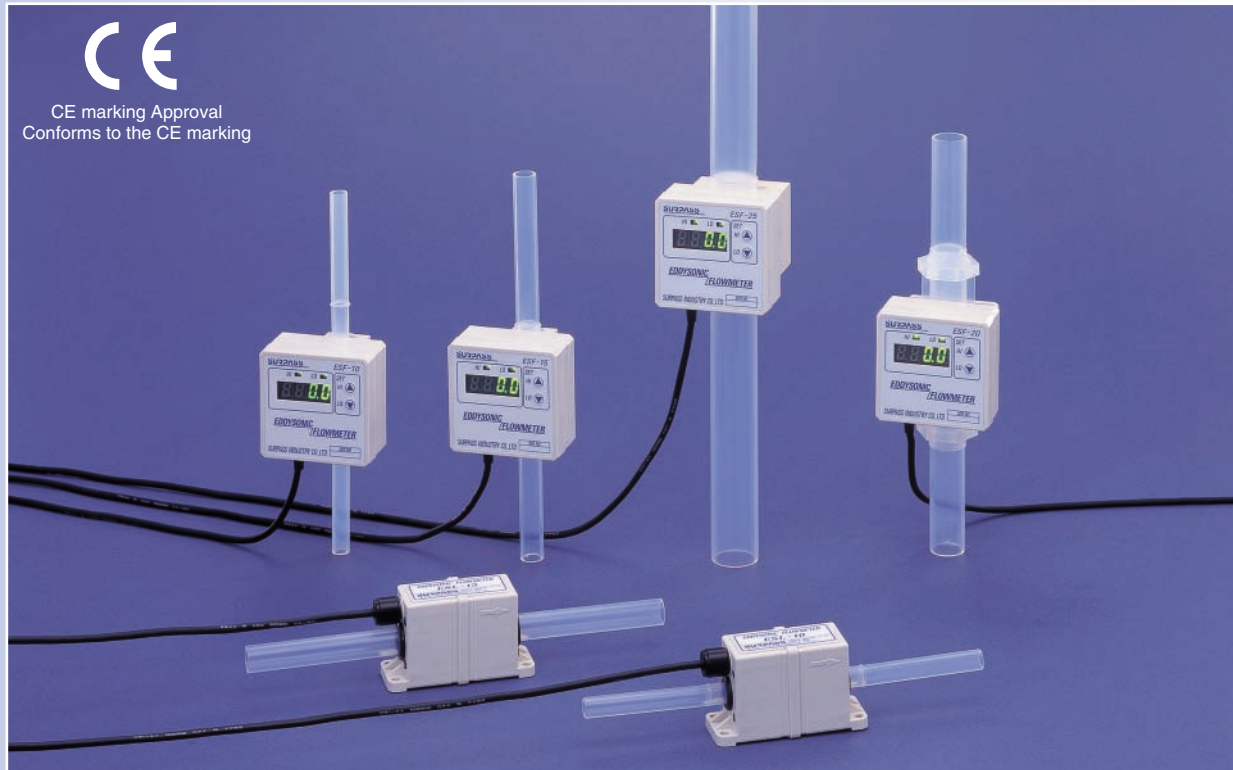


# PFA Eddysonic flowmeter



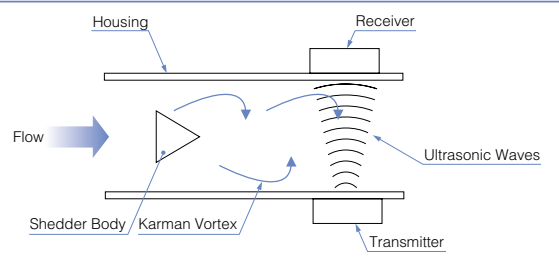
The Eddysonic Flowmeter is a flowmeter for fluids that detects the vortex street using the ultrasonic sensor mounted on the outside of it. Its part in contact with fluids is entirely molded with PFA to provide no movable part.

## Features

- Because PFA Flowmeters measure Karman Vortexes using a non-contact ultrasonic sensor method, they contain no moving parts such as flippers & floats, thus eliminating particle generation.
- High and Low alarm boundaries can be set to any level using selector keys.
- Lightweight and compact, Flowmeters can be mounted directly onto your existing piping systems.
- Monitor attached series (ESF) and monitor unattached series (ESL) are available depending on customer's application.

