



Inexpensive, General-purpose Coriolis Flowmeter

ALTI_{mass} Type B

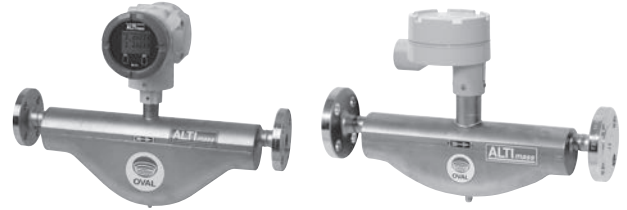
GENERAL SPECIFICATION
GS.No.GBN121E-23

■ 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)



Separately mounted transmitter



Rack-mount transmitter

■ GENERAL PERFORMANCE

Item		Description					
Model		CB006	CB010	CB015	CB025	CB040	CB050
Flow rate	Guaranteed min. rate (kg/h)	24	76.8	192	576	1920	
	Min. setting rate (kg/h)	60	192	480	1440	4800	
	Max. service rate (kg/h)	600	1920	4800	14400	48000	
	Max. 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 max. service rate. (within guaranteed flow range)

*2: ±1/2 Zero stability error is applied for flow rates below 7.5% of the max. 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		Max. 150°C (*2)					
Max. 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.

OVAL Corporation

<http://www.oval.co.jp/english>

Head Office (Tokyo): Tel. +81 3-3360-5121 Fax. +81 3-3365-8605
International Sales Division Email: SK10@oval.co.jp
Overseas Branch Offices: Beijing, Seoul, Singapore, Taipei

● 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	Max. 15W	
Ambient temperature	-40 to +55°C (*1)	
Transmission length (separate type)	Max. 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	TIIS, 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 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 (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 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 output 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 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 max. length, consult the factory.

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

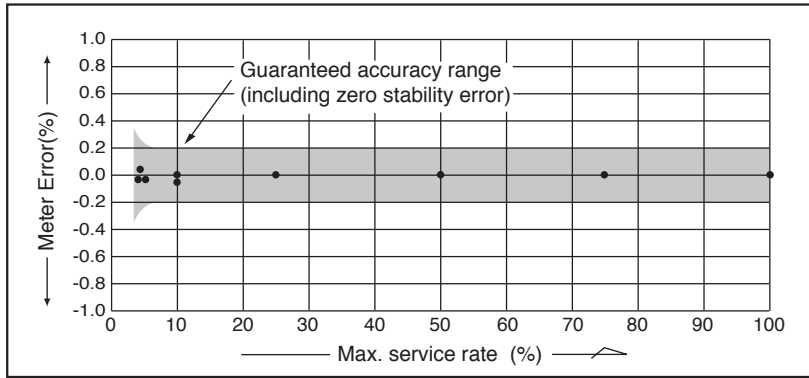
- ① Mass instant flowrate
- ② Volume instant flowrate
- ③ Density
- ④ Temperature
- ⑤ Pulse count 1 (mass or volume)
- ⑥ Pulse count 2 (mass or volume)
- ⑦ Total 1 (mass or volume)
- ⑧ Total 2 (mass or volume)
- ⑨ Analog 1 (% instant)
- ⑩ Analog 2 (% instant)
- ⑪ Status information
- ⑫ Mode select (parameter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

CB006

CB010

CB015

CB025

CB040, CB050

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,

$$\Delta P = \frac{C}{d} \text{ (MPa)}$$
- For high viscosity liquids not shown in these graphs, calculate the pressure loss by the following formula:

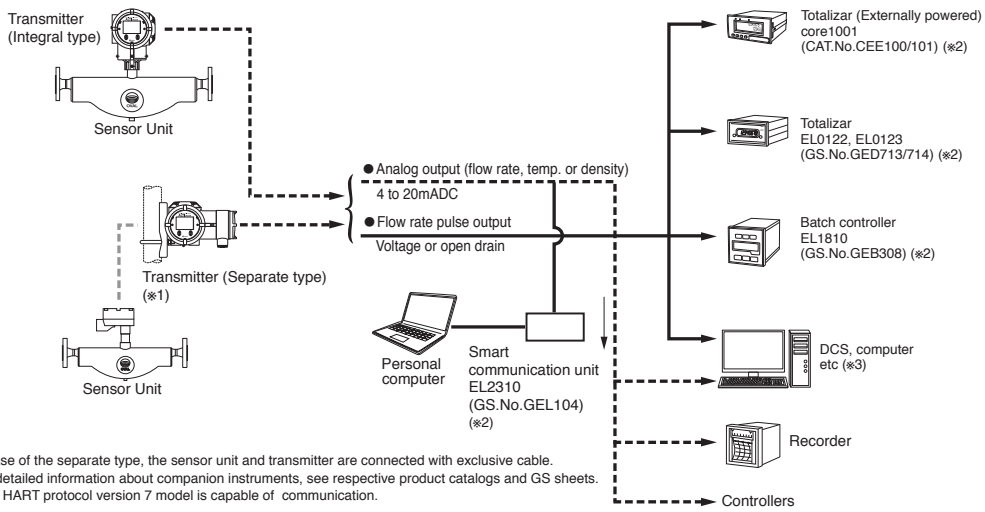
$$\Delta P_2 = C \times \frac{\mu_2}{\mu_1} \times \frac{1}{d}$$

where ΔP_2 : Pressure loss of high viscosity liquid (MPa)
 μ_1 : Max. 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 factor found from the max. viscosity curve at a given flow rate (kg/h).

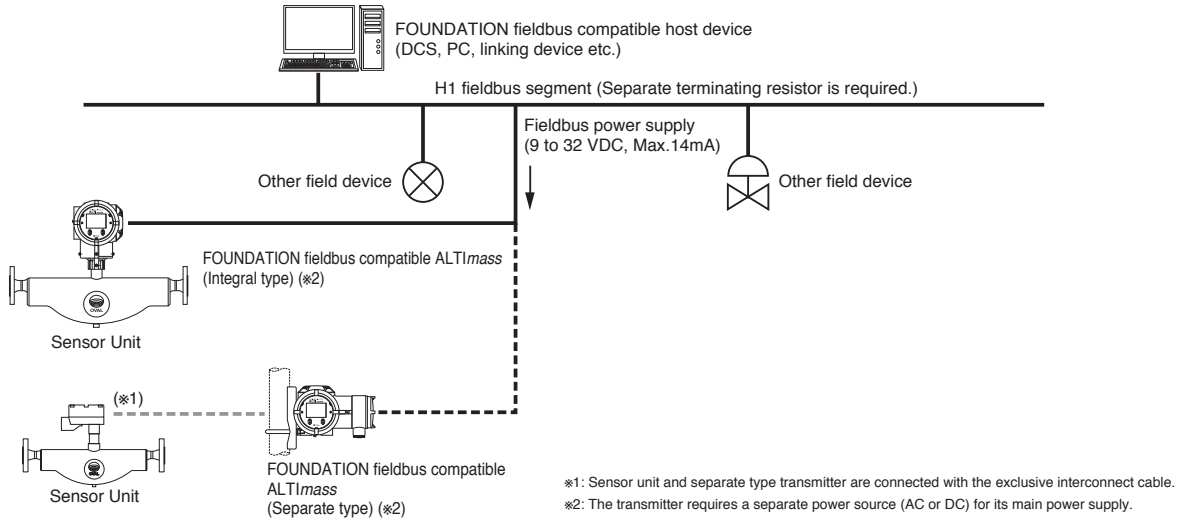
※1: Pressure loss is calculated with Newtonian fluid. For Non-Newtonian fluid, please consult OVAL.

