



Excellent Vortex Flowmeter INSERTION Type SMART EX DELTA II

GENERAL SPECIFICATION
GS.No.GBD605E-4N

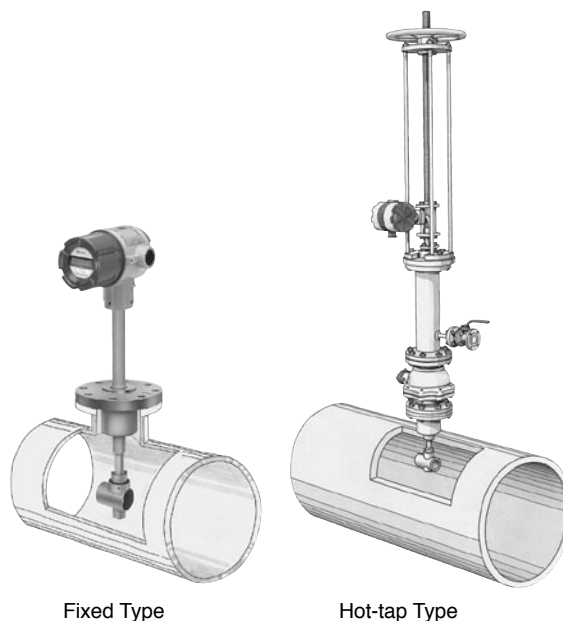
■ GENERAL

The Insertion Type Smart EX DELTA II has various functions, i.e., conversion computing, intelligent functions such as setting, changing, self-diagnosis and loop check with calling of range and every factor to be entered.

Furthermore, additionally provided communication function utilizing a Smart Communication Unit(EL2310), can execute those operations such as setting and calling of each parameter and also communication with an upper ranked computer. There are two types of the sensors, one is fixed type and the other is hot-tap type. In case of the latter, check and replace are possible without interrupting of metering flow.

■ FEATURES

- Offers high accuracy measurement over a wide flow-range.
- Applicable for flow measurement of gas, liquid and steam.
- The sensor, completely isolated from wetted parts, has a long service life.
- Absence of any moving parts means that dust and mist in the medium measured are less likely to pose a problem.
- Materialization of 2 wires transmission system for cost reduction and simplification of a system to be applied.
- Ease to data setting.
- Maintenance cost saving means increasing of security operation.
- Maintenance operation such as range and parameter setting, and calibration can be performed.



Fixed Type

Hot-tap Type

■ GENERAL SPECIFICATIONS

Item	Description	
Mounting type	Fixed Type	Hot-tap Type
Nominal size to be applied (※1)	200, 250, 300, 400, 500, 600, 800, 1000, 1500, 2000mm	400, 500, 600, 800, 1000, 1500, 2000mm
Nominal size of the probe	50mm	
Materials	Meter body	Stainless Steel (SUS304)
	Bluff body	Stainless Steel (SUS304)
Pressure rating	JIS 10K, ASME 150, JPI 150	
Mounting flange	100mm (4") JIS 10 K, ASME 150, JPI 150	
Installation	Horizontal or Vertical	Horizontal
Max. operating pressure	Depends on flange rating	
Operating temperature rang (※2)	-10 to +300°C	
Velocity range	Air (Atm.press.) : 12 to 50m/s Water : 0.6 to 6m/s	
Standard insertion depth	Nominal size of Piping: D<500mm ; 0.5D approx. D≥500mm ; 0.2D approx. D=Inner Dia.of Piping(mm)	
Accuracy (※3)	Within ± 2% of FS	
Fluid to be metered	Liquids (Water, Hot Water, Chemical Liquids) Gases (Oxygen, Nitrogen, Carbon Dioxide, Compressed Air, etc.) Steam (Saturated Steam, Super Heated Steam)	

※1: Nominal size not mentioned is applicable if it is within the range of applicable piping.

※2: Operating temperature range depends on condition of the fluid to be measured.

※3: Accuracy is guaranteed only with the designated conditions, i.e. the pipe inner diameter and fluid conditions and etc.

■ CONFORMITY EN DIRECTIVES

Applicable EU Directives	EMC: 2014/30/EU ATEX: 94/9/EC
Applicable EN Standards	EMC: EN61326-1 : 2013 Class A ATEX: EN60079-0 : 2006, EN60079-1, 2007

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CONVERTER SPECIFICATIONS

Item		Description
Model	PA25 (No Display)	PA25S (w/Totalizer, Digital Indicator)
Mounting	Select one of the followings : ① Integral with flowmeter ② Separate type (installed on 2" pipe)	
Waterproof configuration	IP66 (dusttight/weathertight) -IEC/EN 60529, JIS C 0920-NEMA TYPE 4X	
Explosionproof configuration	Select one of the followings : ① Non-explosionproof configuration ② Flameproof configuration TIIS:Exd IIB+H ₂ T4 ③ Flameproof configuration ATEX: II2G Exd IIB+H ₂ T6 to T1 ④ Flameproof configuration GOST: 1Exd IIB+H ₂ T6 to T1 ⑤ Flameproof configuration NEPSI: Exd IIC T4 (Hydrogen only)	
Ambient Temperature	Non-explosionproof construction: -40 to + 80°C Explosionproof construction: -20 to + 60°C	Non-explosionproof construction : -20 to +60°C Explosionproof construction: -20 to +60°C
Ambient Humidity	5 to 100%RH without dew condensation	
Housing Material	Aluminum alloy	
Housing Finish	Finished in baked melamine Finish Munsell 10B8/4 (Cover: Munsell 2.5PB4/10)	
Output (Choose any from the right)	Current signal	2-wires system (Common as Power line) ① Scaled pulse (factored pulse) Pulse level : 0/1 = 4/20mADC Pulse width : 10 to 1000ms (St'd : 50ms) ② Unscaled pulse (Vortex synchronized pulse) Pulse level : 0/1 = 4/20mADC Pulse width : 200μs ③ Analog 4 to 20mADC at 0 to FS Time constant : 0 to 100s (St'd : 2.5s)
	Open collector	3-wire type, NPN transistor output (Max. impressed voltage: 30VDC, Allowable current: 50mA, ON voltage: 1.5VDC or less) ① Scaled pulse (factored pulse), Pulse width: 10 to 1000ms (Standard 50ms) ② Unscaled pulse (vortex synchronized pulse), Pulse width: 200μs
Display (Option)	Display : 7 segments LCD Content : One of the following 4 ways display is possible with switching over of an internal switch or a EL2310 ① Totalizing flow throughput : 6 digits Unit of totalizing : Same as scaled pulse output Unit of flow rate Indication : Refer to (※2) • Upon power interruption, Totalized counts are held by Non-volitized memory • Totalized counts are resettable by an internal switch or EL2310 ② Instantaneous flow rate : 7 digits (3 1/2 digits are effective) Unit of flow rate indication : Refer to (※2) ③ % Instantaneous flow rate : Unit of display : % FS Discrimination : 0.1% Full scale : Same as that of Analog output ④ 8 scaled % Bar graph Display : % FS Full scale : Same as that of Analog output	
Power Supply	12 to 45V DC (See Load Resistance Range curve) NOTE: If you connect OVAL communication unit EL2310, use a power supply below 33V DC.	
Cable Entry	G1/2 internal threads : External cable lead-in method for the flameproof configuration (TIIS and NEPSI) : pressure tight gasket (furnished with lead-in metal clasp)	
Cables (※1)	Converter to receiving instrument : 1.25mm ² Min., 2-conductor shield cable (analog, current pulse type) 3-conductor shield cable (open collector pulse type) Sensor to converter : 1.25mm ² Min., 3-conductor shield cable (applicable to separate type) Finished cable outside diameter : Non-explosionproof φ13.5mm Max Flameproof φ 8.5 to φ11mm	
Transmission Length	Converter to receiving instrument : 1km Max Sensor to converter : 200m Max (applicable to separate type)	
Communication	HART Protocol Communication (※3)	
Computation	• Actual flow rate computation (Liquid, Gas, Steam) • Temp./Press. correcting computation (Gas)	

※1: In case of TIIS explosionproof type used under the ambient temperature of 50°C or higher, use a cable resistant to the temperature of 70°C or higher.

※2: Unit of Totalized Flow Counts of Flow and Instantaneous Flowrate Indication can be selected from following table.

Unit of Instantaneous Flowrate	Top: Instantaneous flowrate units Bottom: Total flow units	Calculation on actual flow	Calculation corrected for temp. and press.
L/min, L/h, m ³ /min, m ³ /h, kL/min, kL/h		○	×
L, m ³ , kL			
L/min (normal), L/h (normal), m ³ /min (normal), m ³ /h (normal), L (normal), m ³ (normal)		×	○
g/min, g/h, kg/min, kg/h, t/min, t/h		○	○
g, kg, t			
ton (US)/min, ton (US)/h		○	○
ton (US)			
gal (US)/min, gal (US)/h		○	×
gal (US)			
ft ³ /sec, ft ³ /min, ft ³ /h		○	×
ft ³			
SCFS(=ft ³ /sec [standard]), SDFM(=ft ³ /min [standard]), SCFS(=ft ³ /h [standard])		×	○
SCFT(=ft ³ [standard])			
lb/min, lb/h		○	○
lb			

※3: In case a specification for Pulse output is given, Communication function is available only under the following conditions:

① During flow interruption ② Upon Power "ON" (Continuous communication is possible it started within 15 sec. after Power "ON")

● Guidelines to set the analog output and indicator full scale are given below: 3 times the minimum flowrate ≤ Full scale ≤ 1.3 times the max. flowrate.
For minimum and maximum flowrates, refer to the section "Flow Ranges". If you want to set up a full scale outside the range above, consult the factory.

■ FLOW RANGE

Table A, B, C, E are given value calculated from a nominal size. In order to determine flow range for actual piping nominal size, correction should be made according to the following equation.

● Flow Range for Liquid in General

Select the minimum flowrate from Table A (based on specific gravity) or Table B (based on viscosity), whichever is greater.

$$Q = Q_0 \times (D/D_0)^2 \dots \dots \dots [A]$$

Q : Flowrate based on actual nominal size.

Q₀: Flowrate based on nominal size.

D : Actual nominal size.

D₀: Nominal size.

Table A: Calculated value from specific gravity

Unit in m³/h

Nominal size mm (inch)	Sp.Gr. Velocity (m/s)	Minimum Flow Rate							Maximum
		0.5	0.6	0.7	0.8	0.9	1.0	1.1	
		0.90	0.82	0.76	0.71	0.67	0.64	0.61	
200 (8")		102	93	86	80	76	72	69	678
250 (10")		158	145	134	125	118	112	107	1060
300 (12")		228	208	193	180	170	161	154	1520
400 (16")		405	370	342	320	302	287	273	2710
500 (20")		633	578	535	500	472	447	427	4240
600 (24")		911	831	770	720	679	644	614	6100
800 (32")		1620	1480	1370	1280	1210	1150	1100	10800
1000 (40")		2530	2310	2140	2000	1890	1790	1710	16900
1500 (60")		5690	5200	4810	4500	4250	4030	3840	38100
2000 (80")		10200	9240	8550	8000	7540	7160	6820	67800

Table B: Calculated value from viscosity

Unit in m³/h

Nominal size mm (inch)	Kinematic Viscosity (mm ² /s) Velocity (m/s)	Minimum Flow Rate								
		1	2	3	5	10	15	20	25	30
		0.13	0.26	0.39	0.65	1.30	1.95	2.60	3.25	3.90
200 (8")		Refer to table A.		45	74	147	221	294	368	441
250 (10")				69	115	230	345	460	575	690
300 (12")				100	166	331	497	662	827	993
400 (16")				177	294	589	883	1180	1470	1770
500 (20")				276	460	919	1380	1840	2300	2760
600 (24")				397	662	1330	1990	2650	3310	3970
800 (32")				706	1180	2360	3530	4710	5890	7060
1000 (40")				1110	1840	3680	5520	7360	9190	11100
1500 (60")				2490	4140	8270	12400	16600	20700	24900
2000 (80")				4410	7360	14700	22100	29400	36800	44100

Table C&D

● Flow Range for General Gases

In this table, flowrates are specified in [actual] base. Therefore, in case of [normal] base, make it sure to convert the flowrate to [actual] condition and determine the flow range and the nominal diameter based on this table.

		Density kg/m³ Velocity m/s	Minimum Flow Rate (m³/h)										Max. Flow Rate (m³/h)
			0.38	0.7	1.2	2.0	3.6	6	11	19	34	(60)	
			20.3	15.0	11.8	10.0	8.2	6.9	5.7	4.7	3.9	3.2	
Table C	200 (8")		2300	1690	1330	1130	923	778	636	530	437	362	5650
	250 (10")		3590	2640	2080	1760	1450	1220	994	828	682	565	8830
	300 (12")		5160	3810	3000	2530	2080	1750	1430	1200	982	813	12700
	400 (16")		9180	6760	5330	4490	3690	3120	2550	2120	1750	1450	22600
	500 (20")		14400	10600	8320	7020	5770	4870	3980	3320	2730	2260	35300
	600 (24")		20700	15200	12000	10100	8310	7010	5730	4770	3930	3250	50800
	800 (32")		36700	27100	21300	18000	14800	12500	10200	8480	6990	5780	90400
	1000 (40")		57400	42300	33300	28100	23100	19500	15900	13300	10900	9030	141000
	1500 (60")		129000	95100	74900	63200	51900	43800	35800	29800	24600	20400	318000
2000 (80")		230000	169000	133000	113000	92300	77800	63600	53000	43700	36200	565000	
Table D	Type of Gases	Density kg/m³	Gas Pressure (MPa (gauge)) at 20 C										(Ref.) Viscosity of Gas
	Acetylene	1.175	—	—	0	0.08	0.23	0.55	0.9	1.65	3	—	0.00943 (mPas)
	Argon	1.785	—	—	—	0.02	0.12	0.26	0.55	1.05	2	3.6	0.0209
	Ammonia	0.771	—	0	0.07	0.21	0.42	0.75	1.45	2.55	4.6	—	0.0092
	Carbon Monoxide	1.250	—	—	0	0.07	0.21	0.42	0.85	1.55	2.8	—	0.0166
	Ethane	1.357	—	—	0	0.06	0.18	0.37	0.8	1.4	2.6	—	0.0085
	Ethylene	1.264	—	—	0	0.07	0.21	0.42	0.85	1.55	2.8	—	0.0097
	Air	1.293	—	—	0	0.07	0.20	0.4	0.85	1.5	2.7	—	0.017
	Oxygen	1.429	—	—	0	0.05	0.17	0.35	0.75	1.35	2.5	4.4	0.0192
	Hydrogen	0.0899	0.35	0.73	1.33	2.3	4.2	—	—	—	—	—	0.0084
	Carbon Dioxide	1.977	—	—	—	0.01	0.1	0.23	0.5	0.95	1.7	3.3	0.0138
	Nitrogen	1.251	—	—	—	0.07	0.21	0.42	0.85	1.55	2.8	—	0.0166
	City Gas	0.802	—	0	0.06	0.17	0.38	0.7	1.4	2.45	4.5	—	0.01
	Natural Gas	0.828	—	0	0.06	0.16	0.37	0.68	1.35	2.4	4.3	—	0.0107
	Freon-12	5.533	—	—	—	—	0	0.02	0.12	0.27	0.56	1.1	0.0127
	Propane	2.020	—	—	—	0.01	0.09	0.22	0.49	0.9	1.7	3.2	0.0075
	Butane	2.703	—	—	—	0	0.04	0.14	0.34	0.65	1.2	2.4	0.0069
Methane	0.717	—	0	0.08	0.2	0.44	0.8	1.55	2.8	—	—	0.0103	

How to Determine the Minimum Flow Rate

Find a value D, follow the same column upwards and find a value intersecting the desired diameter in Table C for the minimum flowrate.

● Flow Range for Saturated Steam

Table E

Unit in t/h

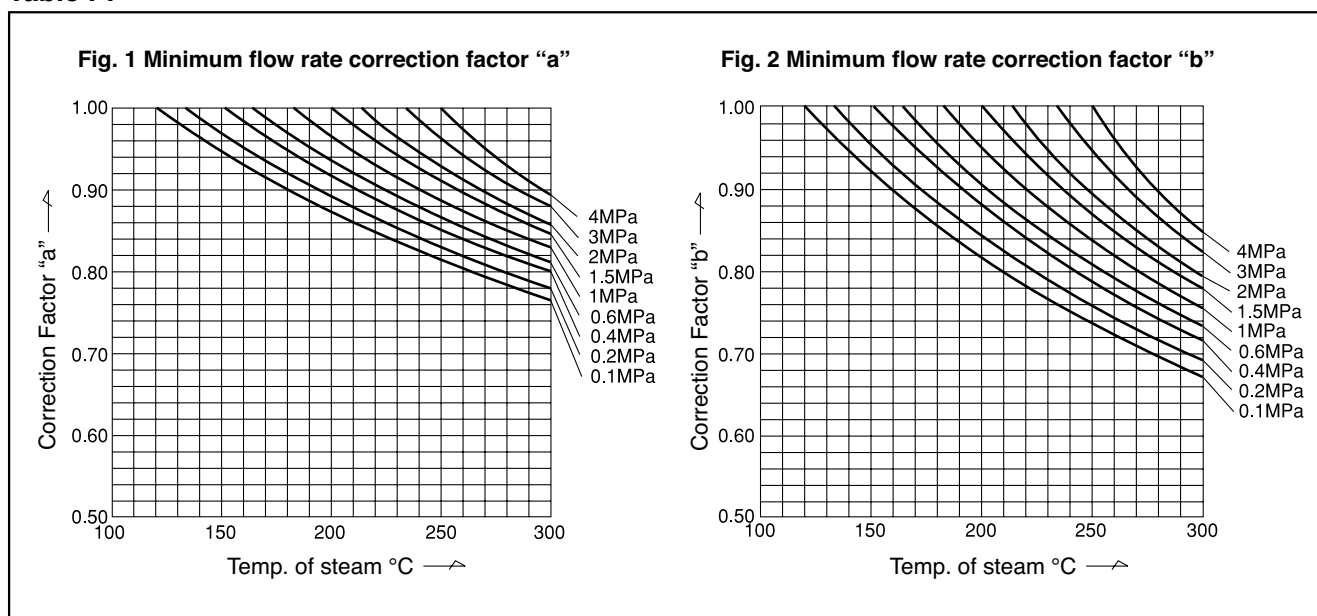
Nom. size Flow Rate Press. MPa(gauge)	200 (8")		250 (10")		300 (12")		400 (16")		500 (20")		600 (24")		800 (32")		1000 (40")		1500 (60")		2000 (80")	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
0.049	1.32	4.89	2.06	7.64	2.96	11.0	5.26	19.5	8.22	30.5	11.9	44.0	21.1	78.2	32.9	122	74.0	275	132	489
0.098	1.50	6.37	2.35	9.94	3.38	14.3	6.00	25.4	9.38	39.7	13.5	57.3	24.0	101	37.5	159	87.4	358	150	636
0.196	1.97	9.26	3.07	14.4	4.42	20.8	7.86	37.0	12.3	57.8	17.7	83.3	31.5	148	49.2	231	111	521	197	926
0.294	2.35	12.1	3.67	18.9	5.29	27.2	9.39	48.4	14.7	75.6	21.2	108	37.6	193	58.7	302	132	680	235	1210
0.392	2.70	14.9	4.22	23.2	6.07	33.5	10.8	59.6	16.9	93.1	24.3	134	43.2	238	67.5	372	152	838	270	1490
0.490	3.03	17.6	4.73	27.6	6.81	39.7	12.1	70.7	18.9	110	27.2	159	48.4	282	75.6	442	170	994	303	1760
0.588	3.33	20.4	5.21	31.9	7.50	45.9	13.4	81.7	20.9	127	30.0	183	53.3	327	83.3	511	188	1140	333	2040
0.686	3.62	23.1	5.66	36.2	8.15	52.1	14.5	92.7	22.7	144	32.6	208	58.0	370	90.6	579	204	1300	362	2310
0.785	3.90	25.9	6.10	40.4	8.78	58.2	15.6	103	24.4	161	35.1	233	62.4	414	97.5	647	220	1450	390	2590
0.883	4.17	28.6	6.52	44.7	9.38	64.4	16.7	114	26.1	178	37.6	257	66.7	458	105	715	235	1610	417	2860
0.981	4.44	31.4	6.93	49.0	9.98	70.6	17.8	125	27.7	196	39.9	282	71.0	502	111	785	250	1760	444	3140
1.08	4.69	34.1	7.32	53.3	10.6	76.7	18.8	136	29.3	213	42.2	307	75.0	545	118	852	264	1910	469	3410
1.18	4.93	36.8	7.70	57.5	11.1	82.8	19.8	147	30.8	230	44.4	331	78.9	588	124	920	278	2070	493	3680

● Flow Range for Superheated Steam

The flow range for superheated steam is determined by first finding the correction factors *a* and *b* for the minimum flow rate and maximum flow rates from the table below

and then multiplying the applicable connection diameter and pressure readings in the flow range table of saturated steam by those correction factors.

Table F:



Example:

Measurement of super heated steam having pressure of 0.098MPa and temperature of 160 °C by actual nominal size 477.8mm.

From table E, minimum flow rate and maximum flow rate for 0.098MPa saturated steam with nominal size 500mm are determined as 9.38t/h and 39.7t/h.

Correction factor "a" is determined as 0.93 from Fig. 1 and Correction factor "b" is determined as 0.9 from Fig. 2 and consulting from Table E and formula [A].

Min. flow rate

$$Q_{\min} = 9.38 \times 0.93 \times \left(\frac{477.8}{500} \right)^2 \approx 8 \text{ t/h}$$

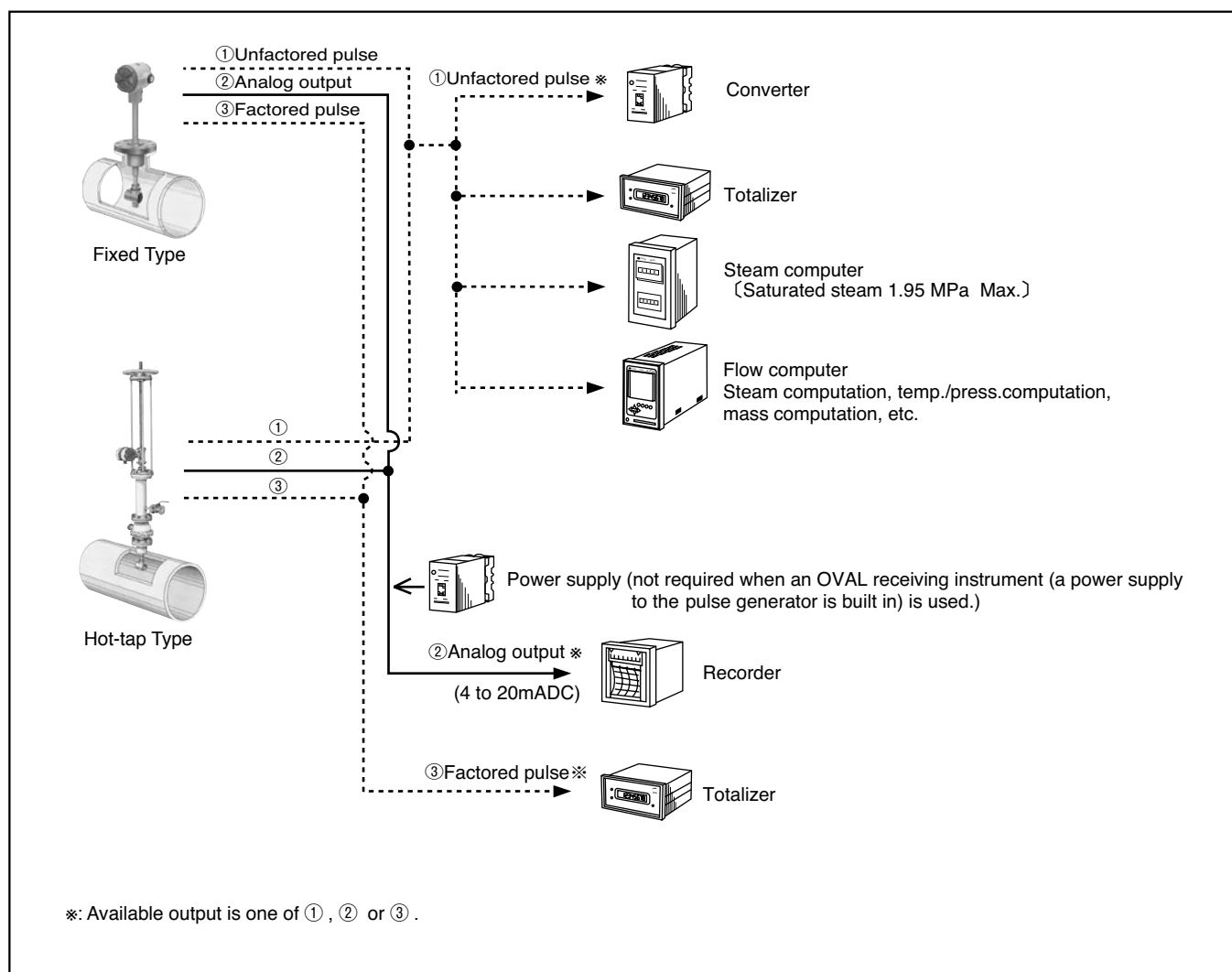
Max. flow rate

$$Q_{\max} = 39.7 \times 0.9 \times \left(\frac{477.8}{500} \right)^2 \approx 32 \text{ t/h}$$

● Nominal Meter Factor

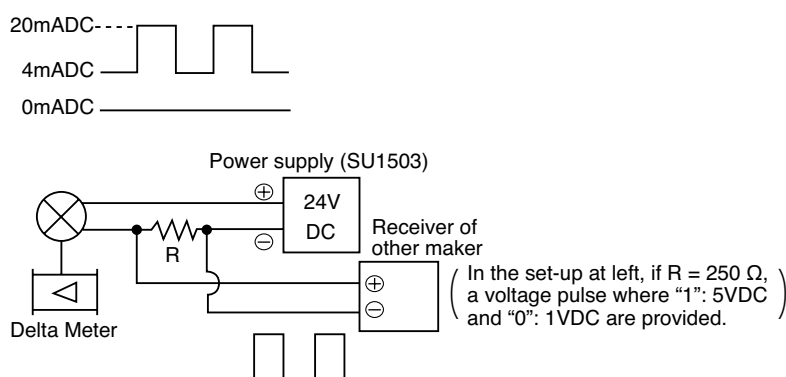
Nominal size of Piping mm (inch)	Nominal Meter Factor L/p
200 (8)	2.42
250 (10)	3.89
300 (12)	5.75
400 (16)	10.7
500 (20)	18.9
600 (24)	27.7
800 (30)	49.2
1000 (40)	76.9
1500 (60)	173
2000 (80)	309

HOOK-UP WITH RECEIVING INSTRUMENTS

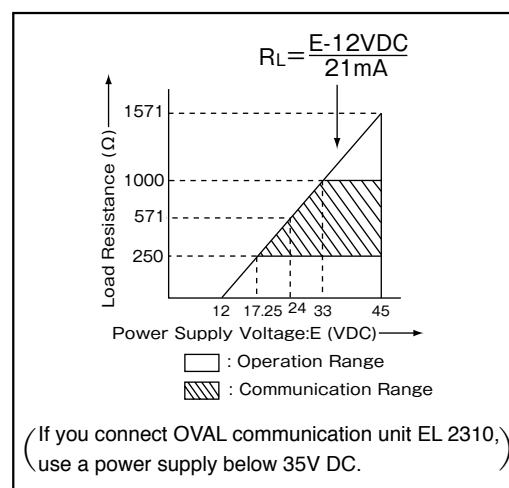


- Shown above are typical examples. Depending on individual applications and specifications, hookup with many other electrical instruments are acceptable.
- For any arrangement with an electrical instrument, indicator, indicator, etc. other than those supplied by OVAL, a 24VDC power supply is required. Use OVAL Model SU1503 power supply.
- As to individual receiving instruments, see respective General Specification sheets.

※That the unfactored and factored pulse output levels are "1": 20mADC and "0": 4mADC, respectively, means as illustrated below. Therefore, if you plan to use any instrument designed to accept a voltage pulse signal, couple a resistor in series as shown. The resistance value of load resistor is given in the Acceptance Load Resistance Range diagram.



Acceptable Load Resistance Range



■ **OUTLINE DIMENSIONS** (Unit in mm)

● **Fixed Type**

Converter: Integral type

Nominal size to be applied: 200 to 1300 mm

(If nominal size of the pipe exceeds 1300mm, different dimensions will apply. Please consult OVAL.)

Ln: Height of mounting neck (st'd. 100 mm)

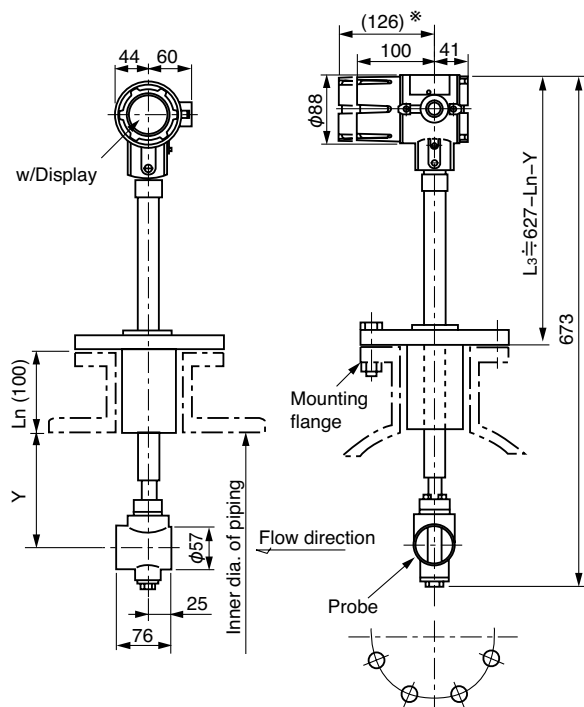
Y : Length of insertion

Nominal size < 500 mm; 0.5D approx.

Nominal size ≥ 500 mm; 0.2D approx.

D = Inner dia. of piping

Confirm the actual insertion length on the delivery specification.



● **Fixed Type**

Converter: Separate type

Nominal size to be applied: 200 to 1300 mm

(If nominal size of the pipe exceeds 1300mm, different dimensions will apply. Please consult OVAL.)

Ln: Height of mounting neck (st'd. 100 mm)

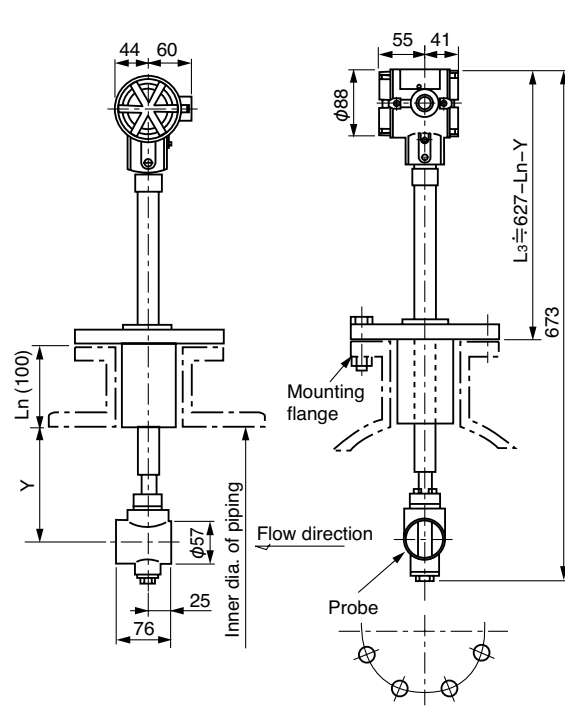
Y : Length of insertion

Nominal size < 500 mm; 0.5D approx.

Nominal size ≥ 500 mm; 0.2D approx.

D = Inner dia. of piping

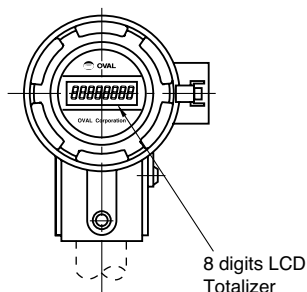
Confirm the actual insertion length on the delivery specification.



Approx. Weight : 13 kg

● **Converter PA25S**

(w/Totalizer & Digital Indicator)

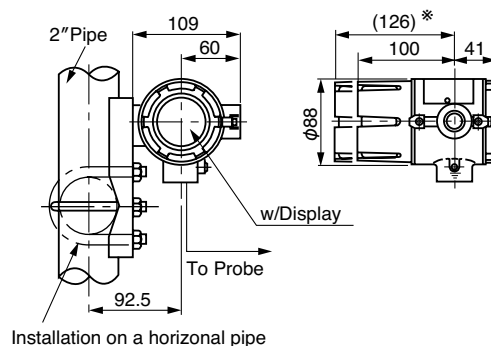


① Direction of mounting of the converter is changeable with 90° step being rotated around the center of a mounting bracket.

② Direction of a display is also changeable with 90° step being rotated within the converter.

※ In case of w/indicator

● **Separate Type Converter**



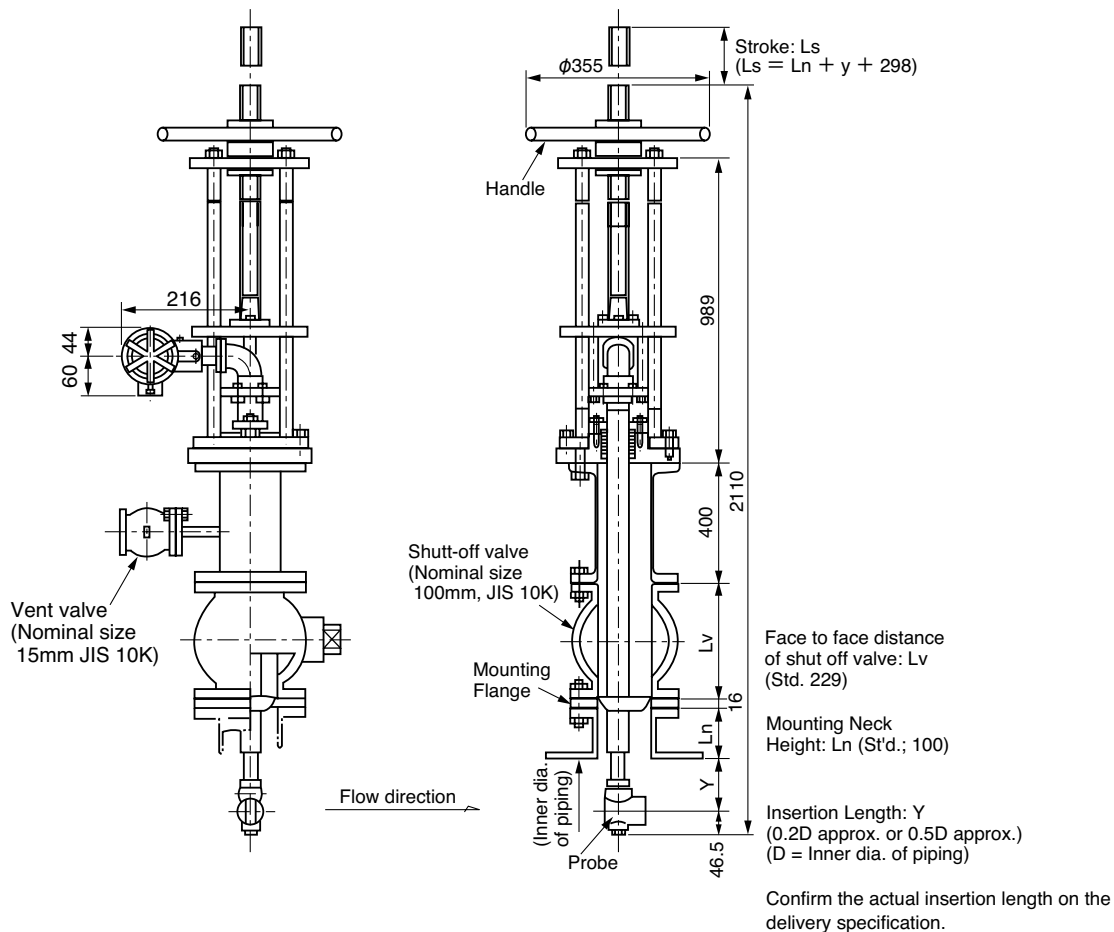
Installation on a horizontal pipe

Approx. Weight (kg)	
No Display	w/Display
1.9	2.1

- **Hot-tap type**

Nominal size to be applied: 400 to 1000mm

(If nominal size of the pipe exceeds 1000mm, different dimensions will apply. Please consult OVAL.)



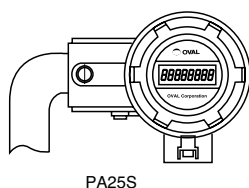
Approx. Weight : 140 kg

● Mounting Direction of Transducer

Standard: Down to the left when viewing from upper side, upstream.

Conduit connection port should face downward to prevent water intrusion.

Converter with totalizer or indicator (PA25S) : Direct reading face shall be down side of stream.



■ PRESSURE LOSS

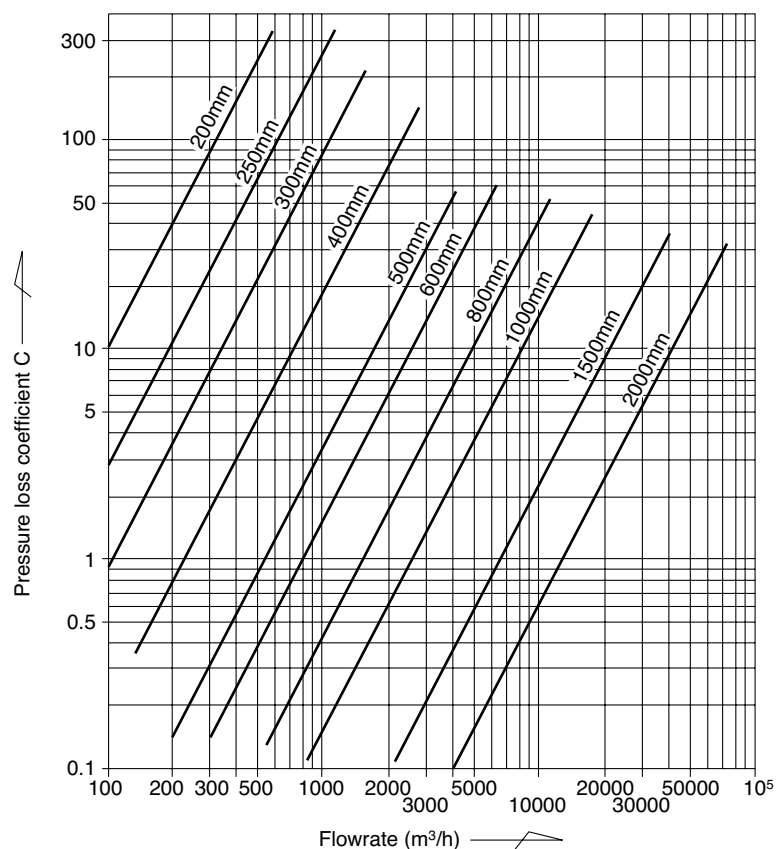
● **Liquid Service**

$$\Delta P = \frac{C \times \rho}{10^5}$$

ΔP = Pressure loss (kPa)

ρ = Density (kg/m³)

C = Pressure loss coefficient



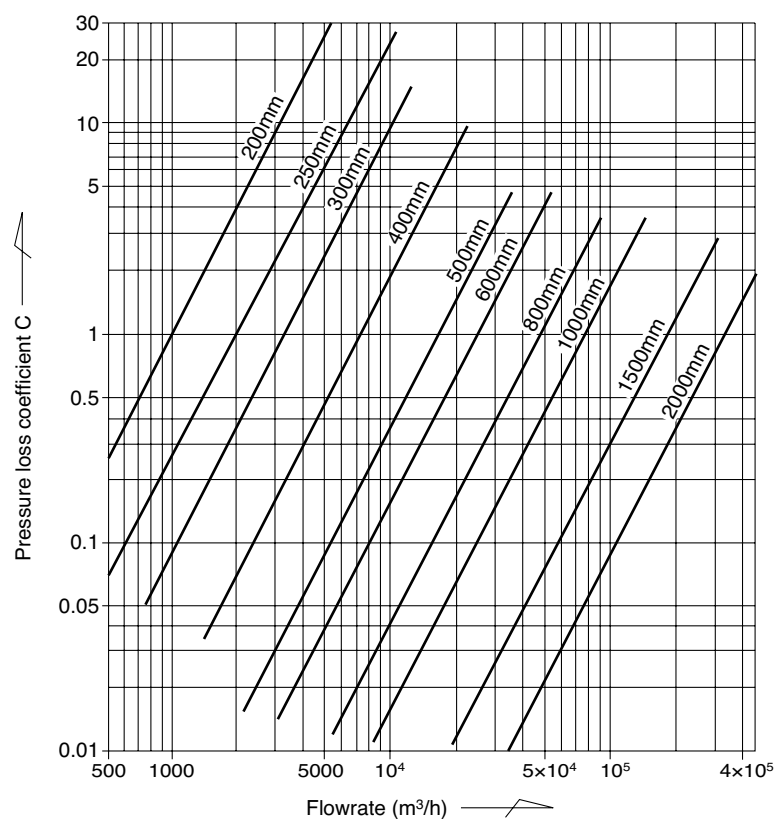
● **Gas, Steam Service**

$$\Delta P = \frac{C \times \rho}{100}$$

ΔP = Pressure loss (kPa)

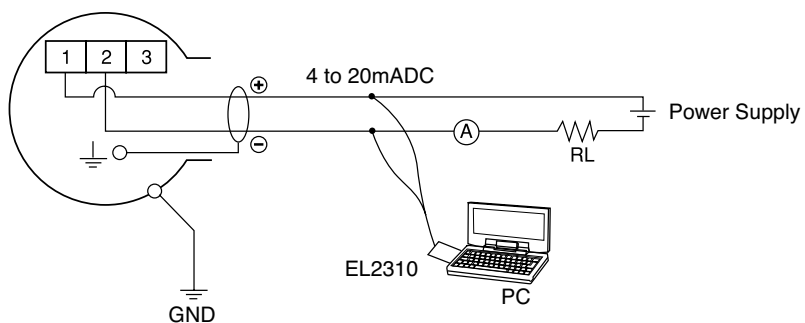
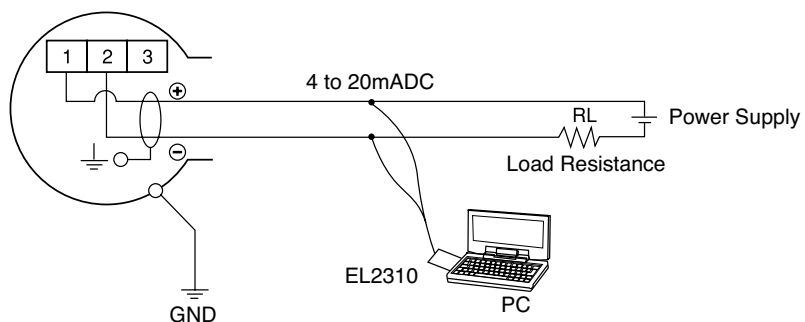
ρ = Density (kg/m³)

C = Pressure loss coefficient

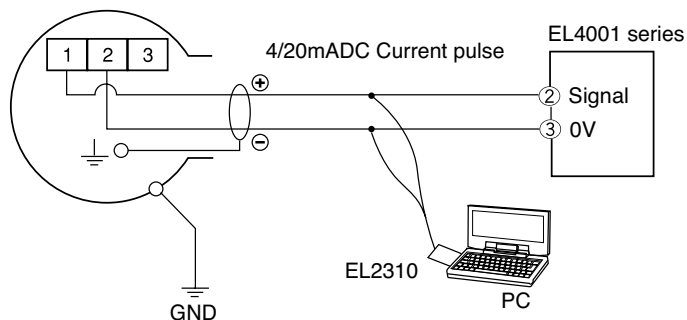
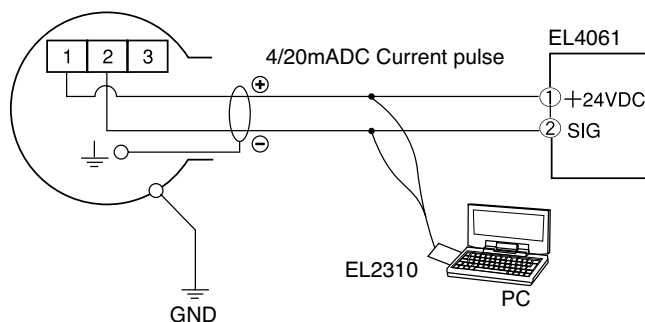


■ WIRING CONNECTIONS (an example)

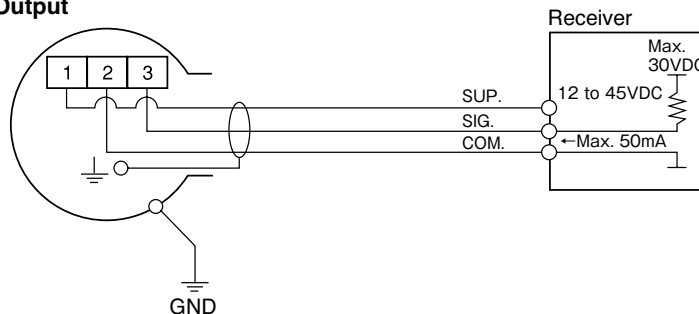
Analog Output



Pulse Output



Open collector pulse Output



*For EL2310 : Smart Communication Unit, refer to GS No.GEL104E

TYPICAL PIPING INSTRUCTIONS

In making flow measurements with inferential flowmeters, it is generally desired that the flow pattern of fluid coming into the meter be as uniform as possible. For this reason, take flow straightening into consideration when you plan to install a Delta Flowmeter.

With OVAL flow straightening devices (flow straightener and downstream pipe), straight pipe sections are in most cases not required. But if you plan to use straight pipes only, secure the straight pipe section required in accordance with the ISO standards, using a Sch. 40 pipe, as shown in the table.

Mounting:

Shorten span of a meter fixing part so as to be less affected by piping vibration.

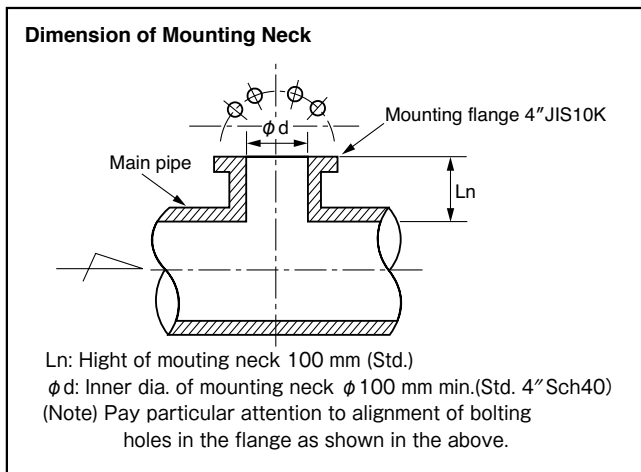
Where Straight Pipe is Used

Piping Connection	Req'd of Length (L)	Description
Reducer	15D min.	A concentric reducer upstream of meter
Elbow	23D min.	An elbow upstream of meter
	25D min.	Two elbows in horiz. plane upstream of meter
	40D min.	Two elbows in vertical. plane upstream of meter
Sluice Valve	15D min	A fully open sluice valve upstream of meter

The minimum length required for downstream pipe is 5D.

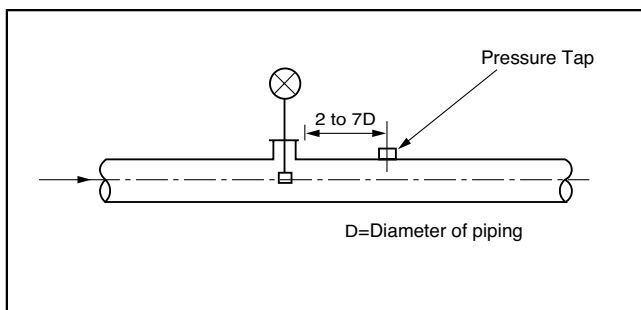
D = Piping I.D.

● Mounting Neck:



● Pressure Gage and Thermometer Installation

For pressure detection, provide the probe downstream of the flowmeter (see figure below). To avoid disturbances in the flow, temperature detection should be made downstream of the flowmeter and, at the same time, upstream of the control valve.



• Fluid to be measured shall be full in a pipe. Air vent valve is needed when non-filling flow is possible.

• Construction of working stage is recommended for securing safety maintenance operation. Lifting device is also required, in case of Hot-tapping type.

● Pulsation

Installing this flowmeter in a line where a roots-blower, compressor, etc. that produce pulsating pressures are used as blowers could subject the meter to the effects of pulsation. If such is the case, consult factory.

The value of allowable fluctuating pressure shall be given according to the following equation.

$$N < \frac{0.73 \rho V_2}{100} \text{ (kPa)}$$

where N: Fluctuating pressure (kPa)

ρ: Density of liquid to be measured (kg/m³)

V: Min. velocity (m/s)

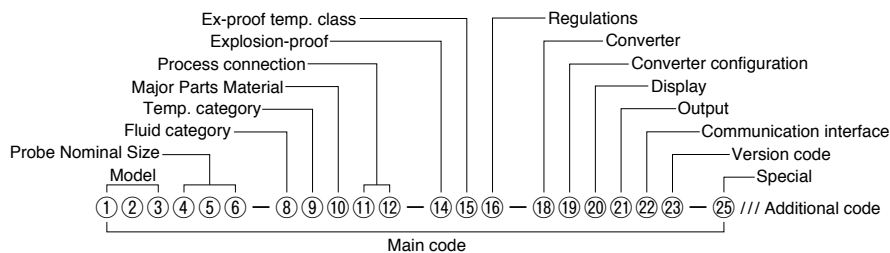
● Thermal Insulation

If it is desired to thermally insulate the pipe line, simple lagging (without mortar finish) is suggested to facilitate servicing. This arrangement will permit taking off flowmeter connecting bolts without destroying the lagging.

■ PRECAUTIONS ON USE

1. This flowmeter is developed, designed, and manufactured to be used as a flowmeter for general industrial application. Therefore, when it is used for the application where its operation is directly related to the safety of the relevant system or where the product is important in the facilities (such as process control and custody transfer), you are requested to secure sufficient safety including safety design, redundancy and duplication of the process, and implementation of periodic inspection. Do not use this flowmeter in the case where its operation and performance is directly related to human life.
2. If this flowmeter is used under appropriate conditions, it can demonstrate its stable performance without aging degradation of accuracy. However, malfunction or failure may occur due to various factors. Thus, considering the operating conditions, operating status, and importance in the process, you should study the cycle of periodic maintenance and its items of your flowmeter. In order to secure long-term and safe use, OVAL recommends the customer to verify the soundness of the flowmeter through periodic inspection every two years. For the details of inspection, contact our sales agent or person in charge.
3. This flowmeter is manufactured, adjusted, and inspected to meet the conditions of use. The fluid measured, flow range, pressure, temperature, or the like must be applied under the specified conditions. The conditions for use are stated in the nameplate attached to the flowmeter converter and specification sheet supplied with the product.

■ PRODUCT CODE EXPLANATION



●Main code

①	②	③	Model	
V	X	S	EX DELTA II Insertion Type Fixed Type	
V	X	H	EX DELTA II Insertion Type Hot-tap Type	
④	⑤	⑥	Probe Nominal Size	
0	5	0	50mm (2")	
⑦	—			
⑧	Fluid category			
L	Liquid			
G	Gas			
S	Saturated Steam			
K	Heating Steam			
⑨	Temp. category			
2	Standard (180°C and lower)			
3	High temp. (300°C and lower)			
⑩	Major Parts Material			
D	SUS304 equivalent			
Z	Special			
⑪	⑫	Process connection		
J	1	JIS10K RF (100mm)		
P	1	JPI150 RF (4")		
A	1	ASME150 RF (4")		
Z	9	Special		
⑬	—			
⑭	Explosion-proof			
0	Non-explosionproof			
1	Flameproof (TIIS) ※2		T4	
2	Flameproof (ATEX)		T1 to T6	
5	Flameproof (CSA)		T1 to T6	
A	Flameproof (GOST)		T1 to T6	
7	Flameproof (NEPSI) ※2		T4	
⑮	Ex-proof temp. class			
0	Non-explosionproof			
4	T4			
6	T6			
7	T1 to T6			
⑯	Regulations			
0	Standard			
G	High Pressure Gas Safety Act (Approved product)		※w/Material test certificate	
H	High Pressure Gas Safety Act (Individual test)		※w/Material test certificate (Designed on PO issued)	
F	w/Material test certificate			

⑰	—
⑱	Converter
2	PA25 External power supply: 12 to 45 VDC
9	Special
⑲	Converter configuration
1	Integrally mounted
2	Separately mounted (2" pipe mounting)
⑳	Display
0	Non
1	w/Totalizer · digital indicator ※3
㉑	Output
A	Analog output
D	Current pulse output
G	Open collector pulse output
Z	Special
㉒	Communication interface
H	HART
㉓	Version code
C	Version: C
㉔	—
㉕	Special
0	Standard
Z	When "Special" or "Designed on PO issued" is chosen

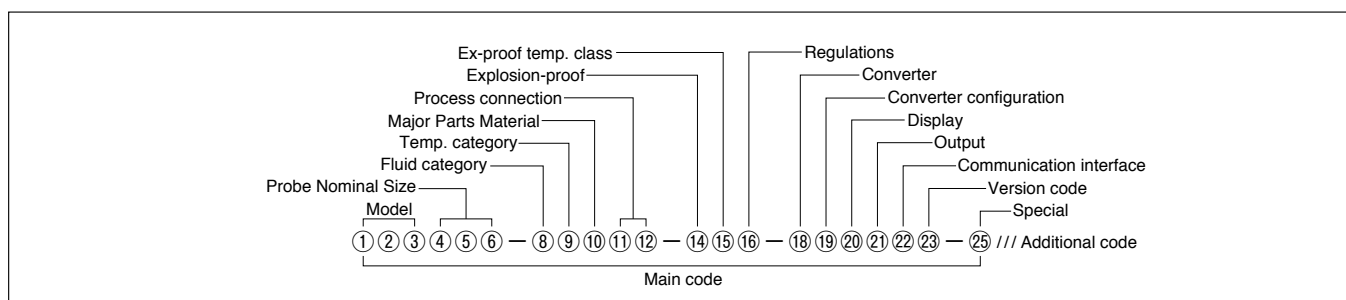
※1: Flange type is a special specification except for size 100mm (4").

Flange serration according to ASME standard complies with ASME B 16.5–2003.

※2: For the TIIS and NEPSI compliant, dedicated cable gland for the explosionproof is supplied also. Do not fail to use accordingly.

※3: By using the internal switch or EL2310, any of ①6 digits total flow, ②instantaneous flow rate, ③% instantaneous flow rate, and ④8 divided % bar graph can be displayed by switching.

■ PRODUCT CODE EXPLANATION



●Additional code

Header's Nominal Size ※Must choose				
P	S	A	200mm	Fixed Type
P	S	B	250mm	Fixed Type
P	S	C	300mm	Fixed Type
P	S	D	350mm	Fixed Type
P	S	E	400mm	Fixed Type, Hot-tap Type
P	S	F	450mm	Fixed Type, Hot-tap Type
P	S	G	500mm	Fixed Type, Hot-tap Type
P	S	H	550mm	Fixed Type, Hot-tap Type
P	S	J	600mm	Fixed Type, Hot-tap Type
P	S	K	650mm	Fixed Type, Hot-tap Type
P	S	L	700mm	Fixed Type, Hot-tap Type
P	S	M	750mm	Fixed Type, Hot-tap Type
P	S	N	800mm	Fixed Type, Hot-tap Type
P	S	P	850mm	Fixed Type, Hot-tap Type
P	S	Q	900mm	Fixed Type, Hot-tap Type
P	S	R	950mm	Fixed Type, Hot-tap Type
P	S	S	1000mm	Fixed Type, Hot-tap Type
P	S	T	1050 to 1300mm	Fixed Type
P	S	9	Special	
Mounting Neck ※Must choose				
P	N	1	Height of mounting neck: 100mm; nozzle nominal size (connecting flange size): 100mm (4") as standard	
P	N	2	Height of mounting neck: 100mm; nozzle nominal size (connecting flange size): special	
P	N	3	Height of mounting neck: special; nozzle nominal size (connecting flange size): 100mm (4")	
P	N	4	Height of mounting neck: special; nozzle nominal size (connecting flange size): special	
Category of High Pressure Gas ※Must choose				
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	
Accuracy ※Must choose				
F	2	0	±2.00% FS	FS: rated max. flow rate
Flow direction ※Must choose				
F	R	0	R→L	
F	L	0	L→R	
F	U	0	T→B: electric conduit at the bottom	Only Fixed Type
F	D	0	B→T: electric conduit at the bottom	Only Fixed Type
F	U	1	T→B: electric conduit at the top	Only Fixed Type and indoor use
F	D	1	B→T: electric conduit at the top	Only Fixed Type and indoor use
Designated special paint on body				
B	C	0	Corrosion proof	
B	A	0	Salinity and acid tolerance	Limited to 120°C and lower
B	X	0	Customer designation	Special
Designated special paint on transmitter				
S	F	0	Corrosion proof	Special
S	D	0	Salinity tolerance	
S	E	0	Acid tolerance	Special
S	X	0	Customer designated paint	Special
S	Z	9	Special	Special
Cleansing				
T	W	0	Non-oil and non-water treatment	Hot-tap Type is special
T	W	1	Non-oil and non-water treatment equivalent	

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) Unavailable for the Japan law compliant
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	M	J	Magnetic particle inspection (Japanese) Welded part of pressure resistant vessel
S	M	E	Magnetic particle inspection (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	U	J	Ultrasonic inspection (Japanese) Welded part of pressure resistant vessel
S	U	E	Ultrasonic inspection (English) Welded part of pressure resistant vessel
S	X	J	PMI test report (Japanese) ※1
S	X	E	PMI test report (English) ※1
S	S	J	Impact test report (Japanese) ※1
S	S	E	Impact test report (English) ※1
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)
Witnessed by customer			
V	1	0	Required

*1: Need not choose the item when required to implement in Japan law and regulation. Only for items other than the legal requirement, customer can choose as special requirement.

■ When making inquiries, please specify the following:

Fill in the blanks or check ☐ with ☒ mark.

Item	Description
1. Fluid to the metered	
2. Flow range	Max. _____ Normal _____ Min. _____ <input type="checkbox"/> m³/h[normal] <input type="checkbox"/> m³/h[actual] <input type="checkbox"/> kg/h
3. Temp. range	Max. _____ Normal _____ Min. _____ °C
4. Press. range	Max. _____ Normal _____ Min. _____ <input type="checkbox"/> MPa <input type="checkbox"/> MPa[gauge]
5. Density or Sp. Gr.	Density _____ <input type="checkbox"/> kg/m³ [normal] <input type="checkbox"/> kg/m³ [actual] Sp. Gr. _____
6. Viscosity	_____ <input type="checkbox"/> mPa·s, <input type="checkbox"/> mm²/s at _____ °C
7. Actual inner Dia. of mainline pipe	_____ mm Actual inner Dia _____ mm
8. Type of mounting	<input type="checkbox"/> Fixed Type. <input type="checkbox"/> Hot-tap Type
9. Flow straightening device:	<input type="checkbox"/> Req'd (Straightener and downstream pipe) <input type="checkbox"/> Not req'd (Please prepare the straightening pipe of specific length, bore and Sch. No.)
10. Compensation	<input type="checkbox"/> Requested <input type="checkbox"/> Not requested
11. Compensation range	Temp. _____ to _____ °C, Pressure _____ to _____ <input type="checkbox"/> MPa <input type="checkbox"/> MPa[gauge]
12. Compensation ref.	Ref. temp. _____ °C Press. ref. _____ <input type="checkbox"/> MPa <input type="checkbox"/> MPa[gauge]
13. Compensation coeff. (In case of gas measurement)	Z (service conditions) = _____ Zo (standard conditions) = _____
14. Converter	Type : <input type="checkbox"/> Integral construction <input type="checkbox"/> Separate construction Explosionproof construction : <input type="checkbox"/> Non-explosionproof <input type="checkbox"/> Intrinsic safe
15. Output	<input type="checkbox"/> Unscaled pulse, <input type="checkbox"/> Scaled pulse, Pulse unit _____ / P <input type="checkbox"/> Analog output, Full scale _____ to _____ / h
16. Receiving instrument	<input type="checkbox"/> Separate-mount LCD counter <input type="checkbox"/> Remotely located receiver (Specify model and spec.)
17. Explosion-proof construction	<input type="checkbox"/> Not requested <input type="checkbox"/> Requested
18. Miscellaneous	

The specification as of June, 2017 is stated in this GS Sheet. Specifications and design are subject to change without notice.

Sales Representative: