



## Super High Pressure Coriolis Flowmeter

# ALTI<sup>mass</sup> Type U CA004

GENERAL SPECIFICATION  
GS.No.GBN124E-9

### ■ GENERAL

Our concentrated effort in developing true state-of-the-art measuring tools and specialized manufacturing experience in Coriolis technology has resulted in this super high pressure service Coriolis flowmeter characterized by outstanding performance, ease of use, and increased safety.

### ■ FEATURES

1. High accuracy ( $\pm 0.5\%$  of reading, or  $\pm 0.05\%$  of max. allowable rate below 9.6kg/h) and high sensitivity (measuring range 1 to 125).
2. Accepts both liquid and gas. Measures a wide flow range accurately with low pressure loss.
3. Measures temperature accurately besides mass flow rate.
4. Branch-less flow path design offers ease of cleaning.
5. No welded point - a truly dependable design suitable for high pressure gas measurement.
6. All wetted parts are made of TPXM-19, and are particularly suited for the flow measurement of high-pressure hydrogen.
7. The meter casing has a high mechanical rigidity for ease of use, reducing space requirements, and increasing process safety.
8. Transmitter can be separately mounted or integrally mounted.
9. High pressure gas safety regulations-compliant models also available.
10. Rack-mount transmitter available (refer to GS No.GEJ516E for details)



Separately mounted transmitter

Rack-mount transmitter

### ■ GENERAL SPECIFICATIONS

#### ● Sensor unit

Item		Description
Model		CA004
Nominal size		9/16"
Materials	Wetted parts	TPXM-19 UNS S20910 SA-312
	Housing	SUS304
Connector connection		High-press. cone & thread connection, size 9/16 562C (male thd. 1•1/8-12UNF)
Applicable fluids		Liquids and gases (*1)
Density range		0 to 2.0 g/mL
Temperature range (Structural rating)		-40 to +130°C
Max. operating pressure		120MPa (at 93°C)
Flow direction		Forward and reverse, both available
Explosionproof configuration		TIIS, ATEX, IECEx, KCs, CSA, EAC, NEPSI, ITRI (Refer to page 9, 10 for details)
Weight (Terminal box and mtg. base incl.)		Approx. 21kg

\*1: For required operating pressure of gas measurement, contact OVAL.

\*: Density and volume flow measurements are unavailable.

\*: Since the casing of sensor unit is not pressure resistant, the withstanding pressure rating of the casing is not indicated. To afford adequate protection, an Rc1/4 boss is provided; use customer's discretion in providing a rupture disc (Supported with options we offer.), pressure switch, etc. Rupture disc pressure rating and pressure switch setting is 7 MPa (G).

\*: For high pressure gas safety regulations-compliant models, contact OVAL.

## OVAL Corporation

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## ● Transmitter specifications (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. 200m (dedicated 9-core cable used) (*2)
Applicable EU directive	EMC Directive: 2014/30/EU ATEX Directive: 2014/34/EU LVD Directive: 2014/35/EU RoHS Directive: 2011/65/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 RoHS EN50581: 2012
Explosionproof configuration	TIIS, ATEX, IECEX, KCs, CSA, EAC, NEPSI, ITRI (Refer to page 9, 10 for details.)
Maritime certification	DNV GL Refer to page 10 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 provided (128x64 dots), backlit (white, orange) Infrared light 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 blockx4, IT blockx2, with Link Master function
	PROFIBUS PA AI blockx4, TOT blockx2
Damping (default)	Flow rate 0.8sec, temperature 2.5sec.
Low flow cutoff (default)	Under 0.6% of max. service flow rate
Pulse output (*5)	Open drain output (equivalent to open collector output ) [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.
Status output (*5)	Open drain output (equivalent to open collector output ) [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 maximum transmission length, consult OVAL.

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

## ■ GENERAL PERFORMANCE

Item	Description		
Model	CA004		
Flow rate	Max. allowable rate	300kg/h	
	Max. service rate	120kg/h	
	Min. setting rate	6kg/h	
	Guaranteed min. rate	2.4kg/h	
	Accuracy	Less than 9.6kg/h	±0.05% of max. allowable rate
		9.6kg/h or above to 300kg/h or less	±0.5% of RD
	Repeatability	Less than 9.6kg/h	±0.025% of max. allowable rate
9.6kg/h or above to 300kg/h or less		±0.25% of RD	
Analog output accuracy	±0.1% of FS added to each accuracy		
Pressure loss (Reference)	Water: at Max. allowable rate	1.15MPa	

■ DISPLAY

Coriolis Mass Flowmeter  
**ALTI<sub>mass</sub>**

Mass Flow kg/min  
**0.00000**

Vol Flow L/min  
**0.00000**

SEL      ENT

OVAL

LED (Red)

LED (Green)

**Display modes**

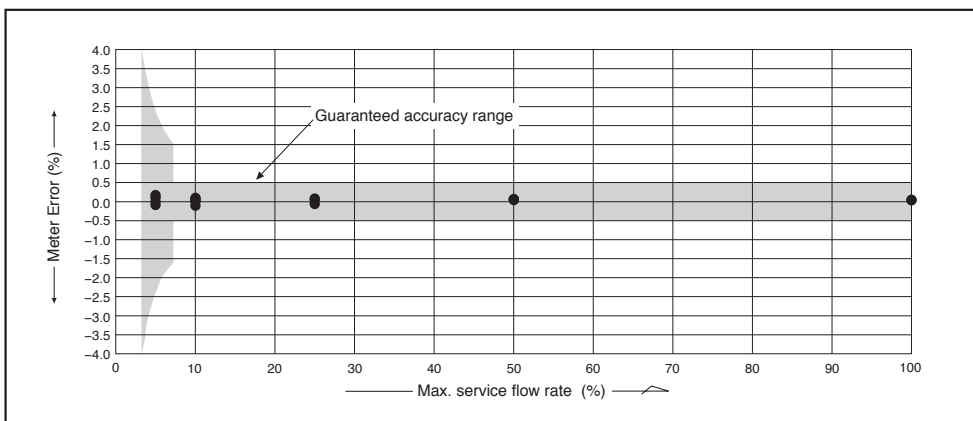
- ① Mass instant flowrate
- ② Volume instant flowrate
- ③ Temperature
- ④ Pulse count 1 (mass or volume)
- ⑤ Pulse count 2 (mass or volume)
- ⑥ Total 1 (mass or volume)
- ⑦ Total 2 (mass or volume)
- ⑧ Analog 1 (% instant)
- ⑨ Analog 2 (% instant)
- ⑩ Status information
- ⑪ Mode select (parameter setup)