REMOTE MEASURING SYSTEM

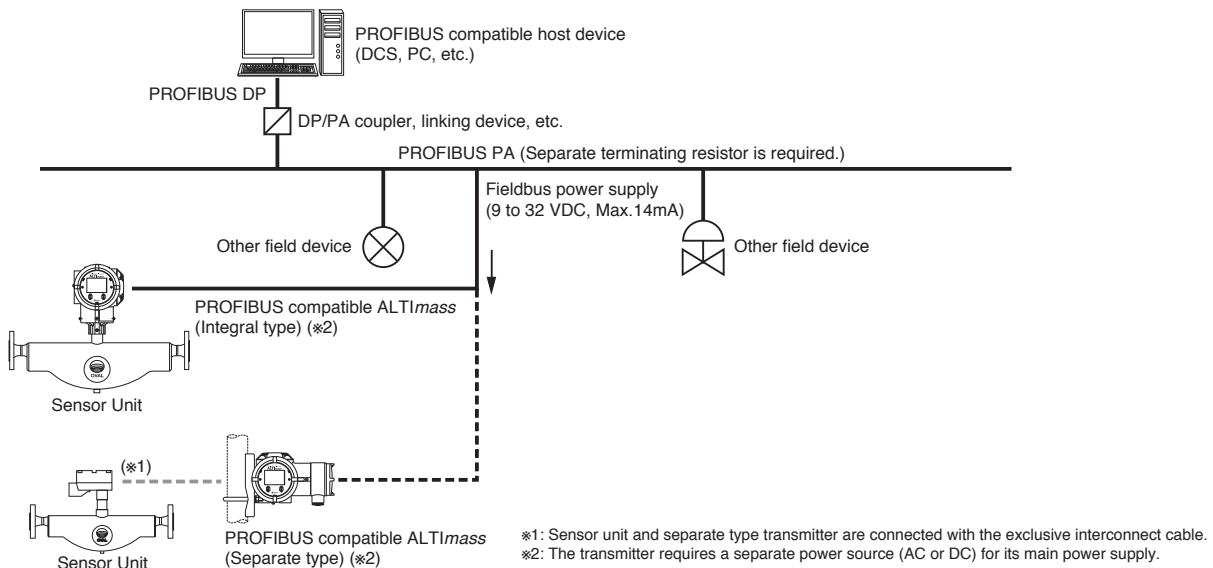
● HART protocol



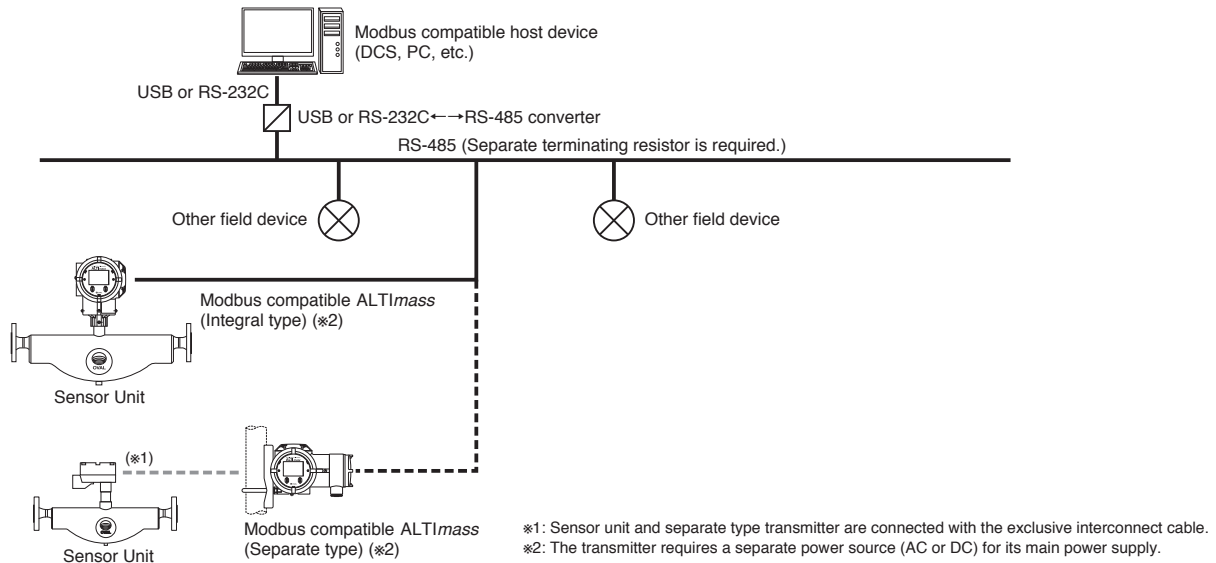
● FOUNDATION fieldbus



● PROFIBUS



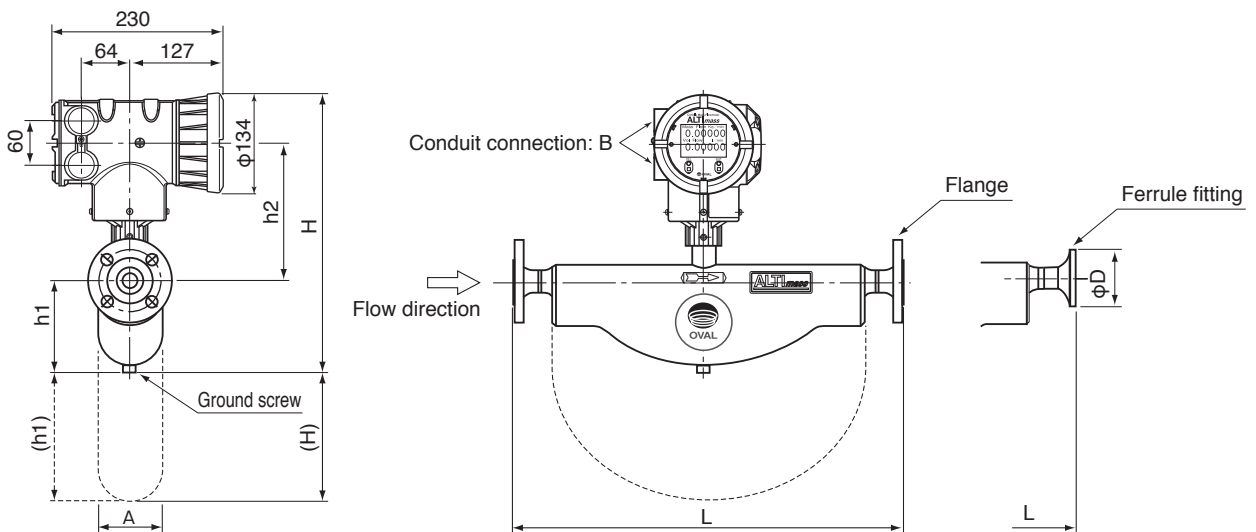
● Modbus



■ DIMENSIONS [Unit in mm]

● Transmitter integrally mounted

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

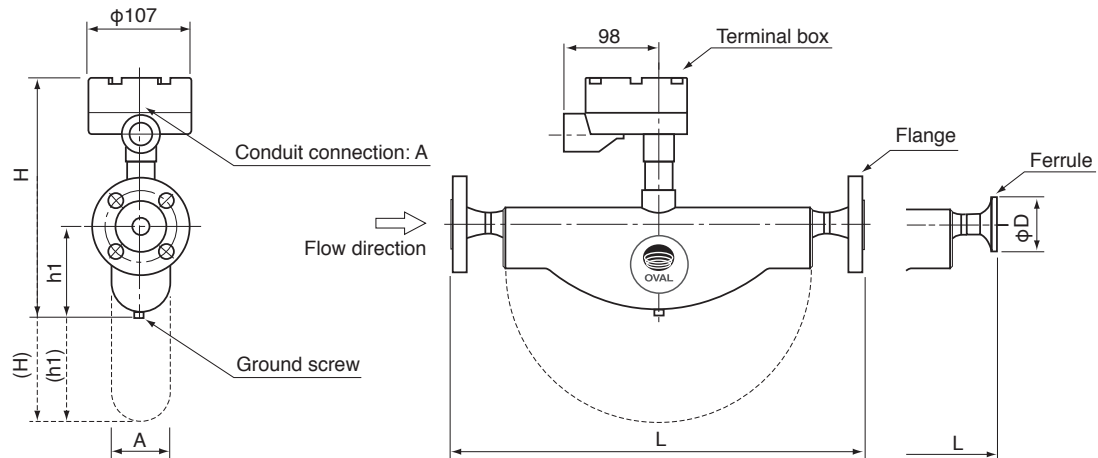
Model	Ferrule			Approx. Weight (kg)
	Connection	L	φD	
CB006	Ferrule 10A	333	34	5.2
CB010	Ferrule 15A	380	34	6.1
CB015	Ferrule 15A	476	34	9.9
CB025	Ferrule 25 (ISO), IDF 1S	559	50.5	11.1
CB040	Ferrule 38 (ISO), IDF 1.5S	606	50.5	29.3
CB050	Ferrule 51 (ISO), IDF 2S	606	64	29.3

