

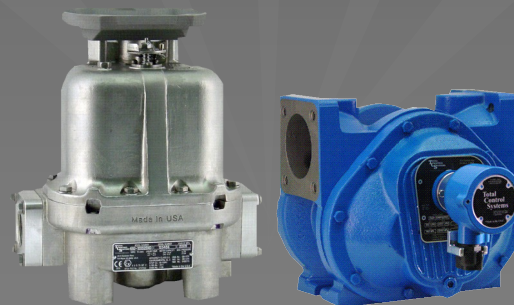
Rotary Piston Positive Displacement Meters and Flow Measurement Systems

Corporate Brochure TCS900-1000
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TOTAL CONTROL SYSTEMS

“The Standard of Measurement”



World Class Manufacturing
Precision Flow Measurement Systems
Worldwide Custody Transfer Approvals

Total Control Systems is ISO-9001 certified

Fuels • Fertilizers • Solvents • Chemicals • Paints • Coatings • Liquid Sweeteners • Others

About Us

Total Control Systems is a leading ISO-9001certified manufacturer of piston and rotary positive displacement flow meters located in Fort Wayne, Indiana. All meters are designed with the highest quality to provide superior performance in custody-transfer measurement of refined fuels, LPG, fertilizers, chemicals, alcohols, and solvents. Marketed to provide application-driven flow meter solutions for vehicles, dispensers, and fixed-site installations, we provide a full line of accessory equipment including strainers, air and vapor eliminators, control valves, pulse transmitters, and mechanical or electronic registration to complete system requirements. Meters are designed and created using sound engineering principles, automated test cells, and state-of-the-art computer numerically controlled (CNC) machines in a world-class manufacturing facility. Each flow meter is built from stock and completely assembled and tested by highly skilled members of our production team, who strive for excellence in workmanship and quality. Our reputation for providing innovative, high-quality, and reliable fluid measurement products is coupled with our sense of customer-driven services. Our first priority is to help our customers achieve increased productivity and provide value to your business today and tomorrow.

Principal Parts of Your Metering System

The TCS metering system may include ancillary components such as a strainer, air eliminator, valve, and register in addition to the basic meter.

The strainer is located on the inlet side of the meter, and serves to catch small system debris such as metal filings, welding slag, or other system contaminants that can damage the meter if carried into the measuring chamber.

The air eliminator is also located on the inlet of the meter, and serves to separate entrapped air or vapor from the liquid so that only 100% liquid is being measured. An air eliminator is required by Weights & Measures authorities for any system used for custody transfer metering.

The valve is located on the outlet of the meter and functions to start or stop flow through the meter. Mechanical or electronic valves are available.

The register provides a record of flow through the meter. Electronic or mechanical registers are available from TCS, along with printers for a hardcopy record of each transaction.

Complete descriptions of metering system components are provided on pages 6 through 11 of this publication.



Series 700 petroleum meter shown, with electronic registration and solenoid-operated control valve.

Applications

Total Control Systems meters are designed to provide years of unsurpassed performance in all types of applications and all types of environments. Whether on board trucks or ships, in loading terminals, mounted on mobile skids, on the farm or in the factory, TCS meters are up to the job. All meters are custom built for the application with application-specific components.

Applications routinely addressed with TCS meters include:

- Off-truck metering of refined fuels, LPG, aviation fuels, fertilizers
- Loading terminals for over-the-road tankers and railcars
- Workboat and general marine refueling
- Agricultural chemicals batching and blending
- Industrial applications



Liquids

Liquids routinely metered include: fuel oil, gasoline, kerosene, avgas, Jet A, LPG, ethanol, bio-diesel, diesel exhaust fluid (DEF), fertilizers, solvents, alcohols, petro-chemicals, liquid sugars, fruit juices, and more.

Meter Types

LP (Liquefied Petroleum Gas)

Liquids: LPG

Materials: Housing & Rotors: Anodized Alum; Bearing Plates: Ni-Resist II; Bearing: "AT" Carbon Graphite; Gears: SS; Seals: Buna-N

SP (Standard Petroleum)

Liquids: Gasoline, Fuel Oils, Diesel, Bio-Diesel, Kerosene, Jet Fuels, Vegetable Oils, Motor Oils, Ethylene Glycol, Naptha

Materials: Housing & Rotors: Anodized Aluminum; Bearing Plates & Bearings: Ni-Resist; Gears: SS; Seals: Viton®

SPA (Standard Petroleum - Aviation)

Liquids: Aviation Gasoline, Gasoline, Jet Fuels, Fuel Oils, Diesel, Bio-Diesel, Kerosene, Naptha

Materials: Housing & Rotors: Anodized Aluminum; Bearing Plates: Ni-Resist; Bearings: Carbon; Gears: SS; Seals: Viton®

SPD (Standard Petroleum - Ductile Nodular Iron)

Liquids: Ethanol, Methanol, Aviation Gasoline, Diesel, Bio-Diesel, Fuel Oils, Kerosene, Vegetable Oils, Motor Oils, Naptha

Materials: Housing: Ductile Iron; Rotors: Ni-Resist; Bearing Plates: Ni-Resist; Bearings: Carbon; Gears: SS; Seals: Teflon®/Simriz®

IC (Industrial Products, Carbon Bearings)

Liquids: Industrial Chemicals, General Solvents, Water, Alcohols, Acetones, MEK, Toluene

Materials: Housing & Rotors: HC Anodized Al; Bearing Plates: Ni-Resist; Bearings: Carbon; Gears: SS; Seals: Teflon®/Simriz®

IP (Industrial Products, SS Bearings)

Liquids: Industrial Chemicals, General Solvents, Liquid Sugars, Corn Syrup, Soybean Oil, Shortenings, Latex Products, Adhesives

Materials: Housing & Rotors: HC Anodized Aluminum; Bearing Plates: SS; Bearings: SS Alloy; Gears: SS; Seals: Teflon®/Simriz®

AF (All Ferrous)

Liquids: Ind. Chemicals, Solvents, Pesticides, Fertilizer, Chlorinated Solvents, Paints, Inks, Alcohols, Molasses, Corn Syrup

Materials: Housing: Ductile Iron; Rotors: SS; Bearing Plates: Ni-Resist; Bearings: AT Carbon; Gears: SS; Seals: Teflon®/Simriz®

SS (Stainless Steel)

Liquids: Industrial Chemicals, Solvents, DEF, Nitric Acid, Phosphorus Acid, Glacial Acetic Acid, Anti-Icing Fluid, Vinegar, Fruit Juices

Materials: Housing, Rotors, and Bearing Plates: SS; Bearings: AT Carbon; Gears: SS; Seals: Teflon®/Simriz®

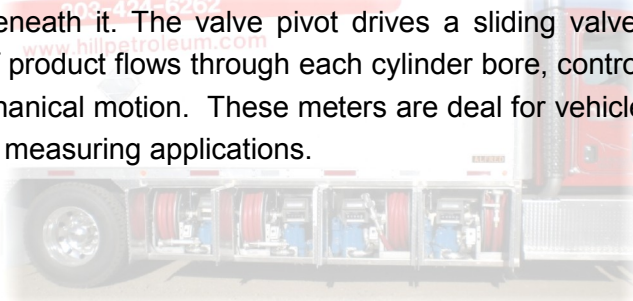
Viton is a registered trademark of E.I. DuPont de Nemours & Co. Teflon is a registered trademark of DuPont Dow Elastomers, LLC. Simriz is a registered trademark of Freudenberg-NOK.

Flow Meters — 682 Series Piston Type

The 682 series piston flow meter is a true positive displacement flow meter that has an inline design consisting of three (3) reciprocating pistons operating within their respective measuring chambers, where each piston works in a manner similar to an automobile engine. The pistons are fitted to a wobble plate, which has a shaft extending from its upper surface and a valve pivot attached beneath it. The valve pivot drives a sliding valve from piston to piston as a known amount of product flows through each cylinder bore, controlling the sequence of events in a smooth mechanical motion. These meters are ideal for vehicles, industrial batching or any other low volume measuring applications.

Features

Industry-leading 10 year warranty
Superior Accuracy over the entire flow range
Low Maintenance
Long Service Life
Proven performance and acceptance since 1933
Wide Viscosity Range - up to 50,000 SSU (11,000 CPS)
Worldwide Weights & Measures Approvals including NIST, OIML, NMI, SABS,
ATEX-MID and PED Certified



Design and Ratings

Reciprocating Three (3) Piston
Available Types: SP, SPA, SPD, AF & SS
Flow Range: 0.2 to 50 GPM (0.76 to 190 LPM)
Linear Accuracy: Capable of +/- 0.1% over 250:1 turndown
Repeatability: 0.01%
Available Materials of Meter Construction: Aluminum, Ductile Iron & Stainless Steel
Available Seals: Viton®, Teflon® & Simriz®



Meter Model No.	Flange Size NPT **	Flow Range		Working Pressure		Working Temperature	
		gpm	lpm	psi	bar	°F	°C
682-15	1-1/2"	0.2 to 50	0.76 to 190	150	10.5	-40 to 160	-40 to 71

+ NPT flanges are standard. BSPT, Slip Weld, ANSI and others available upon request.

* Optional flange sizes available upon request.

Flow Meters — 700 Series Rotary Type

The 700 series rotary flow meter has a simple and efficient design consisting of a housing and three rotors that rotate in unison within the precision-machined measuring chamber. There is no metal-to-metal contact between rotors and housing to minimize internal wear, maintain high accuracy over time, and extend the time between meter calibrations. The rotors are supported by bearings inserted into two bearing plates, one on each side of the meter. A timing gear at the end of each rotor shaft keeps each rotor fully synchronized and transfers meter rotary output through the calibration adjuster to the register for a consistent and highly accurate measurement of flow. Typical applications include metering off of trucks for heating oil, gasoline, or fertilizer deliveries, or metering into trucks at loading terminals.

Features

1-year warranty

Sustained high accuracy; long service life, low maintenance

Low pressure drop with viscosity range up to 1,500,000 SSU

Worldwide Weights & Measures Approvals including NIST, OIML, NMI, SABS,

ATEX-MID and PED Certified



Series 700–LP meter with electronic registration

Design and Ratings

Rotary Three (3) Piston

Available Types: SP, SPA, SPD, LP, IP, IC, AF & SS

Linear Accuracy

5:1 Turndown - capable of $\pm 0.100\%$ of maximum nominal flow rate

10:1 Turndown - capable of $\pm 0.125\%$ of maximum nominal flow rate

15:1 Turndown - capable of $\pm 0.150\%$ of maximum nominal flow rate

Repeatability: 0.02%



Meter Model No. [^]	Meter Types Available (see page 3)	Flange Size NPT ⁺ *	Max. Capacity		Working Pressure		Working Temperature	
			gpm	lpm	psi	bar	°F	°C
700-15	SP, SPA, IP, IC	1-1/2"	60	227	150	10.5	-40 to 160	-40 to 71
700-20	SP, SPA, SPD, IP, IC, AF, SS	2"	100	380	150	10.5	-40 to 160	-40 to 71
700-20	LP	2"	100	380	350	24	-40 to 160	-40 to 71
700-25	SPA, SPD	2"	150	567	150	10.5	-40 to 160	-40 to 71
700-30	SP, SPA, SPD, IP, IC, AF	3"	200	760	150	10.5	-40 to 160	-40 to 71
700-35	SPA, SPD	3"	300	1135	150	10.5	-40 to 160	-40 to 71
700-40	SP, SPA, SPD, IP, IC, AF	4"	500	1893	150	10.5	-40 to 160	-40 to 71
700-45	SPA, SPD	4"	600	2271	150	10.5	-40 to 160	-40 to 71

[^] Refer to the table on page 3 for a complete listing of meter materials of construction.

⁺ NPT flanges are standard. BSPT, Slip Weld, ANSI and others available upon request.

* Optional flange sizes available upon request.

Meter Accessories — Valves

A selection of valves is offered to increase the functionality of your metering system. All valve accessories are fully tested and are designed for bolt-on compatibility with your meter.

650 Hydraulic Preset Valve: A normally closed, hydraulically balanced piston control valve for auto-batch preset deliveries. The inline, two-stage control valve can be mechanically linked to a Veeder Root Preset Counter.

Size: 1-1/2"
Type: SP, AF & SS
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Body Material: Aluminum, Ductile Iron & Stainless Steel
Seals: Viton & Teflon



655 Electronic Control Valve: A normally closed two-stage diaphragm preset valve for use with electronic relay control. Stainless steel or brass pilot valves are available. Dimensionally interchangeable with the 650 Hydraulic Preset Valve.

Size: 1-1/2" and 2"
Type: SP & SPA
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Flow Capacity: 200 GPM (max)
Body Material: Aluminum
Solenoid: Brass or Stainless Steel; 12 or 24 VDC, 110 or 240 VAC (Optional ATEX)
Seals: Viton



750 Hydraulic Preset Valve: A normally closed, hydraulically balanced piston control valve for auto-batch preset deliveries. The right angle, two-stage control valve can be mechanically linked to a Veeder Root Preset Counter.

Size: 1-1/2", 2", 3", and 4"
Type: SP, IP, AF & SS
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Body Material: Aluminum, Ductile Iron (2" only) & Stainless Steel (2" only)
Seals: Viton or Teflon



755 Electronic Preset Valve: Normally closed two-stage piston preset valve for use with electronic relay control. Stainless steel or brass pilot valves are available. Dimensionally interchangeable with the 750 Hydraulic Preset Valves.

Size: 1-1/2", 2" & 3"
Type: SP & SPA
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Flow Capacity: Up to 300 GPM; Viscosity: 2800 SSU (580 cPs)
Body Material: Aluminum
Solenoid: Brass or Stainless Steel; 12 or 24 VDC, 110 or 240 VAC (Optional ATEX)
Seals: Viton or Teflon



Meter Accessories — Valves, continued

756 Pneumatic Preset Valve: Air actuated, normally closed two-stage piston preset valve for use in systems with air supply. Dimensionally interchangeable with the mechanical valve.

Size: 1-1/2", 2" & 3"
Type: SP
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Material: Aluminum
Seals: Viton



757 Differential Valve: The differential diaphragm valve has a normally closed, spring-loaded design. It provides a constant 15 PSI differential pressure and controls flow when vapor is sensed. UL Listed.

Size: 1-1/2" & 2"
Type: LP
Pressure: 350 PSI (24 BAR)
Temperature: -40 to 160F (-40 to 71C)
Material: Aluminum
Seals: Buna-N



760 Air Check Valves: The air check valve operates on differential pressure, closing when air is present. Designed to increase air eliminator efficiency during product depletion.

Size: 2" & 3"
Type: SP
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Material: Aluminum
Seals: Viton



782 In-Line Check Valves: Mounted between the strainer and the meter assembly to help increase air and vapor eliminator efficiency by creating additional back pressure and to help reduce back flow. UL Listed.

Size: 1-1/2" & 2"
Type: LP and SP
Pressure: 150 PSI (10.4 BAR) or 350 PSI (24 BAR) for LPG
Temperature: -140 to 160F (-40 to 71C)
Material: Aluminum & Ductile Iron
Seals: Buna-N



Oil Capitol Valves (OCV): Valves are hydraulically operated, diaphragm actuated for multi-function control of non-corrosive, non-abrasive fluids. Available in globe or angle configuration, these fully automatic valves operate off line pressure, or if desired from an independent power source. The wide range of control pilots makes it possible to offer combination models for virtually any fluid handling need. Control valves are offered for a wide variety of automatic and self-actuated system applications such as pump control valves, pressure relief and safety valves, and flow control valves.



Meter Accessories — Air & Vapor Eliminators

An air eliminator is a device designed to extract free or accumulated volumes of air or vapor from a liquid dispensing system to achieve accurate flow measurements. Each air eliminator must be vented back to a storage tank or into a special "catch" tank vented to atmospheric pressure because the air or vapor released will contain a small amount of liquid.

630 Air Eliminator and Strainer: A float and valve design senses and removes free air before it can enter the flow meter. Required for custody transfer applications to ensure the most precise liquid flow measurement.

Size: 1-1/2"
Type: SP, AF & SS
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Material: Aluminum, Ductile Iron & Stainless Steel
Seals: Viton & Teflon
Strainer Mesh: 40 Mesh (Stainless Steel)



740 Air Eliminator & Strainer: A float and reed valve operated design senses and removes free air or vapor before it can enter the flow meter. Required for custody transfer applications to ensure the most precise measurement. UL Listed.

Size: 1-1/2", 2", 3" & 4"
Type: LP, SP, IP, AF & SS
Pressure: 150 PSI (10.5 BAR); 350 PSI (24 BAR) for LPG
Temperature: -40F to 160F (-40C to 71C)
Material: Aluminum, Ductile Iron & Stainless Steel (SS 2" only)
Seals: Viton, Teflon & Simriz
Strainer Mesh: 40, 80, 100, and 200 Mesh; 0.050 Perforation (Stainless Steel)

LPG Vapor
Eliminator



Air Eliminator

745 High Volume Air Eliminator & Strainer: An offset 90° strainer and air eliminator assembly designed for use in applications where a high volume of free air may potentially enter the measurement system. Recommended for mobile fuel delivery systems to pass product depletion (split compartment) testing by Weights & Measures authorities.

Size: 2" & 3"
Type: SP
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Material: Aluminum
Seals: Viton
Strainer Mesh: 40, 80, and 100 Mesh (Stainless Steel)



Bulk Air Eliminator: Bulk air eliminators are designed for use where a high volume of free air may enter the measurement system, such as metering into storage. Available with single or dual SP, AF or SS air eliminators and assembled to carbon steel or stainless steel vessels.

Size: 3" & 4"
Type: SP, SPD or SS
Pressure: 150 PSI (10.5 BAR)
Temperature: -40F to 160F (-40C to 71C)
Material: Aluminum, Ductile Iron & Stainless Steel
Seals: Viton, Teflon & Simriz



Meter Registration — Mechanical

TCS Meters are available with both mechanical and electronic registers and flow computers. Mechanical registers are shown below from industry-leading suppliers. Refer to the website for more detailed information on each offering.



The 7887 Meter Register totalizes and displays high speed deliveries and transactions in large, 3/4" easy-to-read figures. Displays a 5 digit resettable totalizer and 8 digit non-resettable totalizer.



The 7888 Meter Register and Ticket Printer combine to produce clean, detailed printed records of high-speed fluid deliveries and transactions.



The Meter Register and Preset Counter provide automatic preset batch control. The control function will shut-off (2-stage) when a predetermined quantity is delivered.



The Micro Switch assembly has two double chamber internal switches to provide Full Flow, Low Flow and Off Control for the 7889 preset counters.



The dry reed (1:1 or 10:1) and solid state (100:1) pulse transmitters provide fast and accurate signaling for remote indication, totalizing and data monitoring systems.



This swivel adaptor allows the register to be rotated to any desired angle before delivery or while meter is operating.



Tray switch prevents a pump or valve from turning on until the register counter has been reset. Also used for resetting external digital displays after a transaction is finalized.

Meter Registration — Electronic

Your metering system can be enhanced through Electronic Registration to provide increased accuracy, security and productivity. Electronic registration provides a re-settable totalizer display, as well as preset valve control, temperature volume compensation, ticket printing and electronic communication. Other options available are point-of-sale (POS), data capture, auto -batch, data management, route control, GPS and more.

PLC or digital controllers for fluid process management: Stock or customized units are available from our UL 508A approved engineered systems. Total Control Systems offers all the components to mechanically and electrically connect your liquid handling systems together and control the operation from one convenient, easy to use panel. Utilizing the latest digital electronic preset controls, touch screen or PLC driven technology, we can custom design and build control panels to your specific requirements. Single or multiple product presets are available from stock or we can design a panel to control multiple operations such as manufacturing plants, loadouts, injection systems, or mini-bulk filling. Our menu driven software programs do not require prior computer experience. TCS designed and manufactured control panels meet UL 508A .



e-Count Electronic Register from Mid:Com: MID:COM is a leading manufacturer of electronic meter registers, on board computers, and accessories for vehicle delivery systems. The most common applications are on Propane and Petroleum delivery trucks.

Features of the e-Count include:

- Large easy to read alpha numeric display
- Easy to follow legends for all operations
- Self contained calibration and set up functions
- Accepts any type of pulse input
- Built in Enduro Switch® control keys (for harsh environments)
- Sealed connectors including power, valve control and remote readout
- Field programmable for custom applications
- Eliminate change gears, adjusters, linkages and other mechanical parts
- Class 1, Division II



e-Count can be connected to an Epson slip printer, our own impact or our new thermal printer, to provide basic pump and print functions. Our modular design allows a user to upgrade the system by adding components in the cab and leaving the original register, valve and cables to the meter intact. Possible upgrades include all of the current MID:COM computers, general purpose computers, and other common peripheral components.

For North American sales only.

Meter Registration — Electronic

Veeder-Root is the leading manufacturer of Meter Registration products throughout the world. The Veeder-Root Electronic Registration platform is built on years of experience in the industry and provides robust and reliable productivity solutions for the right price.

From Delivery Truck Fleets and Depot/Terminal installations to Aviation refueling and specialty industrial applications, Veeder Root continues to provide top quality products by offering the latest technology in meter-registers and total flow measurement solutions.

The Next Standard in Electronic Register Systems

The new generation of electronic meter-register, exemplified by Veeder-Root's EMR³, wraps the latest technology around a robust/user-friendly system, providing unprecedented value for customers worldwide. Fully capable of meeting the most demanding customer requirements, it can be affordably configured to fit a wide variety of industry applications.

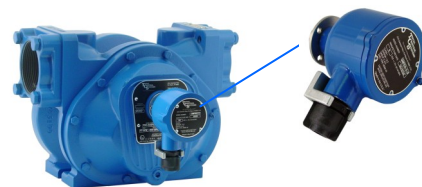


Transaction Data Storage

The ability of any electronic meter register system to store fuel-dispensing transaction data is critical in today's total-solution business environment. That's why Veeder-Root designed a non-volatile memory capability in the EMR³. The system continuously stores data for the last 200 transactions. All EMR³ systems include three communication ports, intended for connection with vehicle On-board computers, Delivery Ticket Printers, I.B. net, or other auxiliary devices. Many leading back-office software providers rely on EMR³ as a key component in their fuel-solution offerings, using hand-held devices to transfer data from the I.B. unit to the customer's Back-office PC.

The TCS Pulse Transmitters

The DMP and RMP pulse transmitters accurately pulse electronic signals from a flow meter rotation or Veeder Root mechanical register to a fluid management system or remote display. The pulse transmitter switches a fixed level input voltage to form a square wave pulse that can provide a single or dual channel output. A pulse transmitter is shown mounted to a Series 700 meter.



Miscellaneous Accessories

Miscellaneous additional product accessories were developed to increase the functionality of your metering system. Such items include rate-of-flow indicators, RTD temperature probes, density sensors, clutch assemblies, insulation jackets, protective covers and various flange connections for applications, worldwide.

Total Control Systems is a leading manufacturer of precision measurement systems. Our world-class positive displacement flow meters are among the most accurate available in any industry and are backed by excellent customer service, support, and prompt deliveries.

TCS meters are designed and manufactured to meet or exceed your needs. Our meters are used world-wide in a multitude of applications including Agriculture, Aviation, Marine, LPG, Refined Fuels, Industrial Chemicals and Alternative Fuels.

*Discover why Total Control Systems
should be the future of your metering solutions!*



**TOTAL
CONTROL
SYSTEMS**



“The Standard of Measurement”

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