

■ 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 direct 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 outputs), current output (dual outputs), and status output (single output)
6. Enhanced maintenance functions:
Error logging, storing factory shipping data, and downloading programs
7. Readily expandable for additional application:
(Improved communication capability, comprehensive maintenance capability, and enhanced expandable functions)



Local Mount
Transmitter



■ 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	SUS316L					
	SUS304					
Process connection	JIS 10, 20, 30K, ASME/JPI 150, 300 RF, Ferrule					
Applicable fluid	Liquid					
Density range	0.3 to 2.0g/mL					
Temperature range	-40 to +125°C (*2, 3)					
Max. operating pressure	7.9MPa max. (at room temp.) Depends on process connection press. rating as well as temp./press. ratings.					
Flow direction	Bidirectional					
Explosionproof configuration	TIIS Ex ib IIB T3, T4 ATEX II2G Ex ib IIB T3, T4 Gb (*1) KOSHA Ex ib IIB T3, T4 (*1)					
Dusttight, waterproof configuration	IP66 / 67					

*1: Explosionproof temperature class T4 rated integrally-mounted type only.

*2: In case of explosionproof model, the integrally mounted type can support operating temp. range for list shown below.

In case of non-explosionproof model, up to 125°C is permitted. However, the product must be used within the maximum ambient temperature of 45°C.

*3: CIP (cleaning in place) is permitted within the temperature range.

● Explosionproof Specifications for Sensor unit

(1) TIIS Explosionproof Explosionproof code : Ex ib IIB ① (① : Temperature class) (Example : Ex ib IIB T2)

Model		CB006	CB010	CB015	CB025	CB040	CB050
①	Temp. class (Metered fluid temperature)	T3 Remotely mounted	-40 to +125°C			-20 to +125°C	
		T4 Integrally mounted	-40 to +80°C	-40 to +70°C	-40 to +80°C	-20 to +80°C	
		T4 Remotely mounted	-40 to +80°C			-20 to +80°C	

(2) ATEX Explosionproof

T3	125°C
T4	80°C

(3) KOSHA Explosionproof

T3	125°C
T4	80°C

● Transmitter specifications

Item	Description
Model	PA0K
Power supply	85 to 264VAC (50/60Hz) or 20 to 30VDC
Power consumption	Max. 15W
Ambient temperature	-40 to +55°C (*1)
Transmission length (separate type)	Max. 5m (interconnect cable used)
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/EN061326-1: 2006 ATEX : EN60079-0 : 2009 EN60079-1 : 2007 EN60079-11 : 2011
Explosionproof enclosure	TIIS Ex d [ib] IIB T4 : Integrally mounted, Ex d [ib] IIB T6 : Remotely mounted ATEX II2G Ex d ib IIB T4 Gb : Integrally mounted, II2G Ex d [ib] IIB T6 Gb : Remotely mounted KOSHA Ex d ib IIB T4 : Integrally mounted, Ex d [ib] IIB T6 : Remotely mounted
Dusttight, waterproof configuration	IP66 / 67
Transmitter configuration	Integrally or remotely mounted
Finish	Sensor: Munsell 10B8/4, Covers (front and rear): 2.5PB4/10
Display	LCD display provided (128x64 dots), backlit (white, orange) Infrared light sensors: 2 LED: 2 (green, red)
Weight	Integrally mounted model 3.6kg approx., Remotely mounted model 5.0kg approx.
Communication interface	Bell 202 (HART protocol) (*2) Option : RS-485 Modbus protocol, Baudrate : 9600bps, 19200bps, 38400bps Transmission mode : RTU or ASCII, Response time : 25 to 50 ms Note : In Modbus communication, set SW3-4 on the maintenance board to ON (only Bell 202 is valid with SW3-4 set to OFF).
Additional damping (Standard)	Flow 0.8sec, Density 4sec, Temperature 2.5sec.
Low flow cutoff (Standard)	1.0% or less of max. service flowrate
Pulse output	Open collector output (10V min. to 30Vmax., 50mADC) , or Voltage pulse ("Low Level": 1.5V max. "High Level": 15V min., Output impedance 2.2kΩ), Setting range: 0.1 to 10000Hz (max. output 11000Hz)
Analog output	4 to 20mADC (max. load 600Ω) Select two outputs from instant flowrate (mass or volume) temperature, and density.
Status output	Open collector output (Max.30V, 50mADC) Select one output from error (*3), flow direction, or high/low alarm (default is error)
Status input	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 and infrared optical sensor may exhibit a slow response.

*2: Analog output 1 is compatible only with Bell202 specification.

*3: Of error outputs "auto zero in progress" status output can be set up.

*: Due to the incorporation of a circuit protection device conforming to EMC requirements, insulation resistance and dielectric strength tests are unacceptable.