*: 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 separately mounted



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

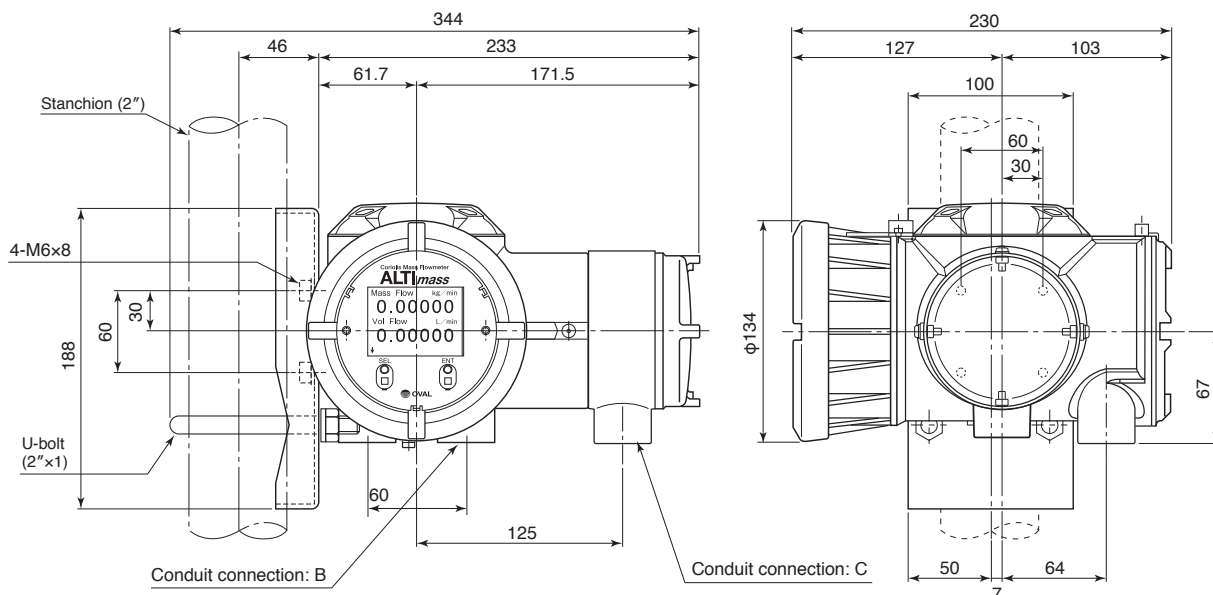
Model	Nominal size	JIS			ASME/JPI			H	h1	A	Approx. Weight (kg) (JIS 10K)
		10 K	20K	30K	150	300	600				
CB006	10 (1/2")	343	343	361	369	378	390.5	257	94	59	4.7
CB010	15 (1/2")	380	380	400	406	415	427.5	254	94	59	5.0
CB015	15 (1/2")	486	486	506	512	521	533.5	345	168	91	9.0
CB025	25 (1")	569	569	589	601	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.

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

● Separately mounted 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 DETECTOR CONDUIT CONNECTIONS

〈Conduit connection: A〉

Separately mounted detector

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."

〈Conduit connection: B〉

Integrally mounted transmitter, Separately mounted 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 contact us.

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

〈Conduit connection: C〉

Separately mounted transmitter

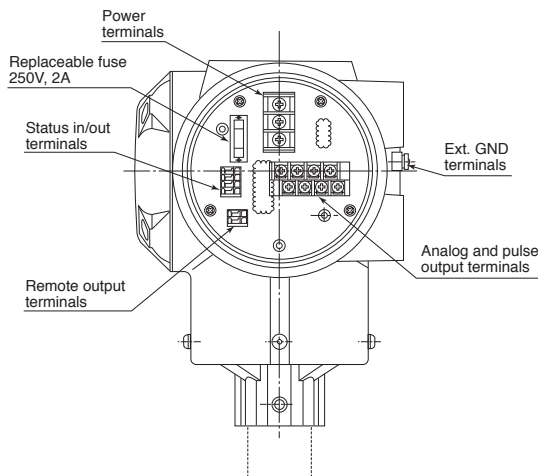
Explosionproof specifications	Connection thread specifications	Note
Non-explosionproof	G3/4	
TIIS	G3/4	Cable gland is supplied.
ATEX, IECEx	G3/4	Adapter is connected (※1)
KCs	G3/4	
CSA	G3/4	Adapter is connected (※2)
EAC	G3/4	Adapter is connected (※1)
NEPSI	G3/4	Adapter is connected (※1)
ITRI	G3/4	Adapter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

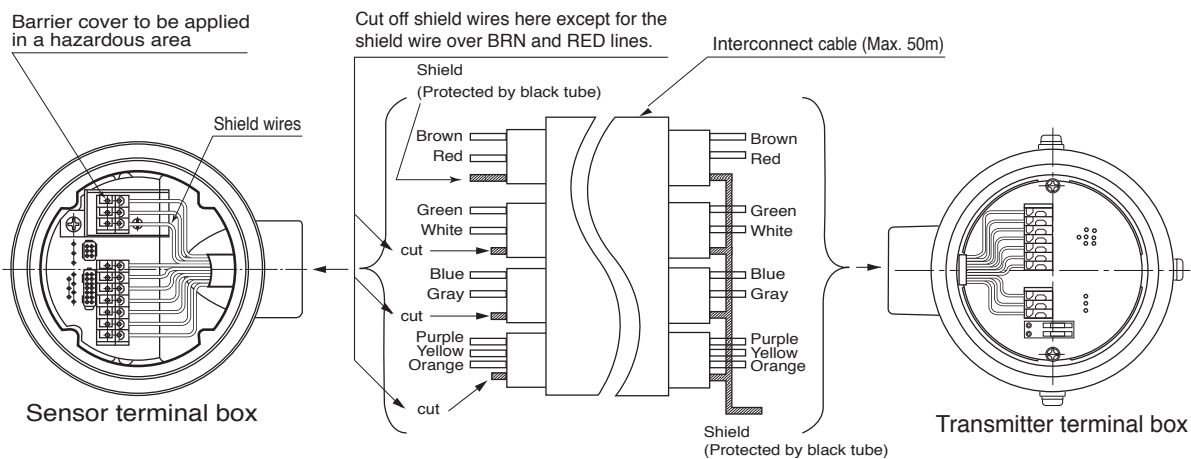
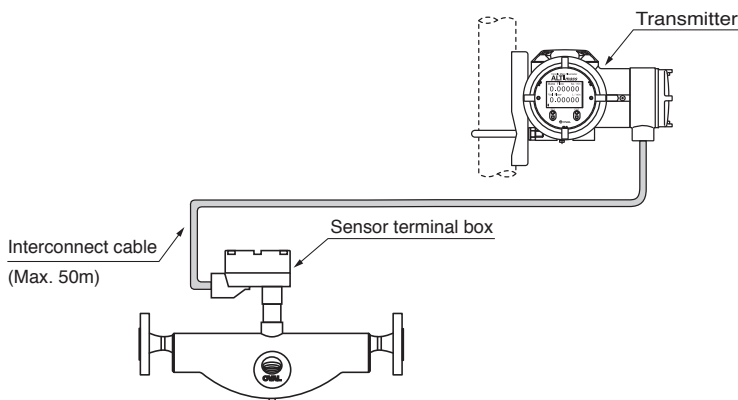
● Transmitter power and input/output signal wiring



● Terminal identification and description

Item	Label	Description	Remarks
Signal	A1 (+)	Analog output 1 (4 to 20mA)	1. 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)	
	S.I. (-)		
S.O. (+)	Status output (open drain output)		
S.O. (-)			
I/O	I/O (+)	Expanded in/out (Modbus communication, etc.)	Modbus communication: Max.transmission length1200m at 0.75sq FOUNDATION fieldbus or PROFIBUS PA communication: Max. transmission length 1900m at 0.8sq
	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:

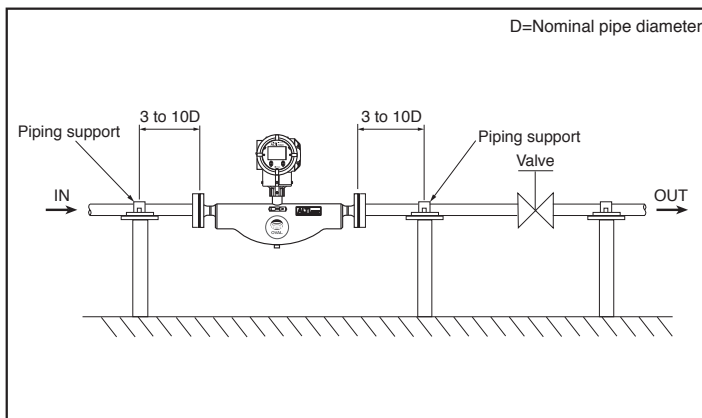


※: Use of crimp pin terminal is not necessary.

■ 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 is of gastight construction. 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.
- 4) In a horizontal run, install the sensor unit with the transmitter up 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.

