote-mount type)	T4 (Xmtr-sensor: Integral-mount type)	T4 (Xmtr-sensor: Remote-mount type)
	Group	IIB	IIB	IIB
Model Ambient temp./ Fluid temp.	CB006/CB010	-40°C to +60°C/ -40°C to +125°C/	-40°C to +60°C/ -40°C to +80°C/	-40°C to +60°C/ -40°C to +80°C/
	CB015	-40°C to +60°C/ -40°C to +125°C/	-40°C to +60°C/ -40°C to +70°C/	-40°C to +60°C/ -40°C to +80°C/
	CB025	-40°C to +60°C/ -40°C to +125°C/	-40°C to +60°C/ -40°C to +80°C/	-40°C to +60°C/ -40°C to +80°C/
	CB040/CB050	-20°C to +60°C/ -20°C to +125°C/	-20°C to +60°C/ -20°C to +80°C/	-20°C to +60°C/ -20°C to +80°C/

2. ATEX, IECEx Explosionproof

● Integral-mount type

- Transmitter symbol: II2G Ex db ib IIB T4 Gb
- Transmitter and sensor ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C (Other than CB015)
-40°C to +70°C (CB015)
- Sensor symbol: II2G Ex ib IIB T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Remote-mount type

- Transmitter symbol: II2G Ex db [ib] IIC T6 Gb
- Transmitter ambient temperature: -40°C to +55°C
- Sensor symbol: II2G Ex ib IIB T3, T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Sensor ambient temperature (Remote-mount type only)	-40°C to +60°C	
Fluid temperature (Remote-mount type only)	Temperature class: T3	-40°C to +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

3. KCs Explosionproof

● Integral-mount type

- Transmitter symbol: Ex d ib IIB T4
- Transmitter and sensor ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C
- Sensor symbol: Ex ib IIB T4
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Remote-mount type

- Transmitter symbol: Ex d [ib] IIC T6
- Transmitter ambient temperature: -40°C to +55°C
- Sensor symbol: Ex ib IIB T3, T4
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Sensor ambient temperature (Remote-mount type only)	-40°C to +60°C	
Fluid temperature (Remote-mount type only)	Temperature class: T3	-40°C to +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

4. CSA Explosionproof

● Integral-mount type

- Transmitter symbol: Class I, Zone 1, Ex d ib IIC T4 Gb
- Transmitter and sensor ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +70°C (CB015)
- Transmitter ambient temperature: -40°C to +55°C
- Sensor symbol: Class I, Zone 1, Ex ib IIB T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Remote-mount type

- Transmitter symbol: Class I, Zone 1, Ex d [ib] IIC T6 Gb
- Transmitter ambient temperature: -40°C to +55°C
- Sensor symbol: Class I, Zone 1, Ex ib IIB T3, T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Sensor ambient temperature (Remote-mount type only)	-40°C to +60°C	
Fluid temperature (Remote-mount type only)	Temperature class: T3	-40°C to +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

5. EAC Explosionproof

● Integral-mount type

- Transmitter symbol: 1 Ex d ib IIB T4 Gb X
- Transmitter and sensor ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +70°C (CB015)
- Transmitter ambient temperature: -40°C to +80°C (Other than CB015)
- Sensor symbol: 1 Ex ib IIB T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Remote-mount type

- Transmitter symbol: 1 Ex d [ib] IIC T6 Gb X
- Transmitter ambient temperature: -40°C to +55°C
- Sensor symbol: 1 Ex ib IIB T3, T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Sensor ambient temperature (Remote-mount type only)	-40°C to +60°C	
Fluid temperature (Remote-mount type only)	Temperature class: T3	-40°C to +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

6. NEPSI Explosionproof

● Integral-mount type

- Transmitter symbol: Ex d ib IIB T4 Gb
- Transmitter and sensor ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +70°C (CB015)
- Transmitter ambient temperature: -40°C to +80°C (Other than CB015)
- Sensor symbol: Ex ib IIB T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus

● Remote-mount type

- Transmitter symbol: Ex d [ib] IIC T6 Gb
- Transmitter ambient temperature: -40°C to +55°C
- Sensor symbol: Ex ib IIB T3, T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus

Sensor ambient temperature (Remote-mount type only)	-40°C to +60°C	
Fluid temperature (Remote-mount type only)	Temperature class: T3	-40°C to +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

7. ITRI Explosionproof

● Integral-mount type

- Transmitter symbol: Ex db ib IIB T4 Gb
- Transmitter and sensor ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C (Other than CB015)
- Transmitter ambient temperature: -40°C to +70°C (CB015)
- Sensor symbol: II2G Ex ib IIB T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus

● Remote-mount type

- Transmitter symbol: Ex db [ib] IIC T6 Gb
- Transmitter ambient temperature: -40°C to +55°C
- Sensor symbol: II2G Ex ib IIB T3, T4 Gb
- Sensor to be connected: CB006 to CB050
- Communication: HART, Modbus

Sensor ambient temperature (Remote-mount type only)	-40°C to +60°C	
Fluid temperature (Remote-mount type only)	Temperature class: T3	-40°C to +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

■ ABOUT MARITIME CERTIFICATION

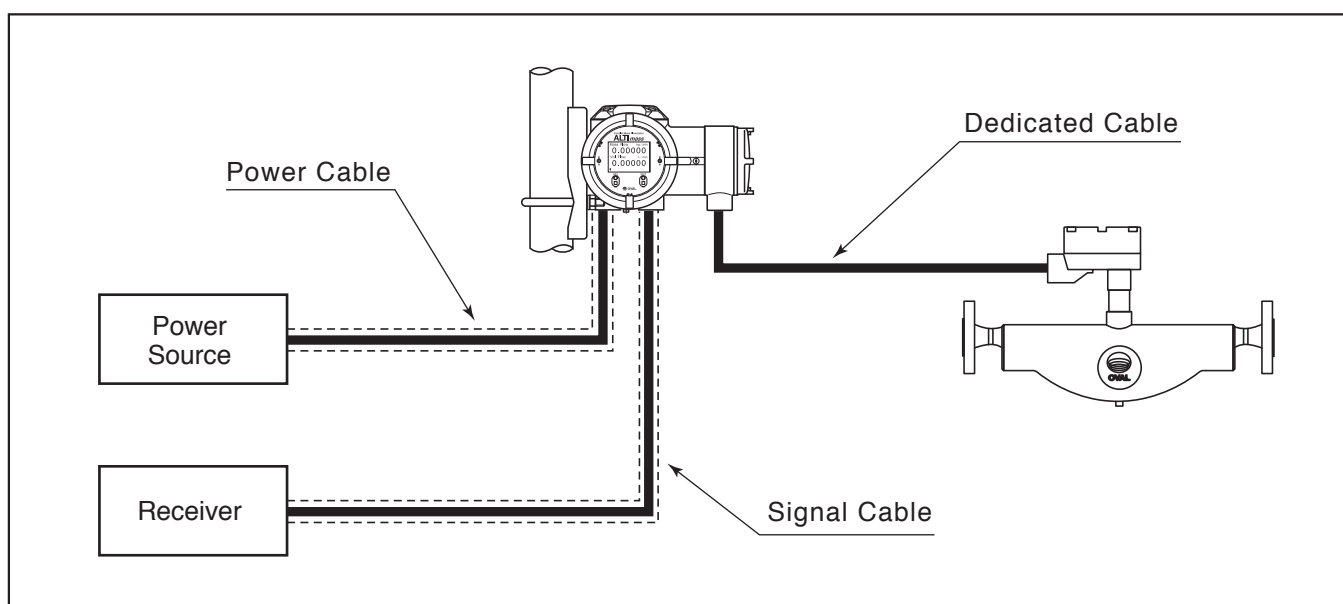
The product is approved for the ship classification under the conditions below.

Item	Contents
Classification Society	DNV GL
Location Classes	Temperature D (-25°C to +55°C)
	Humidity B (Relative Humidity: less than 100%)
	Vibration A (2 to 13.2Hz with 1mm amplitude, 13.2 to 100Hz with 0.7g acceleration) * Install at the place where mechanical vibration from engine, compressor, pump and so on is not introduced into transmitter directly.
	EMC A (All locations except bridge and open deck)
Enclosure	C (IP56)

■ REGARDING CABLE WIRING

If using ALTI^{mass} as certified equipment for maritime applications, use metal conduit tube, marine cable (with shield), etc. for the power and signal cables and connect shielded sections to the transmitter housing.