## Operation principle

If a fluid flows past a shedder body, a regular pattern of vortices called Karman Vortex street alternately trails aft in the wake. The ultrasonic wave oscillating time varies proportional to the vortex shedding frequency. We can obtain the measured flow by detecting any changes in ultrasonic wave oscillating time.



**● Caution**  
**Pressure at downstream side**

To prevent the occurrence of cavitations, the pressure value at the downstream side should be more than one obtained from the following formula.

$$P_d = 2.7 \Delta P + 1.3 P_0$$

P<sub>d</sub> : Pressure values at the downstream side. [kPa abs]  
 ΔP : Pressure loss values. [kPa]  
 P<sub>0</sub> : Vapor pressure values of fluids. [kPa abs]

**\*Cavitations**  
 Phenomenon that the liquid evaporates, generating air bubbles, when the liquid pressure drops to the saturated vapor pressure or below.



# ESF Series



## Ordering Information

ESF-

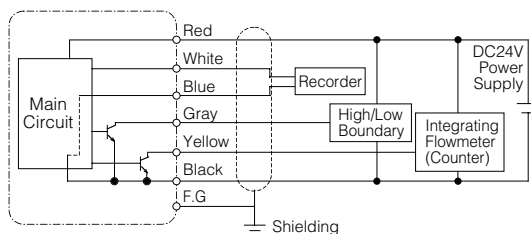
▶ Tube Diameter 10 :  $\varnothing 9.53 \times \varnothing 6.35$   
15 :  $\varnothing 12.7 \times \varnothing 9.53$

## Specifications

Model	ESF-10	ESF-15
Available fluid	Fluids not corrosive or permeable against fluorocarbon resin. (Please contact us for your operating fluids.)	
Flowmeter Range	0.5~3.5l/min	1~16l/min
Indicating Flow Rate	0.0~4.0l/min	0.0~18.0l/min
Measurement Accuracy	±5% F.S	±2.5% F.S
Operating Environmental Temperature	5~60°C	5~60°C
Operating Fluid Temperature	5~85°C	5~85°C
Fluid Pressure	Max.800kPa (25°C)	
Tube Diameter	$\varnothing 9.53 \times \varnothing 6.35$	$\varnothing 12.7 \times \varnothing 9.53$
Wetted Parts	PFA	
Mounting Positions	Horizontal, Vertical or Diagonal (Not vertical in drop position)	
Analog Output	Output	DC4~20mA
	Load Resistance	500Ω or Less
Pulse Output	Output	NPN Open collector
	Excitation Voltage/Current	Max.DC30V/80mA
	Pulse Unit	10ml/P
	Pulse Range	5mS
High&Low boundary Output	Output	NPN Open collector
	Excitation Voltage/Current	Max.DC30V/80mA
	LED indication	LO turns off : less than Low boundary · HI, LO turns on : within High & Low boundary · HI turns off : more than High boundary
Power Supply	DC24±10%	
Current Consumption	120mA or Less	
Cable	2m	
CE marking approval	○	○

## Instructions on Wiring

\* When wiring, be sure to make the appropriate connection in reference to below figure.



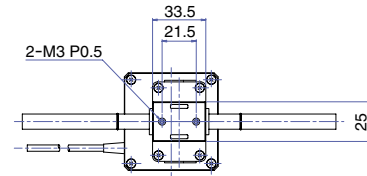
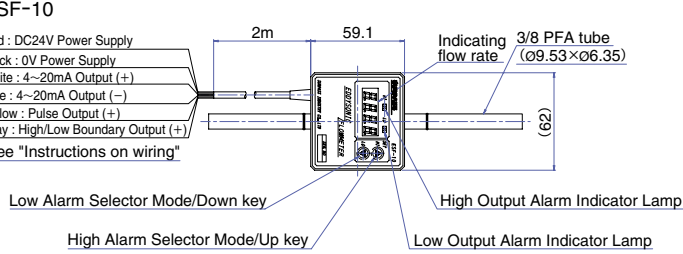
Name of Signal	Color
DC24V Power Supply	Red
0V Power Supply	Black
4~20mA Output (+)	White
4~20mA Output (-)	Blue
Pulse Output (+)	Yellow
High/Low Boundary Output (+)	Gray

\* Black and blue leads are connected each other within the circuit.