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

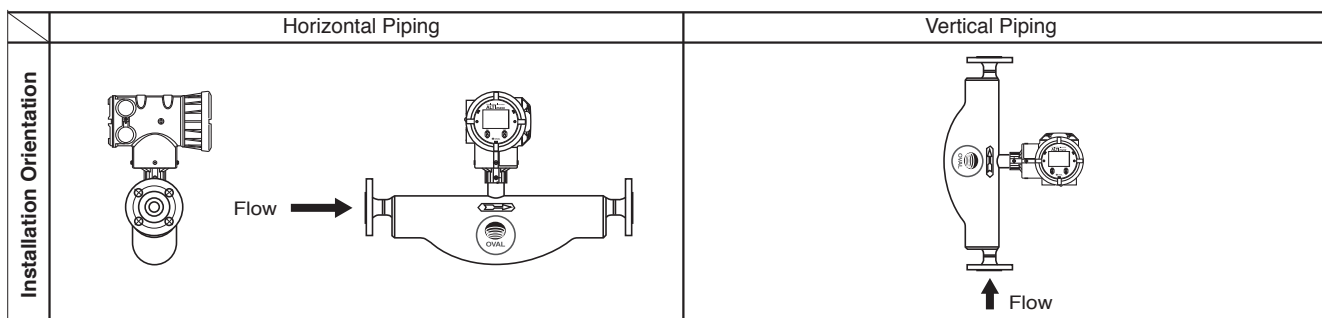
P_d : Downstream pressure (MPa[absolute])

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 type**

- Transmitter symbol: Ex d [ib] IIC T4 X
- Transmitter and detector ambient temperature: -40°C to +55°C
- Explosionproof applied temperature: +59°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°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.	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 +70°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 type**

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

● **Separate type**

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

Detector ambient temperature (Separate type only)	-40°C to +60°C
--	----------------

Fluid temperature (Separate 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 type**

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

● **Separate type**

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

Detector ambient temperature (Separate type only)	-40°C to +60°C
--	----------------

Fluid temperature (Separate 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 type

- Transmitter symbol: Class I, Zone 1, Ex d ib IIC T4 Gb
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +70°C (CB015)
-40°C to +80°C (Other than CB015)
- Detector symbol: Class I, Zone 1, Ex ib IIB T4 Gb
Class I, Zone 1, AEx d ib IIC T4 Gb (Integral type)
- Detector to be connected: CB006 to CB050
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● Separate type

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

Detector ambient temperature (Separate type only)	-40°C to +60°C	
Fluid temperature (Separate 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 type

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

● Separate type

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

Detector ambient temperature (Separate type only)	-40°C to +60°C	
Fluid temperature (Separate 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 type

- Transmitter symbol: Ex d ib IIB T4 Gb
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +70°C (CB015)
-40°C to +80°C (Other than CB015)
- Detector symbol: Ex ib IIB T4 Gb
- Detector to be connected: CB006 to CB050
- 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: CB006 to CB050
- 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 +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

7. ITRI Explosionproof

● Integral type

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

● Separate type

- Transmitter symbol: Ex db [ib] IIC T6 Gb
- Transmitter ambient temperature: -40°C to +55°C
- Detector symbol: II2G Ex ib IIB T3, T4 Gb
- Detector to be connected: CB006 to CB050
- 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 +125°C
	Temperature class: T4	-40°C to +70°C (CB015) -40°C to +80°C (Other than CB015)

■ ABOUT MARITIME CERTIFICATION

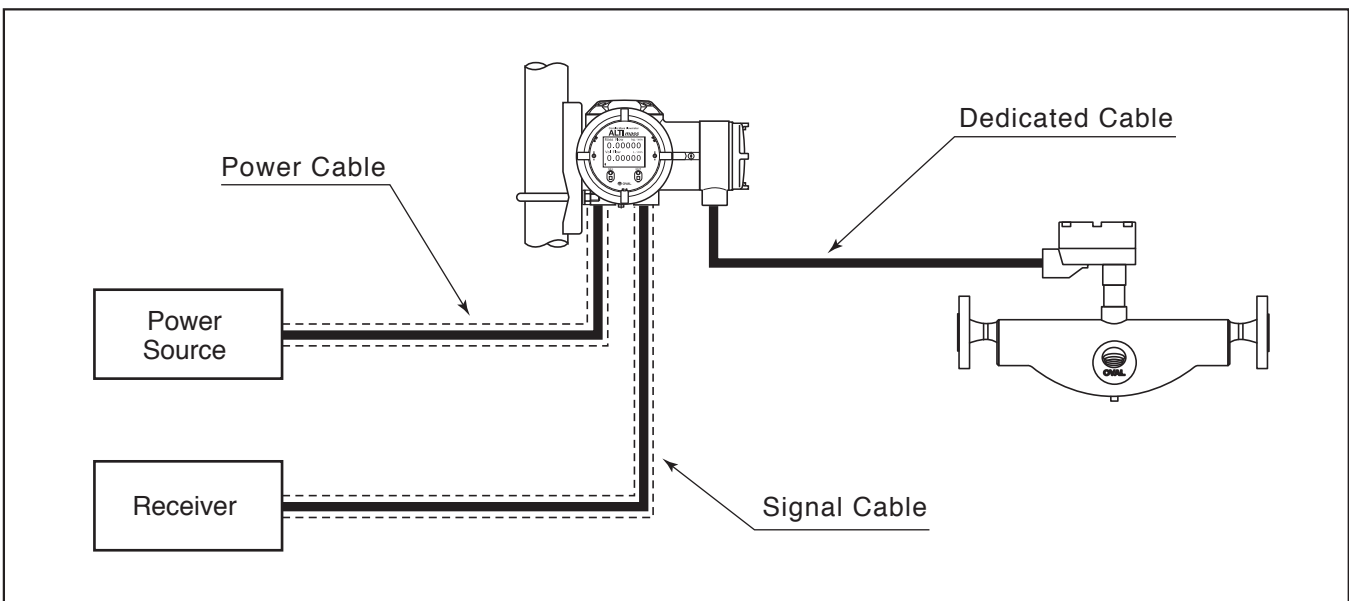
The product is approved for the ship classification under the conditions below.