■ GENERAL PERFORMANCE

Item		Description					
Model		CB006	CB010	CB015	CB025	CB040	CB050
Flowrate	Normal flow range (kg/h)	0 to 600	0 to 1920	0 to 4800	0 to 14400	0 to 48000	
	Allowable flow range (kg/h)	0 to 1200	0 to 3840	0 to 9600	0 to 28800	0 to 96000	
	Min. range (kg/h)	0 to 60	0 to 192	0 to 480	0 to 1440	0 to 4800	
	Min. measurable rate (kg/h)	24	76.8	192	576	1920	
	Factory calib. accuracy	[±0.2% ± zero stability error] of RD					
	Repeatability	[±0.1% ± 1/2 zero stability error] of RD					
	Zero stability (kg/h)	0.09	0.288	0.72	2.16	7.2	
Analog accuracy		±0.1% of FS added to each accuracy					
Density (Liquid)	Metering range	0.3 to 2g/mL					
	Factory calib. accuracy (Option)	±0.003g/mL					

$$\text{Zero stability error} = \frac{\text{Zero stability (kg/h)}}{\text{Flow rate at the moment (kg/h)}} \times 100\%$$

■ DISPLAY

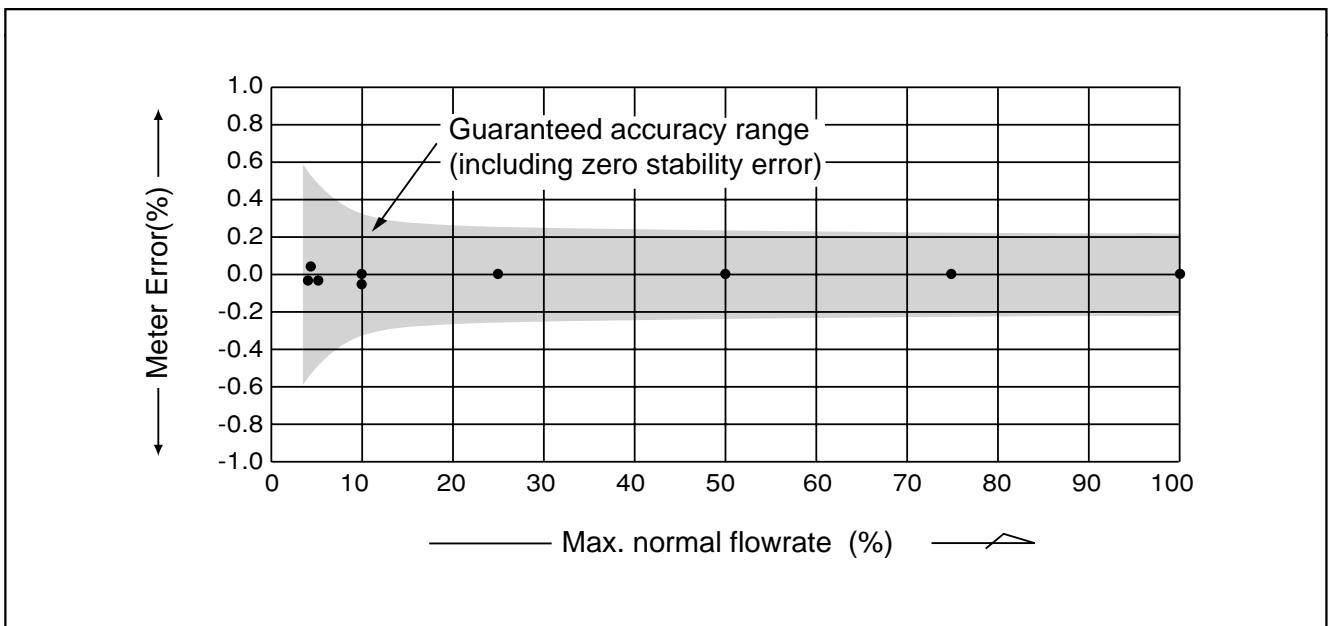
Available display modes

- ① Instantaneous mass flow rate
- ② Instantaneous volume flow rate (fixed density calculation) (*1)
- ③ Density
- ④ Temperature
- ⑤ Totalized flow 1 (no unit)
- ⑥ Totalized flow 2 (no unit)
- ⑦ Totalized flow 1 (has units)
- ⑧ Totalized flow 2 (has units)
- ⑨ Analog output 1 (% instant flowrate)
- ⑩ Analog output 2 (% instant flowrate)
- ⑪ Status information
- ⑫ Mode select (param. setting)

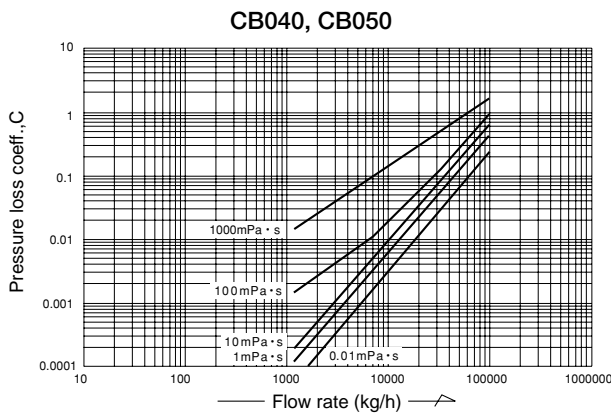
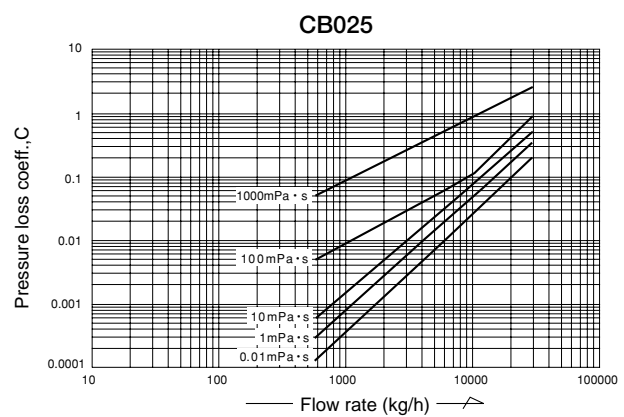
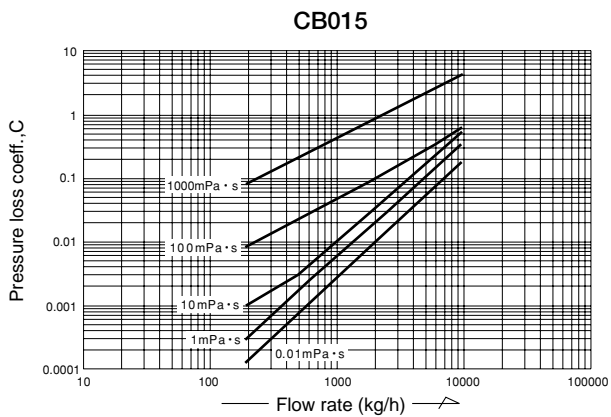
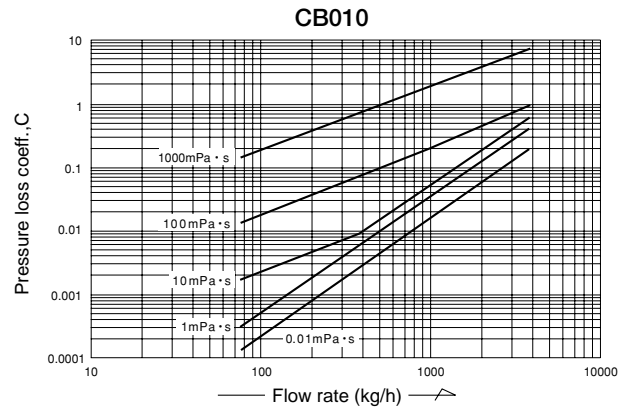
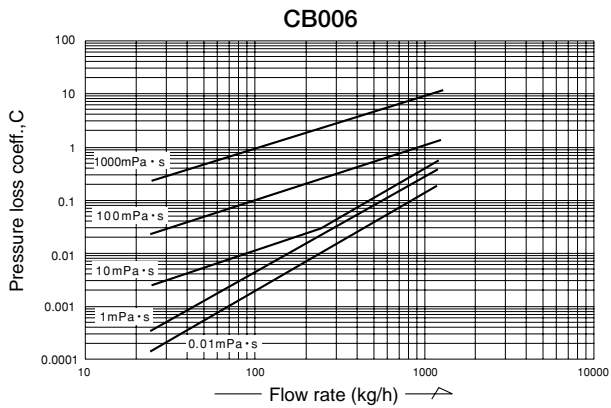
*1: Indicated only when volumetric output by fixed density calculation is selected in the output specification.

A tap of a finger on this glass faceplate area (infrared light sensor) selects the desired display modes.
 * LCD backlight in two colors: white and orange.
 Changes according to flowmeter status.
 Backlight goes out automatically when the optical sensor does not respond at all for a set time period.