### Dimensions

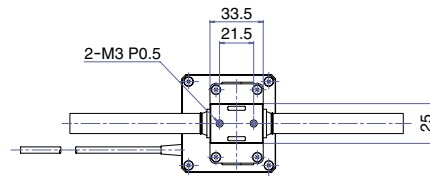
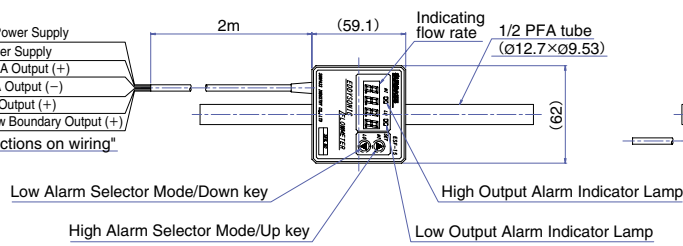
#### ● ESF-10

Red : DC24V Power Supply  
 Black : 0V Power Supply  
 White : 4~20mA Output (+)  
 Blue : 4~20mA Output (-)  
 Yellow : Pulse Output (+)  
 Gray : High/Low Boundary Output (+)  
 See "Instructions on wiring"



#### ● ESF-15

Red : DC24V Power Supply  
 Black : 0V Power Supply  
 White : 4~20mA Output (+)  
 Blue : 4~20mA Output (-)  
 Yellow : Pulse Output (+)  
 Gray : High/Low Boundary Output (+)  
 See "Instructions on wiring"



### Flow characteristic

To prevent the occurrence of cavitations, the pressure value at the downstream side should be more than one obtained from the following formula.

$$P_d = 2.7 \Delta P + 1.3 P_0$$

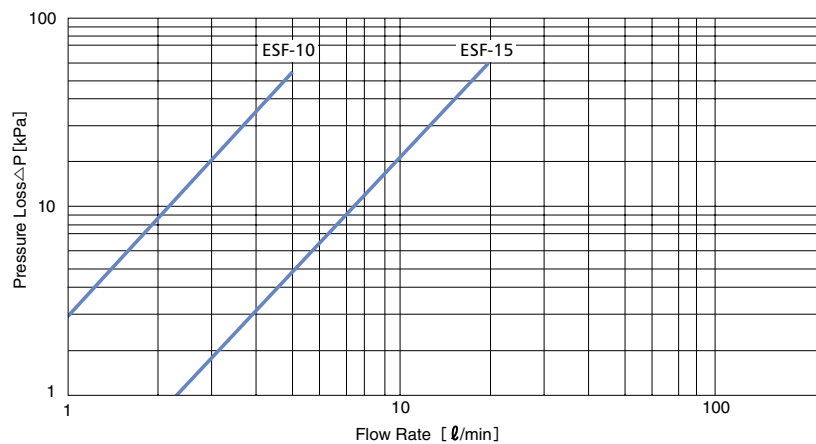
$P_d$  : Pressure values at the downstream side. [kPa abs]

$\Delta P$  : Pressure loss values. [kPa]

$P_0$  : Vapor pressure values of fluids. [kPa abs]

#### \* Cavitations

Phenomenon that the liquid evaporates, generating air bubbles, when the liquid pressure drops to the saturated vapor pressure or below.