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.

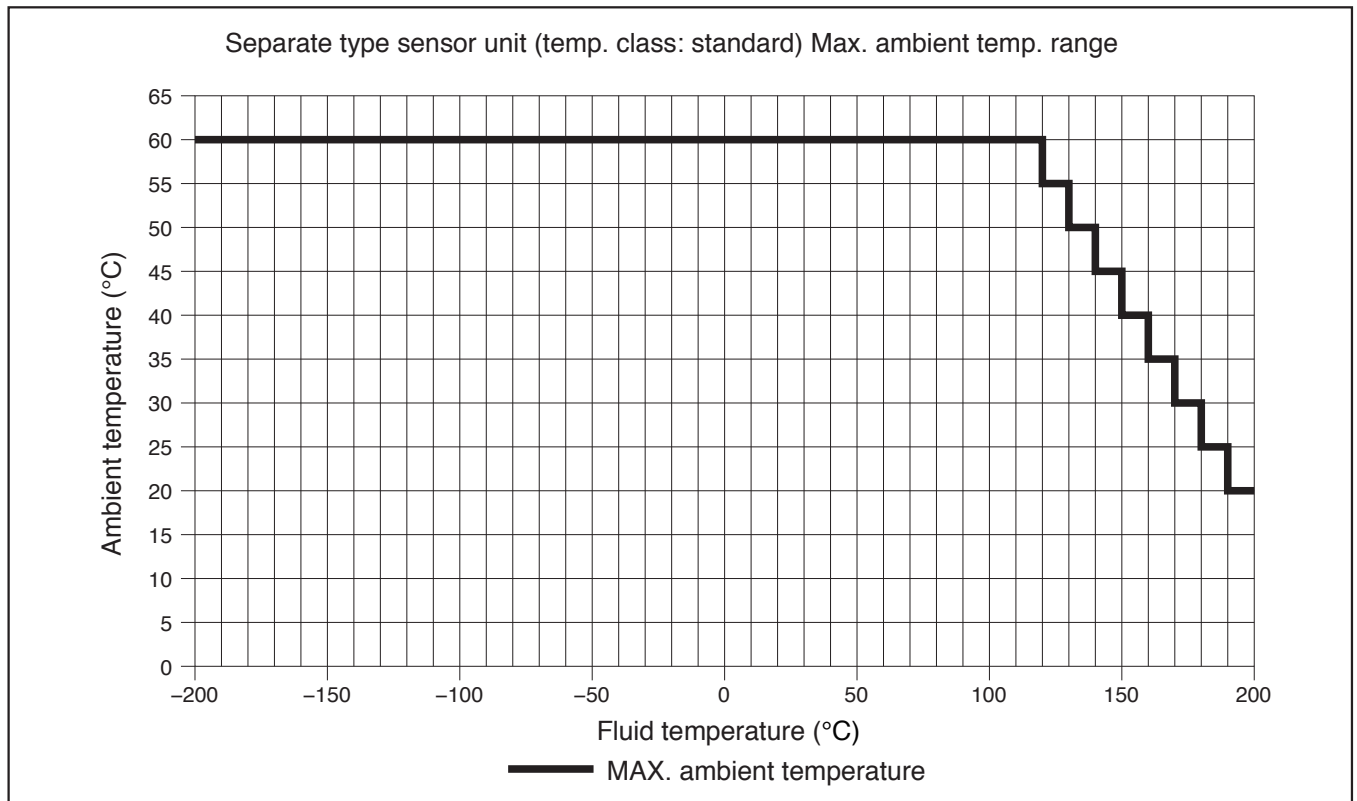


■ AMBIENT TEMPERATURE

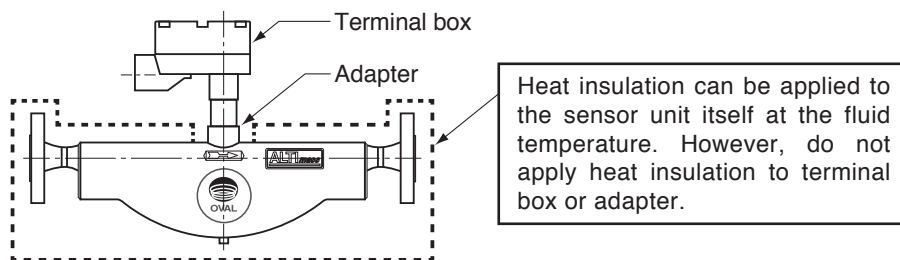
Allowable ambient temperature permitted for the sensor unit is as described in the table below.

(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.)

