



The Standard of Measurement

# 500 Series 3/8" Oval Gear Meter



## Installation, Operation & Maintenance Manual

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## Warning Symbols



### CAUTION

Follow the warning instructions within the following information to avoid equipment failure, personal injury or death.



### TURN POWER OFF

Before performing any maintenance, be sure to turn system power off to avoid any potential electric spark



### FLAMMABLE

Flammable liquids and their vapors may cause a fire or explosion if ignited.



### EYE PROTECTION

Pressurized systems may cause hazardous leaks and spray that may be dangerous for your eyes. Always wear eye protection around pressurized systems and its hazardous liquids.



### INJURY

Wear gloves for protection from hazardous liquids that may cause irritation or burns.



### READ

Read and understand all related manuals thoroughly. The Engineering and OIM manuals will provide the knowledge for all systems, maintenance and operation procedures. If you have any questions, please consult the factory.

## Receipt & Inspection

Upon receipt of meter shipment, be sure to inspect the packaging and the flow meter assembly for any damage before signing the receipt of the shipment. Notify the delivery company about possible damage and refuse receipt of the shipment.

Meters are individually boxed and are protected with packing material. Each package is identified with the flow meter assembly part number, description, direction of flow and serial number. Verify the meter model is the correct model, size, and configuration as ordered. Contact your distributor if there is any discrepancy or question.

Meter assemblies should be handled with appropriate methods for the awkwardness of size and weight involved. Appropriate clothing and shoes need to be utilized. Transport the meter package to the installation site with appropriate transportation methods, careful not to damage the flow meter.

Be careful of any loose or protruding staples from the packaging, as they can be very sharp and may potentially cause injury.

If foam has been used to protect meter, carefully remove top foam layer before attempting to remove meter assembly from box. Foam packaging maybe formed around the meter assembly making it difficult to remove. If meter is bolted to a wood pallet remove bolts while being careful not to let the meter tip over when the support has been removed. Do not lift the meter assembly by flex hoses, thermowells, wires, pulsers, or put objects through meter. Removing meter assembly from packaging without regard to these warnings may cause serious injury.

Every effort has been made to remove the test fluid before shipment. All TCS flow meters are plugged and enclosed in a plastic bag. The test fluid Safety Data Sheet (SDS) can be reviewed on page 9. Appropriate precautions should be taken regarding any personal, environmental and material compatibility with the end use system.

## Notice

Total Control Systems (TCS) shall not be liable for technical or editorial errors in this manual or omissions from this manual. TCS makes no warranties, express or implied, including the implied warranties of merchantability and fitness for a particular purpose with respect to this manual and, in no event, shall TCS be liable for special or consequential damages including, but not limited to, loss of production, loss of profits, etc.

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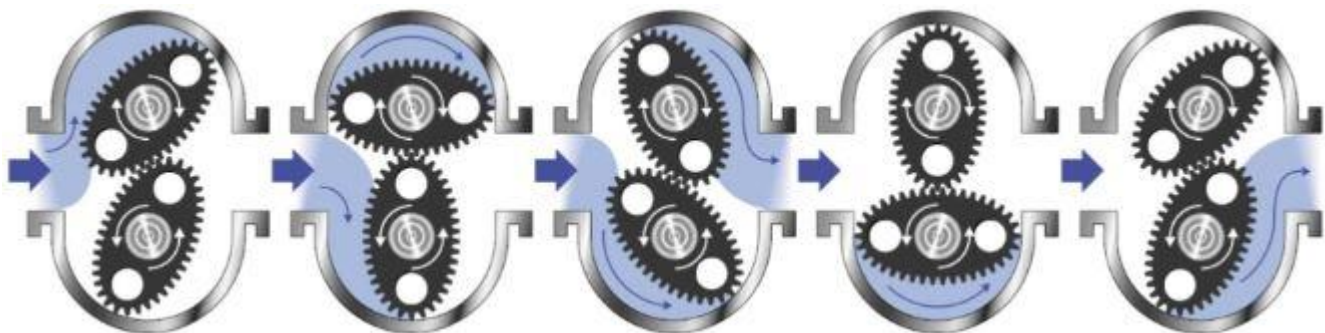
## Meter Specifications

Principle Design:	Oval Gear
Connection:	3/8" NPT
Flow Rate:	4 to 180 GPH (15 to 681 LPH)
Linear Accuracy:	Capable of +/- 1%
Repeatability:	Capable of 0.03%
Maximum Pressure:	150 PSI (10.5 BAR)
Working Temperature:	-30 F to 176 F (-34 C to 80 C)
Hall Effect Output:	3 wire open collector, 5-30vdc at 20 mA max
Protection Class:	Built to IP66/67 (NEMA 4X)

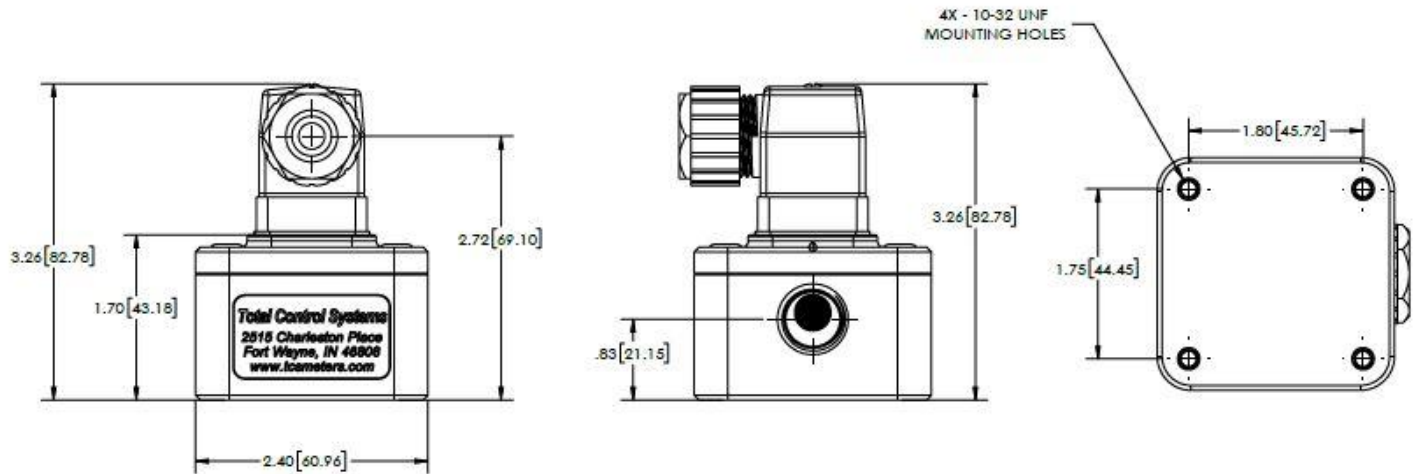
## Material of Construction

Housing and Cap:	316 Stainless Steel
Gears:	316 Stainless Steel
Gear Bearing:	Carbon
O-ring Gasket:	FKM, PTFE or Neoprene

### FLOW ILLUSTRATION



## Dimensions



## Installation Orientation

- The flowmeter **MUST** be mounted so that the rotor shafts are in a horizontal plane. The flow meter can operate with liquid flowing from Left-to-Right, Right-to-Left and Vertically up and down.
- It is recommended that a strainer be installed upstream of each flow meter, to prevent damage from foreign material.
- The meter should be installed in a manner, so that it remains full of liquid at all times.



**INSTALLED CORRECTLY:**  
Face conduit entry downwards to avoid conduit moisture migration



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Face conduit entry downwards to avoid conduit moisture migration



**INSTALLED INCORRECTLY:** The weight of the rotors will wear on the base of the measuring chamber

## System Recommendations



### Control Valves

Safety and isolation valves should be used throughout the metering system. In any pumping system where there is one (1) pump and multiple flow meters, a digital or hydro-mechanical Rate-of-Flow control valve must be used at each flow meter to prevent over-speeding of the flow meters.

### Best Plumbing Configuration

- 1) The flow meter must be securely mounted to a riser or foundation.
- 2) The inlet and outlet piping must be securely supported, in such a manner so as to avoid pipe stress on the flow meter.
- 3) The system should be designed to keep the flow meter full of liquid at all times.
- 4) The meter is bi-directional. Install the meter in a horizontal position with the DIN connector facing out.
- 5) The pipe should be laid out as straight as possible to reduce pressure loss from flow restriction.
- 6) The meter and piping must be installed in such a way so as to avoid accidental draining of the meter. The inlet and outlet of the meter should be lower than the associated system plumbing. This is known as the sump position.
- 8) The metering system should include a means for calibration.

### Protection From Debris

On new installations, care must be taken to protect the meter from damage during start-up. It is recommended that a strainer be installed in the system upstream from the meter. The meter could be subject to damage from the passage through of dirt, sand, welding slag or spatter, thread cuttings, rust, etc. A spool can be fabricated and installed in place of the meter until the system is flushed. A spool is a flanged length of pipe equal in length to the meter and any accessories attached to the meter such as an air eliminator or control valve. Another method is to temporarily bypass the plumbing containing the meter until the system is flushed. This will also protect the meter from debris. Once the system has run "clean" for a period of time the meter may be reinstalled or protective means removed.

### Thermal Expansion

Most liquids will expand and contract with temperature. In any system where there is a chance for liquid to be captured between closed valves without relief, thermal expansion will likely occur. This can create dangerously high pressures within the system. When product is trapped within the system, the pressure will increase as temperature increases.

Care should be taken in designing the system in which thermal expansion may occur by implementing Pressure Relief Valves or Thermal Expansion Joints in the system design.

### Thermal Shock

The metal parts within the flow meter will expand or contract with variations in the system operating temperature. For any systems where sudden or immediate temperature increases of 68 F (20 C) degrees or more are possible, the meter will require clearance rotors. The extra clearance will be necessary to eliminate the effects of immediate expansion of the rotors vs. the meter body, caused by thermal shock.

### Hydraulic Shock (Water Hammer)

Hydraulic shock is a rise in pressure, which happens when an operating system undergoes an immediate change in flow direction. This is most often the result of a rapid valve closure while the system is operating at a high flow rate. Hydraulic shock can damage any system component. Particularly susceptible are internal components of the meter, valves, and pump. System design and improper operating procedures will contribute to the seriousness of this problem. In order to eliminate hydraulic shock, the valve closure rate must be slowed. The use of 2-stage preset control valves or surge suppressing bladders or risers will help reduce or eliminate this problem.

### Products that Dry/Congel/Crystallize

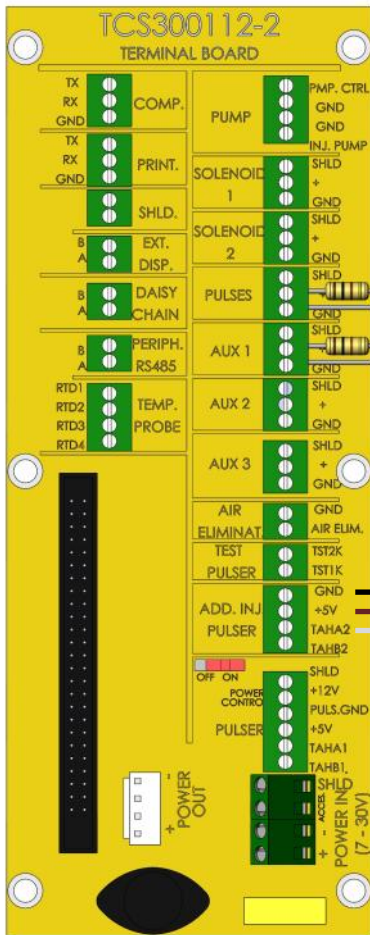
There are many liquids that crystallize, harden and/or solidify on contact with air or with an increase in temperature. A proper system design and a good understanding of the product being measured will help to avoid the possibility of air entering into the system and the product and effective operation of the meter being affected.

### Calibration

The meter shall be tested and calibrated with the product it is intended to measure when installed. Total Control Systems shall not be responsible for loss of product or any damages resulting from the end user's failure to test this meter to insure proper calibration. Every 500 series meter is tested at the factory to prove that the meter can be calibrated in your system. It is the owner's responsibility to report this device to the local Weights and Measures officials for their inspection before the meter is put to use.

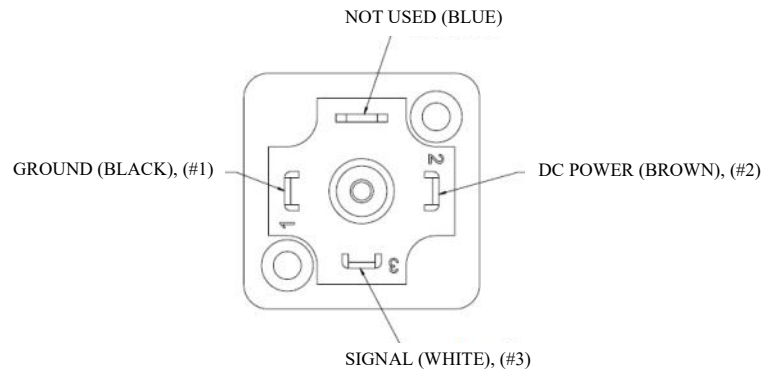
Check us out at [www.TCSmeters.com](http://www.TCSmeters.com)!

# 500-380 Meter Installation



TCS 3000 REGISTER TERMINAL BOARD

## OVAL GEAR METER CONNECTION



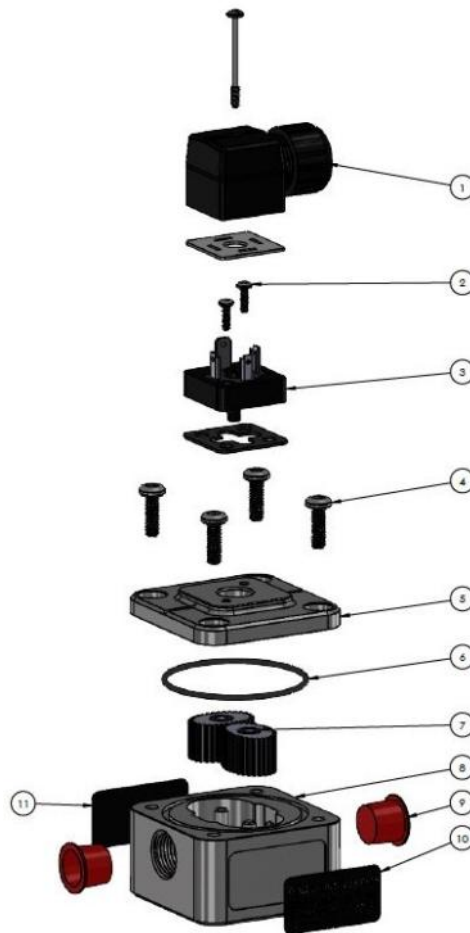
Black—GROUND, (#1)  
Brown—5V DC, (#2)  
White—SIGNAL, (#3)



## TCS 500-380 GEAR METER WIRED TO A TCS 3000 REGISTER

- Connect the GROUND (PIN #1—BLACK) terminal on the meter to the GND terminal for the ADD. INJ. PULSER.
- Connect the DC POWER (PIN #2—BROWN) terminal on the meter to the +5V terminal.
- Connect the SIGNAL (PIN #3—WHITE) terminal on the meter to the TAHA2 terminal.

## 500-380, 3/8" Oval Gear Meter Assembly



Item	Description	Quantity	Part Number
1	DIN CONNECTOR	1	740102
2	SCREW, 4-40 X 3/8 PAN	2	538425
3	CIRCUIT BOARD, 5-30VDC	1	500500
3B	CIRCUIT BOARD, 5VDC	1	500505
4	SCREW, 10-32 X 5/8 TORX	4	538420
5	CAP 3/8 OVAL GEAR	1	538150
6	ORING GASKET, FKM	1	538415
6A	ORING GASKET, PTFE	1	538417
6B	ORING GASKET, NEOPRENE	1	538418
7	GEAR SET	1	538360
8	HOUSING ASSEMBLY	1	538110
9	CAP PLUG	2	300719
10	NAMEPLATE-TCS INFO	1	538077
11	NAMEPLATE	1	538017

## Notes

# Warranty Information

## WARRANTY

New 500 gear meters manufactured by Total Control Systems, a division of Murray Equipment, Inc. ("TCS") with which this warranty is enclosed, are warranted by TCS to the original purchaser only for a period of one (1) year from the date of shipment, to be free, under normal use and service, from defects in material and workmanship. TCS manufactured new equipment or components are warranted for a period of eighteen (18) months from the date of shipment, under normal use and service. This warranty is extended only to the original purchaser. For defects occurring within the stated warranty period, TCS will repair or replace, at TCS's option; provided that part or parts are returned to TCS transportation charges prepaid, and the TCS's examination discloses the parts or workmanship to have been defective upon delivery to the purchaser.

## EXCLUSIONS

TCS's one (1) year warranty applies to meters only and does not apply to accessories such as valves and the pump assembly. Parts and equipment not manufactured by TCS may be covered by separate warranties of their respective manufacturers. This warranty does not cover any parts or equipment not manufactured by TCS or related companies. This warranty does not extend to any equipment that has been altered in any way, subjected to misuse, negligence, accident, or if operated in any manner other than in accordance with TCS's operating instructions or have been operated under conditions more severe than, or otherwise exceeding those set forth in the specifications. General maintenance, calibration, clean up and normal wear is excluded from this limited warranty.

## CLAIM PROCEDURES

In order to obtain performance by TCS of its obligations under this warranty, the original purchaser must obtain a Return Goods Authorization (RGA) number from TCS's customer service department within 30 days of discovery of a purported breach of warranty, but not later than the expiration of the warranty period. Once authorization is received, return the defective meter, piece of equipment, or component covered by this warranty, with transportation charges prepaid, to TCS with a written statement setting forth the nature of the defect and RGA number.

## LIMITATIONS

THERE ARE NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED. TCS SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. TCS will determine if all parts or meter defect falls within the warranty guidelines and will repair or replace within a reasonable time span. TCS is not responsible for any in or out bound freight. TCS's sole obligation that shall represent the buyer's sole and exclusive remedy shall be to repair or at TCS's option to replace any product or part determined to be defective. In no event shall TCS be liable for any special, direct, indirect, incident, consequential or other damages of similar nature, including without limitation, loss of profits, products, production time, or loss of expenses of any nature incurred by the buyer or any third party. TCS has not authorized on its behalf any representation or warranties to be made, nor any liability to be assumed except as expressly provided herein; there is no other express or implied warranty.

## REPAIR WARRANTY

All repair work is warranted for (90) days from the date of shipment to customer. Some parts may be warranted for longer periods by the Original Equipment Manufacturer.

## DESIGN AND EQUIPMENT CHANGES

Any changes in design or improvements added shall not create any obligation to install or replace equipment previously sold or ordered.



The Standard of Measurement

2515 Charleston Place  
Fort Wayne, IN 46808

Phone: (260) 715-4500  
Fax: (260) 484-9230  
Email: [sales@tcsimeters.com](mailto:sales@tcsimeters.com)  
Website: [www.tcsimeters.com](http://www.tcsimeters.com)

Check us out at [www.TCSimeters.com](http://www.TCSimeters.com)!