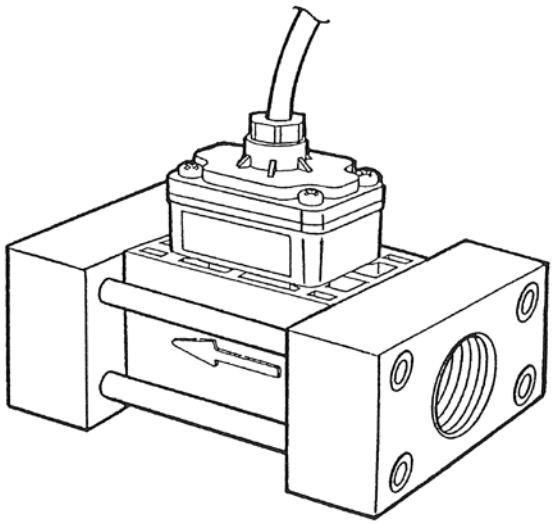
SPARLING/OVAL

OPERATION MANUAL

Vortex Flow Monitor

Eggs DELTA *Pulse*

MODEL : FLP□□—$^{L\ 1}_{G\ 2}$□A



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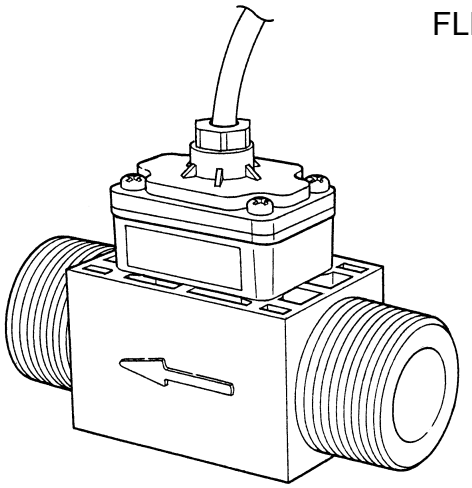
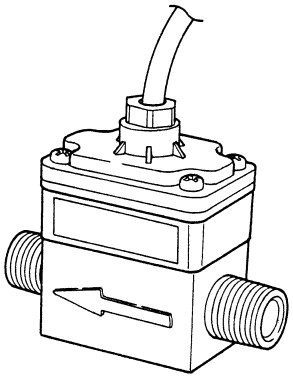




FLP□□—$^{L\ 1\ P}_{G\ 2\ N}$A

Every Sparling/OVAL vortex flow monitor Eggs DELTA Pulse is fabricated and shipped from our factory under stringent quality control. In order to maintain its design performance throughout its life, this manual offers the operator the necessary installation, operation and maintenance information. Be well familiar with these instructions before you place the meter in service and keep this manual at the field location for ready reference.

CONTENTS

CONVENTIONS

Shown in this manual are the signal words NOTE, **CAUTION** and **WARNING**, as described in the examples below:

➡ NOTE: Notes are separated from the general text to bring the user's attention to important information.

⚠ **CAUTION: Caution statements signal the user about hazards or unsafe practices which could result in minor personal injury or product or property damage.**

⚠ **WARNING: Warning statements signal the user about hazards or unsafe practices which could result in severe personal injury or death.**

■ Reminder

We are not liable for faulty conditions of, or damage to this product, and consequential damage to properties or personnel caused by any of the following:

- Modification and repair made by others than by Sparling/OVAL
- Consequence of using a product made by others
- Failure to observe the precautionary notes, operating conditions, or procedure prescribed in this manual
- Natural disasters, such as fire, earthquake and thunderbolt

1. BEFORE YOU BEGIN

Every **Eggs DELTA Pulse** is thoroughly inspected and tested before it leaves the factory. When received, it should be thoroughly inspected for indication of rough handling during transit.

Be sure to adhere to the following instructions:

⚠ CAUTIONS

1. **Eggs DELTA Pulse is not compatible with flammable, corrosive, or toxic fluids.**
2. **Eggs DELTA Pulse is made of synthetic resin; avoid exposure to the sun.**
3. **Eggs DELTA Pulse is a non-explosionproof product and is not serviceable in explosionproof areas (hazardous locations).**

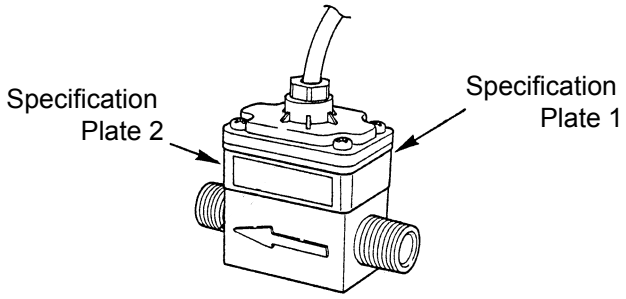
⚠ WARNING: Negligence of the above warnings can result in damage to the product.

Necessary handling precautions are described in this section; read the instructions carefully.
As for other information, find the respective sections.
For any inquiries, contact your nearest Sparling/OVAL designated sales office.

➡ NOTE: When you make inquiries, include the product name, model number, stock number, ratings and other pertinent information.

1.1 Confirming the Specification Plates

Eggs DELTA Pulse is assembled and adjusted according to individual customer specifications. Product code number and ratings are stated on the sides of preamplifier. Make sure that the ratings shown conform to your particular specifications, along with GENERAL SPECIFICATIONS on page 9 and PRODUCT CODE EXPLANATION on page 10.



MODEL :
S / No.
FLUID :
L / min

Specification Plate 1

BRN : +12～24VDC
GRN : SIG (PULSE)
WHT : COM (0V)
P : mL/P

Specification Plate 2

1.2 Transportation Considerations

(1) It is desirable that **Eggs DELTA Pulse** be transported to the installation site in the shipping container used for transit from the factory.
(2) **Eggs DELTA Pulse** is adjusted and inspected as one complete assembly consisting of the flowmeter body, sensor subassembly, and preamplifier. Be sure to treat them as an integral assembly, not attempting to disassemble them.

1.3 Storage Considerations

If Eggs DELTA Pulse upon receipt is to be stored for long periods of time before installation, unexpected faulty conditions could arise. If a long-term storage is anticipated, take the following precautions:
(1) Keep the equipment in store in the same shipping container used for transportation from Sparling/OVAL if possible.
(2) Place of storage should conform to the following requirements:
★ Free from rainwater and moisture.
★ Free from vibration and impact shocks.
★ Temperature and relative humidity in the storage place are at room temperature and humidity (around 25°C and 65%).

(3) Purge the **Eggs DELTA Pulse** that has once been placed in service with clean air, nitrogen gas, etc. to prevent the metered fluid from adhering to the meter connections, piping inner walls, housing, etc. before storage. (Wash clean with suitable detergent if necessary).

⚠**CAUTION: Do not use solvents, such as thinner or alcohol, for cleansing.**

(4) For long-term storage, it can best be stored in the shipping container used for transportation from the factory.

2. OPERATING CONDITIONS

Eggs DELTA Pulse operating conditions appear on its specification plates, in the installation requirements on pages 5 and 6 and the general specifiactions on page 9.

3. GENERAL

Eggs DELTA Pulse, a small, lightweight vortex flowmeter, uses a piezoelectric sensor. Behind the bluff body, Von Karman vortices form and shed proportional to the rate of flow on alternating sides of the bluff body placed perpendicular to the stream of flow.
Eggs DELTA Pulse picks up the frequency of these vortices with the sensor for flowrate measurement.

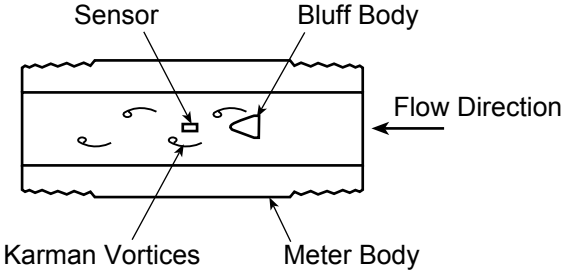


Fig. 3.1

3.1 Features

(1) Absence of any moving parts contributes to long service life.
(2) Lightweight and compact with major parts made of resin molding.
(3) May be installed in any physical orientation.

4. COMPONENT NAMES AND FUNCTIONS

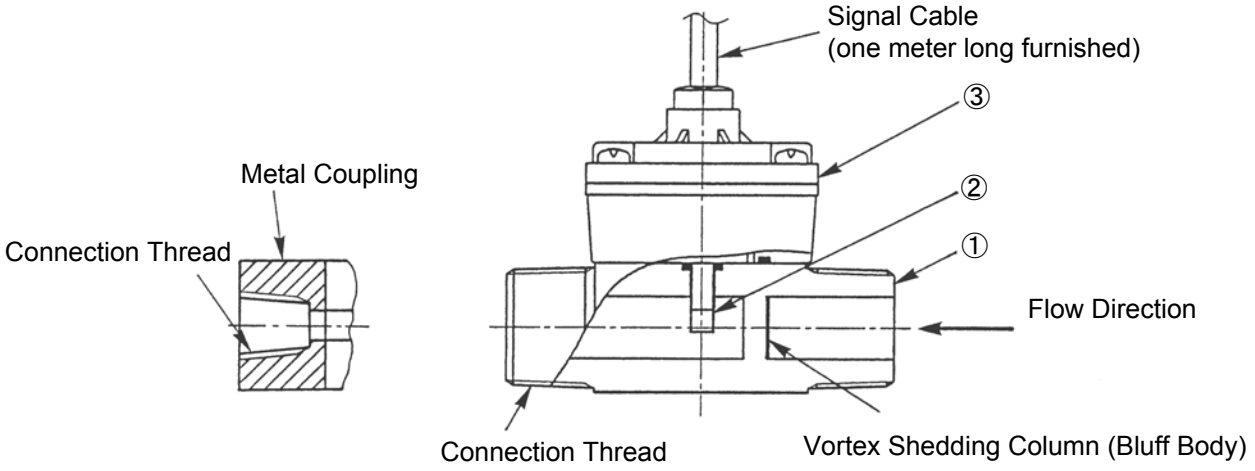


Fig. 4.1

No.	Part Name	Functions
①	Meter Body	Consists of the measuring tube and bluff body (vortex shedding triangular column) Karman vortices form and shed behind the bluff body as the process fluid flows.
②	Sensor	Has a built-in piezoelectric element. Oscillates by Karman vortices and picks them up as changes in electric charge.
③	Preamplifier	Amplifies changes in electric charge from the sensor, shapes the waveform and provides a pulse output (open collector).

5. INSTALLATION

5.1 Installation Location

Select an installation location that meets the following conditions.

⚠CAUTION: It is not serviceable in explosionproof areas (hazardous locations).

(1) Free from rainwater and moisture.

⚠CAUTION: Avoid exposure to the sun.

(2) Temperature does not change widely (desirably within a range from 0 to +60°C.
(3) Free from vibration and impact shock (desirably pipeline oscillation below 0.2 G).
(4) Easy to access for servicing.
(5) Where pipeline remains filled with the process fluid with no air bubble entrapment (in liquid measurement).
(6) Process fluid pressure is held below the maximum permissible pressure 0.98MPa.
(7) Where the process fluid will not freeze.

5.2 Physical Orientation

From an accuracy point of view, **Eggs DELTA Pulse** may be oriented to any position. Make sure that the flow direction arrow points in actual direction of flow.

In liquid measurement in a line where air bubble entrapment is likely to take place, meter installation in a vertical run (from bottom to top) is suggested.

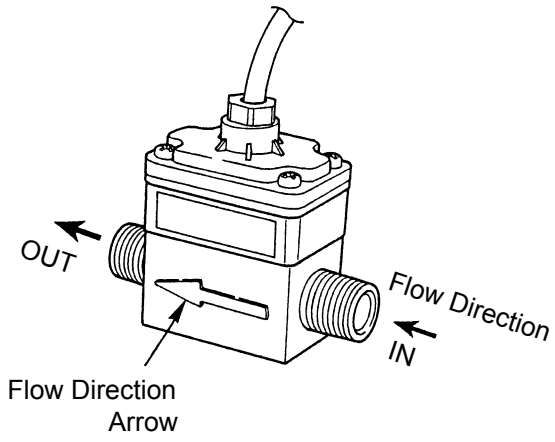


Fig.5.1

5.3 Installation Procedure

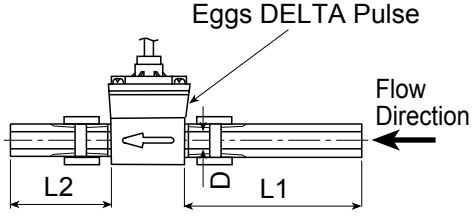
Rule to follow is to **secure a straight pipe longer than 7D upstream of, and 3D downstream of the meter** (where D is the nominal meter diameter). See Table 5.1 for actual lengths of straight pipes. To maintain design accuracy observe the following instructions.

(1) Use tubing which has an inside diameter greater than that of the process connections of meter body.
(2) Any device or component having a sharp increase in inside diameter, such as a throttle valve or flared tube, upstream of the flowmeter should be located at least 50 D away.
(3) To control the flowrate, provide a flow regulator valve downstream of the meter.

Table 5.1 Required Straight Pipe Lengths

Nom. Size	Inside Dia. D (mm)	Upstream Side L1 (mm)	Downstream Side L2 (mm)
4	8.5	59 min.	25 min.
8 (PPS)	13	91 min.	39 min.
8 (SCS14A)	8.5	59 min.	25 min.
15	14	98 min.	42 min.
25	24.5	171 min.	73 min.

➡ NOTE: See page 9 for **Eggs DELTA Pulse** pressure losses.



D: Flowmeter Inside Diameter

Fig. 5.2

5.4 Flushing

If foreign matter is expected to flow into the piping assembly on a new installation, for example, flush the piping assembly thoroughly prior to installing **Eggs DELTA Pulse.**

5.5 Tubing Connections

(1) The meter body is made of resin molding. Exercise care to avoid excessive stress and impact shock while making connections.
Shown in the table below is the tightening torque at pipe connections.

Nom. Dia. (mm)	Tightening Torque Specification (N•cm)
4, 8, 15	1960
25	9800

⚠ CAUTION

1. Tapered threads are used at connections. So use seals, such as seal tape, for connections.
2. Adhere to the torque specifications above to avoid a broken body with PPS resin connectors.
3. With metal connectors, hold the meter connectors with wrench or similar tool when connecting to the tubing.
4. Do not allow a tool, such as wrench, to come in contact with preamp. Avoid holding the preamp while making connections to the tubing.

(2) If the pipeline cannot support the body, or if the meter is to be installed for some reason in a location subject to strong vibration, secure the body to a rigid foundation, using threaded holes (4-M4) located at back of the body (Fig. 5.3).
Fit a rubber spacer sheet between the bracket and foundation in line with the tubing installation dimension (H) and secure the flowmeter body to avoid stress acting on the flowmeter body anchorage (Fig. 5.4).

⚠ CAUTION:

Do not use screws at the back of meter body for metal connector type 25A. Instead, use U-bolts, or similar fittings, to secure the tubing (Fig. 5.5).

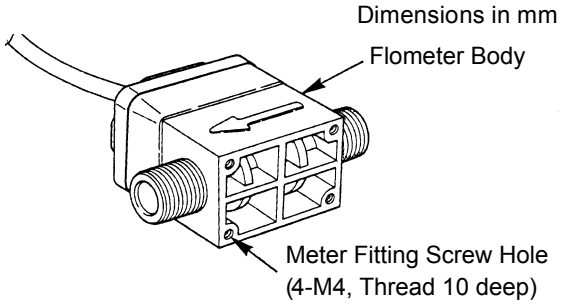


Fig.5.3

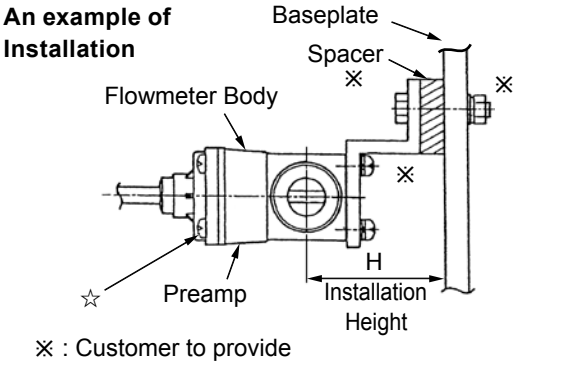


Fig. 5.4

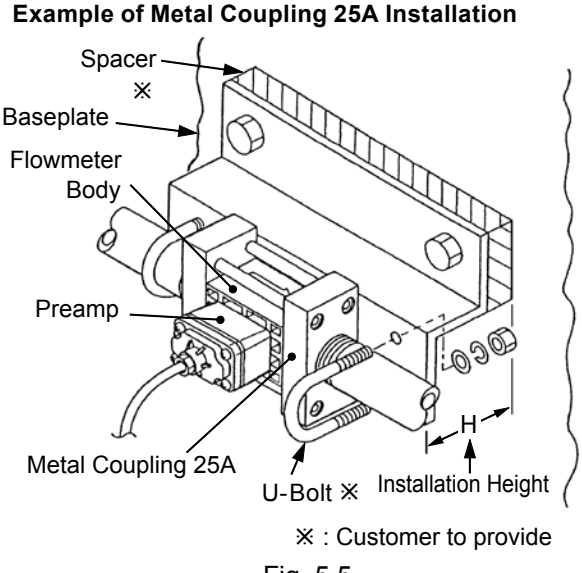


Fig. 5.5

⚠ WARNING

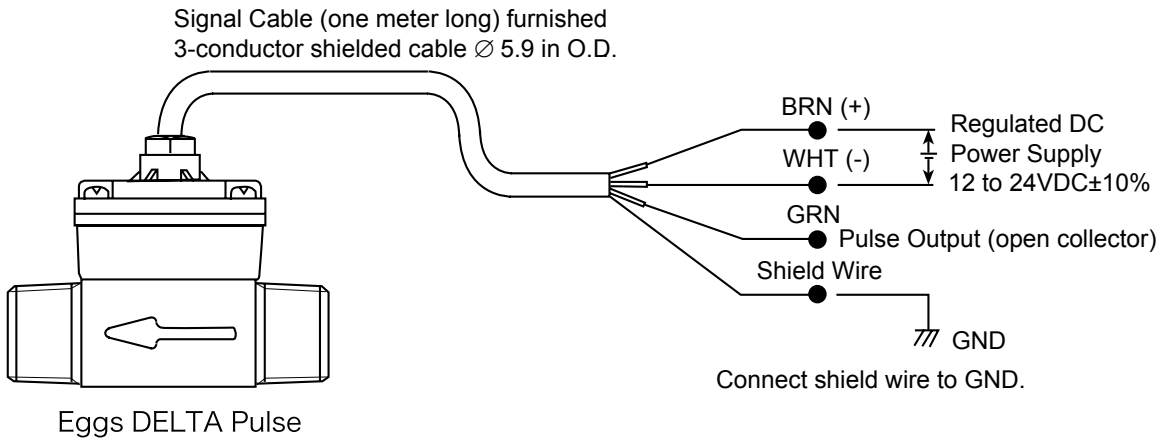
1. Observe the instructions above in making connections with tubing to avoid damage to the body.
2. Do not take off screws (marked (☆) in Fig. 5.4) securing the preamplifier and open up the preamplifier, as which could lead to a damage to it.

6. WIRING INSTRUCTIONS

Table 6.1

Item	Description
Signal Cable	O.D. ∅ 5.9, 3-conductor shielded cable (one meter long furnished)
Polarities	Brown: + White: - Green: Pulse Output Shield: GND
Pulse Output	Open-collector unfactored pulse Max. voltage impression: 30VDC Allowable current: 20mA Duty ratio: 1 to 1, approx.
Supply Voltage	12 to 24VDC ± 10%

■ Wiring Diagram



⚠ CAUTION: Do not fail to earth ground the shield wire to GND.

Fig.6.1

⚠ WARNING

It is most important that you observe power line polarities.

7. OPERATION

(1) Confirm that the process fluid conditions (pressure, temperature, etc.) conform to the ratings of specification.

(2) Making sure that there is no leaks in the piping system, progressively open the upstream valve.

⚠ **CAUTION: To prevent adverse influence on associated equipment, avoid sharp increase in flowrate.**

(3) If the output hunts excessively due to entrapped air in large quantities immediatly after installation, open and close the upstream valve several times to let the air out completely.

(4) Making sure of correct wiring connections, turn on power and ensure that no erratic condition is found in the pulse output.

8. TROUBLESHOOTING

If **Eggs DELTA Pulse** operation is erratic, isolate the problem by the table below.

Problem	Possible Cause	Coping Action
Fails to measure.	Flowrate too low.	Open the flow regulating valve progressively.
	Flowrate too high.	Progressively closing the flow regulating valve, make sure of pulse output.
	Flowmeter installed out of position.	Make sure of flow direction.
Produces pulses at no flow.	Exposed to pipeline oscillation.	Install and support the flowmeter so that its body is isolated from pipeline oscillation.
	Exposed to noises.	Select an installation location sufficiently away from the noise source.
		Earth ground the shield wire of signal transmission cable.
Inconsistent flowmeter measurement.	Influenced by bubbles (liquid service).	Let the air out.
	Exposed to noises.	Review the piping conditions.
		Earth ground the shield wire of signal transmission cable.
	Tubing conditions are not proper	Reconfirm the tubing conditions.
	Flowrate controlled upstream of the meter.	Control the flowrate downstream of the meter.

9. GENERAL SPECIFICATIONS

Table 9.1

ITEM		DESCRIPTION			
Model	Liquid service	FLP04-L1□A	FLP08-L1□A	FLP15-L1□A	FLP25-L1□A
	Gas service	FLP04-G2□A	FLP08-G2□A	FLP15-G2□A	FLP25-G2□A
Nominal Diameter and Connection		4mm R3/8 Ext. thd. NPT3/8 Ext. thd. or Rc1/4 Int. thd.	8mm R1/2 Ext. thd. NPT1/2 Ext. thd. or Rc1/4 Int. thd.	15mm R3/4 Ext. thd. NPT3/4 Ext. thd. or Rc1/2 Int. thd.	25mm R1-1/4 Ext.thd. NPT1-1/4 Ext. thd. or Rc 1 Int. thd.
Acceptable Fluids ※	Liquid service	Water			
	Gas service	Air or nitrogen			
Flow Range (L/min.)	Water	0.4 to 4	1.1 to 15	2.8 to 45	8.3 to 133
	Atm. Press., air	7.2 to 17	18 to 90	55 to 283	167 to 850
Operating Temperature Range	Fluid	-20 to +80 (free from dew condensation)			
	Ambient	-20 to + 60°C			
Max. Operating Pressure		0.98 MPa			
Accuracy		Better than ± 3% of full scale			
Repeatability		± 0.5%			
Pressure Loss (kPa)	Water	0.31 to 31	0.12 to 34.3		
	Atm. Press., air	0.13 to 0.7	0.06 to 1.52		
Major Parts Materials		Meter body, sensor, preamplifier housing: PPS resin (polyphenylene sulfide) Housing fitting screws: PEEK Wetted parts seals: Flourine rubber			
Installation Location		① Free from rain and water, ② Minimal temp. change, ③ Free from direct sunlight.			
Output		Open collector factored pulse Max. voltage impression: 30VDC, Allowable max. current: 20mA, Pulse width: duty ratio 1 to 1			
Power		DC 12 to 24V ± 10% Current drain: 10mA max.			
Signal cable		O.D. 5.9 ∅. 3-conductor shielded cable, one meter long furnished BRN: + power, WHT: 0V, GRN: pulse output			
Transmission Length		One kilometer (when cable 2.0mm² in conductor area is used.			

➡ NOTE: ※ This meter is not compatible with flammable, corrosive, or toxic fluids.

■ Output Units of Measurement (default settings)

(1) Liquid Service

Model	Nominal Dia. (mm)	Nom. Pulse Unit (mL/P) ※	Max. Flowrate (L/min)	Max. Pulse Output Frequency (Hz)
FLP04-L1□A	4	0.08900	4	750
FLP08-L1□A	8	0.4408	15	570
FLP15-L1□A	15	2.363	45	320
FLP25-L1□A	25	12.66	133	180

(2) Gas Service

Model	Nominal Dia. (mm)	Nom. Pulse Unit (mL/P) ※	Max. Flowrate (L/min)	Max. Pulse Output Frequency (Hz)
FLP04-G2□A	4	0.8900	17	320
FLP08-G2□A	8	4.408	90	350
FLP15-G2□A	15	23.63	283	200
FLP25-G2□A	25	126.6	850	120

➡ NOTE: ※ Nominal pulse units may vary with operating conditions and other factors.
Refer to the specification plates found on the sides of the flowmeter.

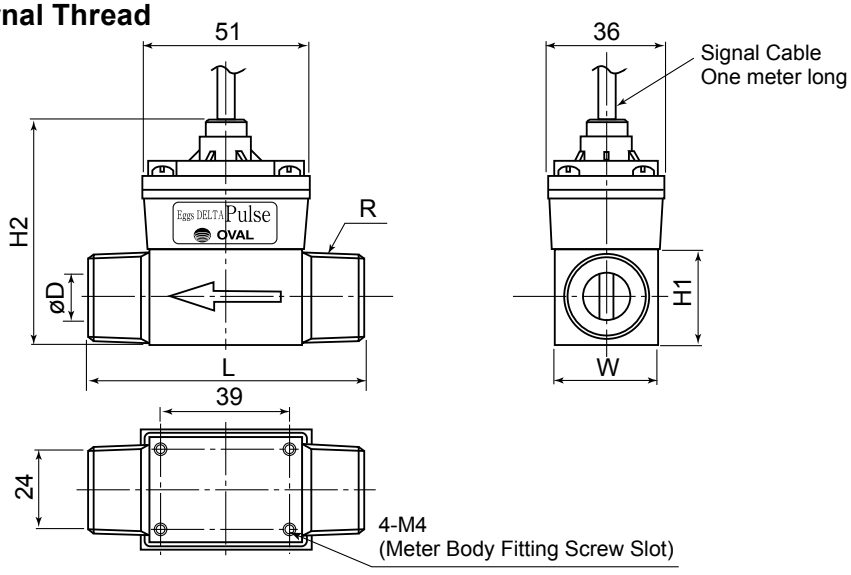
10. PRODUCT CODE EXPLANATION

Item	Product Code										Description
	①	②	③	④	⑤	–	⑥	⑦	⑧	⑨	
Model	F	L	P								**Eggs DELTA Pulse**
Nominal Size				0	4						4 mm
				0	8						8 mm
				1	5						15 mm
				2	5						25 mm
						–					
Fluid Kind							L				Liquid service
							G				Gas service
Frequency Division								1			1/1 Default setting for liquid service
								2			1/10 Default setting for gas service
								3			1/100
Process Connection									P		R external thread Material: PPS resin
									N		NPT external thread Material: PPS resin
									S		Rc internal thread Material: SCS14A
Version										A	Always “A”

Table 10.1

11. OUTLINE DIMENSIONS

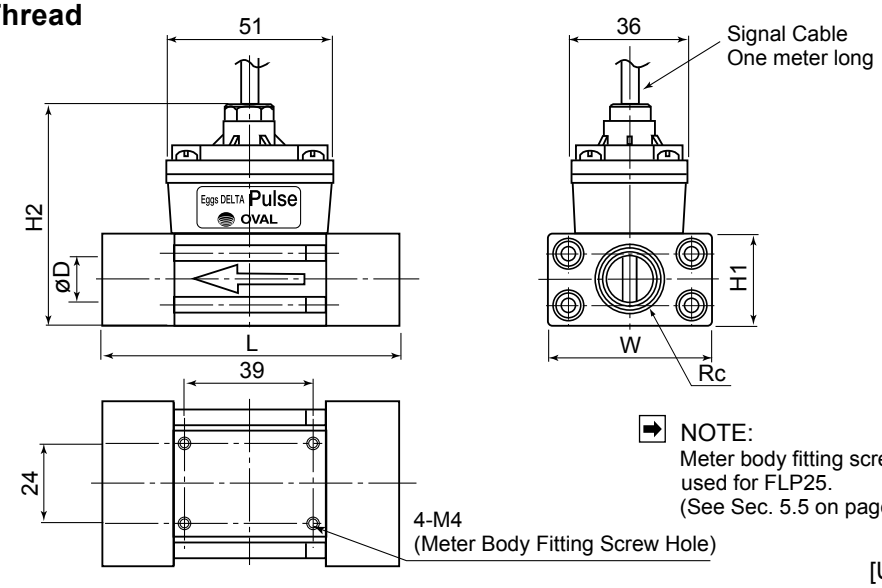
● R or NPT External Thread



[Unit: mm]

Model	Nominal Diam.	Ø D (Meter I.D.)	R	L	W	H	H	Approx. Weight [g] (Cable weight incl.)
FLP04 – L 1 P / G 2 N A	4	8	R3/8 Ext. thd. NPT3/8 Ext. thd.	80	32	29	68	270
FLP08 – L 1 P / G 2 N A	8	13	R1/2 Ext. thd. NPT1/2 Ext. thd.	80	32	29	68	270
FLP15 – L 1 P / G 2 N A	15	14	R3/4 Ext. thd. NPT3/4 Ext. thd.	85	32	29	68	280
FLP25 – L 1 P / G 2 N A	25	24.5	R1-1/4 Ext. thd. NPT1-1/4 Ext. thd.	120	46	46	85	410

● Rc Internal Thread



➡ NOTE:
Meter body fitting screws cannot be used for FLP25.
(See Sec. 5.5 on page 6.)

[Unit: mm]

Model	Nominal Diam.	Ø D (Meter I.D.)	R	L	W	H	H	Approx. Weight [g] (Cable weight incl.)
FLP04 – L 1 P / G 2 N SA	4	8.5	Rc1/4 Int. thd.	91	50	29	68	650
FLP08 – L 1 P / G 2 N SA	8	8.5	Rc1/4 Int. thd.	91	50	29	68	650
FLP15 – L 1 P / G 2 N SA	15	14	Rc1/2 Int. thd.	91	50	29	68	650
FLP25 – L 1 P / G 2 N SA	25	24.5	Rc 1 Int. thd.	126	46	46	85	950

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All specifications are subject to change without notice for improvement.

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