



New Single Straight Tube Type OVAL Coriolis Mass Flowmeter

ST_{mass} MK II

Transmitter : MT9603

GENERAL SPECIFICATION
GS.No.GBN034E-12

■ GENERAL

The STmass MKII is a user friendly Coriolis mass flowmeter capable of making direct mass flowrate measurement with a single straight tube.

Combined with our sensor technologies and most advanced electronics techniques accumulated over many years, this perfect full-moon shaped mass flowmeter finds a wide range of applications with a high degree of metering accuracy.

■ FEATURES

1. The sensor body has a welded one-piece construction made of stainless steel in a single straight tube design.
2. The transmitter has integrally mounted with, or remotely mounted from.
3. Has no pocket for the process fluid to accumulate most desirable from an ease-of-cleaning point of view.
4. Process connections can be finished so as to comply with sanitary requirements.
5. Compact design reduces space requirements for pipeline
6. Absence of moving parts enables long time use and ease of handling.
7. Communication interface is a standard feature
8. Explosionproof configuration permits installation in hazardous locations.
9. Except for S080, the models are the Japanese High Pressure Gas Safety Law compliant (flow tube material: SUS316L).



Lack mount type
Transmitter
MT9603
(GS.No.GEJ513)

Архангельск (8182)63-90-72
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■ GENERAL SPECIFICATIONS

● Sensor unit

Item		Description					
Model		S010C	S015C	S025C	S040C	S050C	S080C
Nominal size		15mm or 1/2"	15mm or 1/2"	25mm or 1"	40mm or 1-1/2"	50mm or 2"	80mm or 3"
Materials	Wetted parts	SUS316L					
	Housing	SUS304					
Process connection		JIS 10, 20K RF, ASME/JPI 150 RF, IDF ferrule					
Applicable fluid		Liquid					
Temp. range	Non-explosionproof type	-25 to +130°C					
	Explosionproof type	-20 to +130°C					
Density range		0.5 to 1.0g/mL, 0.7 to 1.3g/mL, 1.0 to 1.5g/mL					
Max. operating pressure		Up to 2.45MPa (Depends on flange rating)					
Sensor housing withstanding pressure		2.8MPa					
Flow direction		Normal or reverse					
Explosionproof configuration		See the transmitter specifications below.					

※1 : The density range varies depending on the fluid to be used. Also, please consult OVAL if density measurement is required.

● Transmitter

Item		Description
Model		MT9603
Companion Flowmeter		Straight-tube mass flowmeter STmass MKII sensor unit
Rangeability	Flowrate	Depends on the standard performance table of the sensor ※1
	Temperature	-25 to 115°C (Nonexplosionproof model -25 to +130°C) (NOTE: Depends on the operating temp. range of sensor unit.)
Power supply		85 to 264VAC 50/60Hz or 20 to 30VDC
Power Consumption		Max. 25VA, or Max. 10W
Ambient Temperature		-10 to +50°C
Transmission Length		200 meters max. (sensor to transmitter) using a dedicaed 10-conductor cable ※2
Explosionproof configuration		Intrinsically safe explosionproof [Exia] IIB
Installation		Rack mount type (installed in a nonhazardous location)
Finish		Munsell N6.0 (grey)
Approx. Weight		1.8kg
Communication Interface		Bell202 (under HART protocol) ※3
Remote Zero		Communication, zeroing button, or status input (option)
Pulse Output		Open collector output (standard) (Min.10V to Max.30V, 50mADC) or voltage pulse (option) "0" : 0V, "1" : 15V Output impedance 2.2kΩ FS 0.1 to 10000Hz
Analog Output	ANA 1	4 to 20mADC Max. load resistance 600Ω 2 outputs from mass flowrate and temperature Added damping : 0 to 200 sec.
	ANA 2	
Status Input		Contact-closure input (Form "a" contact) Close : 200Ω max. Open : 100kΩ min. Select one from function OFF (default), remote zero, total counter reset, or 0% signal lock.
Status Output		Open collector output (10V min. to 30Vmax., 50mADC) Normal : ON; Error : OFF Select one from error (default), flow dir., zeroing in progress, or Hi/Low alarm.
Drive Voltage Output		DC voltage output (test output)

※1 : 1% or less of max.,allowable flowrate is cut off. (Standard setting)

※2 : If it exceeds 200 meters, consult the factory.

※3 : Bell 202 is superimposed on Analog Output 1 (when connected to Smart com. unit EL2300).

GENERAL PERFORMANCE

Item		Description					
Model		S010C	S015C	S025C	S040C	S050C	S080C
Flowrate	Normal flow range (kg/h)	0 to 720	0 to 2400	0 to 7200	0 to 18000	0 to 36000	0 to 72000
	Allowable flow range (kg/h)	0 to 1080	0 to 3600	0 to 10800	0 to 27000	0 to 54000	0 to 108000
	Min. range (kg/h)	0 to 72	0 to 240	0 to 720	0 to 1800	0 to 3600	0 to 7200
	Accuracy in factory calibration	[±0.2% ± zero stability error] of RD					
	Repeatability	[±0.1%±1/2 zero stability error] of RD					
	Zero stability (kg/h)	0.36	1.2	3.6	9	18	36
Analog accuracy	MT9603	Accuracy at the flow rate ±0.1% of FS					

Zero stability error=

Zero stability (kg/h)

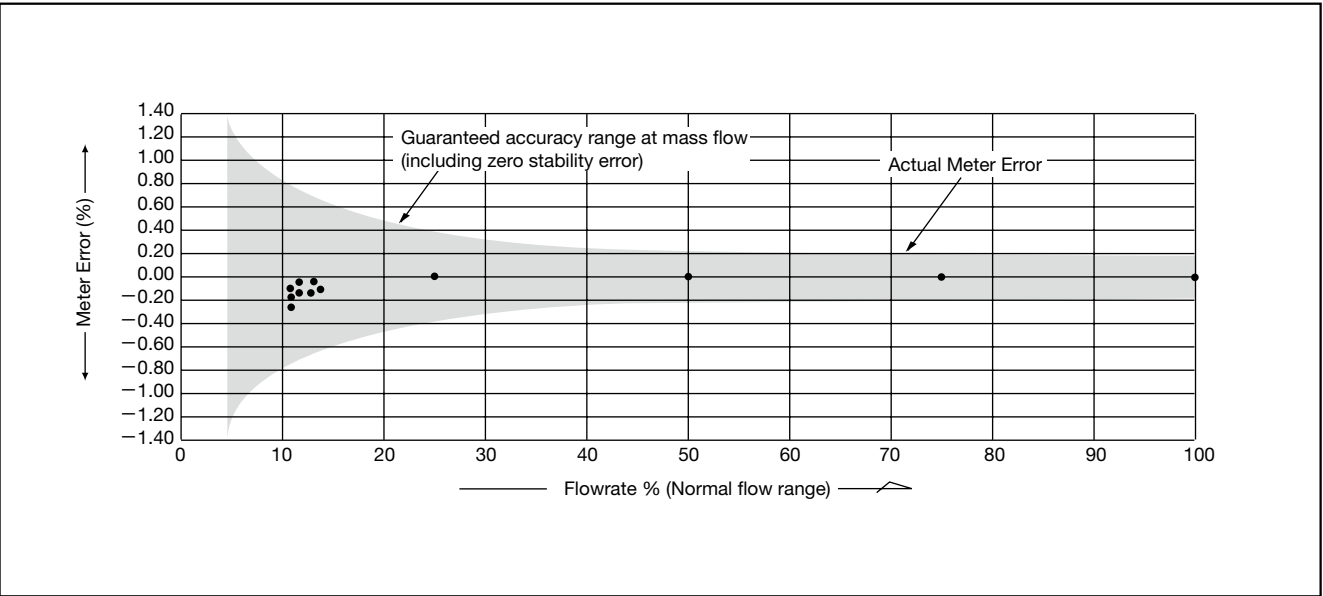
Flowrate at that time (kg/h)

× 100%

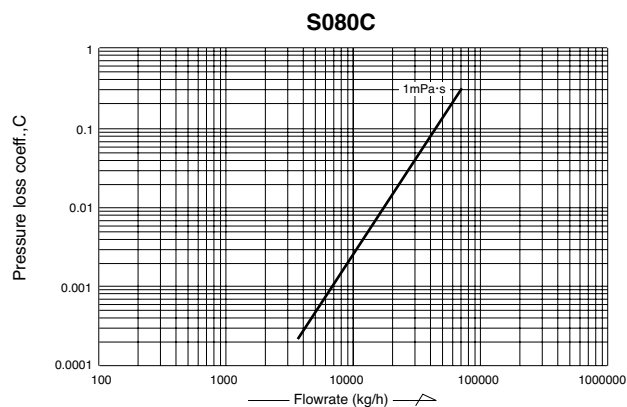
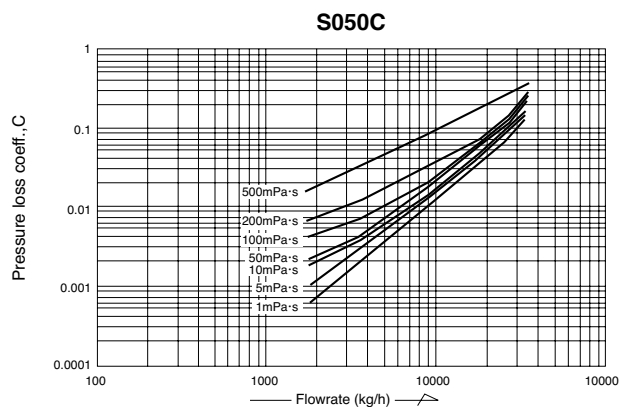
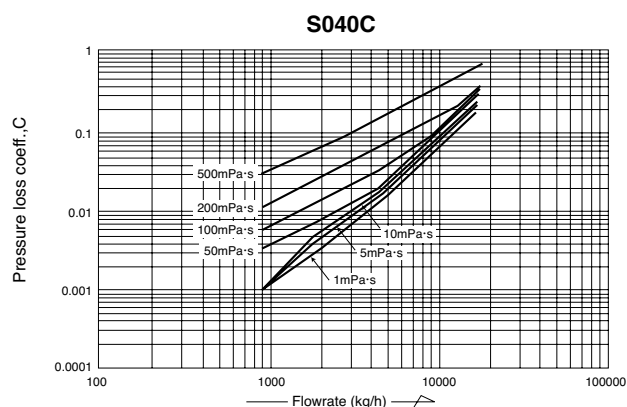
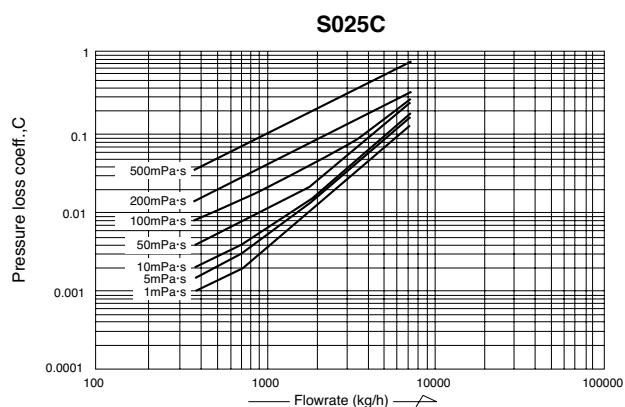
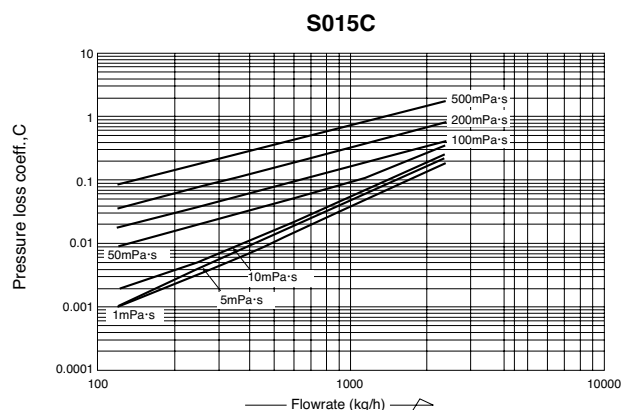
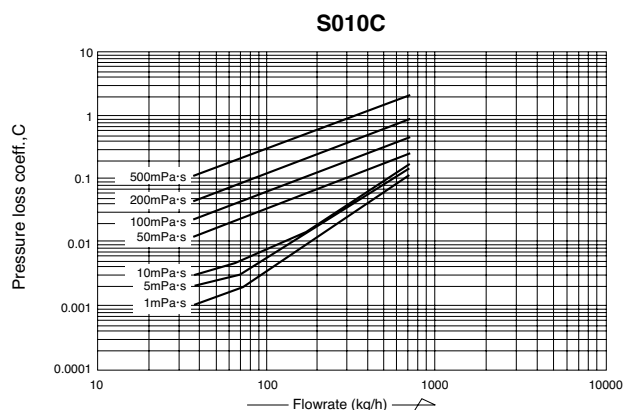
Notes :

If the temperature of the fluid to be measured changes accidentally during measurement (mass or density) or if the flowmeter is used under the condition possibly causing large temperature difference between its inner tube and outer tube, precise measurement may not be achieved.