Be sure to use the dedicated cable for the connection between the sensor and the transmitter, and implement waterproofing treatment which satisfies IP56.

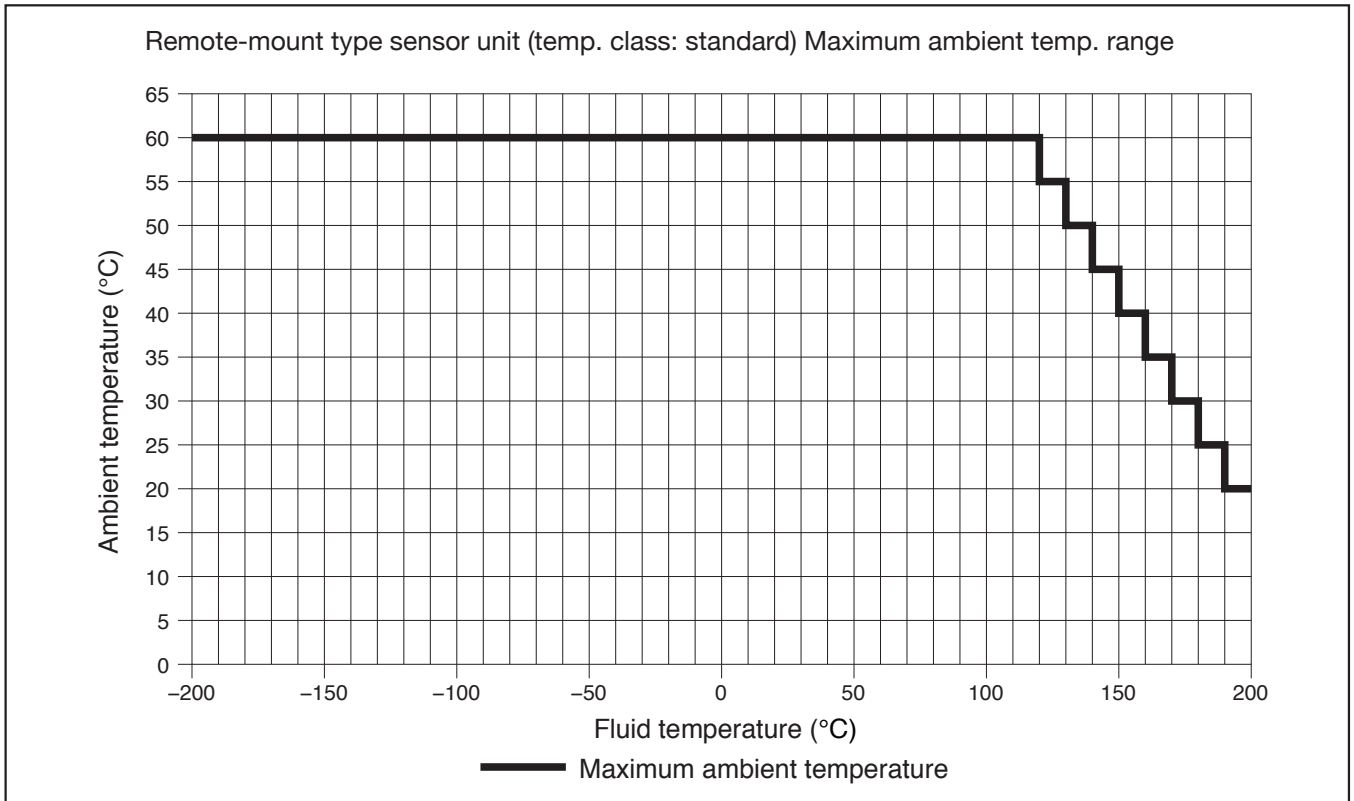


■ AMBIENT TEMPERATURE

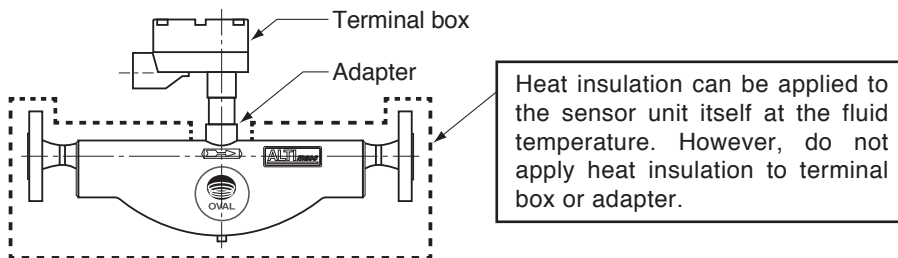
Allowable ambient temperature permitted for the sensor unit is as described in the table below.

(The following table describes the condition for the non-explosionproof models. For the explosionproof models, make sure to satisfy the temperature conditions described in “Explosionproof Specification” as well as the condition described below.)

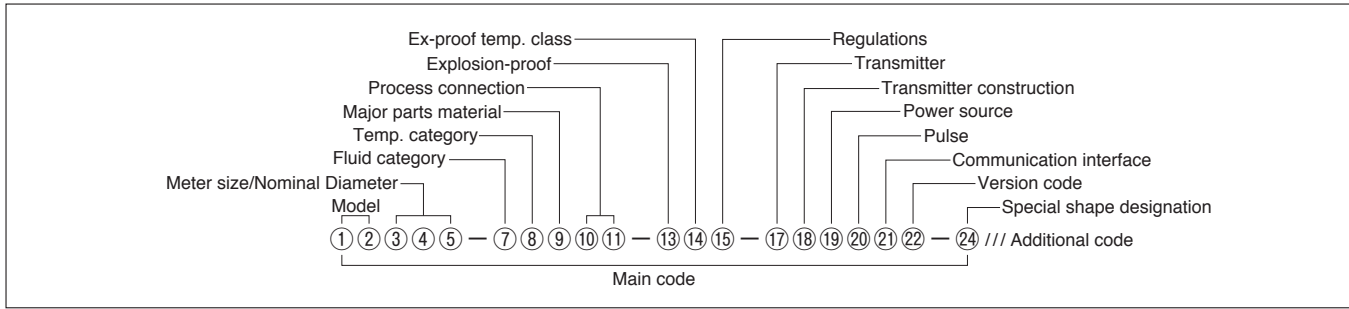
Transmitter construction	
Integral-mount type	Remote-mount type
[Fluid temperature] +130°C and below [Ambient temperature] -40 to +55°C	[Sensor unit ambient temp.] CB006 to CB025: -40°C and above CB040/CB050: -20°C and above to maximum ambient temp. in the graph below



*Please contact us in the case the ambient temperature exceeds maximum ambient temperature in the graph.