# ESF Series



## Ordering Information

ESF-20-□

ESF-25

Non : Base unattached  
B : Base attached

▶ Tube Diameter :  $\varnothing 19 \times \varnothing 16$

▶ Tube Diameter :  $\varnothing 25.4 \times \varnothing 22.2$

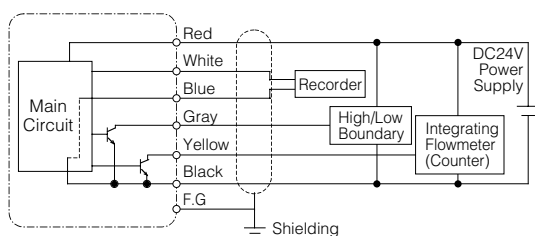
## Specifications

Model	ESF-20-□	ESF-25
Available fluid	Fluids not corrosive or permeable against fluorocarbon resin. (Please contact us for your operating fluids.)	
Flowmeter Range	2~40l/min	5~130l/min
Indicating Flow Rate	0.0~44l/min	0.0~145l/min
Measurement Accuracy	$\pm 1.5\%F.S$	$\pm 2.5\%F.S$
Operating Environmental Temperature	5~60°C	5~60°C
Operating Fluid Temperature	5~85°C*	5~85°C
Fluid Pressure	Max.600kPa (25°C)	Max.450kPa (25°C)
Tube Diameter	$\varnothing 19 \times \varnothing 16$	$\varnothing 25.4 \times \varnothing 22.2$
Wetted Parts	PFA	
Mounting Positions	Horizontal, Vertical or Diagonal (Not vertical in drop position)	
Analog Output	Output	DC4~20mA
	Load Resistance	500Ω or Less
Pulse Output	Output	NPN Open collector
	Excitation Voltage/Current	Max.DC30V/80mA
	Pulse Unit	10ml/P
	Pulse Range	5mS
High&Low boundary Output	Output	NPN Open collector
	Excitation Voltage/Current	Max.DC30V/80mA
	LED indication	LO turns off : less than Low boundary · HI, LO turns on : within High & Low boundary · HI turns off : more than High boundary
Power Supply	DC24±10%	
Current Consumption	120mA or Less	
Cable	2m	
CE marking approval	○	○

\* ESF-20 : When fluid temperature more then 70°C, flow range comes to 6~40l/min.

## Instructions on Wiring

\* When wiring, be sure to make the appropriate connection in reference to below figure.

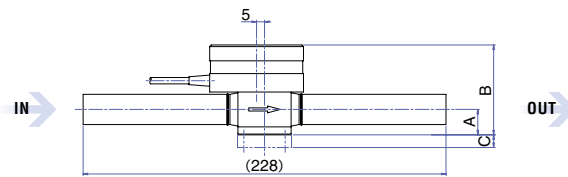
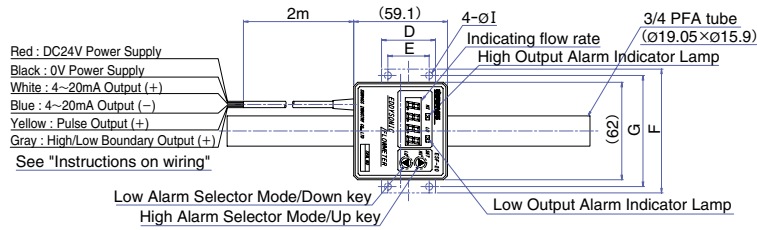


Name of Signal	Color
DC24V Power Supply	Red
0V Power Supply	Black
4~20mA Output (+)	White
4~20mA Output (-)	Blue
Pulse Output (+)	Yellow
High/Low Boundary Output (+)	Gray

\* Black and blue leads are connected each other within the circuit.

### Dimensions

#### ● ESF-20-□

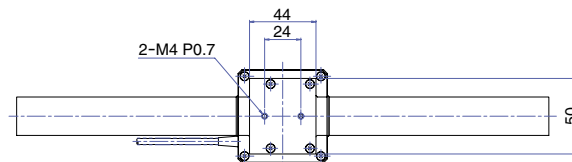
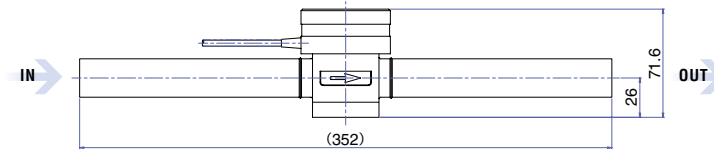
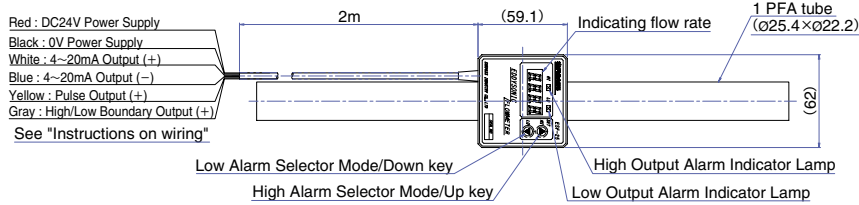


Model	A	B	C
ESF-20	16	56.6	—
ESF-20-B	16	56.6	8

#### ◎ Mounting dimension table

Model	D	E	F	G	ØI
ESF-20-B	34	26	78	70	4.5

#### ● ESF-25



### Flow characteristic

To prevent the occurrence of cavitations, the pressure value at the downstream side should be more than one obtained from the following formula.

$$P_d = 2.7 \Delta P + 1.3 P_0$$

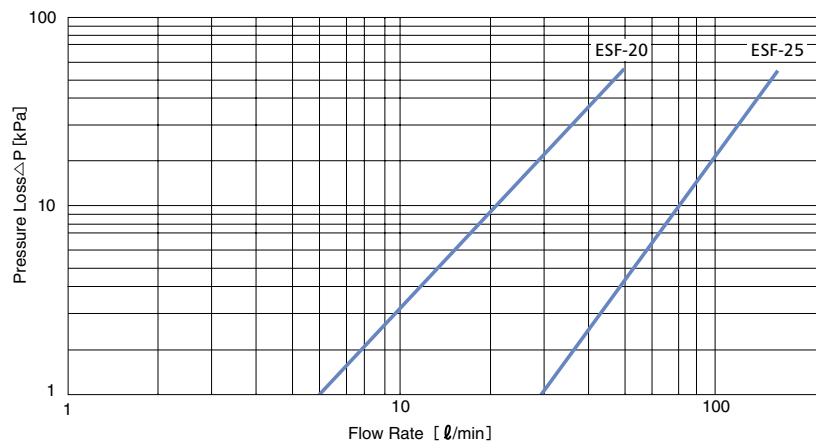
$P_d$  : Pressure values at the downstream side. [kPa abs]

$\Delta P$  : Pressure loss values. [kPa]

$P_0$  : Vapor pressure values of fluids. [kPa abs]

#### \* Cavitations

Phenomenon that the liquid evaporates, generating air bubbles, when the liquid pressure drops to the saturated vapor pressure or below.



# ESL Series



## Ordering Information

ESL-□

▶ Tube Diameter	6-2.5 : $\varnothing 6.35 \times \varnothing 3.95$
	10 : $\varnothing 9.53 \times \varnothing 6.35$
	15 : $\varnothing 12.7 \times \varnothing 9.53$

## Features

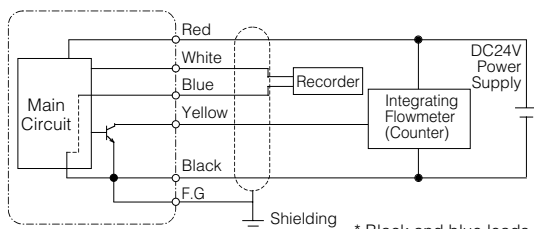
- This series is no monitor, lightweight and compact, so it can be parallel piping in closely-spaced, and it is appropriate for equipment compact design.
- ESF is simple structure to provide cleanliness and no-moving parts such as flipper because Karman vortex is detected by ultrasonic sensor.

## Specifications

Model	ESL-6-2.5	ESL-10	ESL-15
Available fluid	Fluids not corrosive or permeable against fluorocarbon resin. (Please contact us for your operating fluids.)		
Flowmeter Range	0.4~2.5l/min	0.5~3.5l/min	2.5~16l/min
Measurement Accuracy	±2% F.S		
Operating Environmental Temperature	5~60°C		
Operating Fluid Temperature	5~85°C		
Fluid Pressure	Max.800kPa (25°C)		
Tube Diameter	$\varnothing 6.35 \times \varnothing 3.95$	$\varnothing 9.53 \times \varnothing 6.35$	$\varnothing 12.7 \times \varnothing 9.53$
Wetted Parts	PFA		
Mounting Positions	Horizontal, Vertical or Diagonal (Not vertical in drop position)		
Analog Output	Output	DC4~20mA	
	Load Resistance	500Ω or Less	
Pulse Output	Output	NPN Open collector	
	Excitation Voltage/Current	Max. DC30V/80mA	
	Pulse Unit	10ml/P	
	Pulse Range	5mS	
Power Supply	DC24±10%		
Current Consumption	110mA or Less		
Cable	2m		
CE marking approval	○	○	○

## Instructions on Wiring

\* When wiring, be sure to make the appropriate connection in reference to below figure.

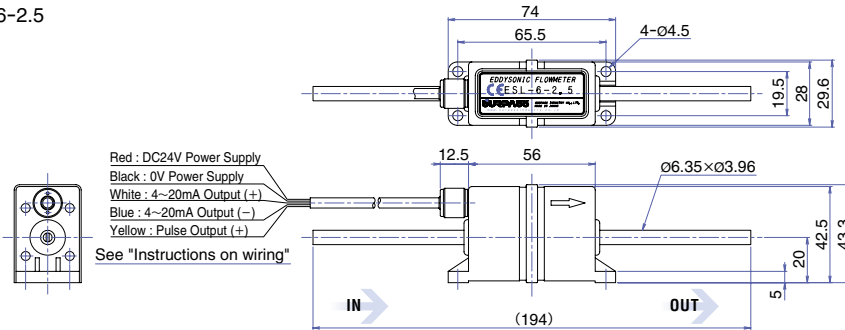


Name of Signal	Color
DC24V Power Supply	Red
0V Power Supply	Black
4~20mA Output (+)	White
4~20mA Output (-)	Blue
Pulse Output (+)	Yellow

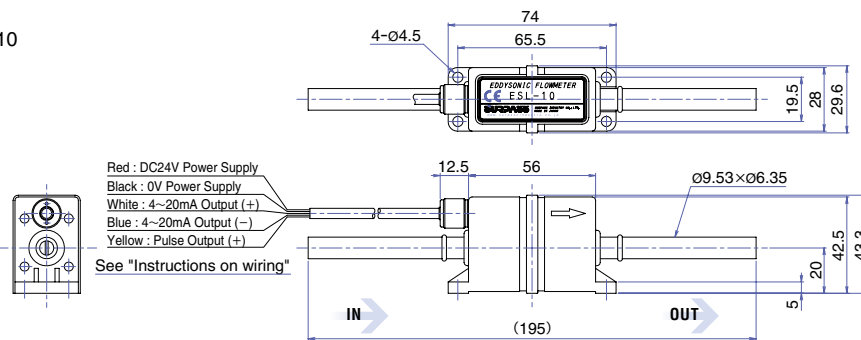
\* Black and blue leads are connected each other within the circuit.

### Dimensions

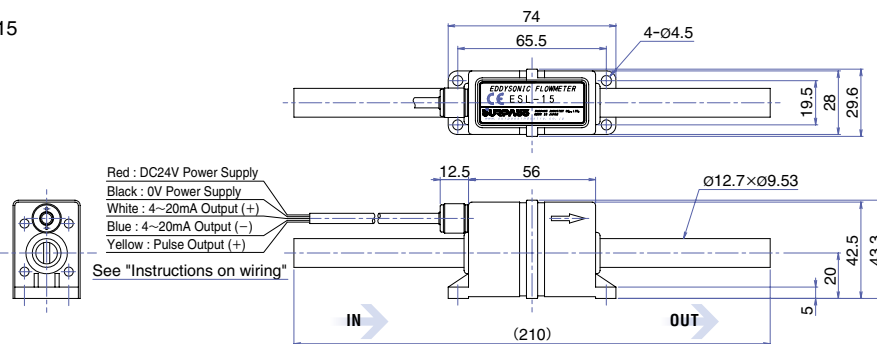
#### ● ESL-6-2.5



#### ● ESL-10



#### ● ESL-15



### Flow characteristic

To prevent the occurrence of cavitations, the pressure value at the downstream side should be more than one obtained from the following formula.

$$P_d = 2.7 \Delta P + 1.3 P_0$$

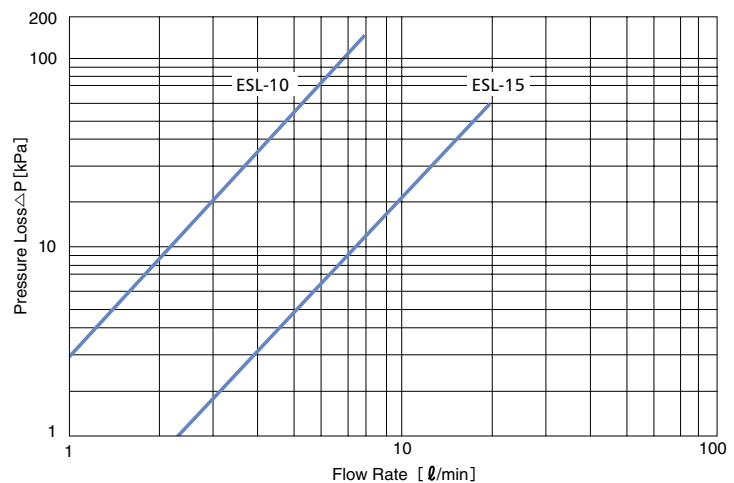
$P_d$  : Pressure values at the downstream side. [kPa abs]

$\Delta P$  : Pressure loss values. [kPa]

$P_0$  : Vapor pressure values of fluids. [kPa abs]

#### \* Cavitations

Phenomenon that the liquid evaporates, generating air bubbles, when the liquid pressure drops to the saturated vapor pressure or below.



## Kinetic viscosity of fluids - Minimum flow rate

Kinetic viscosity of fluids [ $\times 10^{-6} \text{m}^2/\text{s}$ ]	1	2	3	4	5	6	7	Maximum flow rate [ $\ell/\text{min}$ ]
Minimum flow rate of ESL-6-2.5 [ $\ell/\text{min}$ ]	0.4	0.8	1.2	1.6	2.0	2.4	—	2.5
Minimum flow rate of ESF-10.ESL-10 [ $\ell/\text{min}$ ]	0.5	1	1.5	2	2.5	3	—	3.5
Minimum flow rate of ESF-15 [ $\ell/\text{min}$ ]	1	2	3	4	5	6	7	16
Minimum flow rate of ESL-15 [ $\ell/\text{min}$ ]	2.5	5	7.5	10	12.5	15	—	16
Minimum flow rate of ESF-20-□ [ $\ell/\text{min}$ ]	2	4	6	8	10	12	14	40
Minimum flow rate of ESF-25 [ $\ell/\text{min}$ ]	5	10	15	20	25	30	35	130

\* The minimum flow rates of the fluids, of which kinetic viscosity are more than  $2 [\times 10^{-6} \text{m}^2/\text{s}]$ , are the theoretical values and may be different from the actual values.

### ● Safety Instructions



- Before you use this product, carefully read this manual for safety operation. We are not liable to any accident caused by neglect of our instructions.
- Use this product in accordance with its specification.
- Confirm the compatibility of the type of fluid to be used and the material of the part in contact with fluid before using this product.
- Eddysonic Flowmeter is designed for indoor-only use. Do not apply this product to outdoor use.
- Before wiring, be sure to turn off the power supply. Neglecting this may result in electric shock.
- Whenever using a commercial switching regulator as power supply, ground it to the frame ground (F.G.) terminal.
- Any noise-generating equipment (such as switching regulators or inverter motors) used close to the Flowmeter should be grounded to an F.G. terminal.
- Avoid the parallel wiring or the sharing of wiring tube with any high-voltage cable and power cable. Doing so may cause induction, resulting in malfunction of the product.
- Always use Eddysonic Flowmeter within the rated flow meter range.
- Make sure that power input does not exceed the rated supply limit.
- Before tubing, confirm the correct flow direction by checking the arrow direction of "IN-OUT" marked on the side of flowmeter unit. Incorrect tubing system may result in personal injury due to liquid leakage caused by damage of flowmeter unit.
- Never disassemble this product. Neglecting this caution may result in abnormal operation.
- Before mounting, align the axes of tubes on both sides to avoid excessive stress to the flowmeter.
- The IN or OUT side's tube of which bore diameter is smaller than that of flowmeter may generate an error in measurement.
- The tube can be mounted in horizontal, vertical and diagonal. However, in any case, the tubing system must be filled with the fluid at all times.
- We recommend the vertical tubing system. To prevent gas-liquid two-phase flows, design the tubing system in which the measured fluids flow to the upward direction. (bottom-top)
- The flowmeter may be disable to measure the flow mixed with gas-liquid two-phase flows or air bubbles. Install the flowmeter so that air bubbles do not flow into it or get trapped inside its tube. When using flowmeter, be sure to release the air inside its tube.
- Design straight-tube parts on both sides of flowmeter. The straight-tube length of IN side must be at least 7 times longer than the inner bore diameter, and that of OUT side must be at least 5 times longer than the inner bore diameter.
- Do not mount the flowmeter in the places that may provide high temperature gradients or sharp temperature changes.
- Large ripples of bellows the ripples by using dampers or similar devices may result in errors in measurement. Minimize the ripples by using dampers or similar devices.
- Do not use this product for liquid containing foreign substances. Such usage may degrade the performance of the product.
- Please handle abrasive and coagulable fluids with care not to cleave. Such fluids may degrade the system performance.
- ESF, ESL series are not applicable with ozone water.



# Digital Flow Monitor DV-4000 Series



## Features

- It is possible to be remote display using with Karman flowmeter (ESF, ESL)
- Panel mounting type : Size DIN 48×24
- Face of operating parts : IP 66 acquired
- Analog output : DC 4~20mA
- High & Low limit output and Relay contact contained.