METER ERROR



■ PRESSURE LOSS



How to determine pressure loss

- Find the pressure loss factor C from flowrate (kg/h) and viscosity (mPa·s).
Dividing the obtained value C by specific gravity d (1 for water) gives the pressure loss. That is,

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

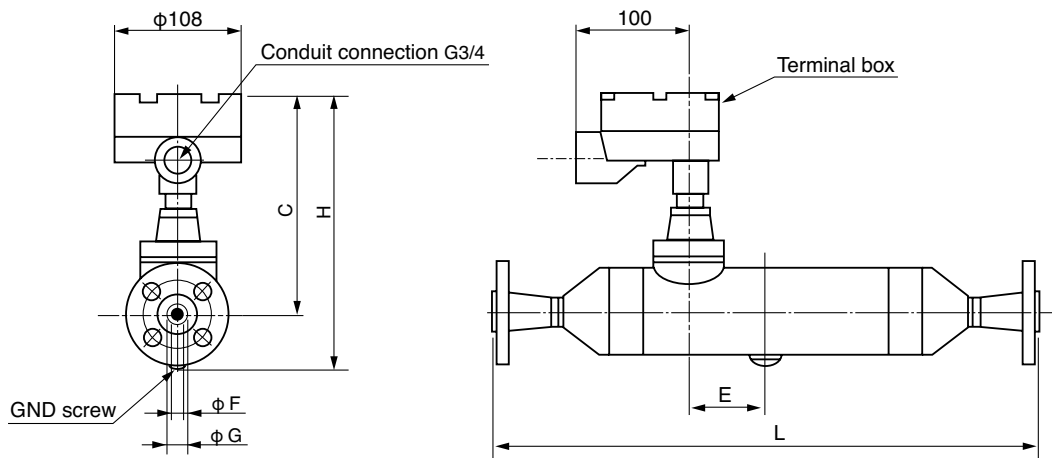
- For high viscosity liquids not shown in these graphs, calculate the pressure loss by the following formula:

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

- where ΔP_2 : Pressure loss of high viscosity liquid (MPa)
 μ_1 : Max. viscosity shown in the graph (mPa·s)
 μ_2 : Viscosity of high-viscosity liquid (mPa·s)
 d : Specific gravity of high-viscosity liquid (1 for water)
 C : Pressure loss factor found from the max. viscosity curve at a given flowrate (kg/h).

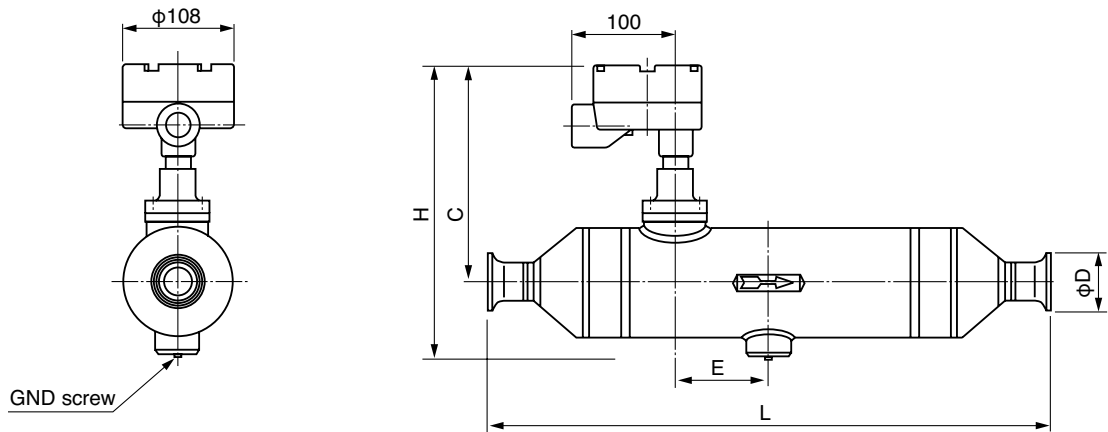
DIMENSIONS [Unit in mm]

Flange connection



Model	JIS 10K	ASME 150	H	C	ϕF	ϕG	E	Weight (kg)
	L	L						
S010C	426	458	246	197	5.0	16.8	69	7
S015C	464	496	246	197	7.4	16.8	80	9
S025C	529	570	280	210	12.4	26.6	88	16
S040C	716	749	296	210	17.8	40.4	112	25
S050C	882	919	332	229	26.4	52.6	153	35
S080C	1032	1073	371	253	38.0	77.8	176	66

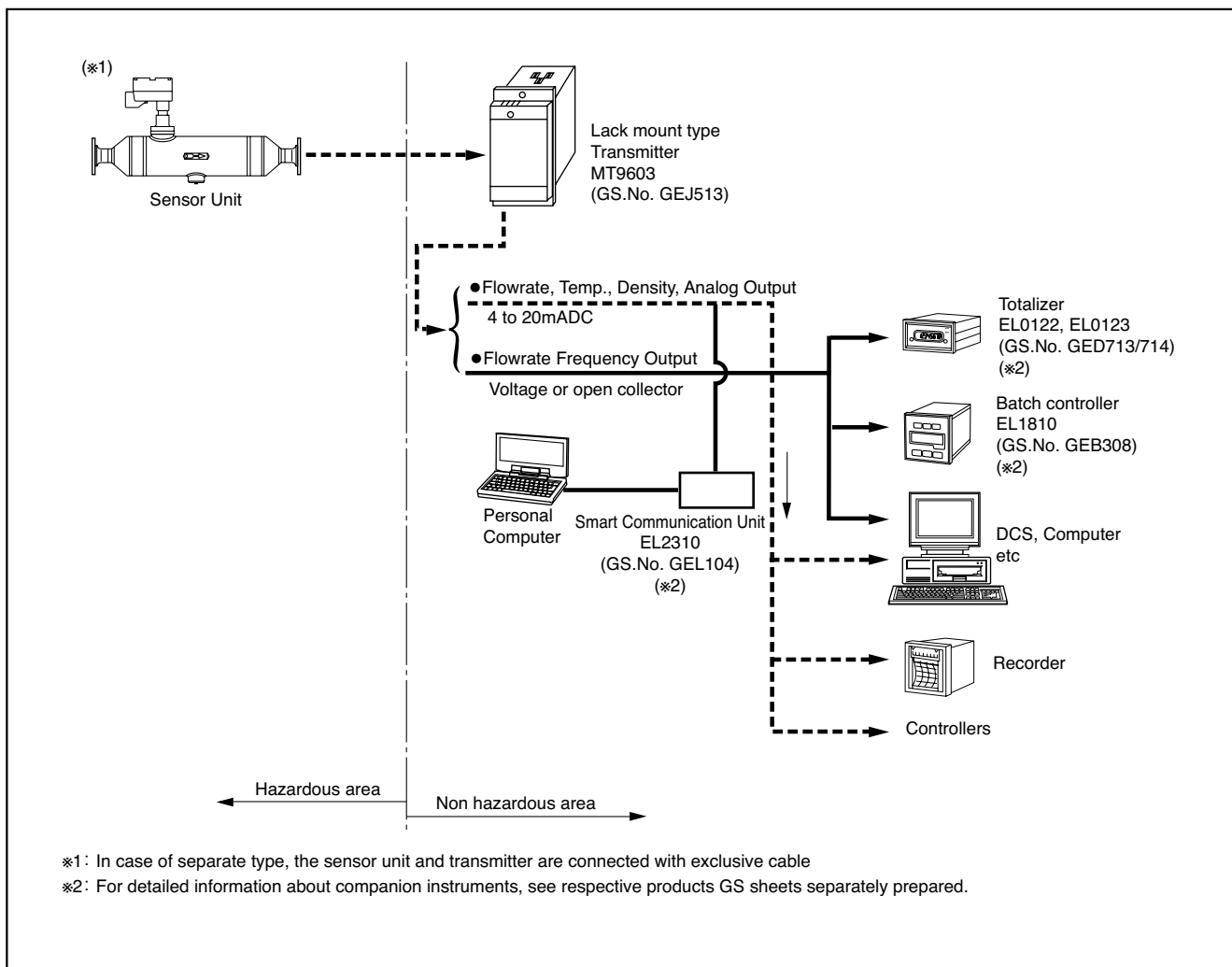
Ferrule connection



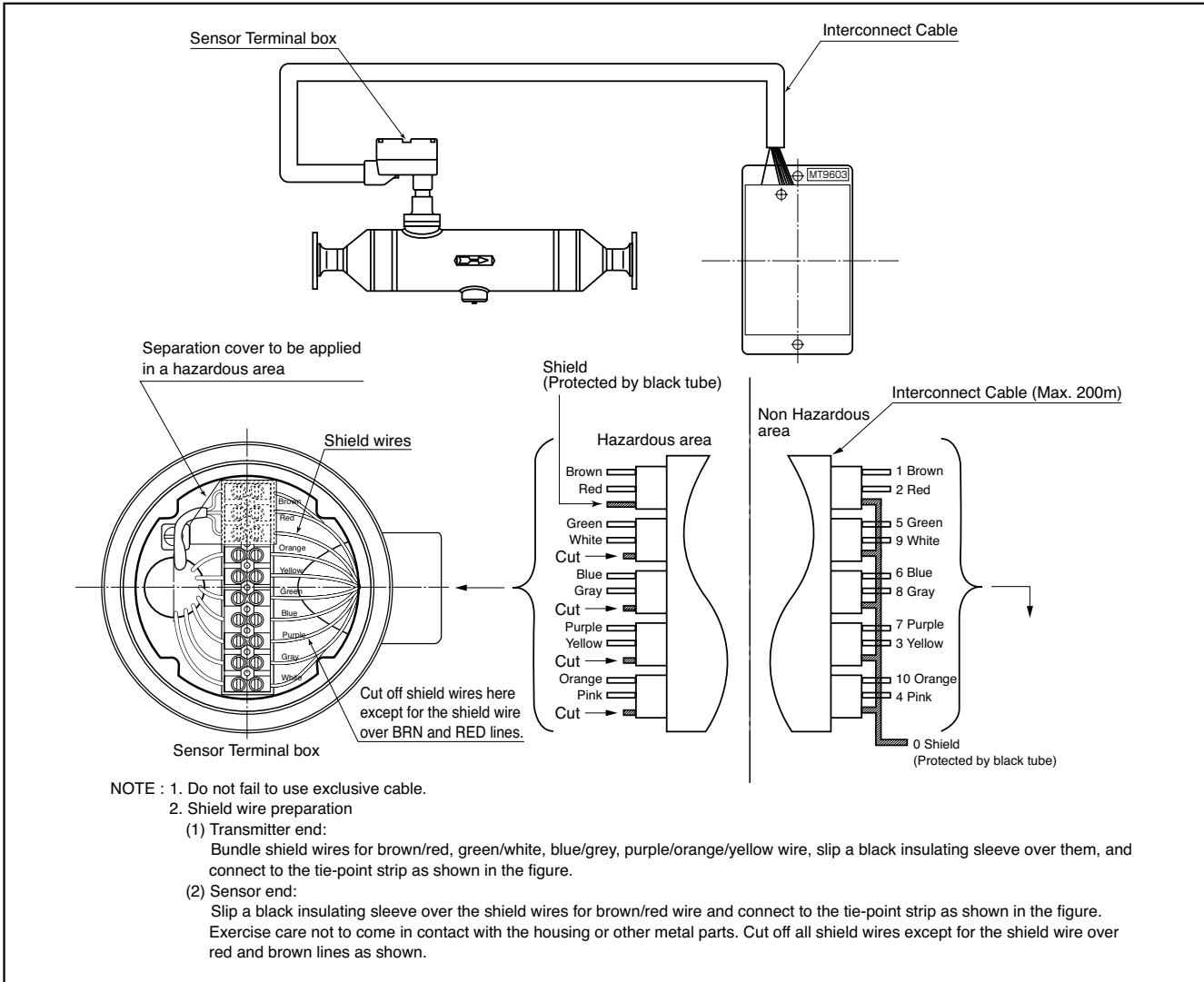
Model	Nominal size	L	H	C	ϕD	E	Weight (kg)
S010C	15A	426	246	197	34	69	6
S015C	15A	464	246	197	34	80	7
S025C	1 · 1/2S	529	280	210	50.5	88	13
S040C	2S	716	296	210	64	112	21
S050C	2 · 1/2S	882	332	229	77.5	153	31
S080C	—	—	—	—	—	—	—

Nominal size : A :mm, S :Inch Sanitary version

■ REMOTE MEASURING SYSTEM



■ WIRING



■ Terminal Identification (MT9603)

Item	Terminal No.	Label	Description	Cable Color	Remarks
Intrinsically Safe Side	1	DRIVE SIG.	Drive output to flow tube	BRN	1. Use 10-conductor dedicated interconnect cable. 2. Bundle BRN/RED, GRN/WHT, BLU/GRY, YEL/PUR, ORG/PNK shielded wires and slip black tubing over them.
	2	DRIVE 0V		RED	
	E	EARTH	Kind A ground work		
	3	TEMP. B	Temperature input	ORD	
	4	TEMP. b		YEL	
	0	SHIELD		BLK	
	5	(+) L.P.O		GRN	
	6	(+) R.P.O		BLU	
	7	TEMP. A		PUR	
	8	(-) R.P.O		GRY	
	9	(-) L.P.O		WHT	
	10	TEMP.A'	Outer temperature input	ORD	
Nonintrinsically Safe Side	1	N.C.	Common		1. Use twisted pair AWG24 to 16 shielded wires for output wiring. 2. Max. load resistance 600 Ω for analog outputs 1 and 2 3. Frequency output (voltage pulse) transmission length 20 meters Max. (at 5kHz) 100 meters Max. (at 1kHz) 1 kilometer Max. (at 100Hz)
	2	N.C.			
	3	COM.			
	4	D.GAIN			
	5	(+) ANALOG 1	Analog output 1		
	6	(-) ANALOG 1			
	7	(+) PULSE	Frequency output : Voltage pulse or open collector pulse		
	8	(-) PULSE			
	9	(+) ANALOG 2	Analog output 2		
	10	(-) ANALOG 2			
	11	(+) STOUT	Error (Standard), flow direction, zeroing during adjustment, or hi/low alarm output		
	12	(-) STOUT			
	13	(+) STIN	Function OFF (Standard), remote zero, total counter reset, or 0% signal lock (a contact)		
	14	(-) STIN			
	15	N.C.			
	16	N.C.			
Power	L1	LINE/L1 (+)	Power supply		1. DC of Power supply L : +, N : -
	L2	LINE/L2 (-)			
	G	GND	Ground		

MT9603

INTRINSICALLY SAFE SIDE

1 BRN	DRIVE SIG.	3 YEL	TEMP. B	5 GRN	LPO (+)	8 GRA	RPO (-)
2 RED	DRIVE 0V	4 PIN	TEMP. b	6 BLU	RPO (+)	9 WHT	LPO (-)
E	EARTH	0 BLK	SHIELD	7 VIO	TEMP. A	10 ORN	TEMP. A'

NON INTRINSICALLY SAFE SIDE

1	N.C.	5	⁺ ANALOG	9	⁺ ANALOG	13	⁺ ST IN
2	N.C.	6	1 —	10	2 —	14	—
3	COM.	7	⁺ PULSE	11	⁺ ST OUT	15	N.C.
4	D.GAIN	8	—	12	—	16	

POWER SUPPLY

L1 (+)	GND	L2 (-)
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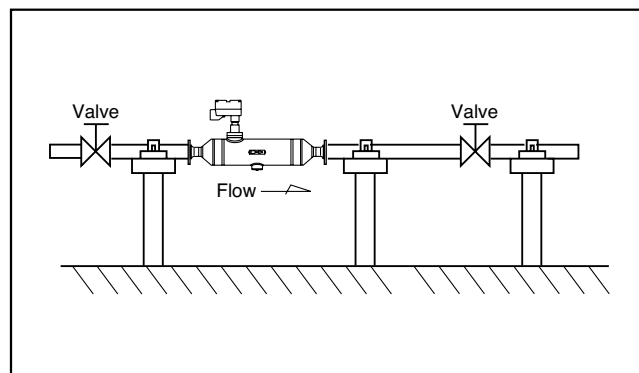
OVAL Corporation

Do not fail to connect EARTH terminal to the ground earth of kind A (explosionproof) or kind D (Non-explosionproof).

■ STANDARD INSTALLATION

1. Typical Installation (See figure at right.)

- 1) Avoid pipeline stresses on the STmass MKII.
- 2) The STmass MKII should be supported near and between connections to the process pipelines.
- 3) Avoid supporting the STmass MKII body directly.
- 4) Pipeline should be arranged such that the STmass MKII 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 STmass MKII 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 130°C. Explosionproof models require the temperature to be held below their maximum allowable levels.

- 3) The sensor unit is of gastight configuration. 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 STmass MKII.
In an arrangement where cavitation may possibly take place, locate it at least 5 meters away.

3. Physical Orientation

The sensor unit may be installed either in a horizontal or a vertical line. Installation in a vertical run facilitates fast process fluid replacement and self draining; you can make the most of the desirable characteristics of the single straight-tube STmass MKII.

	Horizontal Piping	Vertical Piping
	No. 1	2
Installation Position		

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

■ PRODUCT CODE EXPLANATION

● Sensor unit

Item	Code No.												Description		
	①	②	③	④	⑤	⑥	—	⑦	⑧	—	⑨	⑩		⑪	⑫
Model	S														STmass MK II
Nom. size	0	1	0												15mm
	0	1	5												15mm
	0	2	5												25mm
	0	4	0												40mm
	0	5	0												50mm
	0	8	0												80mm
Construction			C	—											To be coupled to a field-mount transmitter
Material				S	S	—									SUS316L
Connection type								3							Flange connection
								4							Ferrule connection
Connection type								1						JIS	
								2						ASME	
								3						JPI	
								4						IDF	
Pressure rating								0						Ferrule (5K)	
								1						10K	
								2						20K, 150Lb	
Density range								2						0.5 to 1.0g/mL	
								3						0.7 to 1.3g/mL	
								4						1.0 to 1.5g/mL	
Installation mode of transmitter								R							MT9603

● Rack mount type Transmitter (MT9603)

Item	Code No.						Supplementary Corde							Description	
	①	②	③	④	⑤	⑥	—	⑦	⑧	⑨	⑩	⑪	⑫		⑬
Model	M	T	9	6	0	3	—								Rack-mount type transmitter
Power supply								6							20 to 30VDC
								7							85 to 264VAC, 50/60Hz
Analog output								M	M						2 mass flowrate outputs (1 output inclusive)
								M	T						Mass flowrate output + temperature output
Pulse output										1					Mass flowrate voltage pulse
										3					Mass flowrate open collector
Status output											1				Error output
											2				Flow direction
											3				Zeroing in progress
											4				Hi/Low alarm output
Explosionproof											0				Non-explosionproof
											1				TIIS (Technology Institute of Industrial Safety, Japan)
												A			Always “A”

■ PLEASE SUPPLY THE FOLLOWING INFORMATION WHEN YOU INQUIRE.

1. Process fluid (※1)	Name_____ Sp.gr._____ Viscosity_____	
	Concentration_____%	
2. Flow range	Max._____ Normal_____ Full scale_____ ☐ kg/min. ☐ kg/h	
3. Fluid temperature	Max._____°C Normal_____°C Min._____°C Sudden temperature change : Yes, No	
4. Operating pressure	Max._____MPa Normal_____MPa Min._____MPa	
5. Ambient temperature	Max._____°C Min._____°C	
6. Fluid flow direction	☐ Left→Right ☐ Right→Left ☐ Bottom→Top (☐ Top→Bottom)	
7. Nominal size	☐ _____mm ☐ _____inch	
8. Required accuracy	± _____ % of reading ± _____ % of full scale	
9. Process connection	☐ Flanged connection (Flange rating) ☐ Ferrule connection	
10. Explosionproof	☐ Required ☐ Not required	
11. Power supply	Power_____V ☐ AC ☐ DC	
12. Output specifications	Pulse output	☐ Volt. pulse : [0] : 1.5V [1] : 15VDC min. Out. impedance : 2.2kΩ
		☐ Open collector : Min.10V to Max. 30VDC, 50mA
		☐ Output frequency : Any point from 0.1 to 10000Hz at full scale
	Analog output	4 to 20mA DC Max. load : 600Ω
		2 outputs from instant. flowrate, temp.
	Additional damping	0 to 200sec.(variable)
13. Companion receiver	☐ Totalizer ☐ Indicator ☐ Recorder ☐ Flow controller ☐ Batch controller ☐ Computer ☐ Others	
14. Transmission length	Sensor unit (→) m	Transmitter (→) m (5m Max.)
15. Exclusive cable length	_____ m (200m Max.)	
16. No. of units required		
17. Application		
18. Other considerations		

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

※2 : Option

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