■ PRODUCT CODE EXPLANATION



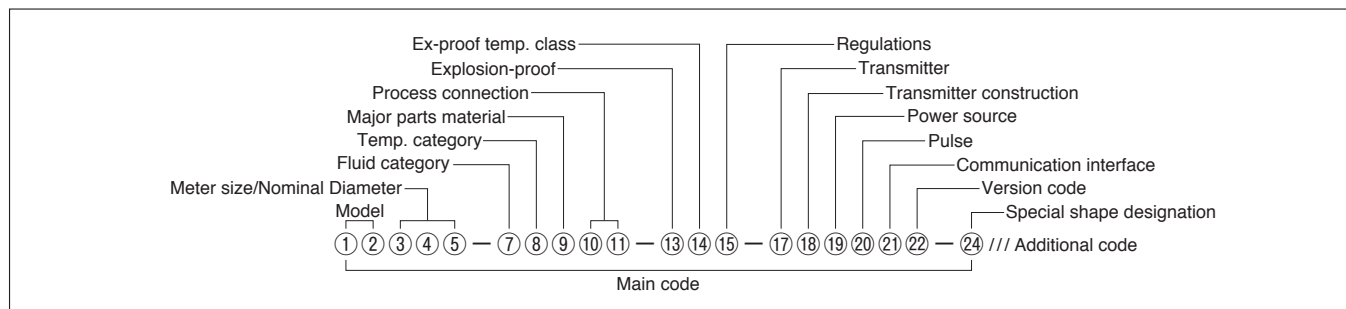
●Main code

①	②	Model		
C	B	ALTI $_{mass}$ Type B		
③	④	⑤	Meter size/Nominal Diameter	
			JIS flange	ASME-JPI flange
0	0	6	10mm	1/2"
0	1	0	15mm	1/2"
0	1	5	15mm	1/2"
0	2	5	25mm	1"
0	4	0	40mm	1-1/2"
0	5	0	50mm	2"
⑥	—			
⑦	Fluid category			
L	Liquid			
⑧	Temp. category *1			
1	Standard (130°C and lower)			
⑨	Major parts material			
S	SUS316L			
⑩	⑪	Process connection		
J	1	JIS10K		
J	2	JIS20K		
J	3	JIS30K		
A	1	ASME150		
A	3	ASME300		
A	6	ASME600		
P	1	JPI150		
P	3	JPI300		
P	6	JPI600		
H	S	ISO Ferrule		
Z	9	Special		
⑫	—			
⑬	Explosion-proof			
0	Non-explosionproof			
1	TIIS			
2	ATEX/IECEx			
3	KCs			
4	CSA (C-US)			
5	EAC			
7	NEPSI *2			
T	ITRI *2			
⑭	Ex-proof temp. class			
0	Non-explosionproof			
3	T3			
4	T4			

⑮	Regulations	
0	Standard	
H	High Pressure Gas Safety Act (Individual test)	*w/Material test certificate (Designed on PO issued)
J	High Pressure Gas Safety Act (Completion inspection)	*w/Material test certificate
T	Fire Service Act	*w/Material test certificate
S	Ship Classification Society Pattern Approval	
P	Ship Classification Society Pattern Approval + w/Material test certificate	
C	CRN (Canadian Registration Number) Pattern approval *3	
K	CRN (Canadian Registration Number) Pattern approval+w/Material test certificate *3	
F	w/Material test certificate	
⑯	—	
⑰	Transmitter *4	
1	ALTI $_{mass}$	
3	Rack-mount transmitter (Refer to GS No.GEJ516E.)	
⑱	Transmitter construction *5	
1	Integral-mount	
2	Remote-mount (Terminal box materials: ADC12)	
3	Remote-mount (Terminal box materials: SCS13A)	
⑲	Power source	
1	20 to 30VDC	
2	85 to 264VAC (Safety rated 100 to 240VAC 50/60Hz)	
⑳	Pulse	
0	When "2, 3" are chosen for "Communication interface ㉑"	
B	Voltage pulse	
G	Open drain pulse (equivalent to open collector pulse) (standard)	
㉑	Communication interface	
1	HART communication (HART protocol version 7, Bell202)	
2	FOUNDATION Fieldbus H1communication (ITK version6)	
3	PROFIBUS PA communication (Profile version3.02)	
4	Modbus communication (RS-485 Modbus protocol)	
㉒	Version code	
B	Version code: B	
㉓	—	
㉔	Special shape designation	
0	Standard	
Z	Special shape	

*1: Explosionproof specifications are restricted based on temperature class.
 *2: "2, 3" for "Communication interface ㉑" are in preparation and is not available yet.
 *3: CRN is applicable only to CSA explosionproof and ASME flange models.
 *4: Applicable specifications differ with the rack-mount transmitter.
 For detailed product code explanation, refer to GS No.GEJ516E.
 *5: If temperature of the fluid exceeds 80°C for explosionproof types, only "Remote-mount" type is available for the transmitter construction.
 In case of non-explosionproof, Integral-mount type can be used up to 130°C by restricting the transmitter ambient temp. to 45°C at maximum.
 When "3" is chosen for "Transmitter construction ⑱" following limitations apply:
 Code ⑧ Only "Standard" available
 Code ⑰ Only "Rack-mount transmitter" available

