



# EX DELTA Series

Excellent Vortex Flowmeter

Vortex flowmeter...Ranks first in its adaptability to today's diversified applications among available flowmeters.

The **EX DELTA**,  
OVAL's representative vortex flowmeter series,  
is applicable to a wide variety of applications.

**You can count on  
our EX DELTA which  
supports flow measurement  
in every sector of the industry.**



# EX DELTA

Always ready to make our contribution to a broad range of flow measurement needs with

Covering a broad flow and temperature range, the EX DELTA measures liquid, gas and steam flows. Its outstanding performance and absence of any moving parts along with its robust and durable yet simple construction makes it suitable for a broad range of applications.

## ●Features

### **Wide application and outstanding performance**

A triangular-section vortex shedder combined with a piezoelectric sensor can measure liquid, gas, and steam flows to a high degree of accuracy.

### **Easy to use and economic benefits**

Durable and simple design. Easy to use, easy to service. The net result is substantial savings in initial cost, running expense, and total cost.










### **Increased safety**

Unobstructed flow path with minimum seals. Replaceable type in particular permits the operator to service the sensor intact without the need of interrupting the fluid flow.

### **Saves energy and space**

Small pressure loss is synonymous with energy saving. A dedicated flow straightener reduces installation space requirements, too.

# A wide choice of components gives you so much design freedom

Product Name	Acceptable Fluid	Bluff Body	Basic Meter	
<b>Standard EX DELTA</b>	<p>Liquid</p> <p>Gas</p> <p>Steam</p>		 Replaceable Sensor	 Fixed Sensor
<b>Insertion EX DELTA</b>	<p>Liquid</p> <p>Gas</p> <p>Steam</p>		 Hottap Type	 Fixed Type
<b>EX DELTA -DIA designed for "dirty" fluids</b>	<p>Liquid</p>		 Replaceable Sensor	 Fixed Sensor

## EX DELTA-fixed sensor type



Basic model of the EX DELTA. Does the job of measuring liquid, gas, or steam flows with one flowmeter throughout your plant. Having a wide flow and temperature range, it can be extensively used in numerous applications.

## EX DELTA-replaceable sensor type



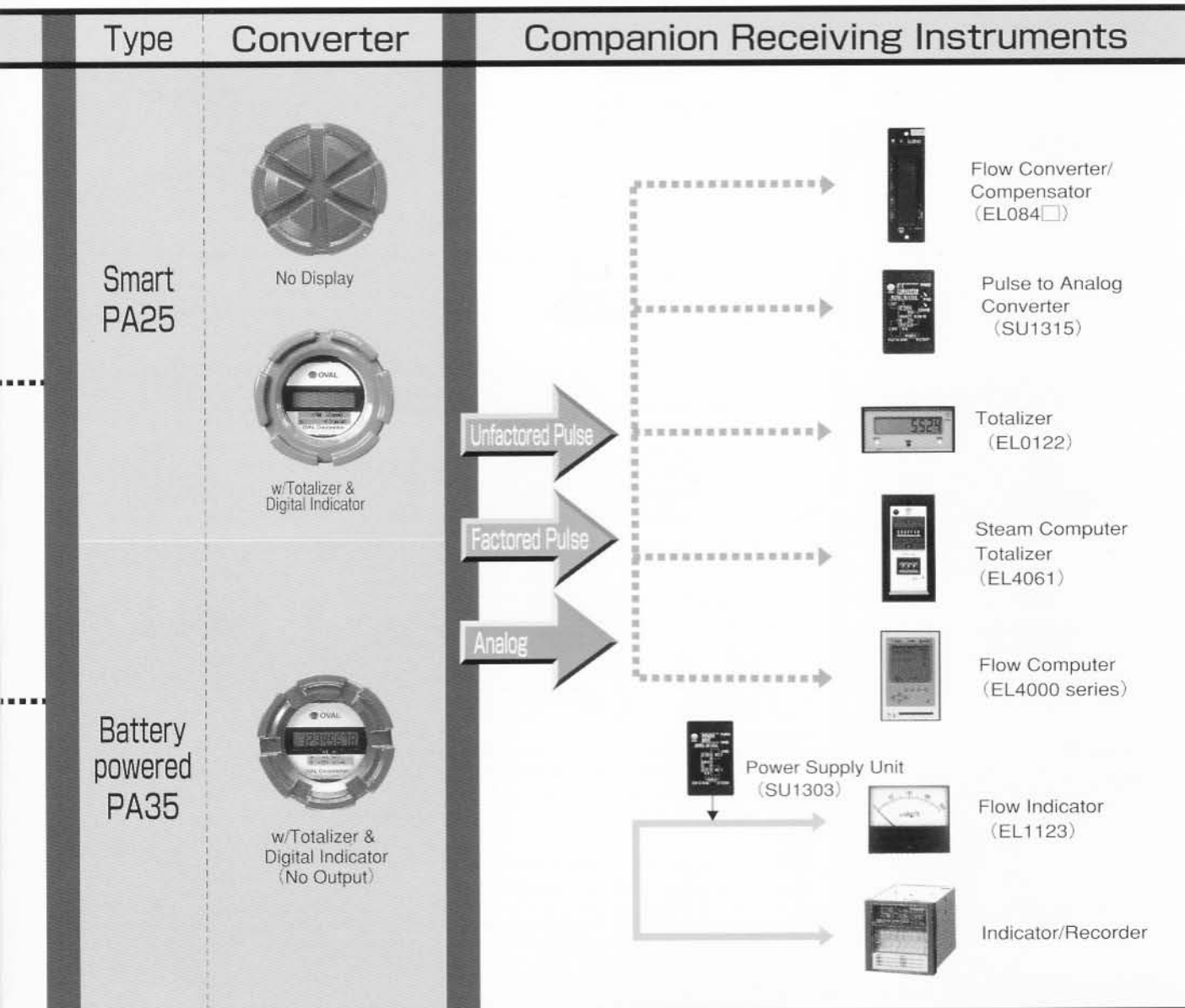
Servicing the vortex sensor does not interrupt the process fluid or require removal of the meter from the pipeline. Particularly suited for long-run processes or on-site instrumentation where utmost reliability and rugged structure are required.