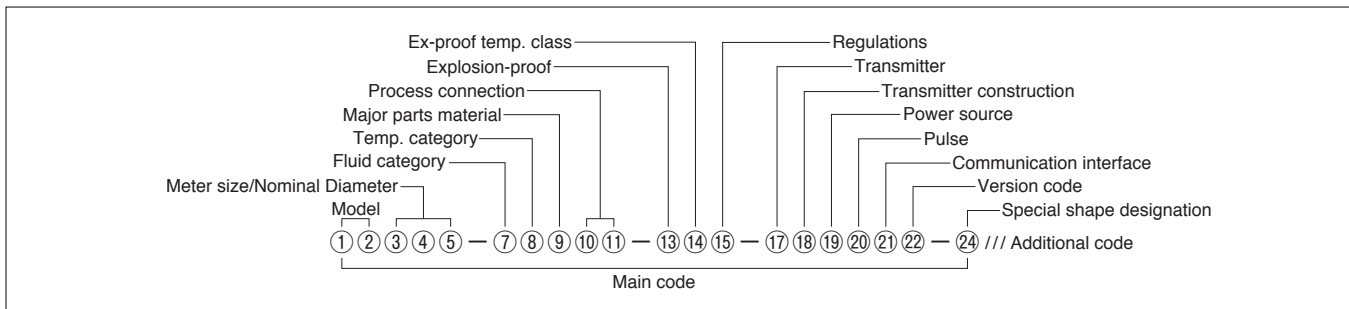
Transmitter construction	
Integral type	Separate type
[Fluid temperature] +130°C and below [Ambient temperature] -40 to +55°C	[Sensor unit ambient temp.] CB006 to CB025: -40°C and above CB040/CB050: -20°C and above to max ambient temp. in the graph below



*Please contact us in the case the ambient temperature exceeds max. 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	Ferrule	
0 0 6	10mm	1/2"	10A	
0 1 0	15mm	1/2"	15A	
0 1 5	15mm	1/2"	15A	
0 2 5	25mm	1"	25 (ISO), IDF 1S	
0 4 0	40mm	1-1/2"	38 (ISO), IDF 1.5S	
0 5 0	50mm	2"	51 (ISO), IDF 2S	
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	Integrally mounted	
2	Separately mounted	
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 H1 communication (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.

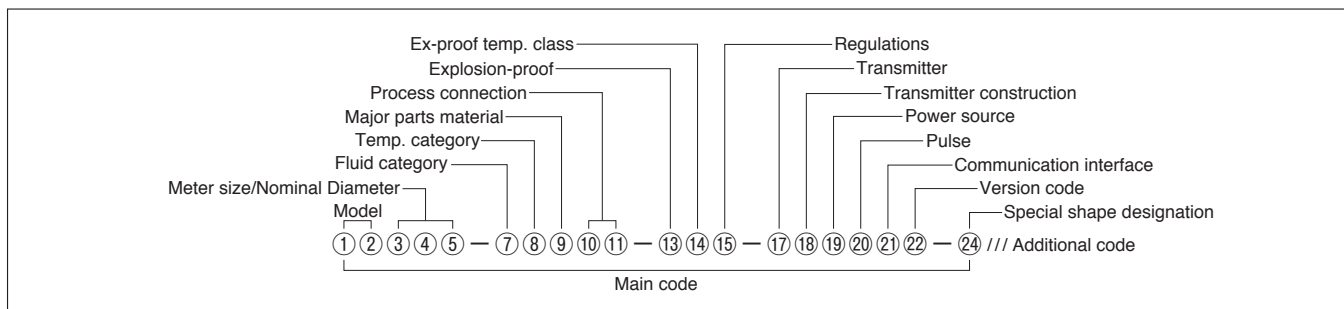
*4: Applicable specifications differ with the rack-mount transmitter.

For detailed product code explanation, refer to GS No.GEJ516E.

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

In case of non-explosionproof, integral type can be used up to 130°C by restricting the transmitter ambient temp. to 45°C at max.

■ 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	L→R
F R	0	R→L
F D	0	B→T Electric conduit at the 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	Non-oil and non-water treatment
T F	0	Food cleansing

Document		
D S	J	DWG and specifications for approval (Japanese)
D S	E	DWG and specifications for approval (English)
D R	0	Re-submission of DWG with specifications
D C	J	Final DWG (Japanese)
D C	E	Final DWG (English)
D P	J	Calculation sheet (Japanese)
D P	E	Calculation sheet (English)
S E	J	Instrumental error test report (Japanese)
S E	E	Instrumental error test 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 (Japanese) Welded part of pressure resistant vessel
S R	E	Radiographic inspection (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	Inspection certificate: A set Only Japanese
C B	J	Inspection certificate: B set Only Japanese
C C	J	Inspection certificate: C set Only Japanese
C D	J	Inspection certificate: D set Only Japanese
Witnessed by customer		
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								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 (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	
												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 : 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, 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, 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 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	Max. _____ Normal _____ Full scale _____ <input type="checkbox"/> kg/h <input type="checkbox"/> 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	<input type="checkbox"/> Left→Right <input type="checkbox"/> Right→Left <input type="checkbox"/> Bottom→Top (<input type="checkbox"/> 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	<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 min. Out. impedance: 2.2kΩ
		<input type="checkbox"/> Open drain (equivalent to open collector) [Min. 10V to Max. 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 Max. 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 separately- mounted type _____ m	
18. In case of separate 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 June, 2019 is stated in this GS Sheet. Specifications and design are subject to change without notice.

Sales Representative: