



# EX TURBINE

INDUSTRIAL TURBINE METER



Based on the theoretical analysis in fluid dynamics and experimental approaches in the field of liquid flow measurement, "EX TURBINE" series was developed for high accuracy and durability for a wide range of viscosities. For example, petroleum products in general, liquefied gas, chemical products and water applicable to process control, and loading/unloading systems for general fluid flow management.

# EX TURBINE

EX TURBINE is compatible with a wide choice of receiving instruments available for other types of OVAL flowmeters. We also supply converters equipped with a local totalizer or indicator for monitoring at the point of measurement.



▶ **Integrally-mounted LCD total counter Model PA14S**

A converter with cumulative digital total counter and resettable counter.

The total count is retained to an internal non-volatile memory (EEPROM) as backup.



Integral type



Separate type

## ■ GENERAL SPECIFICATIONS

Item	Description				
Nominal size	15 to 50mm			80 to 400mm	
Model	Low temp.	Standard	High temp.	Standard (High)	High viscosity
Flow range	1 to 54m <sup>3</sup> /h	0.63 to 54m <sup>3</sup> /h	1 to 54m <sup>3</sup> /h	10 to 4500m <sup>3</sup> /h	45.2 to 4500m <sup>3</sup> /h
Kinematic viscosity	Than 1mm <sup>2</sup> /s				Than 10mm <sup>2</sup> /s
Operating temp. range	-200 to -30°C	-30 to +120°C	120 to 300°C	-30 to +300°C	
Max. operating pressure	Depends on flange rating.				
Linearity	±0.15% or ±0.35%				
Converter	Display	Without display or total count			
	Output	Pulse or analog (Pulse only for model w/totalizer; analog only for model w/analog instant. output)			
	Power supply	12 to 45V DC			
	Construction	Non-explosionproof or explosionproof			

# Aiming at an ideal turbine meter design

With low pressure loss, long service life and a wide range of acceptable fluids, two types available to choose from.

## Standard EX TURBINE

### Features

- ① A high degree of accuracy  
Linearity to  $\pm 0.15\%$  in the most demanding application.
- ② Low pressure drop saves energy.
- ③ High resolution and consistent accuracy over many years' service.
- ④ The turbine rotor made up with the latest precision-machining techniques features interchangeability.
- ⑤ Fine ceramics and tungsten-carbide alloy are used for rotor bearings to increase durability.
- ⑥ A broad operating range from  $-200^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$ .

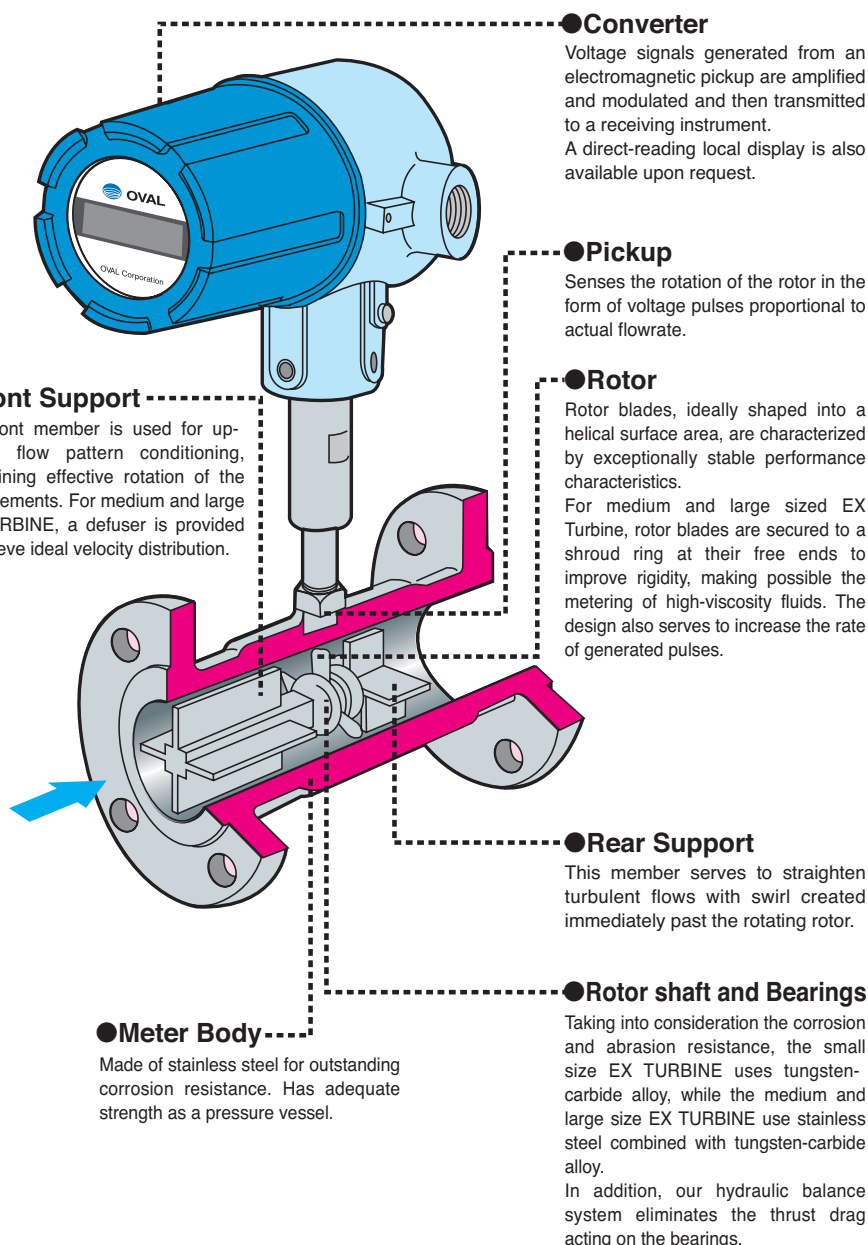
## EX TURBINE for high viscosity service

### Features

- ① Introduction of a shroud ring permits precise liquid flow measurement in low Reynolds number regions.
- ② A high frequency of pulses generated per rotor revolution benefits meter testing with the master, such as a pipe prover.
- ③ Linearity to  $\pm 0.15\%$  or better..... desirable in the accounting field.
- ④ Rotor blades - paper-thin yet sturdy enough thanks to a double-ended shroud ring, and shaped to give a helical surface area reduce pressure loss more than the traditional cantilever, or single-ended, blades.

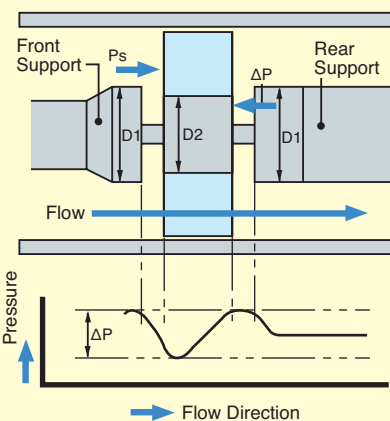
## Operating Principle and Construction

EX TURBINE measures the process fluid flowing across it with a rotor turning freely on its shaft which is fixed parallel to the flow path. As the rotor turns proportional to the flowrate, this rotational frequency is electrically picked up to obtain the flowrate information. Due to the marked difference in nominal diameter/flowrate, the small and medium size EX Turbine meters have bearings and support members designed to minimize their cross sectional area, whereas the medium and large size EX Turbine meters are so designed to increase rotor blade rigidity relative to their diameter to achieve precise flow measurement in low Reynolds number regions.



## HYDRAULIC BALANCE

The rotor hub diameter is smaller than that of the rear support in our design, resulting in a greater sectional area of the flow path around the rotor hub and a reduction in flow velocity. As a result, a pressure ( $\Delta P$ ) acting on the reverse face of the rotor, opposite to the flow direction, appears to cancel out the thrust force ( $P_s$ ) acting on the shaft.



# APPLICATIONS

EX TURBINE exhibits desirable meter error characteristics comparable to the OVAL PD flowmeter. Small in physical size, yet flexible enough to handle large quantities of the process fluid. These benefits are all the more remarkable when you note how it works in high Reynolds number regions.



## LPG loading control for tank trucks

EX Turbine is ideally suited for metering low viscosity liquids, such as LPG. Tank truck loading service, in particular, is one of its applications where linearity to  $\pm 0.15\%$  and long-term maintenance-free operation are required as essential conditions. The EX Turbine is the right answer to meet both of these needs.



## Calibration to establish and maintain EX Turbine accuracy

OVAL employs world's top flowmeter calibration facilities, including pipe provers, which are traceable to the established international standards, for proving EX Turbine meters, and for simulating actual user conditions with water, oil, or any other fluids. Inferentialtype meters, including the EX Turbine, are generally effected of the given operating conditions. We therefore conduct stringent meter error testing before every EX Turbine leaves our factory to insure its stated performance under customer's particular operating conditions.

The specification as of October, 2015 is stated in this catalog. Specifications and design are subject to change without notice.



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