■ PRODUCT CODE EXPLANATION



●Additional code

Category of High Pressure Gas		
H P	0	Other than High Pressure Gas
H P	1	Toxic gas and flammable gas
H P	2	Toxic gas
H P	3	Flammable gas
H P	4	Other than toxic or flammable gas
Density calibration		
M	0 0	Density calibration
Special test (instrumental error)		
A	2 0	By certified measurer
A	9 9	Designation of instrumental error test method Addition of one (1) test point, etc.
Flow direction		
F L	0	Left to right
F R	0	Right to left
F D	0	Bottom to top Electric conduit must face bottom
Designated special paint on body		
B X	0	Customer designation
Designated special paint on transmitter		
S F	0	Corrosion proof Special treatment
S D	0	Salinity tolerance
S E	0	Acid tolerance Special treatment
S X	0	Customer designated paint Special treatment
Cleansing		
T W	0	Oil free and Water free treatment
T F	0	Food cleansing

Document		
D S J	SPEC. & DWG (Approval Drawing) (Japanese)	
D S E	SPEC. & DWG (Approval Drawing) (English)	
D R 0	Re-submission of SPEC. & DWG	
D C J	Final DWG (Japanese)	
D C E	Final DWG (English)	
D P J	Strength Calculation sheet (Japanese)	
D P E	Strength Calculation sheet (English)	
S E J	Inspection Certificate (Calibration report) (Japanese)	
S E E	Inspection Certificate (Calibration report) (English)	
S T J	Pressure test report (Japanese)	
S T E	Pressure test report (English)	
S A J	Airtight test report (Japanese)	
S A E	Airtight test report (English)	
D D J	Dimensional check record (Japanese)	
D D E	Dimensional check record (English)	
S P J	Penetrant test report (Japanese)	Welded part of pressure resistant vessel
S P E	Penetrant test report (English)	Welded part of pressure resistant vessel
S R J	Radiographic inspection report (Japanese)	Welded part of pressure resistant vessel
S R E	Radiographic inspection report (English)	Welded part of pressure resistant vessel
S X J	PMI test report (Japanese)	
S X E	PMI test report (English)	
S S J	Impact test report (Japanese)	Manifold only
S S E	Impact test report (English)	Manifold only
D Y J	WPS/PQR (Japanese)	
D Y E	WPS/PQR (English)	
D 9 J	Photo (Japanese)	
D 9 E	Photo (English)	
D T J	Inspection procedure (Japanese)	
D T E	Inspection procedure (English)	
C A J	Traceability certificate: A set	Only available in Japanese
C B J	Traceability certificate: B set	Only available in Japanese
C C J	Traceability certificate: C set	Only available in Japanese
C D J	Traceability certificate: D set	Only available in Japanese
Witness Test		
V 1 0	Required	

FORMER PRODUCT CODE EXPLANATION

The new product code has been implemented since April 2017.
Therefore, the product code explanation of the old product code will not be updated after April 2017.
Contact OVAL if you wish to order with the old product code for reasons such as type approval.

Item	Product Code																		Description
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	
Model	C	B																	ALTI ^{mass} Type B
Nominal size			0	0	6														10mm connection (3/8")
			0	1	0														15mm 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")
Fluid category						L													Liquid service
Temp. category (*1)							1												Standard (below 130°C)
Pressure category								1											Standard
Major parts material									S										SUS316L
Process connection										B									Ferrule
										C									JIS 10K
										D									JIS 20K
										E									JIS 30K
										H									ASME 150
										J									ASME 300
										K									ASME 600
										L									JPI 150
										M									JPI 300
									Z									Other than above	
Transmitter construction (*2)										1									Integral-mount
										2									Remote-mount
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 (true 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	
												X						Non-output In the case of FOUNDATION fieldbus,PROFIBUS communication	
Pulse output (*3, 4, 5)												A						Output 1: Mass flow	Single pulse
												B						Output 1: Volume flow (true density)	
												C						Output 1: Volume flow (fixed density)	
												D						Output 1: Mass flow Output 2: Mass flow	Double pulse
												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: Vol. flow (true dens.) Output 2: Vol. flow (true dens.)	
												H						Output 1: Vol. flow (fixed dens.) Output 2: Vol. flow (fixed dens.)	
												J						Output 1: Volume flow (true density) Output 2: Mass flow	
											K						Output 1: Volume flow (fixed density) Output 2: Mass flow		
											X						Non-output In the case of FOUNDATION fieldbus,PROFIBUS communication		
Pulse output type (*3, 4, 5)											0							Non-output In the case of FOUNDATION fieldbus,PROFIBUS communication	
											1							Open drain (equivalent to open collector) (standard)	
											2							Voltage pulse	
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 rating												0						Non-explosionproof	
												1						TIIS (*6)	
												2						ATEX, IECEx	
												3						KOSHA/KTL (*6)	
												4						CSA (*6)	
												5						GOST (*6)	
												7						NEPSI (*6)	
Explosionproof temperature class												0						Non-explosionproof	
												3						Sensor unit: Temp. class T3, Remote-mount 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, only "Remote-mount" type is available for the transmitter construction.
 *3: When FOUNDATION fieldbus, PROFIBUS is selected for communication interface, product code categories of analog output is "X" and pulse output is "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 ⑱ are not available. (In preparation)

