



INSTRUCTION MANUAL

Oval Gear Flowmeters



Instructions for Safe Installation

Titan Enterprises Limited

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General

Please read this instruction manual carefully before installation and operation of your oval gear device - this should only be completed by competent personnel.

Failure to follow these guidelines may result in damage to the device, equipment or personal injury.

The installation instructions in this manual are applicable to the following Oval Gear flowmeter models and materials / sensors manufactured/supplied by Titan Enterprises:

Models: OG1; OG2; OG3; OG4; OG5; OG6; OG7; Metra-Clear

Body Materials: 316 Stainless Steel; Aluminium; PEEK

Sensor Types: Hall effect (NPN,PNP); Reed switch; Namur switch (Intrinsically Safe Sensor)

Oval gear flowmeters work by using the low differential pressure generated across the body to drive a pair of oval gears. This rotation can be detected by a variety of means to give either a TTL (NPN/PNP transistor) or contact closure pulse output. The unit is manufactured in a choice of materials and pressure ratings to suit most applications and as with all positive displacement flowmeters, the performance improves with increasing viscosity, achieving an accuracy of $\pm 0.1\%$ of reading with higher viscosities. The standard meters can be used up to 1000 cSt. Above 1000 cSt viscosity specially profiled gears **MUST** be used and the maximum flow rate will be reduced. More information can be found at [Oval Gear Meters for High Viscosity Liquids](#).

Intended use:

- Titan Enterprises' flowmeters are designed for measurement of low particulate (<80µm) liquid flow. These units **must not** be used with gases of any type.
- It is the installers responsibility to ensure the meter is correct for the application and process conditions.
- It is the installers responsibility to ensure all wetted materials are compatible with the liquid being measured.
- These meters are not approved for safety or MID flow measurement.
- The meters are not for use in Explosive Atmospheres / Hazardous Environments unless specified with intrinsically safe sensors.
- The installer must ensure the meter is operated within its specification only.
- Titan Enterprises Ltd accepts no liability for damage or loss resulting from incorrect or inappropriate installation or use.

Disclaimer:

This information has been reviewed and believed to be correct at the time of publication. Titan Enterprises holds no responsibility for any inaccuracies. The material in this document is for information purposes only.

Storage:

The equipment should be stored in its original packaging in a non-hazardous area. Care must be taken to ensure it is not subjected to extremes of temperature or humidity. Store away from solvents.

General Safety:

Installation should be completed by competent personnel only, adhering to the instructions provided.

Equipment must be protected from electric and electrostatic shock, fire and solvents.

Ensure the flowmeter being installed is undamaged.

Ensure the flowmeter being installed is chemically compatible with the liquid being measured.

Manufacture Information:

The Oval Gear flow meter is designed and manufactured by:

Titan Enterprises Ltd, Unit 2, 5A Coldharbour Business Park, Sherborne, Dorset, United Kingdom.
DT9 4JW.

Prior to Installation

ATTENTION:

 PRESSURE	DANGER: Risk of Injury due to pressure. Always ensure systems are de-pressurised before working on them
 TEMPERATURE	DANGER: Risk of Injury due to high temperature. Always ensure high temperature systems are cooled adequately before working on them
	DANGER: Risk of Injury due to electrical voltage. Isolate electrical supply before working on the flow meter Incorrect wiring may damage the meter and cause overheating
	DANGER: Risk of Injury due to chemical liquids. Always ensure adequate safety and COSHH procedures are adhered to if working with hazardous chemicals
	WARNING: A regulated maximum 24VDC power supply must be used to prevent electrical damage to the flow meter
	WARNING: Siting the meters close to or on the same power supply as solenoid valves can damage the electronics
	WARNING: Air or gas purging of mechanical meters will damage moving parts
	WARNING: Particulates will damage flow meter devices. Liquids should always be filtered to 80µm upstream of the flow meter
	WARNING: Ensure the meter is installed in the correct flow direction. Mechanical meters will operate in forward and reverse flow, but are only designed and calibrated for forward flow
	WARNING: Incorrect installation may lead to erroneous flow measurements
	WARNING: Pulsating flow can lead to erroneous flow measurement. It is recommended to dampen any pulsation as much as possible upstream of the flow meter

Mechanical Installation

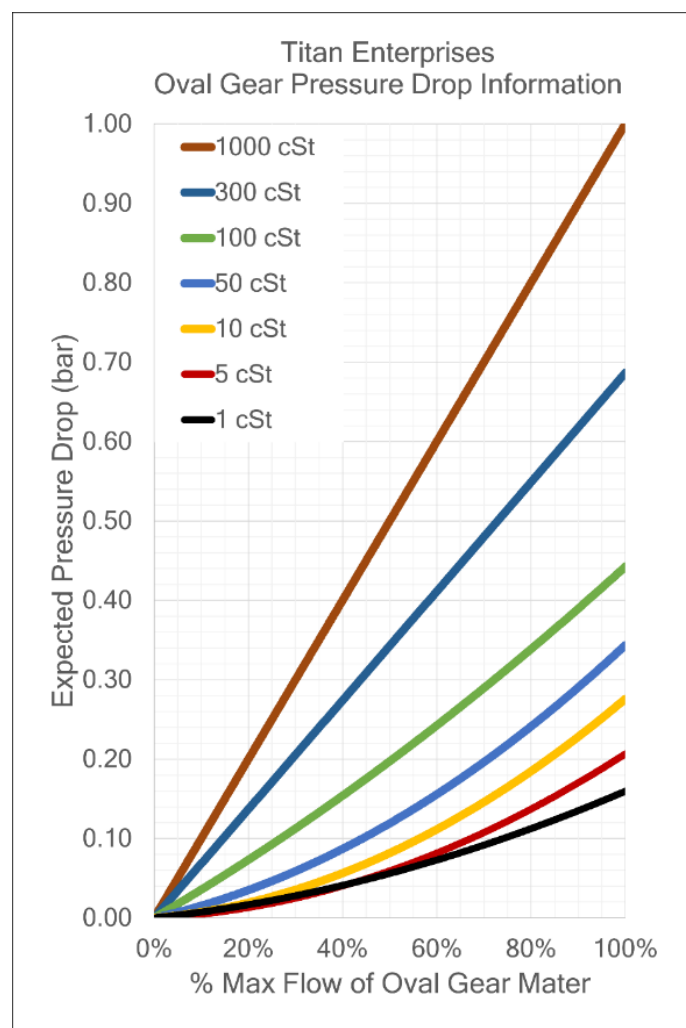
The pipe-work should be designed in such a way as to eliminate reverse flow. The flow meter should be installed in a position that prevents it from draining down as, on start-up, serious damage could result by 'impacting' an empty flowmeter with a high velocity fluid stream.

The liquid should be clean and homogenous. In all cases an upstream filter of at least 80 microns **MUST** be fitted. It is recommended that before the flowmeter is installed in the line a 'dummy' section of pipe is inserted and the system flushed. This is to eliminate any debris in that section of the line. The pipe must not stress the body of the meter and should be fully supported either side with appropriate isolation valves, and in some cases, a bypass valve.

On initial start-up, increase the flow slowly to ensure no over speeding of the flowmeter occurs as the air is forced from the line. This is best achieved by monitoring the flow rate and ensuring that a 50% over-range is not exceeded. **Never blow a flowmeter with an airline.** Care should be taken to ensure that no air enters the system (e.g. leaky pump gland) or that no cavitation takes place.

With a volatile liquid we recommend at least twice the vapour pressure plus 1 bar as the operating back pressure. It is the user's responsibility to ensure that the materials of construction are compatible with their fluid.

Titan Enterprises accepts no responsibility for material compatibility.

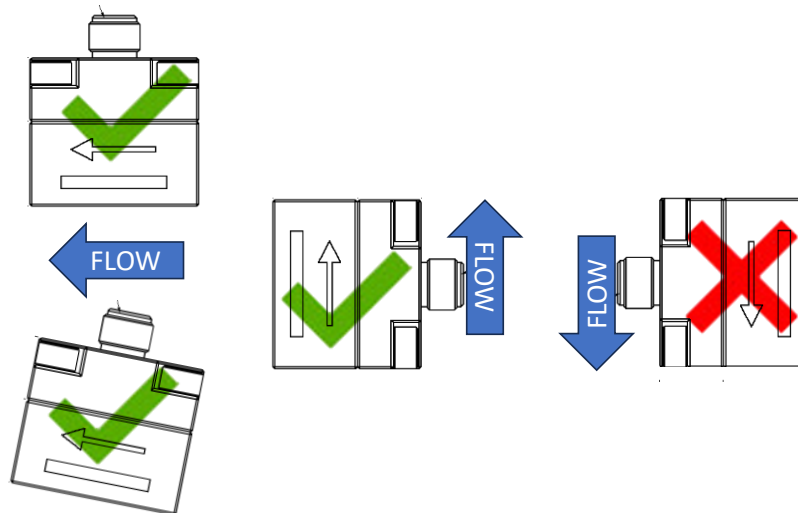


Optimal Orientation

Ensure the flow meter is always fully flooded and with the outlet horizontal or above the inlet to ensure any entrained gas does not remain in the meter.

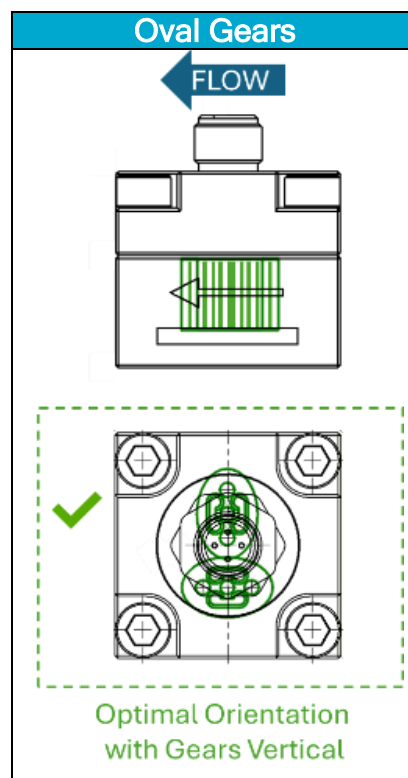
Install with the outlet above the inlet where possible, to prevent gas lock in the measurement section.

It is not recommended to install meters in a downward flow orientation.



Optimal Orientation of Mechanical Meters for Best Performance

*Note: The **Oval Gear meters** are bi-directional by design but are calibrated in the direction of the arrow on the flowmeter.*



Electrical Installation



WARNING: Always use a regulated power supply to prevent over voltage damaging the device.

WARNING: Do not connect on the same power supply as inductive load devices such as solenoid valves. These will cause voltage spikes high enough to damage the electronics of the flowmeter.

CAUTION: This equipment is not intended for use in residential environments and may not provide adequate protection from radio reception in such environments. (The equipment is Group 1 Class A ref CISPR).

CAUTION: The equipment operates by measuring rotating magnetised gears using a proximity sensor. As such the presence of strong magnets or magnetic fields can cause false flow measurement.

- Connect in accordance with the wiring diagrams in the instructions.
- Use adequately sized wire for the flowmeter and power supply being used.
- We recommend using lower than maximum voltage to supply our meters to ensure long life of all electronic components e.g. 12VDC.
- It is recommended that all signal cables are screened and run separately from power distribution cables. Where possible locate the flowmeter away from inverters, motors and other apparatus that emit electrical noise.

Electrical Characteristics

Hall Effect Sensor	
Supply Voltage	4.5 to 24Vdc
Supply current	7.5mA typical
Switch current	10mA max
Temp. range	-40 to 150°C
Connection	3 pole (+V,0V,Pulse) Pull Up 10kOhm resistor required
Output	NPN Open Collector (PNP option)

Reed Switch	
Supply Voltage (max)	24Vdc
Current (max)	50mA
Contact material	Rhodium
Temp. range	-20 to 85°C Or -40 to 150°C
Connection	2 pole
Operations	>10 ⁹
'R' option: Series resistor 560Ω protection For hazardous areas 'X' option, no protection is fitted.	

†Namur (Type BIM-EG08-Y1X)	
Supply Voltage	4.5 to 12Vdc
Current (max)	12-15mA
ATEX category II 1 G, Ex zone 0 ATEX category II 1 D, Ex zone 20	
Temp. range	-40 to +70°C
Connection	2 pole

Hall Effect Sensor *PCB with Dual Output	
Description	Dual output PCB mounted in the meter cap assembly is designed with protection from damage due to miswiring and occasional Voltage spikes
Supply Voltage	4.5 to 24Vdc
Supply current	7.5mA typical
Switch current	10mA max
Temp. range	-40 to 100°C (Not available for 150°C units)
Connection	4 pole : (+V,0V,NPN Pulse; PNP Pulse) Pull Up/Down 10kOhm resistor required
Output	NPN Open collector PNP Open collector (Outputs Logic compliant to TTL Voltage levels)

‡ Namur Sensor wiring instructions are not included in this document

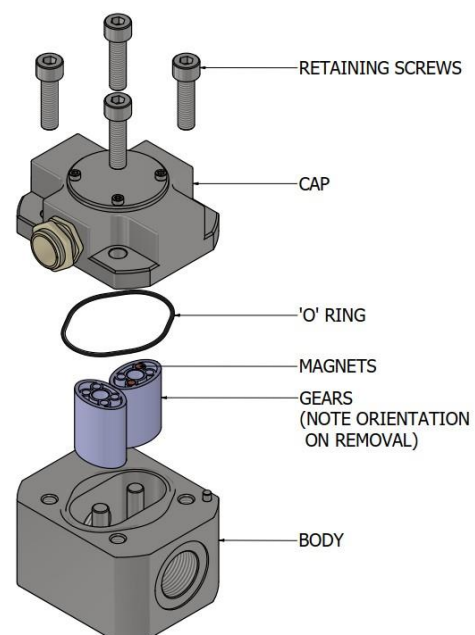
*Dual output PCB not standard on OG1 and OG2 50bar units

It is recommended that all “signal” cables are screened and run separately to power lines and switched inductive loads and are located well away from inverters and other “noisy” apparatus. Always use sound wiring practice ([see installation video](#)). To obtain a pulse from the detector, NPN output requires an external pull-up resistor connected between the output and a suitable power supply; whilst a PNP output requires a pull-down resistor connected between the output and the 0V. Typically, the flowmeter PSU may be used but sometimes a dc pulse, which is of a different voltage, may be required e.g. using a PLC with a 24V PSU and an internal 5V rail for the pull-up resistor/ pulse input. The reed switch has a protection resistor of 560 Ohms in series with the connections unless it is specified for hazardous areas.

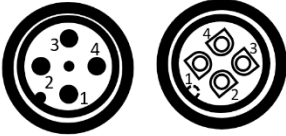
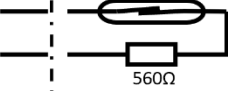
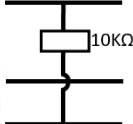
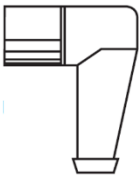
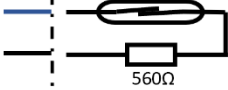
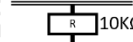
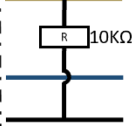
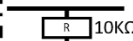
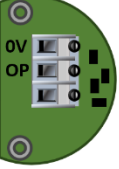
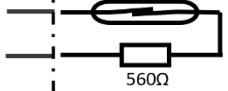
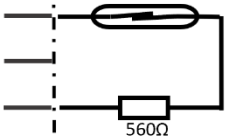
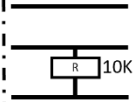
Wiring instruction videos for Titan flowmeters can be found on the [website](#) or scan the QR code:



All oval gear meters do not look the same as each model has a specific standard flow rate. This illustration is for guidance only.



Connection Options

			REED SWITCH	PNP Pulse Output	NPN Pulse Output
M12 4-Pin Connector 	Pin 1 Pin 2 Pin 3 Pin 4	+4.5-24V DC Optional PNP 0 Volts Output / NPN		<i>Option</i> 	
Moulded Plug 	Brown (Pin 1) White (Pin 2) Blue (Pin 3) Black (Pin 4)	+4.5-24V DC PNP 0 Volts Output / NPN		<i>Option</i> 	
Hall Effect PCB 	0V PNP NPN +V	0 Volts PNP Pulse NPN Pulse +4.5-24V DC	Not Available		
Reed Switch PCB 	0V OP	0 Volts Output Not Used		Not Available	Not Available
Terminal Block Connector (150°C Units) 	0V +V OP	0 Volts +4.5-24V DC Output / NPN		Not Available	

Note: Pull-Up resistor required for Hall effect sensor (10KOhm supplied)

Note: Namur Sensor wiring instructions are not included in this document

Commissioning

Checklist for General Flowmeter Installation

- Install the flow meter on the pressure side of any delivery system.
- Install the meter in a section to ensure the meter remains full of liquid, at all times.
- Ideally the meter should be installed with minimum straight lengths of tube either side for a distance of at least 10 pipe diameters upstream and 5 pipe diameters downstream.
- Install the device well away from valves, regulators, bends and other components that could cause excessive turbulence on the fluid entering or leaving the meter.
- Ensure the meter being installed is appropriate for the pressure, temperature, flow range and chemicals being measured prior to installation.
- The meter may be supplied with end caps to protect the inlet and outlet. These need to be removed prior to installation.
- Care must be taken to ensure no contamination of the meters occurs during installation as this can damage internal components.
- Pulsating flow can lead to erroneous flow measurement. It is recommended to dampen any pulsation as much as possible upstream of the flow meter.
- It is good practice to use upstream and downstream isolating full bore ball valves to facilitate easy meter installation or removal.
- Secure meter and/or piping to ensure no stress is seen at the port connections.
- Secure meter to prevent excessive vibration.
- Care must be taken to ensure that the end fittings on the meter are not stressed during use. Ideally, flexible tubes should be used.

Troubleshooting

If problems occur during commissioning always check the fundamentals first.

- Is the flowmeter/instrument the correct one for the installation?
- Is the power connected to the meter and the instrument, and is it turned on?
- Is the instrument set/wired correctly? I/P port, pulse type, frequency span, units etc.
- Where possible check the output from the flowmeter with an oscilloscope before proceeding.
- Was the line flushed prior to installing the meter?
- Was the flow increased slowly?
- Is the meter blocked?

If you are unable to find a solution, ask your supplier for technical support or contact
technical@flowmeters.co.uk

[Ready to specify this solution for
your project or application?](#)

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