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

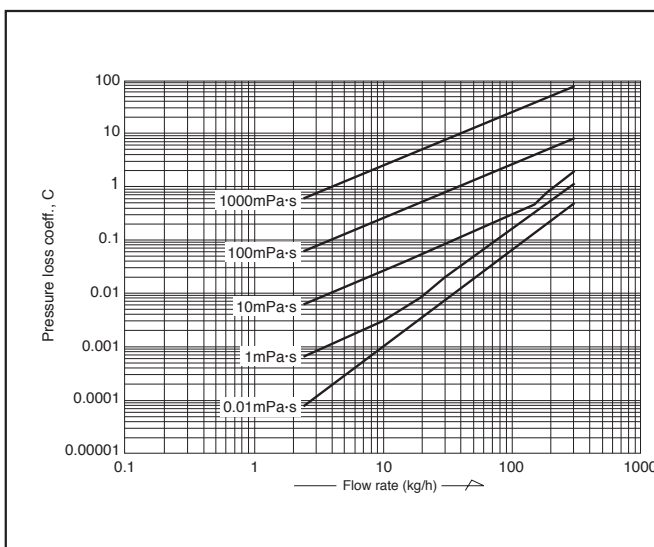
\* LCD backlight comes in two colors: white and orange. Color changes according to the status of flowmeter. Backlight usually comes off automatically if the optical sensor does not respond for a certain period of time.  
\* Backlight duration is selectable.

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)**

- 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:

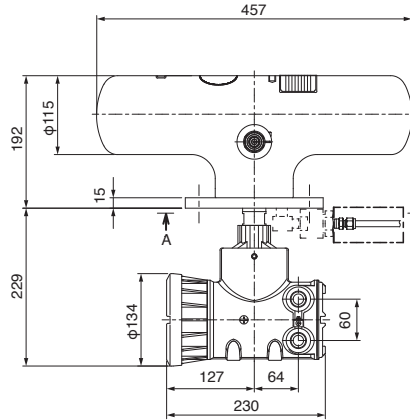
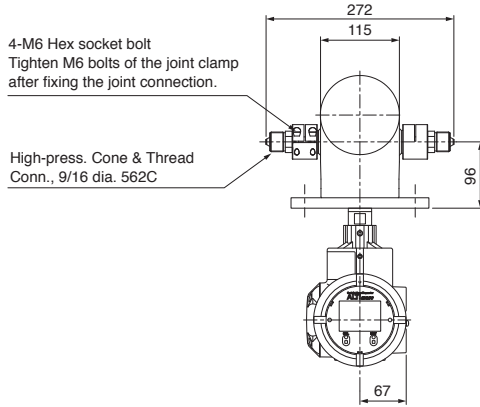
$$\Delta P_2 = C \times \frac{\mu_2}{\mu_1} \times \frac{1}{d}$$

where  $\Delta P_2$  : Pressure loss of high viscosity liquid (MPa)  
 $\mu_1$  : Max. viscosity shown in the graph (mPa·s)  
 $\mu_2$  : 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.

■ DIMENSIONS [Unit in mm]

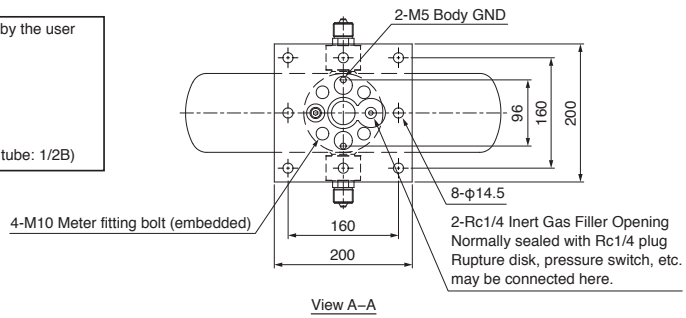
● Transmitter integrally mounted



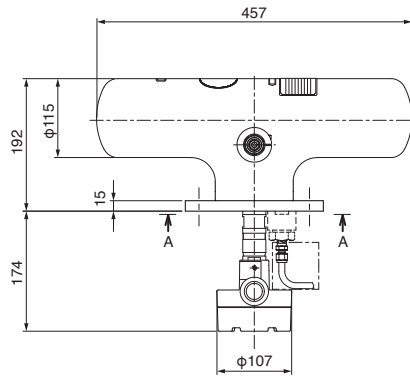
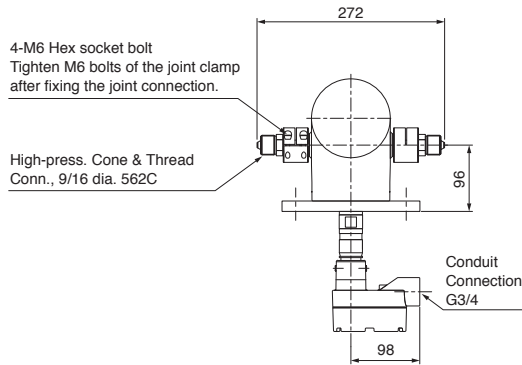
The sections indicated by dashed-dotted line are to be implemented by the user (With rupture disk for implementing option)




Recommended joint: Swagelok tube joint  
Model: SS-810-1-4RT (External thread: 1/4B, External diameter of tube: 1/2B)



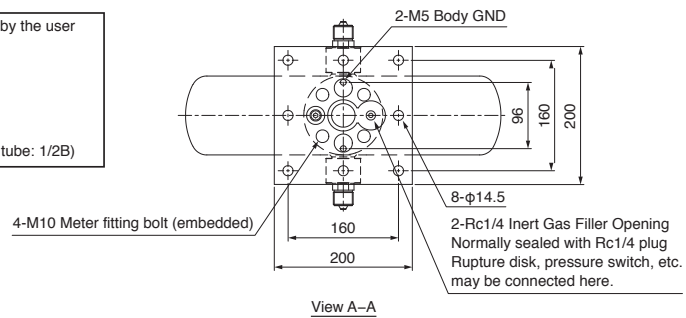
● Transmitter separately mounted



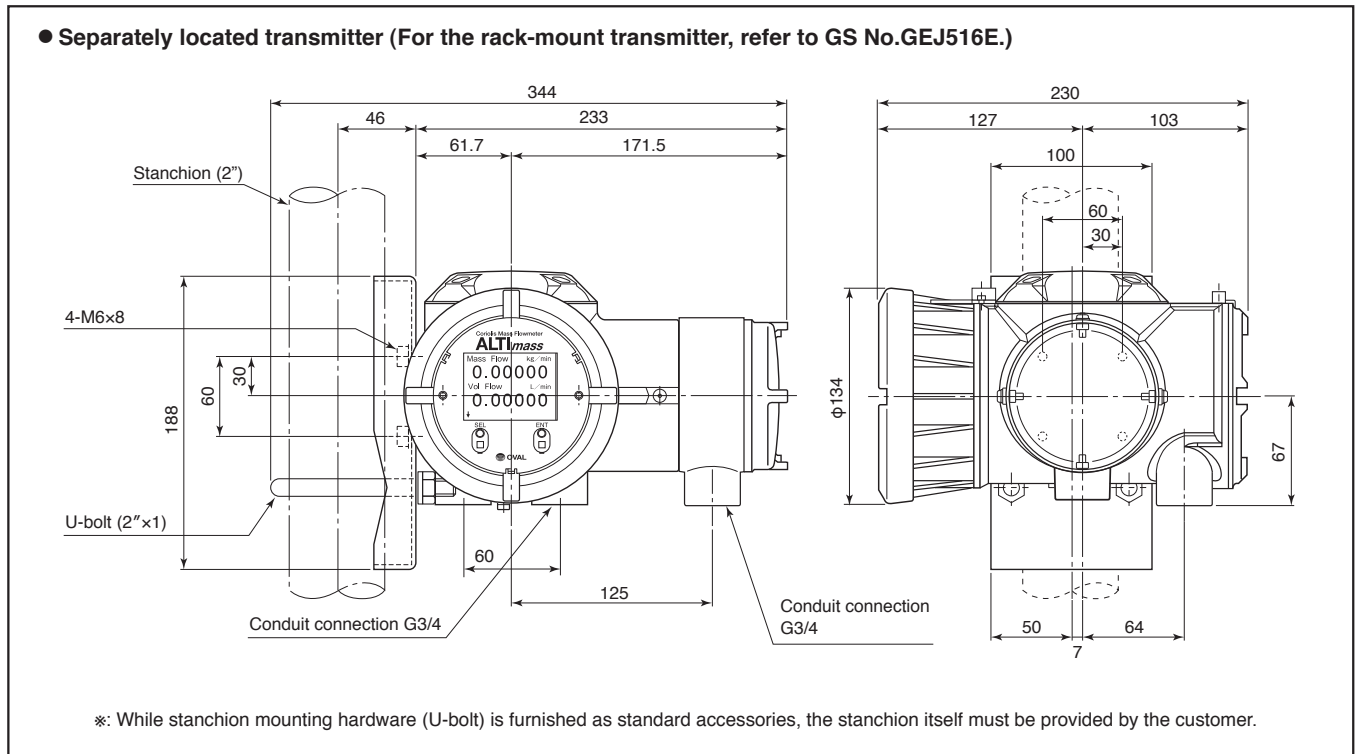
The sections indicated by dashed-dotted line are to be implemented by the user (With rupture disk for implementing option)



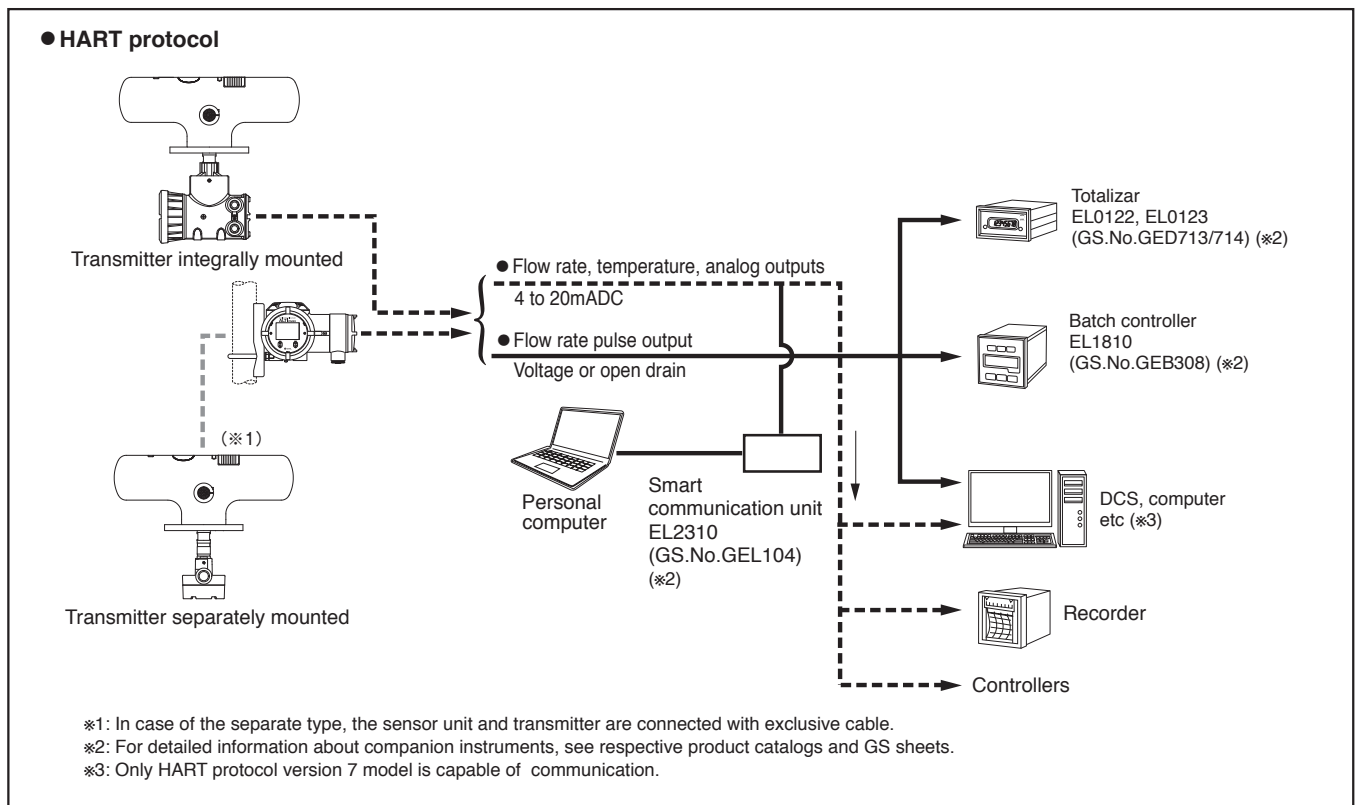
Recommended joint: Swagelok tube joint  
Model: SS-810-1-4RT (External thread: 1/4B, External diameter of tube: 1/2B)



**■ DIMENSIONS [Unit in mm]**

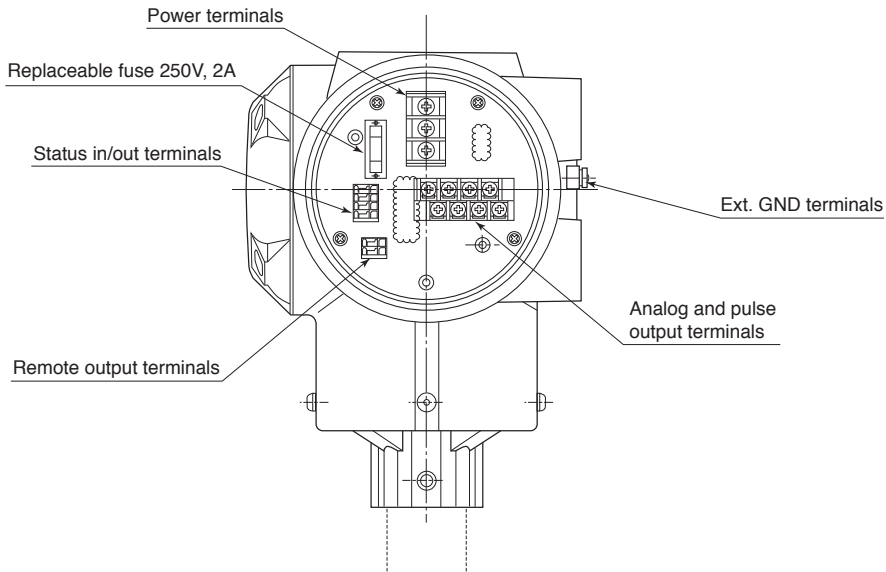


**■ REMOTE MEASURING SYSTEM**



■ WIRING DIAGRAM

● Transmitter power and input/output signal wiring

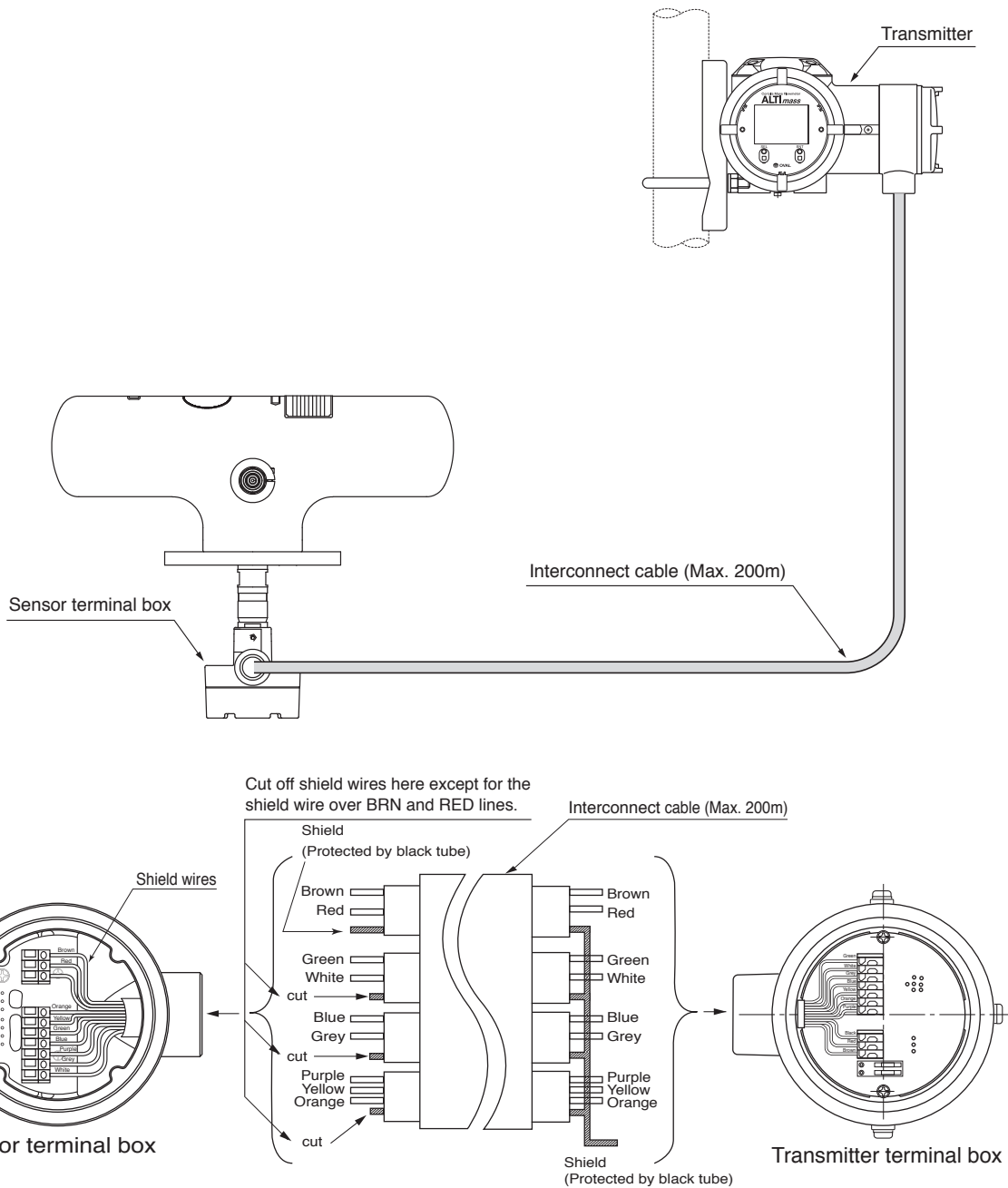


● Terminal identification and description

Item	Label	Description	Remarks
Signal	A1 (+)	Analog output 1 (4 to 20mA)	1. Max. load resistance is 600Ω for analog output 1 and 2. 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. These input and output signals are invalid for FOUNDATION fieldbus, PROFIBUS PA and Modbus communications.
	A1 (-)		
	A2 (+)	Analog output 2 (4 to 20mA)	
	A2 (-)		
	P1 (+)	Pulse output 1 (voltage/open drain output)	
	P1 (-)		
	P2 (+)	Pulse output 2 (voltage/open drain output)	
	P2 (-)		
	S.I. (+)	Status input (contact input)	
	S.I. (-)		
	S.O. (+)	Status output (open drain output)	
	S.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 DIAGRAM

### ● Wiring between Sensor Unit and Separately Mounted Transmitter



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

2. Shield wire preparation

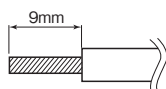
(1) Transmitter end:

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:

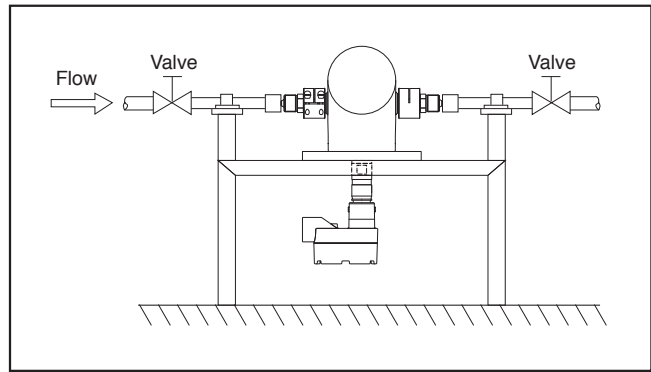


※: Use of a crimp pin terminal is not necessary.

**STANDARD INSTALLATION**

**1. Typical Installation (See figure at right.)**

- ① Exercise care not to place excessive piping stresses on this unit.
- ② While this unit is designed for installation on the mounting base, be sure to provide piping support upstream and downstream of the unit.
- ③ Arrange the piping such that this unit is completely filled with fluid at all times. Avoid installing it in a "pocket" where slurries or other substances may collect.
- ④ Provide a valve that can stop the flow completely downstream of the meter. It is necessary for zeroing with no flow.



We also suggest to provide another valve upstream of the meter for maintenance and servicing.

- ⑤ Make the rigidity between the mounting base and piping support of both up and down stream as high as possible.
- ⑥ Use high-rigidity pipe between the body of sensor unit and piping support.
- ⑦ The mounting base must be installed on a rigid rack. Make sure that the rack itself is fastened on the robust place that would not shake.

**2. Precautions at Installation**

- ① Locate the ALTI<sup>mass</sup> 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 For the measurement of fluids that require heat insulation, heat tracing is applicable directly on the sensor unit. Acceptable heat insulation ranges from -40 to +130 °C.
- ③ The sensor unit is a gas-tight, argon-filled unit to prevent dew condensation inside. Use extra care therefore to avoid inadvertent or accidental dropping or bumping against objects.
- ④ In a horizontal run, install the sensor unit with the transmitter down as shown in the figure.
- ⑤ Locate the control valve downstream of this unit. If cavitation is a possibility, locate it at least five meters apart.
- ⑥ To ensure consistent and accurate measurement, the Coriolis flowmeter should be placed in an environment where pipeline oscillation is held below 0.3G.

**3. Physical orientation**

Physical orientation does not affect the performance of this unit. It can be installed either in a horizontal or vertical run. However, with metered fluids that tend to produce bubbles and/or sediments, or where process fluid removal or purging is conducted after measurement, install the unit in a vertical run.