## EX DELTA-battery powered

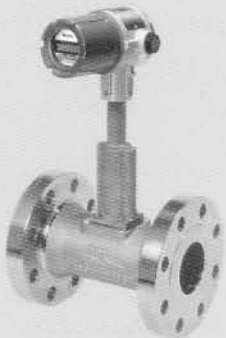


Operates on batteries. Requiring no external power source and related work means cost savings. The battery pack is good for 7 years on a 24-hours-a-day basis (model with integrally mounted transmitter). Can monitor the total flow and instantaneous flowrate on a digital display in this user-friendly meter.

# Smart in instrumentation system configuration



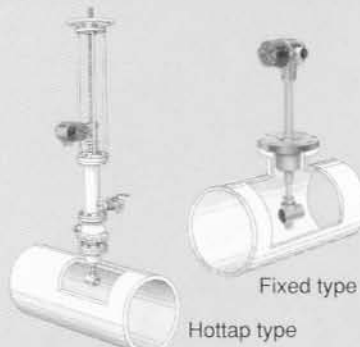
## EX DELTA·DIA



Our proprietary diamond-shaped vortex shedding body, a valuable result of accumulated field experience, demonstrates performance comparable to that of the traditional triangular bluff body. In an arrangement where the sensor is located apart from the bluff body, consistent performance can be maintained in processing "dirty" liquids containing such materials as scale, dust and other contaminants that have a tendency to build up.

GS.No.GBD660

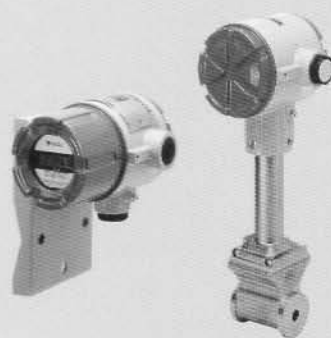
## EX DELTA-insertion type



Economic benefits for flow measurement in pipelines 200mm and larger in nominal diameter. Not only in new installations, but also in the existing installations, all you need is to insert the probe into the pipeline. The hottap type is particularly beneficial for in-line measurement of a continuous process or a vital process where the process flow cannot be interrupted.

GS.No.GBD603, 604

## EX DELTA-with separate type converter



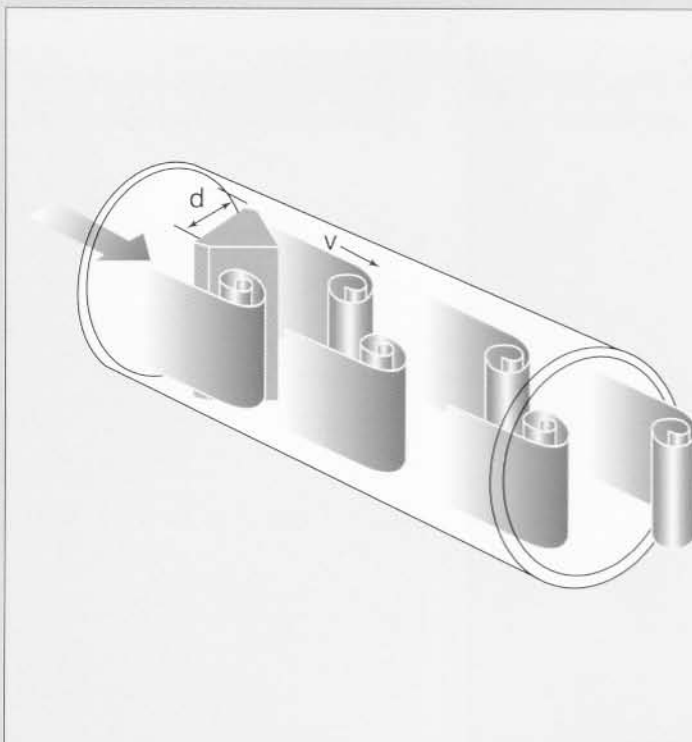
In areas where pipelines are densely installed, or installed in elevated or hazardous locations, a separately-mounted transmitter type is favorable. May be mounted up to 200m from the basic flowmeter. This arrangement allows the operator to monitor a multitude of flowmeters widely distributed in the field from the monitoring station where the transmitters are located for centralized control. It facilitates their servicing, too.

GS.No.GBD641

## ● General Specifications

Item		EX DELTA		
		Standard Type	Insertion Type	DIA
Nominal size	Wafer type (fixed sensor)	10~150mm (10mm for liquid service only)	—	15~80mm
	Flanged type (fixed sensor or replaceable sensor)	50~300mm	—	50, 80mm
	Applicable pipeline dia.	—	200~2000mm (mounted on a 100mm flange)	—
Flow range	Liquid (water)	0.2 <sup>※</sup> ~2510m <sup>3</sup> /h (※ 10mm Accuracy ±2%FS)	72~67800m <sup>3</sup> /h	0.8~172m <sup>3</sup> /h
	Gas (0.2MPa air)	4~15000m <sup>3</sup> /h	923~565000m <sup>3</sup> /h	—
	Steam (0.5MPa saturated steam)	0.2~47.6 t/h	1.98~936 t/h	—
Operating temp. range		-30~+300°C (Max. 150mm) 0~300°C (Min. 200mm) 420°C Max. (replaceable sensor, high temp. model)	-40~+300°C	-30~+300°C  420°C max. (replaceable sensor, high temp. model)
		Up to -196°C (option)		
Max. operating pressure		5MPa	1.37MPa	5MPa
		(Depends on process connection rating.)		
Accuracy		±1% of indicated reading	±2% of full scale	±1% of indicated reading
Converter (integral or separate type)	Smart	Display	No display or w/display model	
		Output	Pulse or analog	
		Function	Compensation through communications (HART protocol)	
	Battery powered	Display	Total/digital instantaneous flowrate	
		Output	None	
Construction		Non-explosionproof or explosionproof		
Power Supply		Smart converter	12~45VDC	
		Battery powered	Five 3.6V lithium batteries Life : 7 years (integral) or 4 years (separate)	

## ● Principle of Operation



Downstream of an object placed in a flowing fluid, vortices under certain conditions regularly form and shed on alternating sides of the stream. This phenomenon is commonly called Karman vortex street. Assuming the vortex frequency to be "f", fluid velocity across the orifice to be "v" and the width of the bluff body to be "d", the relationship is represented by  $f = st \cdot v/d$  where "st" is a constant Strouhal number. The Strouhal number is a function of the physical geometry of the bluff body having a triangular cross section used in the EX DELTA. It is constant at 0.16 approx. over a wide region in Reynolds number. In a range where the Strouhal number remains constant, the vortex frequency is proportional to the fluid velocity. Hence the flowrate can be calculated by counting the number of vortices being produced. Strongest and distinct vortices form and shed behind a triangular-column bluff body with no drift in the location of shedding in the vortex street, a desirable performance for consistent measurement. The piezoelectric sensor, on the other hand, is located in an ideal position for picking up vortices accurately and efficiently and, at the same time, for maximum ease of servicing.