■ METER ERROR



■ PRESSURE LOSSES



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,

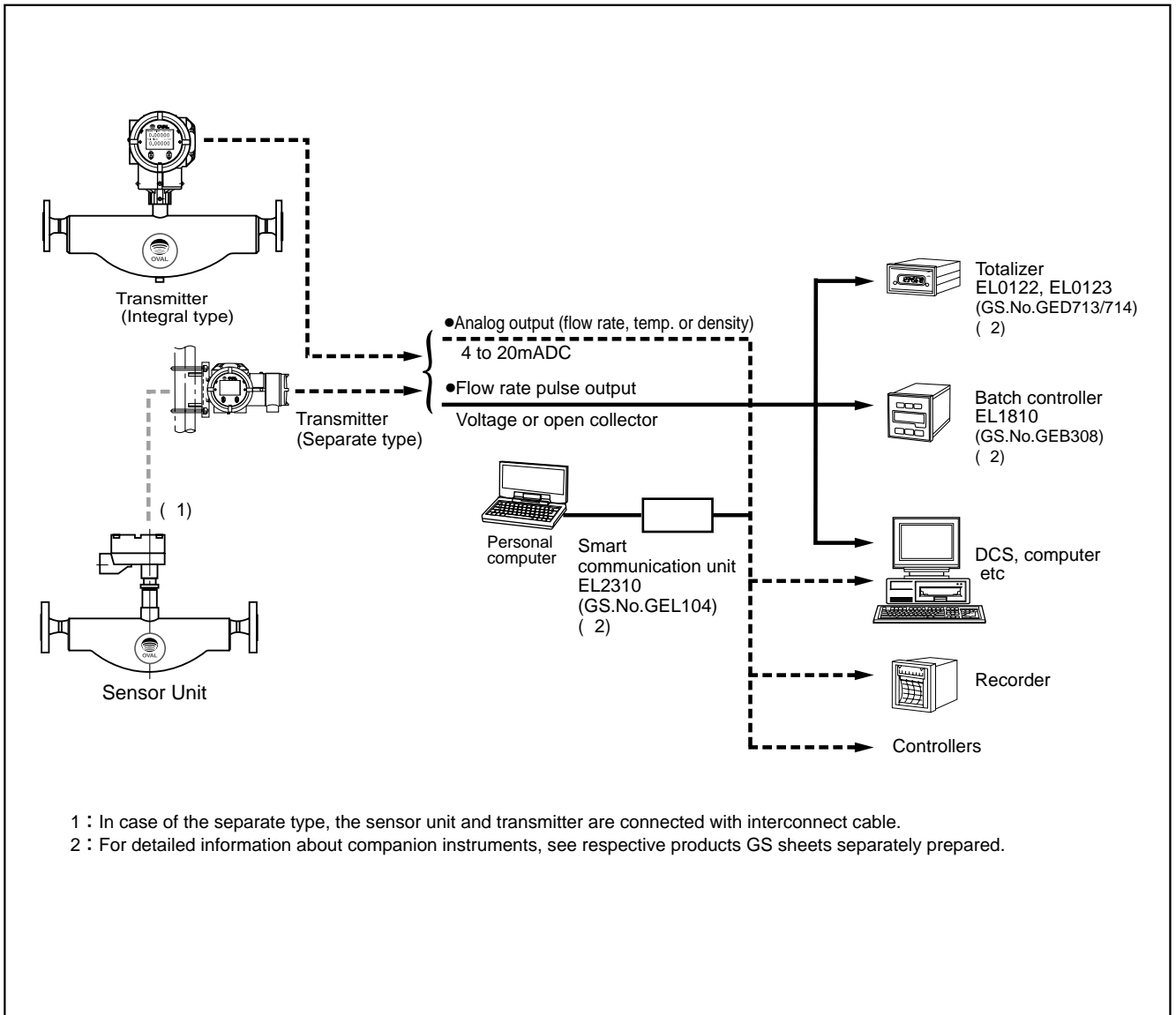
$$\Delta P = \frac{C}{d} \text{ (MPa)}$$

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_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).

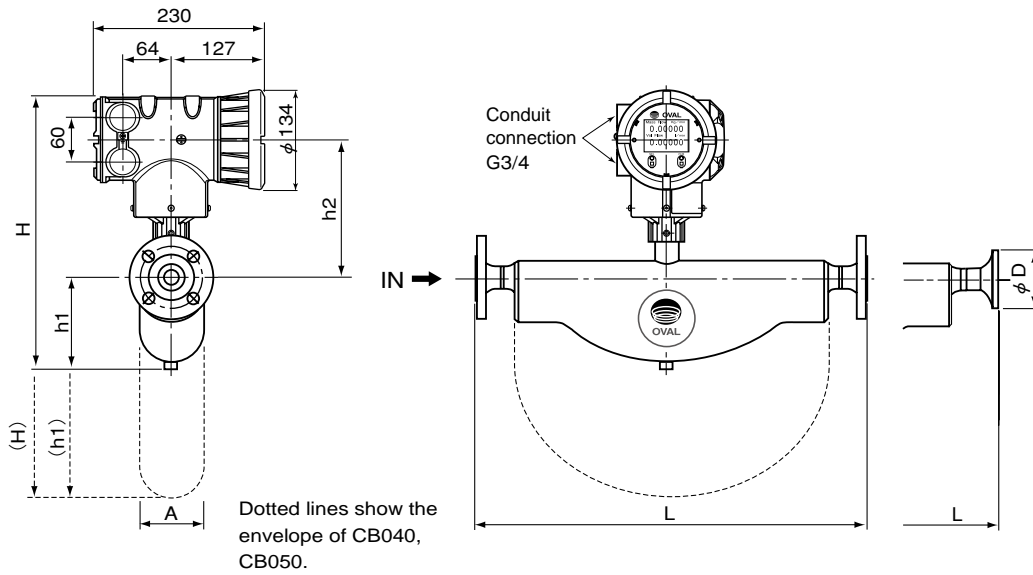
■ REMOTE MEASURING SYSTEM



■ DIMENSIONS [Unit in mm]