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

Please specify the physical orientation when you order.



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

### 1. TIIS 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 IIC T4
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● **Separate type**

- Transmitter symbol: Ex d [ib] IIC T6 X
- Transmitter ambient temp.: -40°C to +55°C
- Detector symbol: Ex ib IIC T4
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Detector ambient temperature	-40°C to +60°C	
Fluid temperature	Temperature class: T4	-40°C to +80°C

### 2. ATEX, IECEx Explosionproof

● **Integral type**

- Transmitter symbol: II2G Ex d ib IIC T4 Gb
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C
- Detector symbol: II2G Ex ib IIC T4 Gb
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● **Separate type**

- Transmitter symbol: II2G Ex d [ib] IIC T6 Gb
- Transmitter ambient temp.: -40°C to +55°C
- Detector symbol: II2G Ex ib IIC T3, T4 Gb
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Detector ambient temperature	-40°C to +60°C	
Fluid temperature	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

### 3. KCs Explosionproof

● **Integral type**

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

● **Separate type**

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

Detector ambient temperature	-40°C to +60°C	
Fluid temperature	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

### 4. CSA Explosionproof

● **Integral type**

- Transmitter symbol: Class I, Zone 1, Ex d ib IIB T4 Gb
  - Transmitter and detector ambient temperature: -40°C to +55°C
  - Fluid temperature: -40°C to +80°C
  - Detector symbol: Class I, Zone 1, Ex ib IIC T4 Gb
  - Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)
- Because explosionproof class of converter is "IIB", explosive atmosphere class is also "IIB".

● **Separate type**

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

Detector ambient temperature	-40°C to +60°C	
Fluid temperature	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

### 5. EAC Explosionproof

● **Integral type**

- Transmitter symbol: 1 Ex d ib IIC T4 Gb X
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C
- Detector symbol: 1 Ex ib IIC T4 Gb
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

● **Separate type**

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

Detector ambient temperature	-40°C to +60°C	
Fluid temperature	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

## 6. NEPSI Explosionproof

### ● Integral type

- Transmitter symbol: Ex d ib IIC T4 Gb
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C
- Detector symbol: Ex ib IIC T4 Gb
- Communication: HART, Modbus

### ● Separate type

- Transmitter symbol: Ex d [ib] IIC T6 Gb
- Transmitter ambient temp.: -40°C to +55°C
- Detector symbol: Ex ib IIC T3, T4 Gb
- Communication: HART, Modbus

Detector ambient temperature	-40°C to +60°C	
Fluid temperature	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

## 7. ITRI Explosionproof

### ● Integral type

- Transmitter symbol: II2G Ex d ib IIC T4 Gb
- Transmitter and detector ambient temperature: -40°C to +55°C
- Fluid temperature: -40°C to +80°C
- Detector symbol: II2G Ex ib IIC T4 Gb
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

### ● Separate type

- Transmitter symbol: II2G Ex d [ib] IIC T6 Gb
- Transmitter ambient temp.: -40°C to +55°C
- Detector symbol: II2G Ex ib IIC T3, T4 Gb
- Communication: HART, Modbus, PROFIBUS and FOUNDATION fieldbus (FISCO)

Detector ambient temperature	-40°C to +60°C	
Fluid temperature	Temperature class: T3	-40°C to +130°C
	Temperature class: T4	-40°C to +80°C

## ■ ABOUT MARITIME CERTIFICATION

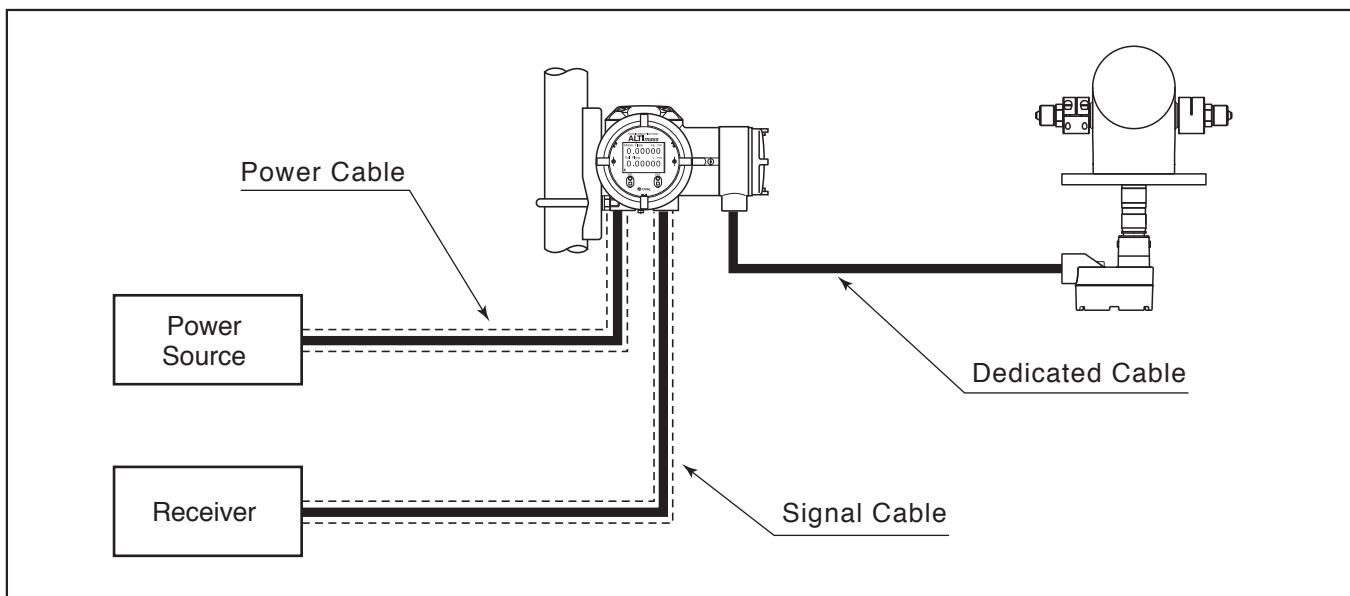
The product is approved for the ship classification under the conditions below.

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)

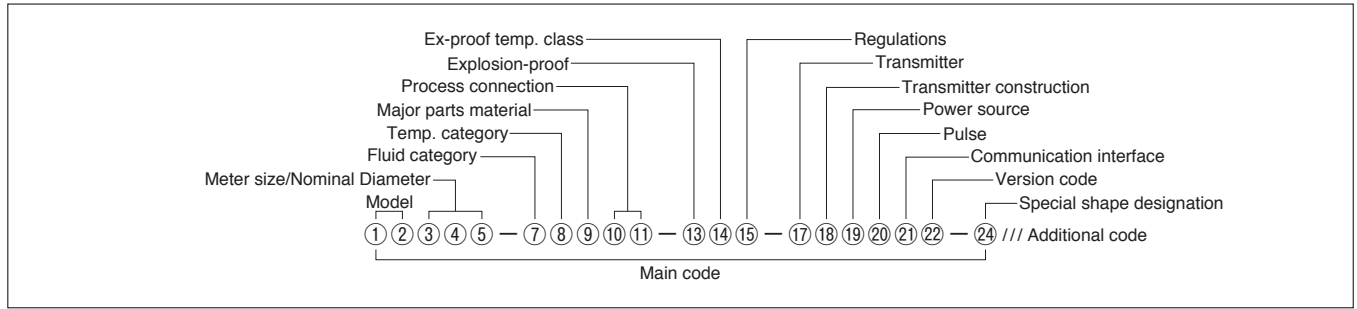
## ■ REGARDING CABLE WIRING

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.



## ■ PRODUCT CODE EXPLANATION



### ●Main code

①	②	<b>Model</b>	
C	A	ALTI $_{mass}$ Type U	
③	④	⑤	<b>Meter size/Nominal Diameter</b>
0	0	4	9/16"
⑥	—		
⑦	<b>Fluid category</b>		
L	Liquid		
G	Gas		
⑧	<b>Temp. category *1</b>		
2	Standard (200°C and lower)		
⑨	<b>Major parts material</b>		
X	XM-19		
⑩	⑪	<b>Process connection</b>	
X	0	High-press. Cone & Thread	
Z	9	Special	
⑫	—		
⑬	<b>Explosion-proof</b>		
0	Non-explosionproof		
1	TIIS		
2	ATEX, IECEx		
3	KCs		
4	CSA (C-US)		
5	EAC		
7	NEPSI *2		
T	ITRI		
⑭	<b>Ex-proof temp. class</b>		
0	Non-explosionproof		
3	T3		
4	T4		
⑮	<b>Regulations</b>		
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		
F	w/Material test certificate		

⑯	—	
⑰	<b>Transmitter *3</b>	
1	ALTI $_{mass}$	
3	Rack-mount transmitter (Refer to GS No.GEJ516E.)	
⑱	<b>Transmitter construction *4, 5</b>	
1	Integrally mounted	
2	Separately mounted	
⑲	<b>Power source</b>	
1	20 to 30VDC	
2	85 to 264VAC (Safety rated 100 to 240VAC 50/60Hz)	
⑳	<b>Pulse</b>	
0	When "2, 3" are chosen for "Communication interface ㉑"	
B	Voltage pulse	
G	Open drain pulse (equivalent to open collector pulse) (standard)	
㉑	<b>Communication interface</b>	
1	HART communication (HART protocol version 7, Bell202)	
2	FOUNDATION Fieldbus H1communication (ITK version 6)	
3	PROFIBUS PA communication (Profile version 3.02)	
4	Modbus communication (RS-485 Modbus protocol)	
㉒	<b>Version code</b>	
B	Version code: B	
㉓	—	
㉔	<b>Special shape designation</b>	
0	Standard	
Z	Special shape	

\*1: Explosionproof specifications are restricted based on temperature class.

\*2: "2, 3" for "Communication protocol " are not applicable.

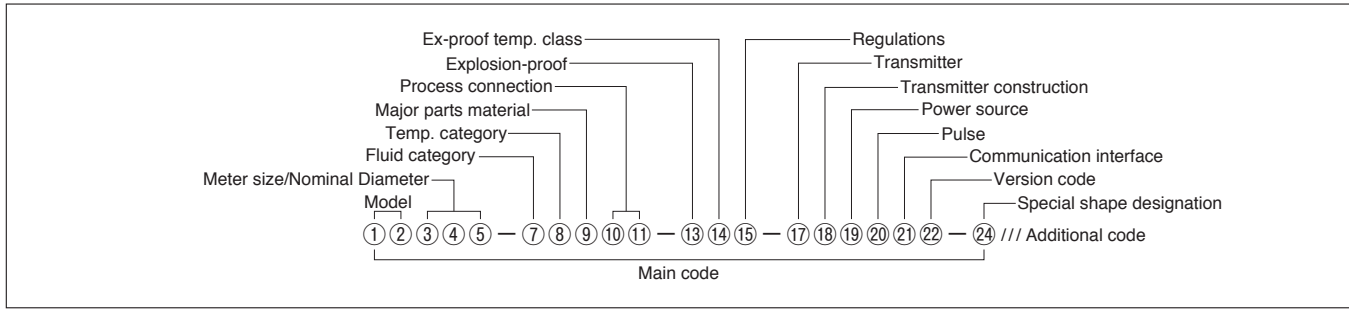
\*3: Applicable specifications differ with the rack-mount transmitter.

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

\*4: Fluids of temperature up to 130°C can be measured, though the maximum operating pressure is lowered.

\*5: In the case of measurements of fluids over 80°C in explosionproof type, only separate type can be used.

## ■ 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
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

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)
S	B	J Airtight test report (Japanese) - over 40MPa
S	B	E Airtight test report (English) - over 40MPa
S	C	J Airtight test report (Japanese) - over 70MPa
S	C	E Airtight test report (English) - over 70MPa
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)
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**

Item	Product Code																		Description
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	
Model	C	A																	ALTI $_{mass}$ Type U
Nominal size		0	0	4															9/16"
Fluid category						L													Liquid
						G													Gas
Temperature category (*1)						2													Standard (below 200°C, TIIS)
Pressure category							1												120MPa max.
							3												120MPa with a rupture disk (Option)
Major parts material								X											TPXM-19
Process connection									X										High-press. Cone & Thread
Transmitter construction (*2, 3)										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												A							Output 1: Mass flow Output 2: Mass flow
												C							Output 1: Mass flow Output 2: Temperature
												E							Output 1: Mass flow Output 2: Volume flow (fixed density)
													K						Output 1: Volume flow (fixed density) Output 2: Temperature
													X						Non-output In the case of FOUNDATION fieldbus, PROFIBUS communication
Pulse output													A						Output 1: Mass flow
													C						Output 1: Volume flow (fixed density)
													D						Output 1: Mass flow Output 2: Mass flow
													F						Output 1: Mass flow Output 2: Volume flow (fixed density)
													H						Output 1: Volume flow (fixed density) Output 2: Volume flow (fixed density)
													K						Output 1: Volume flow (fixed density) Output 2: Mass flow
Pulse output type																			Non-output In the case of FOUNDATION fieldbus, PROFIBUS communication
													0						Open drain pulse (equivalent to open collector pulse) (standard)
													1						Voltage pulse
Communication interface																			0 Non-explosionproof
																			1 TIIS
																			2 ATEX, IECEx
																			3 KCs
Explosionproof rating																			4 CSA
																			5 EAC
																			7 NEPSI (*5)
																			T ITRI
																			0 Non-explosionproof
Explosionproof temperature class																			3 Sensor unit: Temp. class T3 separate transmitter only
																			4 Sensor unit: Temp. class T4

- \*1: Explosionproof specifications are restricted based on temperature class.
- \*2: Fluids within 130°C can be measured, though the maximum operating pressure is lowered.
- \*3: In the case of measurements of fluids over 80°C in explosionproof type, only separate type can be used.
- \*4: 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").
- \*5: "2, 3" for "Communication protocol" are not applicable.

\*: 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.

## ■ 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.

<b>1. Sensor unit</b>	CA004- <input type="checkbox"/> 2X <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> -1 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/>	
<b>2. Process fluid (※1)</b>	Name: _____ SP. gr : _____ Viscosity : _____ Concentration : _____ %	
<b>3. Flow range</b>	Max. _____ Normal _____ Full scale _____ <input type="checkbox"/> kg/h <input type="checkbox"/> Others _____	
<b>4. Fluid temperature</b>	Max. _____ °C Normal _____ °C Min. _____ °C Sudden temperature change: With/Without	
<b>5. Operating pressure</b>	Max. _____ MPa Normal _____ MPa Min. _____ MPa	
<b>6. Ambient temperature</b>	Max. _____ °C Min. _____ °C	
<b>7. Fluid flow direction</b>	<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. _____	
<b>8. Nominal size</b>	_____ mm or _____ inch	
<b>9. Required accuracy</b>	± _____ % of reading ± _____ % of full scale	
<b>10. Explosionproof</b>	<input type="checkbox"/> Not required <input type="checkbox"/> TIIS <input type="checkbox"/> ATEX <input type="checkbox"/> IECEX <input type="checkbox"/> KCs <input type="checkbox"/> CSA <input type="checkbox"/> EAC <input type="checkbox"/> NEPSI <input type="checkbox"/> ITRI	
<b>11. Power supply</b>	_____ V <input type="checkbox"/> AC <input type="checkbox"/> DC	
<b>12. Output specifications</b>	Pulse output	<input type="checkbox"/> Volt. pulse: [0]: 1.5V [1]: 13VDC min. Out. impedance: 2.2kΩ
		<input type="checkbox"/> Open drain (equivalent to open collector output ) [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 with fixed density calculation). 4 to 20mADC Max. load: 600Ω
		Two outputs from instant. flow rate (mass or volume with fixed density calculation) or temperature
Additional damping	0 to 200s. (variable)	
Alarm output	Slug flow High _____ g/mL Low _____ g/mL	
<b>13. Communication protocol</b>	<input type="checkbox"/> HART <input type="checkbox"/> FOUNDATION fieldbus <input type="checkbox"/> PROFIBUS <input type="checkbox"/> Modbus (Address: _____ )	
<b>14. Receiver</b>	<input type="checkbox"/> Totalizer <input type="checkbox"/> Indicator <input type="checkbox"/> Recorder <input type="checkbox"/> Flow controller <input type="checkbox"/> Batch counter <input type="checkbox"/> Density Computer <input type="checkbox"/> Computer <input type="checkbox"/> Other	
<b>15. Transmission length</b>	Sensor unit ( _____ ) m Transmitter ( _____ ) m Receiving instrument	
<b>16. Exclusive cable length</b>	In case of separately- mounted type _____ m	
<b>17. In case of separate type transmitter</b>	<input type="checkbox"/> Stanchion type w/bracket and 2" U bolt	
<b>18. No. of units required</b>		
<b>19. Application</b>		
<b>20. Other considerations</b>		
<b>21. Pressure-resistant packing</b>	<input type="checkbox"/> Standard <input type="checkbox"/> ATEX directive compliant for earthed cable	
<b>22. Maritime certification</b>	<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 August, 2020 is stated in this GS Sheet. Specifications and design are subject to change without notice.

**Sales Representative:**