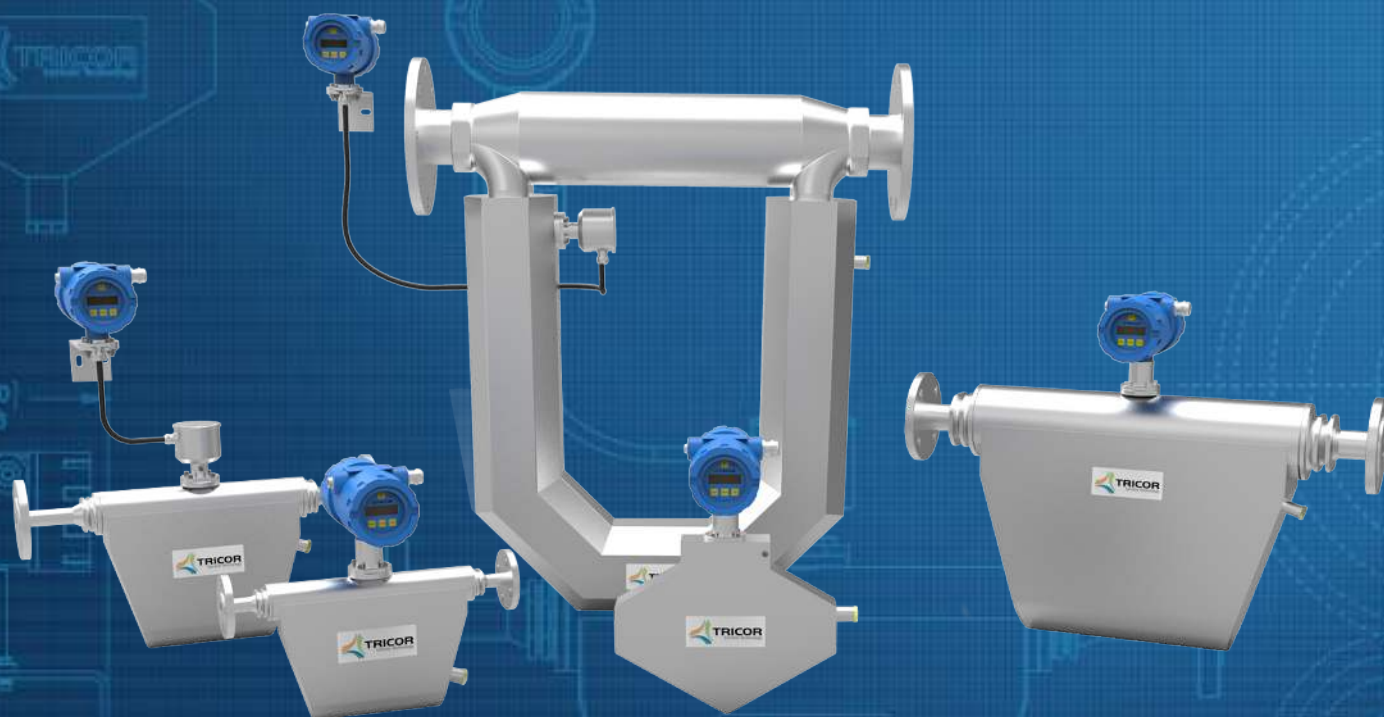




**AW-LAKE**  
PROCESS FLOW MEASUREMENT



## TRICOR CORIOLIS MASS FLOW METERS | CLASSIC SERIES

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## ABOUT

The unique design and proprietary manufacturing procedures of TRICOR products produce perfectly balanced tubes for high accuracy, repeatability and process noise immunity. TRICOR meters offer exceptional ease of use and fast setup time right out of the box. Our service team works with you to provide customized solutions to your real-world needs – from custom connections to pre-programmed transmitter parameters and reporting preferences. The TRICOR family offers a broad portfolio with pricing options that scale to performance.

## FEATURES

- > Multi-variable instrument: direct independent measurement of mass flow, density and temperature with calculated volumetric flow
- > API gravity output reading
- > Frequency output up to 10,000 Hz resolution
- > Easily accessible, integrated meter diagnostics to verify meter health & performance
- > Hazardous area certifications: ATEX, IECEx, CSA, TR (EAC)

## ADDITIONAL OPTIONS

- > Net oil software
- > High pressure designs available up to 15,200 psi, 1050 bar
- > Integrated pressure compensation
- > Customizable installation length and process connections
- > Extended warranty and startup program
- > Calibration maintenance services



## TRICOR FLOW SENSORS | CLASSIC SERIES

TRICOR's Diamond Shape Coriolis Mass Flow Meters range in flow rate from 325 to 3100 kg/hr (12-114 lb/min) and withstand pressures up to 2900 psi (200 bar). The diamond shape (D-shape) tube design has the best overall performance of any Coriolis tube shape. The mechanical advantages of this design include the best signal-to-noise ratio and reduced effects of external vibrations, thus improving zero stability. Each meter is mechanically balanced to ensure the best in class density measurement and overall performance.



### TCM 0325

- Mass Flow Rate (max):** 12 lb/min, 325 kg/h
- Volumetric Flow Rate (max):** 1.43 gpm, 325 l/h, 49 bbl/d
- Standard Pressure Rating:** up to 2900 psi, 200 bar
- Nominal Meter Size:** 1/8", DN4

### TCM 0650

- Mass Flow Rate (max):** 24 lb/min, 650 kg/h
- Volumetric Flow Rate (max):** 2.86 gpm, 650 l/h, 98 bbl/d
- Standard Pressure Rating:** up to 2900 psi, 200 bar
- Nominal Meter Size:** 1/8", DN4

### TCM 1550

- Mass Flow Rate (max):** 57 lb/min, 1550 kg/h
- Volumetric Flow Rate (max):** 6.82 gpm, 1550 l/h, 234 bbl/d
- Standard Pressure Rating:** up to 2900 psi, 200 bar
- Nominal Meter Size:** 1/4", DN6

### TCM 3100

- Mass Flow Rate (max):** 114 lb/min, 3100 kg/h
- Volumetric Flow Rate (max):** 13.65 gpm, 3100 l/h, 468 bbl/d
- Standard Pressure Rating:** up to 2900 psi, 200 bar
- Nominal Meter Size:** 1/4", DN6

TRICOR's U-Shape Coriolis Mass Flow Meters range in flow rate from 5500 to 230,000 kg/hr (202-8450 lb/min) and withstand pressures up to 1450 psi (100 bar). The TCM 5500 is rated at a maximum pressure of 5,000 psi (345 bar). These meters have good overall accuracy, zero stability, and pressure drop. The simple self-draining U-shape tube design provides for easy cleaning/flushing.



### TCM 5500

- Mass Flow Rate (max):** 202 lb/min, 5500 kg/h
- Volumetric Flow Rate (max):** 24.22 gpm, 5500 l/h, 830 bbl/d
- Standard Pressure Rating:** up to 5000 psi, 345 bar
- Nominal Meter Size:** 1/2", DN15

### TCM 7900

- Mass Flow Rate (max):** 290 lb/min, 7900 kg/h
- Volumetric Flow Rate (max):** 34.78 gpm, 7900 l/h, 1193 bbl/d
- Standard Pressure Rating:** up to 1450 psi, 100 bar
- Nominal Meter Size:** 1/2", DN15

### TCM 028K

- Mass Flow Rate (max):** 1029 lb/min, 28,000 kg/h
- Volumetric Flow Rate (max):** 123.3 gpm, 28,000 l/h, 4227 bbl/d
- Standard Pressure Rating:** up to 1450 psi, 100 bar
- Nominal Meter Size:** 1", DN25

### TCM 065K

- Mass Flow Rate (max):** 2388 lb/min, 65,000 kg/h
- Volumetric Flow Rate (max):** 286.2 gpm, 65,000 l/h, 9812 bbl/d
- Standard Pressure Rating:** up to 1450 psi, 100 bar
- Nominal Meter Size:** 1-1/2", DN40



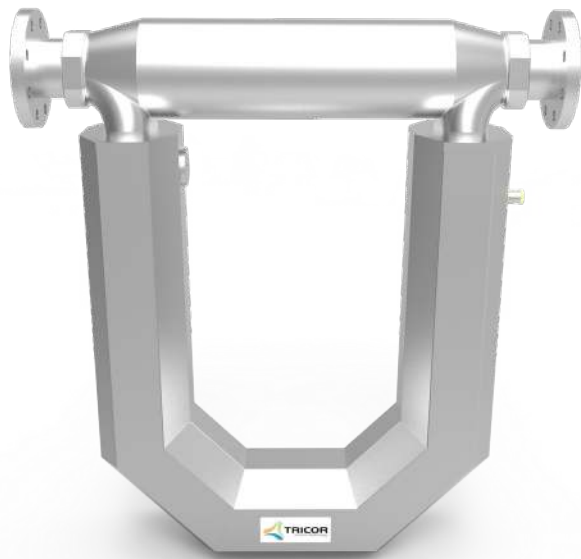
## WIDE USAGE ACROSS MANY INDUSTRIES

TRICOR Coriolis Technology equipment can be used in a variety of different applications and industries to increase process efficiency, reduce downtime, and improve product quality/consistency:

- > Oil & Gas
- > Marine
- > Chemical/Petrochemical
- > Paints, Sealants and Coatings
- > Food and Beverage
- > Power



## TRICOR FLOW SENSORS | CLASSIC SERIES



### TCM 230K

**Mass Flow Rate (max):** 8450 lb/min, 230,000 kg/h

**Volumetric Flow Rate (max):** 1012 gpm, 230,000 l/h, 34700 bbl/d

**Standard Pressure Rating:** up to 1450 psi, 100 bar

**Nominal Meter Size:** 3", DN80

## TRICOR FLOW SENSORS | SPECIALITY SERIES



### TCMH 0450

The TCMH 0450 is TRICOR's High Pressure Coriolis Mass Flow Meter, offered in three pressure ratings: 6,000 psi, 10,000 psi or 15,200 psi. The material choices for the U-shape tubes are either 316 stainless steel for chemical injection applications or Sandvik® Alloy HP 160, chosen to eliminate hydrogen embrittlement, such as in Hydrogen fueling stations.

#### Technical Specifications for Liquids:

**Nom. Flow Rates: (@850 kg/m<sup>3</sup>, Pressure Drop Max. 29 psi):**

- 6.6 lb/min @ 1 cSt, 180 kg/h @ 1 cSt
- 5.5 lb/min @ 10cSt, 150 kg/h @ 10 cSt
- 2.4 lb/min @30 cSt, 65 kg/h @ 30 cSt

**Standard Pressure Rating:**

- TCMH 0450-HC-SPOS: 15,200 psi, 1050 bar
- TCMH 0450-HC-SROS: 10,000 psi, 690 bar
- TCMH 0450-HC-SSOS: 6,000 psi, 414 bar

**Connection:** 3/8" Autoclave (MP)

#### Technical Specifications for Gases:

**Nom. Flow Rates: (@ 20°C air, pressure drop 145 psi):**

- 14.5 lb/min @ 15,200 psi, 394 kg/h @ 1050 bar
- 13.3 lb/min @ 10,000 psi, 362 kg/h @ 690 bar
- 11.6 lb/min @ 6,000 psi, 316 kg/h @ 414 bar

**Nom. Flow Rates: (@ 20°C H<sub>2</sub>, pressure drop 725 psi):**

- 9.30 lb/min @ 15,200 psi, 254 kg/h @ 1050 bar
- 8.80 lb/min @ 12,690 psi, 240 kg/h @ 875 bar
- 8.15 lb/min @ 10,000 psi, 222 kg/h @690 bar
- 6.75 lb/min @ 6,000 psi, 184 kg/h @ 414 bar

**Standard Pressure Rating:** up to 15,200 psi, 1050 bar

**Connection:** 3/8" Autoclave (MP), other connections available



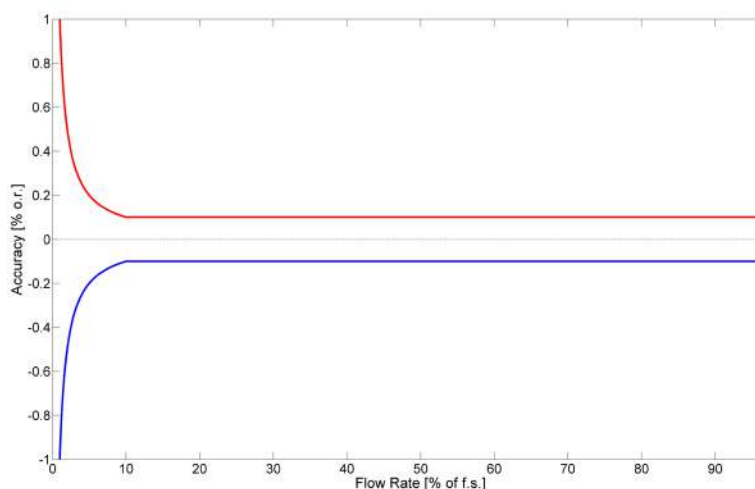
## ► TECHNICAL DATA FOR LIQUIDS

### FLOW RATE FOR LIQUIDS

Model Number	Max. Flow Rate (water) (lbs/min) (kg/hr)		Basic Mass Flow Accuracy (% of flow rate)	Zero Stability (% of full scale)	Repeatability (% of flow rate)
TCM 0325	12	325	±0.1	±0.01	±0.05
TCM 0650	24	650			
TCM 1550	57	1550			
TCM 3100	114	3100			
TCM 5500	202	5500			
TCM 7900	290	7900			
TCM 028K	1029	28,000			
TCM 065K	2388	65,000			
TCM 230K	8450	230,000			
TCMH 0450**	6.6	180	±0.2	0.34 kg/h	±0.1

Density Measuring Range	Density Accuracy	Density Repeatability
0 - 2500 kg/m <sup>3</sup> , 2.5 g/cm <sup>3</sup> (higher ranges on request)	±5.0 kg/m <sup>3</sup> , ±0.005 g/cm <sup>3</sup> (special calibration on request)	±0.5 kg/m <sup>3</sup> , ±0.0005 g/cm <sup>3</sup>

## ► ACCURACY FOR LIQUIDS



Flow Rate of Full Scale	Accuracy
>10%	± Base Accuracy
<10%	$\pm \frac{\text{Zero Point}}{\text{Measured Value}} * 100$

Notes: Calibration for Liquids and Gases:

The TRICOR flowmeters are always factory calibrated with water.

Calibration Conditions: Water: 68°F ... 77°F (20°C ... 25°C), ambient temperature: 68°F ... 77°F (20°C ... 25°C)

All specifications are based on above mentioned calibration reference conditions, a flow calibration protocol is attached to each instrument.

Stated accuracy combines the effects of repeatability, linearity and hysteresis.

Typical flow dynamics based on max. flow rate is 100:1.

\*\* @ 1 cSt



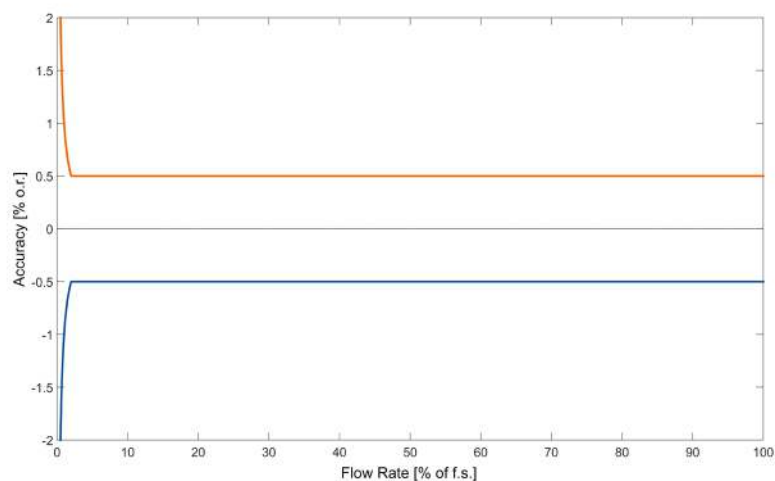
## ► TECHNICAL DATA FOR GASES

### FLOW RATE FOR GASES

Model Number	Normal Flow Rate				Zero Stability in lb/min (kg/h)	Basic Accuracy (% of flow rate)	Repeatability (% of flow rate)
	(lbs/min) <sup>1,3</sup>	(kg/h) <sup>1,3</sup>	(SCFM) <sup>1,2</sup>	(nm <sup>3</sup> /h) <sup>1,2</sup>			
TCM 0325	3	78	109	64	0.0012 (0.0325)	±1.0 (option up to ±0.5)	±0.25
TCM 0650	7	177	247	146	0.0024 (0.065)		
TCM 1550	12	333	464	273	0.0057 (0.155)		
TCM 3100	27	740	1031	607	0.0114 (0.31)		
TCM 5500	34	910	1268	747	0.020 (0.55)		
TCM 7900	53	1430	1993	1173	0.029 (0.79)		
TCM 028K	188	5100	7109	4184	0.103 (2.8)		
TCM 065K	575	15,650	21,813	12,838	0.029 (6.5)		
TCM 230K	1797	48,900	68,157	40,115	0.845 (23)		
TCMH 0450	14.5	394	549	320	0.0165 (0.45)	±1.0	±0.5

Density Measuring Range	Density Accuracy	Density Repeatability
See comment <sup>3)</sup>	±1.0 kg/m <sup>3</sup> , ±0.001 g/cm <sup>3</sup>	±0.5 kg/m <sup>3</sup> , ±0.0005 g/cm <sup>3</sup>

## ► ACCURACY FOR GASES



Flow Rate of Full Scale	Accuracy
>10%	± Base Accuracy
<10%	$\pm \frac{\text{Zero Point}}{\text{Measured Value}} * 100$

Notes: Max. allowed flow velocity (Ma 0.5)

For gas applications, flow rate and pressure drop for individual sensor sizes are dependent on operating temperature, pressure and fluid composition. Therefore, when selecting a sensor for any particular gas application, please use the TSP (TRICOR Sizing Program) or contact us.

<sup>1)</sup> Nominal flow rates that produce approximately 3 bar (43 psi) pressure drop for natural gas at 50 bar (725 psi) operational pressure.

<sup>2)</sup> Normal reference conditions (Nm<sup>3</sup>/h) are 1.013 bar and 0°C. Standard (SCFM) reference conditions are 14.7 psi and 60°F.

<sup>3)</sup> Flow rate and density range depend on the gas density and the pressure range.



## ► TECHNICAL SPECIFICATIONS

### GENERAL

Model Number	Nominal Meter Size (in) (DN)		Internal Tube Diameter (in) (mm)		Tube Arrangement
TCM 0325	1/8"	DN4	0.157"	4 mm*	2 serial
TCM 0650	1/8"	DN4	0.157"	4 mm	2 parallel
TCM 1550	1/4"	DN6	0.315"	8 mm*	2 serial
TCM 3100	1/4"	DN6	0.315"	8 mm	2 parallel
TCM 5500	1/2"	DN15	0.276"	7 mm	2 parallel
TCM 7900	1/2"	DN15	0.354"	9 mm	2 parallel
TCM 028K	1"	DN25	0.630"	16 mm	2 parallel
TCM 065K	1-1/2"	DN40	1.1"	28 mm	2 parallel
TCM 230K	3"	DN80	1.693"	43 mm	2 parallel
TCMH 0450	3/8"	DN10	0.095"	2.40 mm	2 parallel

\*Double loop design.

### TEMPERATURE

Temperature Repeatability	±0.36°F (±0.2°C)
Temperature Accuracy	±1.8°F ±0.5 % of reading (±1°C ±0.5 % of reading)
Process Temperature (Non Ex)	-40°F ... +212°F (-40°C ... +100°C) (standard) -40°F ... +302°F (-40°C ... +150°C) (optional) -76°F ... +392°F (-60°C ... +200°C) (optional)
Process Temperature (Ex)	direct meter mount: -40°F ... +158°F (-40°C ... +70°C ) (T4) (n/a for the TCM 230K) remote mount: -40°F ... +158°F (-40°C ... +70°C ) (T4) -40°F ... +275°F (-40°C ... +135°C) (T3) -76°F ... +392°F (-60°C ... +200°C) (T2)
Ambient Temperature	-40°F ... +158°F (-40°C ... +70°C)
Storage Temperature	-40°F ... +212°F (-40°C ... +100°C)





## ► TECHNICAL SPECIFICATIONS

### PROCESS CONNECTIONS

Model Number	Process Connections	Max. Pressure Standard	Pressure Drop at Max. Flow
TCM 0325	female thread 1/2" adaptors for flanges, dairy and tri-clamp	2900 psi, 200 bar	For detailed information please contact us.
TCM 0650			
TCM 1550			
TCM 3100			
TCM 5500	flanges EN1092, ANSI B16.5, DIN2512, tri-clamp	5000 psi, 345 bar	
TCM 7900		1450 psi, 100 bar	
TCM 028K			
TCM 065K			
TCM 230K			
TCMH 0450	3/8" Autoclave (MP), other connections available	15,200 psi, 1050 bar	

Remote Electrical Connections	Screw type and spring type terminals
Direct Meter Mount Electrical Connections	None (internally connected to the electronics)
Ingress Protection	IP65 (IP66/IP67 on request)

## ► HAZARDOUS AREA CLASSIFICATIONS

### ATEX

Zone 1: Group IIC or IIB, T2-T4

Zone 2: II 3G Ex nA IIC T2-T4 Gc

### IECEx

Zone 1: Group IIC or IIB, T2-T4

### cCSAus

Class 1, Division 1: Group A, B, C, D or C, D, T2-T4

### ATEX + IECEx + cCSAus = Triple Approval

Zone 1: Group IIC or IIB, T2-T4 and

Class 1, Division 1: Group A, B, C, D or C, D, T2-T4

### EAC (TR-CU)

Group IIC or IIB, T2-T4





## NET OIL MEASUREMENT

Net oil measurement is a significant advantage of the TRICOR TCE 8000 Series Transmitter. We integrated the net oil calculation right into the software, so no additional equipment is needed. By combining TRICOR's excellent meter design with the cutting-edge, custom algorithms, AW-Lake is able to take your oilfield allocation and verification to a higher level of reliability, accuracy and sophistication.

Optimizing your well site with TRICOR reduces time spent manually collecting and analyzing data, and operators can monitor multiple process measurement values simultaneously. Through our expertise in signal processing and data analysis, minute measurements are used to calculate reliable, real-time production and oil/water cut data.



## TRICOR FLOW ELECTRONICS | CLASSIC SERIES



### TCE 8000 ELECTRONICS

The multi-variable TCE 8000 Series of Mass Flow Transmitters from TRICOR outputs flow rate, flow total, density or temperature data. The TCE 8000 transmitters are also offered in a variety of mounting styles, including direct meter mount, panel mount, and wall mount; as well as multiple outputs and interfaces to choose from. These transmitters are certified for use in hazardous areas: cCSAus, ATEX, IECEx, and EAC (TR-CU). Optional features include net oil calculations and integrated pressure compensation.

#### Outputs available:

- Analog (up to 2)
- Pulse/Frequency (0.5 -10,000 Hz)
- Status

#### Programmable control inputs

**Interfaces available:** RS485 (MODBUS-RTU), HART®, Foundation Fieldbus

#### LCD Display

**Hazardous area approvals:** ATEX, IECEx, cCSAus



TCE 8000 Wall Mount



TCE 8000 Direct Meter Mount



### TCE 6000

The TCE 6000 Mass Flow Transmitter is ready for ESTA applications. Outputs available include Analog current output, pulse/frequency output (0.5 to 10,000 Hz), and status output. Choose from either RS485 (Modbus RTU), or USB interfaces.

#### Outputs available:

- Analog current output
- Pulse/frequency output (0.5-10000 Hz)
- Status output

#### Programmable control inputs

**Interfaces available:** RS485, USB (option)

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