● Transmitter integrally mounted

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



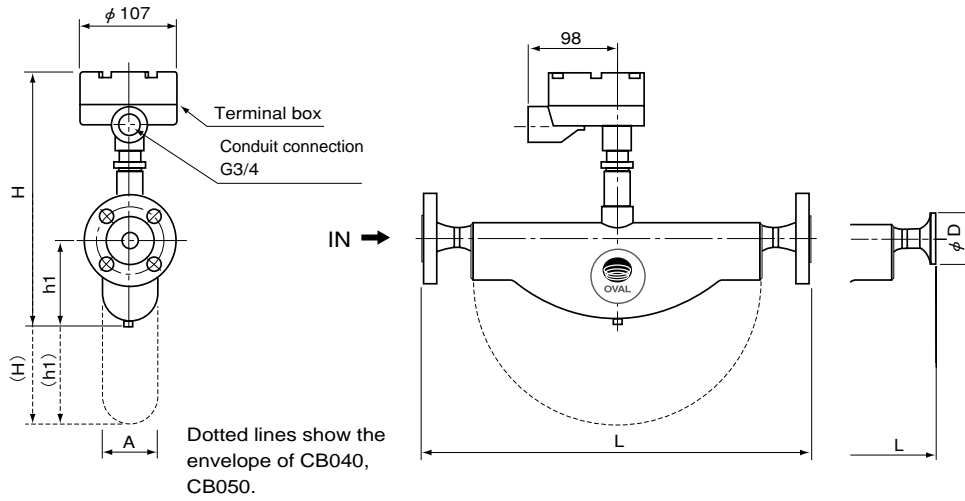
Model	Nominal size	JIS			ASME/JPI		H	h1	h2	A	Approx. Weight (kg) (JIS 10K)
		10 K	20K	30K	150	300					
		L			L						
CB006	10 (1/2")	343	343	361	369	378	344	94	192	59	7.3
CB010	15 (1/2")	380	380	400	406	415	341	94	189	59	7.6
CB015	15 (1/2")	486	486	506	512	521	432	168	206	91	11.6
CB025	25 (1")	569	569	589	601	613	426	175	194	91	14.2
CB040	40 (1-1/2")	626	626	654	660	673	578	323	197	125	32.8
CB050	50 (2")	626	636	674	663	676	578	323	197	125	33.2

※: 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.

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), DF 1S	559	50.5	11.1
CB040	Ferrule 38 (ISO), DF 1.5S	606	50.5	29.3
CB050	Ferrule 51 (ISO), DF 2S	606	64	29.3

■ DIMENSIONS [Unit in mm]

● Transmitter separately mounted

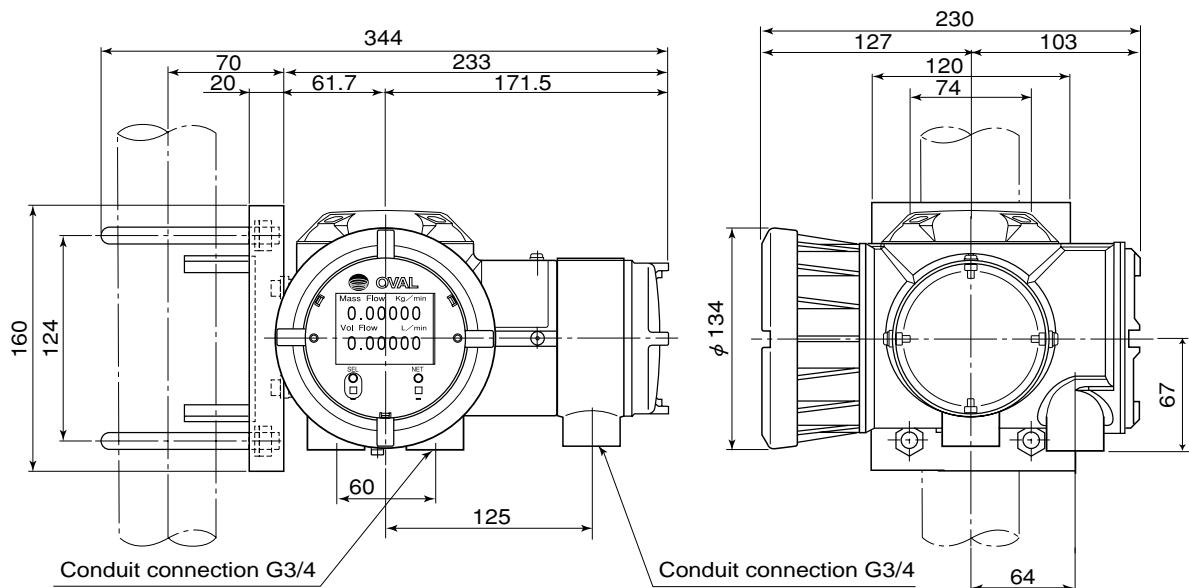


Model	Nominal size	JIS			ASME/JPI		H	h1	A	Approx. Weight (kg) (JIS 10K)
		10 K	20K	30K	150	300				
		L			L					
CB006	10 (1/2")	343	343	361	369	378	301	94	59	4.7
CB010	15 (1/2")	380	380	400	406	415	298	94	59	5.0
CB015	15 (1/2")	486	486	506	512	521	389	168	91	9.0
CB025	25 (1")	569	569	589	601	613	384	175	91	11.6
CB040	40 (1-1/2")	626	626	654	660	673	535	323	125	30.2
CB050	50 (2")	626	636	674	663	676	535	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	7.2
CB025	Ferrule 25 (ISO), DF 1S	559	50.5	8.5
CB040	Ferrule 38 (ISO), DF 1.5S	606	50.5	26.7
CB050	Ferrule 51 (ISO), DF 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.

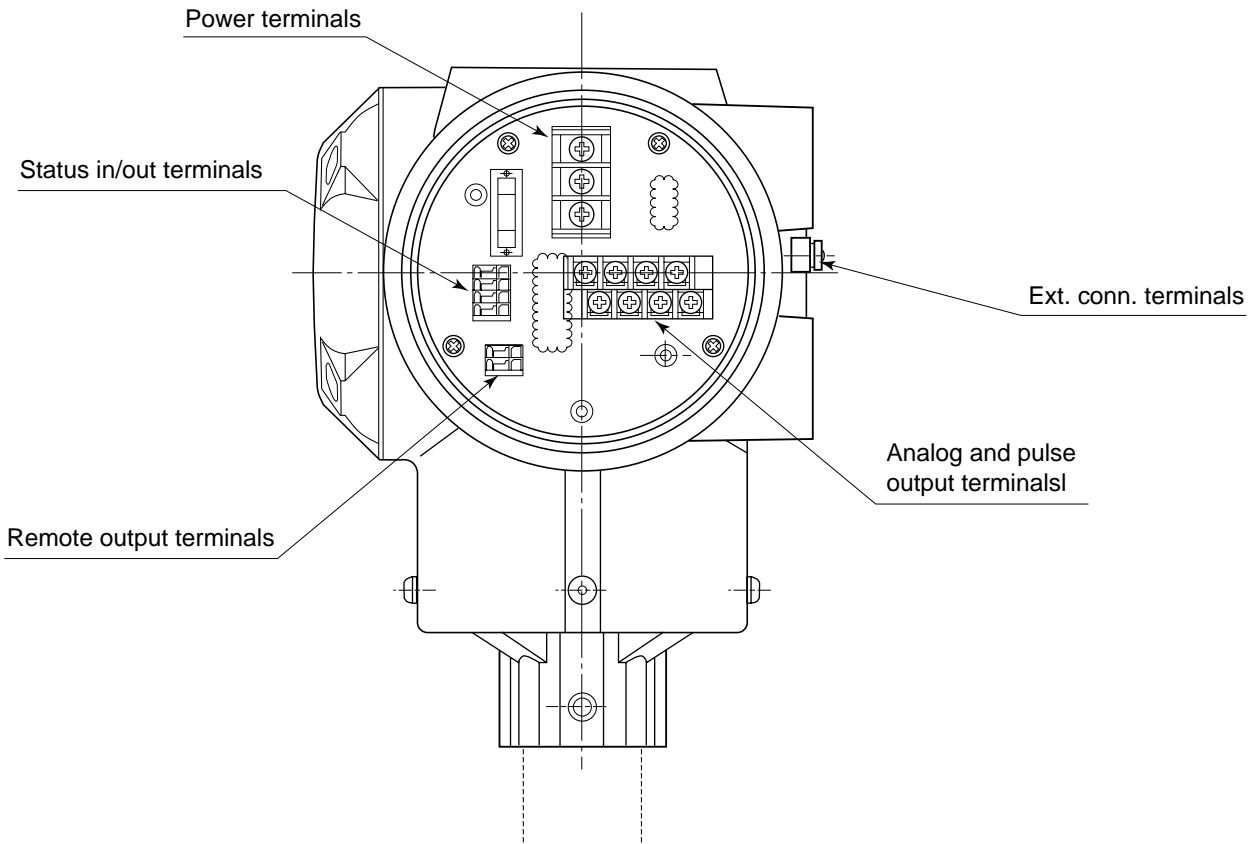
● Remotely located transmitter



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

■ WIRING DIAGRAM

● Transmitter power and in/out signal wiring connections



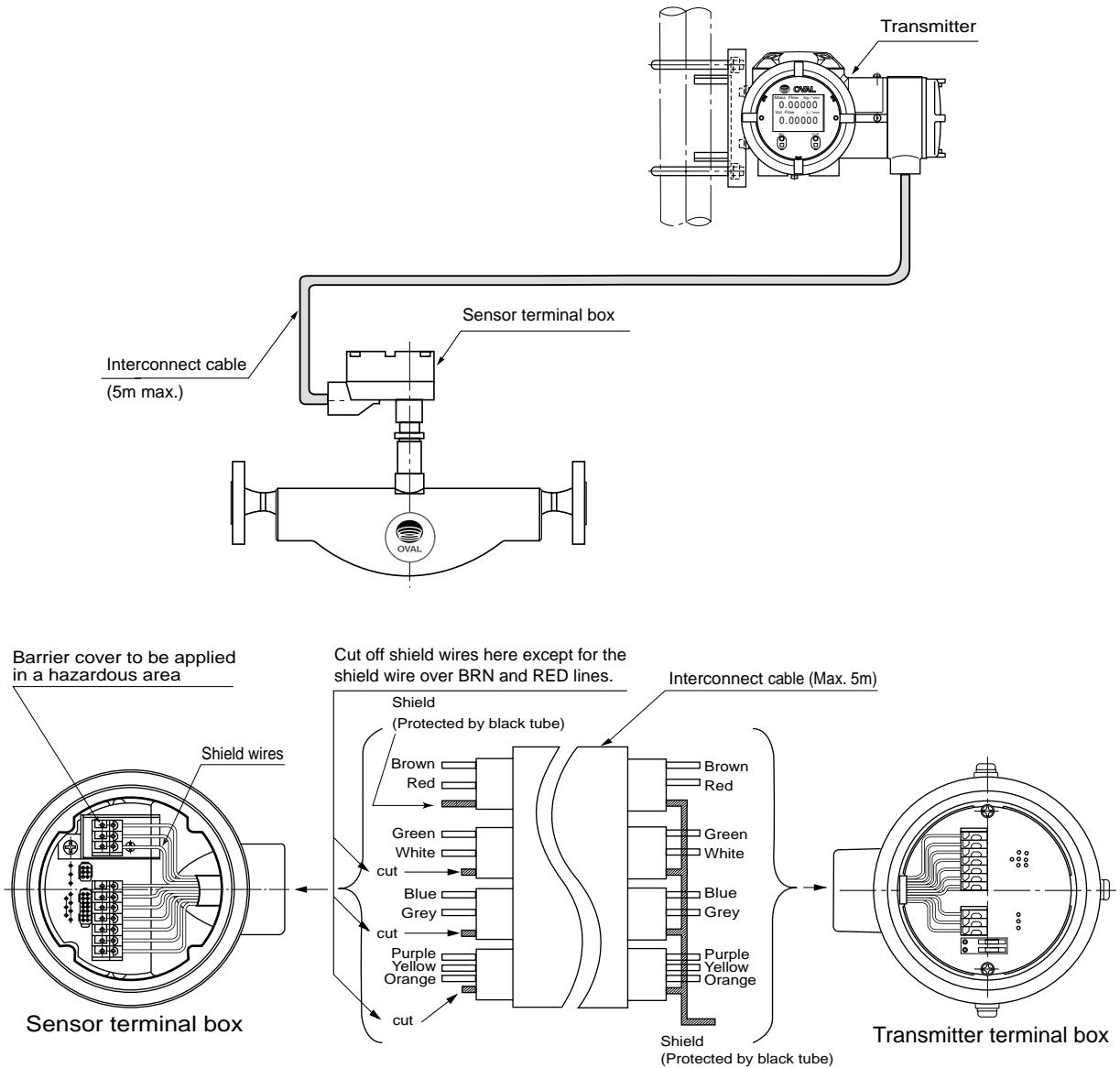
● Terminal identification and description

Item	Label	Description	Remarks
Signal	A1 (+)	Analog output 1 (4 to 20mA)	1. Max. load resistance is 600Ω for analog output 1 and 2. 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 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.
	A1 (-)		
	A2 (+)	Analog output 2 (4 to 20mA)	
	A2 (-)		
	P1 (+)	Pulse output 1 (voltage/open collector output)	
	P1 (-)		
	P2 (+)	Pulse output 2 (voltage/open collector output)	
	P2 (-)		
	S.I. (+)	Status input (contact input)	
	S.I. (-)		
	S.O. (+)	Status output (open collector output)	
	S.O. (-)		
Power	I/O (+)	Expanded in/out (Modbus communication, etc.)	Max. 1km at 0.65sq
	I/O (-)		
	L (+)	Power (with DC power: +)	
	FG	Earth ground	
	N (-)	Power (with DC power: -)	

NOTE: The common terminals for pulse outputs 1 and 2 and the status output of this instrument are not isolated. Therefore, if you want to connect an external device to each output terminal with a load (resistance) added to the minus side, no correct output might be obtained. Please be sure to use the external device with the load connected to the plus side.

■ WIRING

● Wiring between Sensor Unit and Separately Mounted Transmitter



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

2. Shield wire preparation

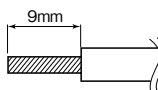
(1) Transmitter end:

As shown in the above figure, bundle shield wires colored in brown/red, green/white, blue/grey 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:

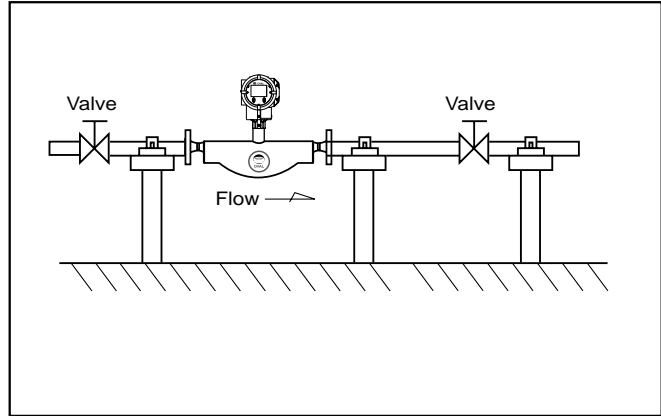


※: Use of a stick type crimp terminal is not necessary.

■ 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) 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 125°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.

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.

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

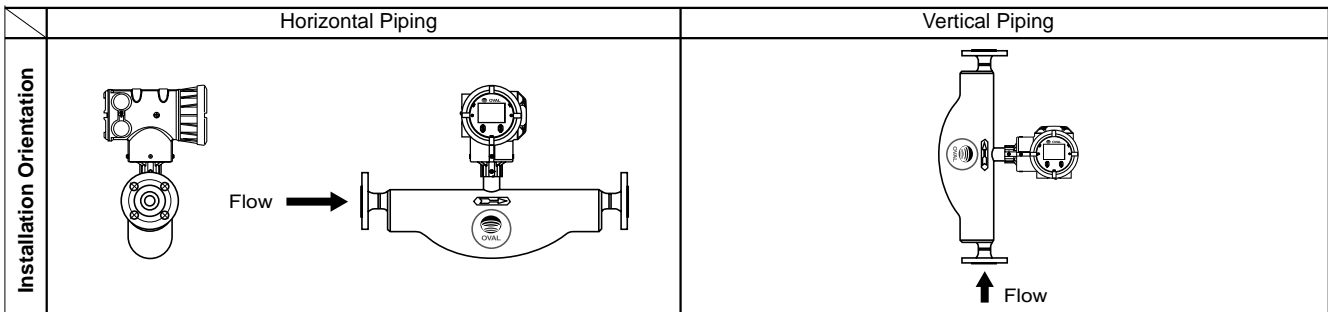
P_d : Downstream pressure (MPa[absolute])

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.

■ PRODUCT CODE EXPLANATION

Item	Code No.																		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														Connection 10mm (3/8")
			0	1	0														Connection 15mm (1/2")
			0	1	5														Connection 15mm (1/2")
			0	2	5														Connection 25mm (1")
			0	4	0														Connection 40mm (1•1/2")
		0	5	0														Connection 50mm (2")	
Applicable fluid		L																Liquid	
Temperature rating (※1)			1															Standard (max. 125°C)	
Pressure rating				1														Standard	
Material					S													SUS316L	
Process connection						B												Ferrule connection	
						C												JIS 10 K	
						D												JIS 20 K	
						E												JIS 30 K	
						H												ASME 150	
						J												ASME 300	
						L												JPI 150	
						M												JPI 300	
					Z												Others		
Transmitter configuration (※2)											1							Integrally mounted	
											2							Remotely mounted	
Power supply												1						20 to 30VDC	
												2						85 to 264VAC 50/60Hz	
Analog output (※4)													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	
Pulse output (※4)													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 density), Output 2: Volume flow (fixed density)	
												J					Output 1: Volume flow (true density), Output 2 : Mass flow		
												K					Output 1: Volume flow (fixed density), Output 2 : Mass flow		
Pulse output form												1					Open collector pulse (default)		
												2					Voltage pulse		
Communication interface													1					Hybrid communication (Bell 202 under HART protocol)	
													4					MODBUS (RS-485 Modbus protocol)	
Explosionproof specification													0					Non-explosionproof	
													1					TIIS (※3)	
													2					ATEX (※3)	
													3					KOSHA (※3)	
												7					NEPSI	In preparation	
Explosionproof temp. class													0					Non-explosionproof	
													3					Sensor unit temp. class T3, remote type transmitter only	
													4					Sensor unit temp. class T4	

※1: With explosionproof specification (applied for), some temperature class related restrictions exist.

※2: In applications where process fluid temperature exceeds 90°C, only "Remotely mounted" transmitter configuration applies.

※3: Modbus is not supported.

※4: In case of measurement tax products or liquor tax products, do not select the mass flowmeter output.

■ 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 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
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 10.	
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	
11. Explosionproof	<input type="checkbox"/> Unnecessary <input type="checkbox"/> TIIS <input type="checkbox"/> ATEX <input type="checkbox"/> KOSHA	
12. Power supply	_____ V <input type="checkbox"/> AC <input type="checkbox"/> DC	
13. Output specifications	Pulse output	<input type="checkbox"/> Volt. pulse: [0]: 1.5V [1]: 15VDC min. Out. impedance: 2.2kΩ
		<input type="checkbox"/> Open collector: Min. 10V to Max. 30VDC, 50mA
		<input type="checkbox"/> Output frequency: Any point from 0.1 to 10000Hz at full scale
		Two outputs from instant flowrate (mass or volume).
	Analog output	4 to 20mA DC Max. load: 600Ω
	2 outputs from instant. flow rate (mass, fixed volume), or temp.	
Additional damping	0 to 200s. (variable)	
Alarm output	Slug flow High _____ g/mL Low _____ g/mL	
14. Companion 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	
15. Transmission length	The maximum length from transmitter to receiving instrument is () meters.	
16. Exclusive cable length	In case of separately- mounted type _____ m (Max. 5m)	
17. In case of separate type transmitter	<input type="checkbox"/> Stanchion type w/bracket and 2" U bolts	
18. No. of units required		
19. Application		
20. Other considerations		
21. Pressure-resistant packing	<input type="checkbox"/> Standard <input type="checkbox"/> ATEX directive compliant	
	<input type="checkbox"/> 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 May, 2013 is stated in this GS Sheet. Specifications and design are subject to change without notice.