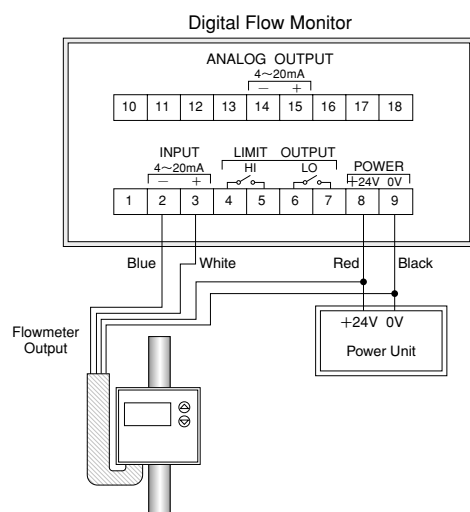
## Specifications

Power Supply	DC24V±10%, Current consumption 80mA
Input	DC4~20mA
High/Low Limit Output	HI,LO limit setting points (Configurable) Relay contact AC220V/DC30V, 1A (Resistive load)
Analog Output	DC4~20mA, supports 0 (-100) to the rated flow Allowable load resistance 100~500Ω
Accuracy	±0.3%F.S (At ambient temperature 23°C)
Operating/storage temperature	-10°C~50°C, 90%RH or less (No condensing) -10°C~45°C (When closely-attached) -20°C~60°C (Storage temperature)

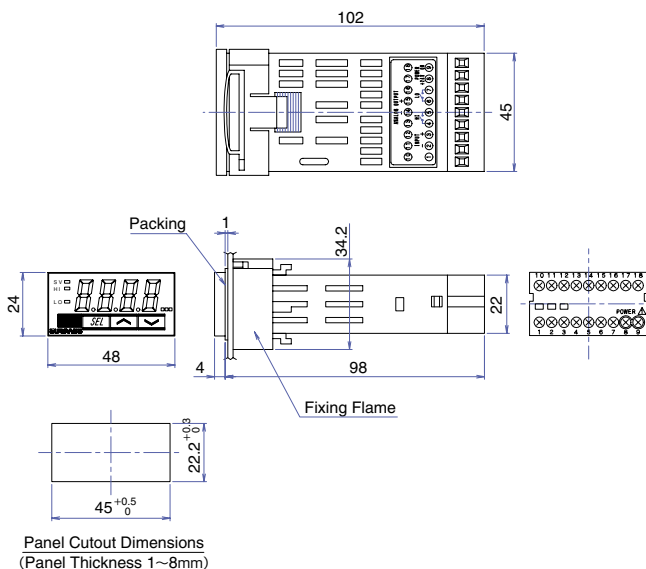
## Corresponding Monitor Table

Eddysonic Flowmeter		Corresponding Monitor	
Model		Model	Indicating Flow Rate
	ESL-6-2.5	<b>DV-1250A</b>	0.0~2.5 l/min
ESF-10	ESL-10	<b>DV-4100</b>	0.0~3.5 l/min
ESF-15	ESL-15	<b>DV-4150</b>	0.0~16.0 l/min
ESF-20		<b>DV-4200</b>	0.0~40.0 l/min
ESF-25		<b>DV-4250</b>	0.0~130.0 l/min

## Terminal Description and Connection



## Dimensions



## ● Notes on product warranty



This product is warranted for a period of one (1) year from the date of delivery by Surpass Industry Co.,Ltd. Within this period, we will replace the product with any defect that is undoubtedly due to design or workmanship. This warranty does not apply to the followings.

- ① Any defective products due to mishandling or improper usage.
- ② Any defective products due to alteration or improper repair by other than Surpass Industry.
- ③ Any defective products due to a natural disaster, riot or accident that we are not liable to.



This product is not designed for use with any equipment or in the system that is operated under conditions that could be critical to human life.



The data described in the catalog is a reference value, not a guarantee value.

## ● Description of marks used in this manual



**Caution** Indicates a potential hazardous situation that, if not avoided, could result in personal injury or damage to the property.



Indicates proper procedures and instructions to avoid any damage to the product and use it properly.

We take an order for customizing the product according to your specific needs. For more information, please contact us.

\* The contents of this manual may subject to future modifications without prior notice.

\* We made best efforts in completing this manual. However, if you find any questionable areas, mistakes or omissions, please contact us.

\* We are not liable to any consequential influence due to usage of this product.

\* We are not liable to any damage due to incorrect usage or unauthorized usage of product.

\* Using inappropriate O-ring material may cause leakage . Before specifying your O-ring material, make sure that it is compliant with your fluid type and corrosion resistance.

# SURPASS

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