■ 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	CB	
2. Process fluid (*1)	Name: _____ SP. gr : _____ Viscosity : _____ Concentration : _____ %	
3. Flow range	Maximum _____ Normal _____ Full scale _____ <input type="checkbox"/> kg/h <input type="checkbox"/> Others _____	
4. Fluid temperature	Maximum _____ °C Normal _____ °C Minimum _____ °C	
5. Operating pressure	Maximum _____ MPa Normal _____ MPa Minimum _____ MPa	
6. Ambient temperature	Maximum _____ °C Minimum _____ °C	
7. Fluid flow direction	<input type="checkbox"/> Left to Right <input type="checkbox"/> Right to Left <input type="checkbox"/> Bottom to Top (<input type="checkbox"/> Top to 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	<input type="checkbox"/> Flanged connection (Flange rating) _____ <input type="checkbox"/> Ferrule connection <input type="checkbox"/> Screw connection	
11. Explosionproof	<input type="checkbox"/> Not required <input type="checkbox"/> TIIS <input type="checkbox"/> ATEX <input type="checkbox"/> IECEX <input type="checkbox"/> KOSHA <input type="checkbox"/> CSA <input type="checkbox"/> GOST <input type="checkbox"/> NEPSI <input type="checkbox"/> ITRI	
12. Power supply	_____ V <input type="checkbox"/> AC <input type="checkbox"/> DC	
13. Output specifications <small>* The I/O functions listed on the right are unavailable with communication protocols FOUNDATION fieldbus, PROFIBUS.</small>	Pulse output	<input type="checkbox"/> Volt. pulse: [0]: 1.5V [1]: 15VDC minimum Out. impedance: 2.2kΩ
		<input type="checkbox"/> Open drain (equivalent to open collector) [Minimum 10V to Maximum 30V, 50mADC, ON resistance 0.6Ω or less]
		<input type="checkbox"/> 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 Maximum load: 600Ω 2 outputs from instant. flow rate (mass, volume), temp. or density (option)
	Additional damping	0 to 200s. (variable)
Alarm output	Slug flow High _____ g/mL Low _____ g/mL	
14. Communication protocol	<input type="checkbox"/> HART <input type="checkbox"/> FOUNDATION fieldbus <input type="checkbox"/> PROFIBUS <input type="checkbox"/> Modbus (Address: _____)	
15. Receiver	<input type="checkbox"/> Totalizer <input type="checkbox"/> Indicator <input type="checkbox"/> Recorder <input type="checkbox"/> Flow controller <input type="checkbox"/> Batch controller <input type="checkbox"/> Density computer <input type="checkbox"/> Computer <input type="checkbox"/> Others	
16. Transmission length	Sensor unit (_____) m Transmitter (_____) m Receiving instrument	
17. Exclusive cable length	In case of Remote-mount type _____ m	
18. In case of Remote-mount type transmitter	<input type="checkbox"/> Stanchion type w/bracket and 2" U bolt	
19. No. of units required		
20. Application		
21. Other considerations		
22. Pressure-resistant packing	<input type="checkbox"/> Standard <input type="checkbox"/> ATEX directive compliant <input type="checkbox"/> ATEX directive compliant for earthed cable	
23. Maritime certification	<input type="checkbox"/> Not required <input type="checkbox"/> DNV GL	

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

The specification as of November, 2019 is stated in this GS Sheet. Specifications and design are subject to change without notice.

Sales Representative: