



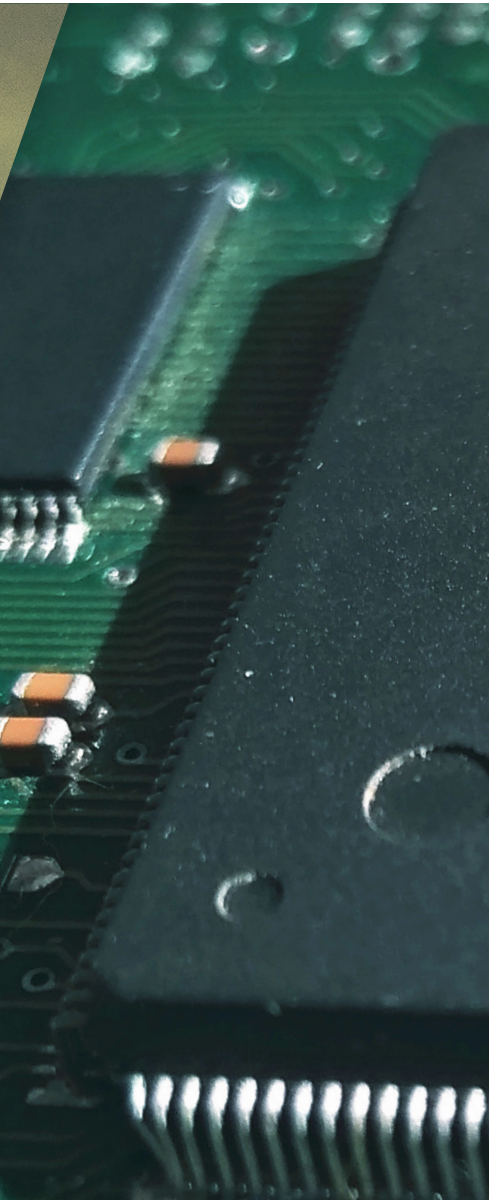
TECHNICAL DATASHEET



- High dosing accuracy
- Flow control for fast measuring cycles with pumps
- Tailored installation length
- Accuracy combined with long-term stability
- Extensive diagnostics and self-monitoring



Our passion is
your **Process**



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DESCRIPTION

TRICOR Coriolis Mass Flow Meters that incorporates a DSP transmitter to provide a smart flow measurement solution. Based on a strong tradition of innovative developments, we have added a new member to the TRICOR Coriolis family. With the TRICOR PRO Plus series, we deliver the next generation of Coriolis flow meters that offer excellent performance, safety and ease of use.

This digital flowmeter features market-leading compactness, very high measurement accuracy, low pressure drop, very stable zero point and first-class data update, with fast 100 Hz signal transmission. Available in three flow meter sizes including ½", 1" and 2", the TCMQ series of Mass Flow Meters offers a choice of a basic Modbus transmitter or a digital transmitter with remote or local mount.

FEATURES

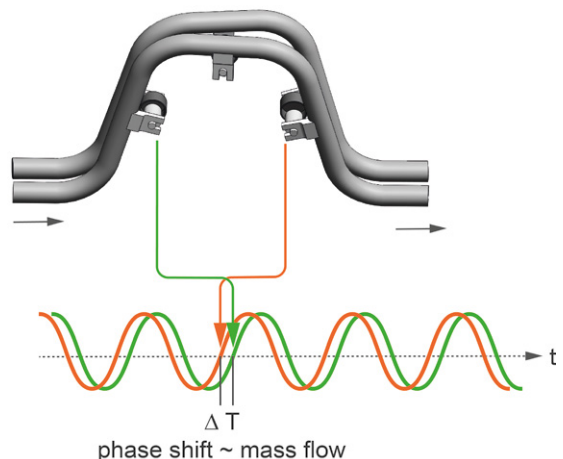
- Measurement of mass flow, volume flow, density and process temperature
- Extremely short installation length
- High zero stability drift-free operation
- Fully welded sensor concept
- High sampling rate (100 Hz), ideal for dynamic process conditions
- Up to four configurable I/Os
- Communication interfaces: HART, PROFIBUS DP¹⁾, PROFIBUS PA¹⁾ or Modbus RTU RS485
- Full graphical local display (HMI), with 6 user views and trend curves
- SD-Card for memory backup, logging and documentation storage
- Transmitter adds functionalities such as Standard volume flow, fractions, totalizers, dosing, access control, diagnostics, configuration and logging
- Modular transmitter design facilitates field service
- USB service interface
- High immunity against process noise

ADDITIONAL OPTIONS

- Superior meter calibration: DAkkS-Accreditation as per DIN EN ISO/IEC 17025:2018
- Tailor-made customer solutions
- Extended warranty

PRINCIPLE OF OPERATION

TRICOR Coriolis Mass Flow Meters operate with two parallel tubes with coils that cause them to oscillate at their resonance frequency. Should a measurement flow enter the measuring tube, Coriolis forces are the result. Coriolis forces appear in oscillating systems when a mass moves towards or away from a rotational axis. These forces act on the inlet and outlet side in the opposite direction and minimally deform the measuring tubes. The deflection of the measurement tubes is captured by sensors on the inflow and outflow side. These two sensors measure a phase shift that is proportional to the mass flow. The resonance frequency of the tubes varies depending on the density of the medium to be measured. This effect is used to measure the density of the medium. The primary characteristics such as mass flow rate, density and temperature are measured with a single flow meter. The volume flow can be determined based on the mass flow rate and density.





PRODUCT OVERVIEW

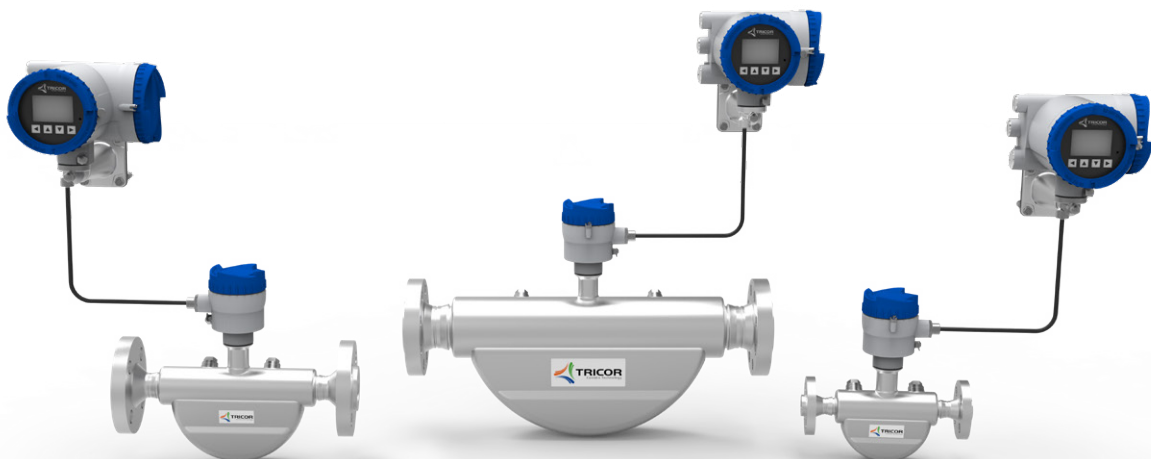
Basic version



Compact version



Wall mounted (remote version)





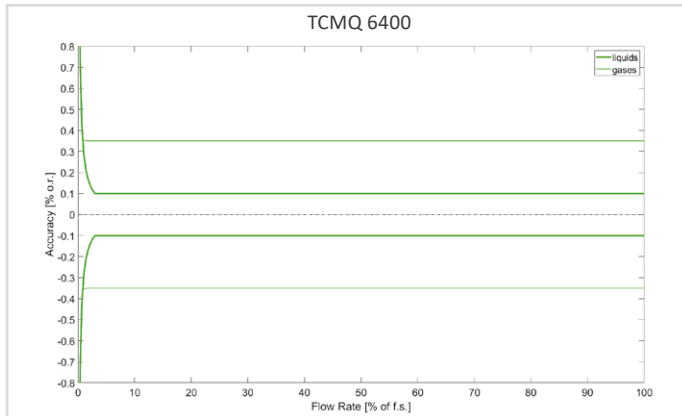
TCMQ SENSOR – TECHNICAL DATA

	TCMQ 6400	TCMQ 018K	TCMQ 070K
Max. Flow Rate (kg/h)	6,400	17,700	70,700
Max. Flow Rate (lb/min)	235	650	2,600
Basic Accuracy (Mass Flow)	±0.1 % of flow rate		
Basic Accuracy (Volume Flow)	±0.5 % (option: up to ±0.1 %) of flow rate		
Repeatability	±0.05 % of flow rate		
Zero Stability	±0.003 % of full scale	±0.01 % of full scale	
Density Range	up to 5,000 kg/m ³ [5.0 g/cm ³]		
Density Accuracy	±5.0 kg/m ³ (option: ±0.5 kg/m ³) [±0.005 g/cm ³ (option: ±0.0005 g/cm ³)]		
Density Repeatability	±0.25 kg/m ³ [±0.00025 g/cm ³]		
Measuring Accuracy Brix	0.1 °Brix (1,000 kg/m ³)		
Process Temperature Range	-60 °C ... +200 °C [-76 °F ... +392 °F]		
Temperature Repeatability	±0.5 °C ±0.25 % of reading [±0.9 °F ±0.25 % of reading]		
Process and Ambient			
Process Connections	DN15 – EN 1092-1 B1, PN40	DN25 – EN 1092-1 B1, PN40	DN50 – EN 1092-1 B1, PN40
Max. Pressure (process connection dependent)	100 bar [1,450 psi]		
Pressure Drop at max. Flow	for detail information please contact us		
Ambient Temperature (Humidity max. 90 %)	-40 °C ... +60 °C [-40 °F ... +140 °F] (depending on transmitter)		
Storage Temperature	-40 °C ... +70 °C [-40 °F ... +158 °F]		
Electrical Connection	<ul style="list-style-type: none"> • M12 connector with 4-wire cable • Standard cable with polymer/brass • Stainless steel cable glands (NPT) • Armored cable with stainless steel armored cable glands (NPT) • Conduit entries (NPT) 		
Ingress Protection	IP67/NEMA 4X		
General			
Tube Arrangement	parallel	parallel	parallel
Tube Inner Diameter	8 mm [0.31 in]	14 mm [0.55 in]	28 mm [1.1 in]
Design	Fully welded		
Tube Material	1.4435 [AISI 316L]		
Housing Material	1.4301 [AISI 304]		
Wetted Material	1.4435 [AISI 316L] ¹⁾		
Dimensions	see dimensional drawing (page 10)		

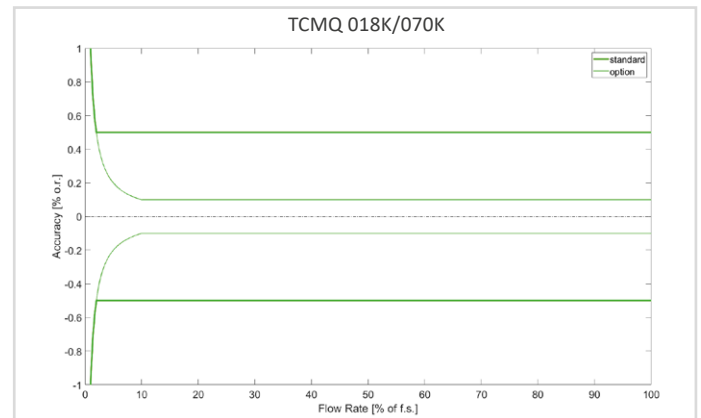
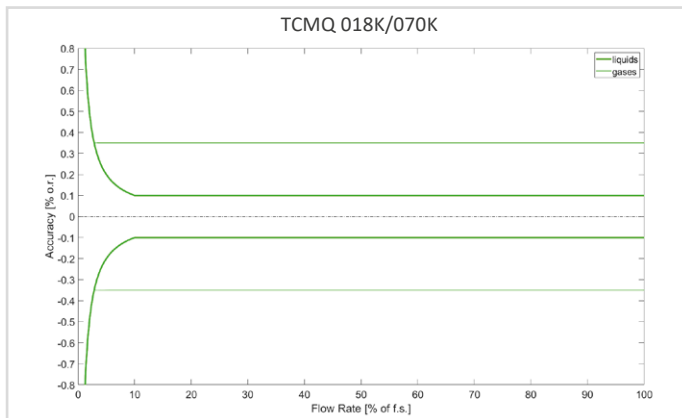
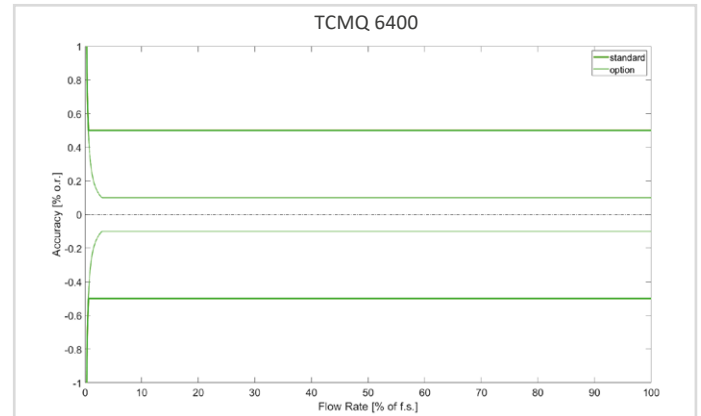
¹⁾ Special material Hastelloy C22 (W2.4602) only on request.



ACCURACY MASS FLOW



ACCURACY VOLUME FLOW



Flow Rate of Full Scale	Accuracy
$\geq \frac{\text{Zero Point}}{\text{Basic Accuracy}} * 100$	$\pm \text{Basic Accuracy}$
$< \frac{\text{Zero Point}}{\text{Basic Accuracy}} * 100$	$\pm \frac{\text{Zero Point}}{\text{Measured Value}} * 100$

EX CERTIFICATIONS²⁾

	TCMQ with TCD 9010 transmitter	TCMQ with TCD 9100/9200 transmitter
ATEX	II 1/2 G Ex db ia IIC T* Ga/Gb II 1/2 G Ex db IIC T* Ga/Gb II 1 D Ex ia IIIC T* °C Da/Db II 2 D Ex tb IIIC T* °C Db	II 1/2 (1) G Ex db eb ia [ia Ga] IIC T* Ga/Gb II 2 (1) D Ex tb [ia Da] IIIC T* Db
IECEX	Ex db ia IIC T* Ga/Gb Ex db IIC T* Ga/Gb Ex ia IIIC T* °C Da Ex tb IIIC T* °C Db	Ex db eb ia [ia Ga] IIC T* Ga/Gb Ex tb [ia Da] IIIC T* °C Db
cCSAus	US marking: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G Class I, Zone 1, AEx db ia IIC T3-T6 Gb Zone 21, AEx tb IIIC T135°C Db Zone 20, AEx ia IIIC T135°C Da Canadian marking: Ex db ia IIC T3-T6 Gb Ex tb IIIC T135°C Db Ex ia IIIC T135°C Da	US marking: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G Class I, Zone 1, AEx db eb ia [ia Ga] IIC T3-T6 Gb Zone 21, AEx tb [ia Da] IIC T85°C Canadian marking: Ex db eb ia [ia Ga] IIC T3-T6 Gb Ex tb [ia Da] IIC T85°C

²⁾ T* refer to Ex-certificate.



TCD 9100/9200 TRANSMITTER – TECHNICAL DATA

General	
Display	240 x 160 pixels
Supply Voltage	20 ... 27 V DC 100 ... 240 V AC
Power Consumption	7.5 W/15 VA
Interfaces	Channel 1: HART 7.5 or Profibus PA/DP or Modbus RTU Channel 2/3/4: Plug-In I/O Card
Housing Material	Aluminum
Ingress Protection	IP65, option: IP67 NEMA 4X to IEC 529 and DIN 40050 (1 mH ₂ O for 30 min.)
EMC	EN 55011/CISPR-11 (Class A), EN/IEC 61236-1 (Industry)
Dimensions	See dimensional drawings (page 11)
Weight	Meter-mount electronics: 4.5 kg [9.9 lb] Wall-mount electronics: 5.6 kg [12.3 lb]
Temperature	
Ambient Temperature Transmitter (Humidity max. 90 %)	-40 °C ... +60 °C [-40 °F ... +140 °F]
Storage and Transport	-40 °C ... +70 °C [-40 °F ... +158 °F]
Connectivity	
Cable (TCD 9200)	4-wire standard industrial signal cable up to 200 m long, 2x screened pairs
Cable Gland	½" NPT M20x1.5 (on request)
Plugin I/O-card	
Available Cards	Option 1: Signal I/O, Signal I/O, Signal I/O Option 2: Signal I/O, Signal I/O, Relay
Signal I/O ³⁾	Configurable universal I/O channels: current output, digital output or digital input Current Output: 0 ... 20 mA or 4 ... 20 mA (CH1 only 4 ... 20 mA) Digital Output: Pulse: 41.6 µs ... 5 s pulse duration Frequency: 0 ... 10 kHz Active: 0 ... 24 V DC, 110 mA Passiv: 3 ... 30 V DC, 100 mA Digital Input: 15 ... 30 V DC, 2 ... 15 mA
Relay	Voltage-free contact, 30 V AC, 100 mA
Output Value (programmable)	Mass flow, volume flow, total mass, total volume, corrected volume, density, temperature, fraction (flow/mass%), alarms



TCD 9010 TRANSMITTER – TECHNICAL DATA

General	
Supply Voltage	12 ... 27 V DC
Power Consumption	1.1 W
Interfaces	Modbus RTU
Housing Material	Aluminum
Protection Class	IP65, Option: IP67 NEMA 4X nach IEC 529 und DIN 40050 (1 mH ₂ O für 30 min.)
EMC	EN 55011/CISPR-11 (Class A), EN/IEC 61236-1 (Industry)
Dimensions	See dimensional drawing (page 10)
Weight	1.4 kg [3.1 lb]
Temperature	
Ambient Temperature Transmitter (Humidity max. 90 %)	-40 °C ... +60 °C [-40 °F ... +140 °F]
Storage and Transport	-40 °C ... +70 °C [-40 °F ... +158 °F]
Connectivity	
Cable	Standard industrial signal cable up to 200 m long, 2x screened pairs or 4-wire overall
Cable Gland	½" NPT M20 (on request)

BUS COMMUNICATION

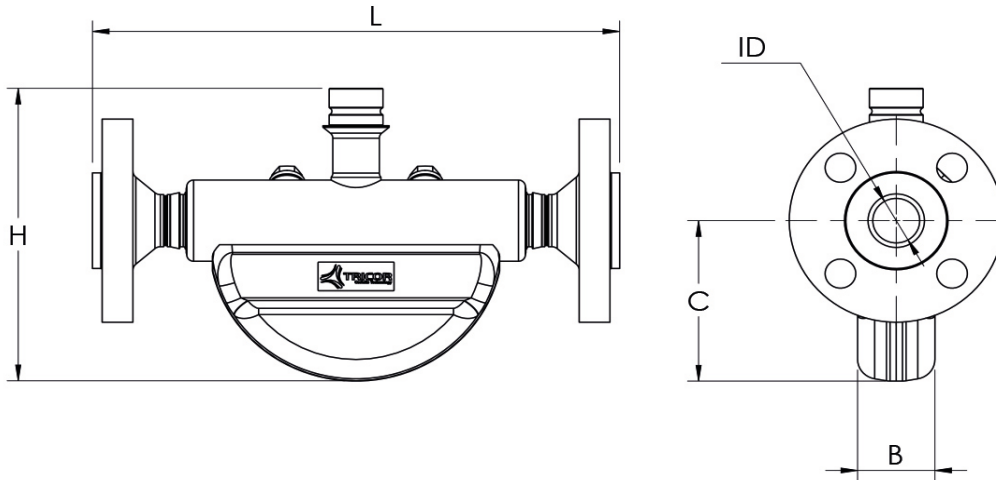
Description	Specification	More information
Manufacturer ID	24816 (60F0 Hex)	Manufacturer ID parameter
Device ID	34 (22 Hex)	Device type parameter
HART Protocol Revision	7.5	HART protocol revision parameter
Profibus Profile	4.0	Profibus protocol revision parameter
Modbus RS485 RTU	—	—
Number of Device Variables	11	Number of process values, both measured and derived
Physical Layers Supported	FSK	Frequency Shift Keying
Loop-Powered	No	4-wire device

SD-CARD

Description	Specification SD-Card (for transmitters with display)
Capacity	4 GB
File System Support	FAT32 / 8.3
Temperature Range	Operation: -40 °C ... +85 °C [-40 °F ... +185 °F] Storage: -40 °C ... +100 °C [-40 °F ... +212 °F]

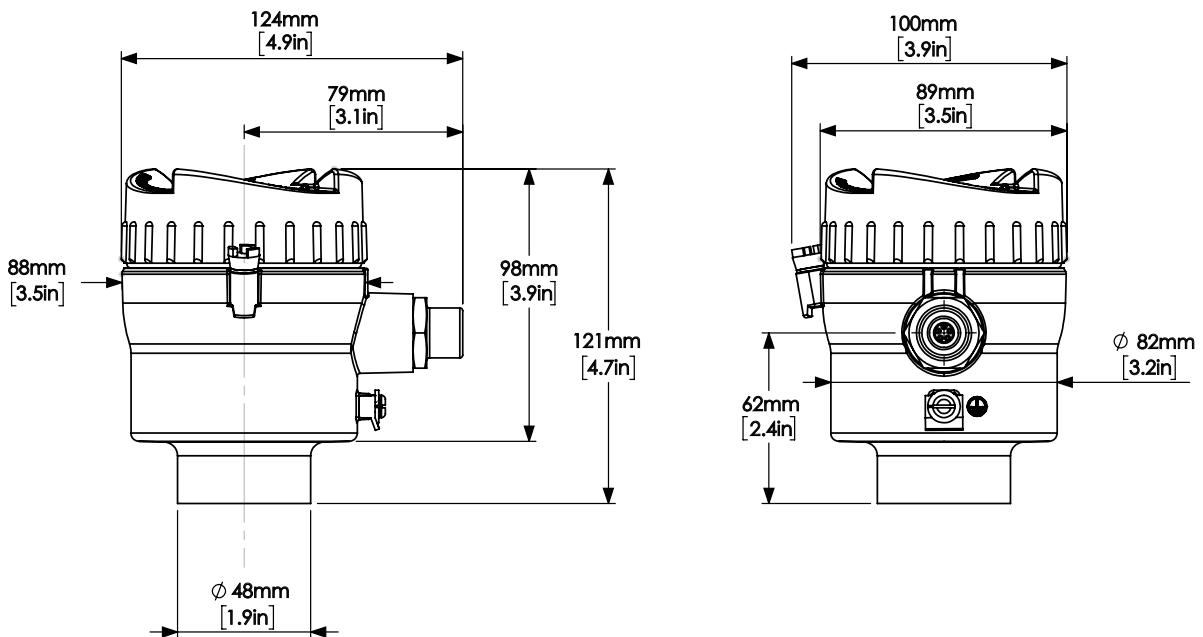


SENSORS TCMQ 6400 TO TCMQ 070K



Sensor Type	B	C	H	L ⁴⁾	I.D.	Connection ⁴⁾
TCMQ 6400	50 mm [2.0 in]	90 mm [3.54 in]	231 mm [9.09 in]	see page 14	on request	on request
TCMQ 018K	56 mm [2.2 in]	123 mm [4.84 in]	330 mm [12.99 in]	see page 14	on request	on request
TCMQ 070K	95 mm [3.7 in]	187 mm [7.36 in]	622 mm [24.49 in]	see page 14	on request	on request

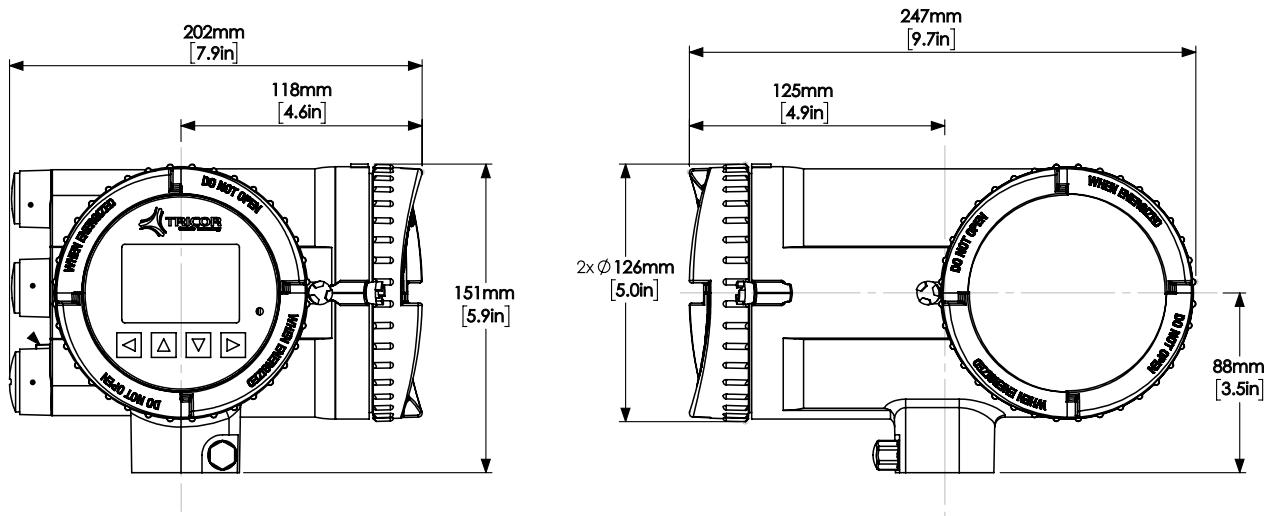
COMPACT TRANSMITTER TCD 9010



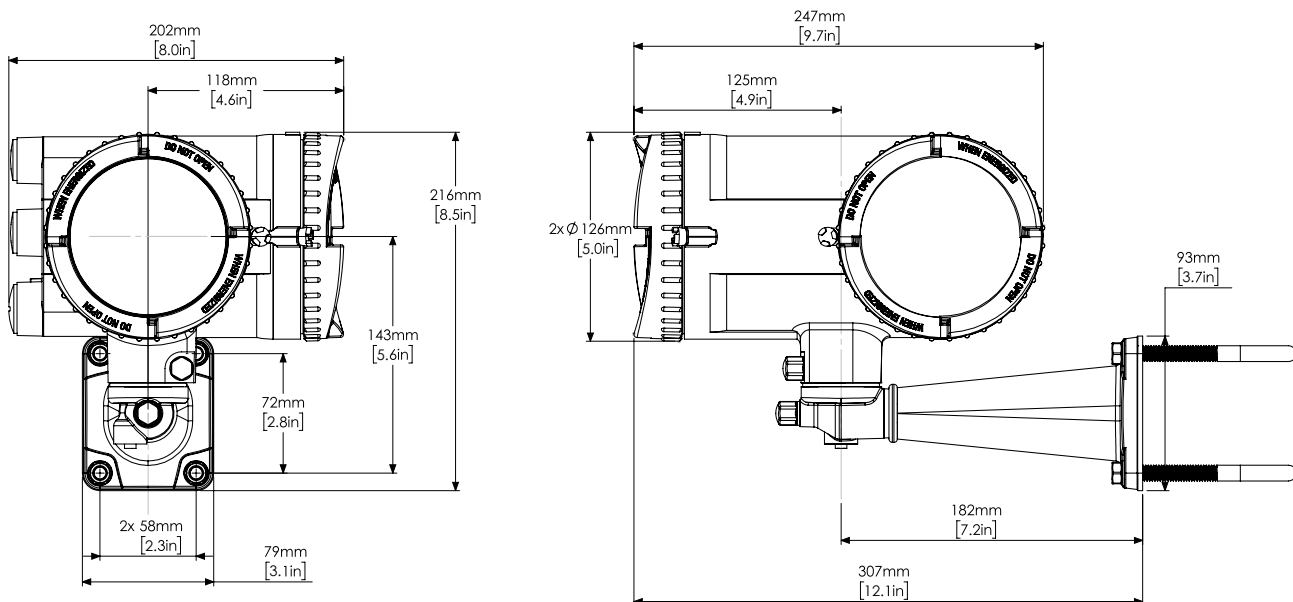
⁴⁾ See page 14: Process connection and installation length.



METER-MOUNT TRANSMITTER TCD 9100



WALL-MOUNT TRANSMITTER TCD 9200





ORDERING CODE TCMQ SENSOR AND TRANSMITTER (TRICOR PRO PLUS SERIES)

TCMQ XXXX	-	XX	XX	-	XX	XX	-	X	-	X	-	X	X	X	EXX	-	XXX	-	X
Sensor Connection																			
TCMQ 6400, DN15, DN6 [¼"]			3E																
TCMQ 6400, DN15, DN10 [⅙"]			3F																
TCMQ 6400, DN15, DN15 [½"]			3G																
TCMQ 6400, DN15, DN20 [¾"]			3H																
TCMQ 6400, DN15, DN25 [1"]			3J																
TCMQ 018K, DN25, DN15 [½"]			3K																
TCMQ 018K, DN25, DN25 [1"]			3L																
TCMQ 018K, DN25, DN32 [1¼"]			3M																
TCMQ 018K, DN25, DN40 [1½"]			3N																
TCMQ 070K, DN50, DN40 [1½"]			4B																
TCMQ 070K, DN50, DN50 [2"]			4C																
Wetted Material and Finish																			
Standard 316L W1.4435 W1.4404 Ra 1.6 µm							ST												
Process Connections⁵⁾																			
see page 14								XX											
Installation length																			
Standard 316L W1.4435 W1.4404 Ra 1.6 µm (see page 14)							ST												
Mechanical Options																			
Temperature																			
-60°C ... +200°C [-76°F ... 392°F] (non hazardous area)																			T
Accuracy																			
Mass flow $\pm 0.1\%$ o.r. [$\pm 0.35\%$ o.r. for gas], density ± 5 kg/m ³ , volume flow $\pm 0.5\%$ o.r., repeatability $\pm 0.05\%$ o.r.																			S
Mass flow with improved density ± 0.5 kg/m ³ , with volume flow $\pm 0.1\%$																			F
Transmitter Options																			
Mount version																			
TCD 9100 - Direct meter mount transmitter with display, IP67, NEMA 4X, ½" NPT, M20x1.5, 24 V DC / 100 ... 240 V AC																			T
TCD 9200 - Wall-mount transmitter (display + link module), ALU, IP67, NEMA 4X, ½" NPT, M20x1.5, 24 V DC / 100 ... 240 V AC																			R
TCD 9010 - Direct meter mount transmitter without display, ½" NPT, M20x1.5, 24 V DC																			W
Interface																			
Non-Ex: 4 ... 20 mA HART active/passive																			G
(Ex) 4 ... 20 mA HART active																			H
(Ex) 4 ... 20 mA HART passive																			I
(Ex) Profibus PA																			J
(Non-Ex) Profibus PA																			N
(Non-Ex) Profibus DP																			K
(Non-Ex) Modbus RTU																			L
(Ex) Modbus RTU																			M
Plug-in I/O-Card																			
none																			A
(Non-Ex) signal I/O, signal I/O, signal I/O																			D
(Non-Ex) signal I/O, signal I/O, relay																			E
(Ex-active) signal I/O, signal I/O, signal I/O																			H
(Ex-active) signal I/O, signal I/O, relay																			I
(Ex-passive) signal I/O, signal I/O, signal I/O																			L
(Ex-passive) signal I/O, signal I/O, relay																			M
Ex-Protection																			
without protection																			--
ATEX/IECEX/EAC Ex, Zone 1/Zone 21: Group IIC and IIIC, T6 ⁶⁾																			Ex
cCSAus: US/CAN ⁵⁾																			Ex1
ATEX Zone 2: II 3G Ex nA IIC T6 Gc																			Exn
CSA/ATEX/IECEX/EAC Ex, Zone 1/Zone 21: Group IIC and IIIC, T6																			Ex3
Remote Cable																			
TCD 9200 Remote M12 Cable, 3 m [10 ft], Standard																			L03
TCD 9200 Remote M12 Cable, 6 m [20 ft]																			L06
TCD 9200 Remote M12 Cable, 10 m [33 ft]																			L10
TCD 9200 Remote M12 Cable, 15 m [49 ft.]																			L15
TCD 9200 Remote M12 Cable, 20 m [66 ft.]																			L20
TCD 9200 Remote M12 Cable, 30 m [98 ft.]																			L30
TCD 9200 Remote M12 Cable, 50 m [164 ft.]																			L50
Customer Specifics																			
Customer specifics, special options not yet coded																			Z

⁵⁾ For connections not indicated with installation length, please contact manufacturer.

⁶⁾ For details see page 7.



ACCESSORIES

Accessories for TCMQ series	Ordering Code
DAkkS-Calibration (ILAC) DIN EN ISO/IEC 17025:2018	3.KAL-0100
Oxygen cleaning TCMQ	219269
TAG Plate (1.4404 / 316L)	219705
Press test certificate PED	223684
Material cert EN 10204-3.1	224005
Fact cert to EN 10204 2.1	224006
Fact cert to EN 10204 2.2	224007
Welding inspection report	224008
Cleaning for oil and grease	224011





PROCESS CONNECTION AND INSTALLATION LENGTH IN MM [INCH]

Process connection ⁷⁾	Code	TCMQ 6400 DN15					TCMQ 018K DN25				TCMQ 070K DN50	
		DN6 [¼"]	DN10 [¾"]	DN15 [½"]	DN20 [¾"]	DN25 [1"]	DN15 [½"]	DN25 [1"]	DN32 [1¼"]	DN40 [1½"]	DN40 [1½"]	DN50 [2"]
Weld neck flange EN1092-1 B1. Pressure PN16	A0			265 [10.43]		265 [10.43]		360 [14.17]	360 [14.17]	365 [14.37]	610 [24.02]	610 [24.02]
Weld neck flange EN1092-1 B1. Pressure PN40	A1			265 [10.43]	265 [10.43]	265 [10.43]		360 [14.17]	360 [14.17]	365 [14.37]	610 [24.02]	610 [24.02]
Weld neck flange EN1092-1 B1. Pressure PN63	A2			265 [10.43]				360 [14.17]			610 [24.02]	610 [24.02]
Weld neck flange EN1092-1 B1. Pressure PN100	A3			270 [10.63]		275 [10.83]		360 [14.17]		365 [14.37]	610 [24.02]	610 [24.02]
Weld neck flange EN1092-1 D. Pressure PN40	A5			270 [10.63]							610 [24.02]	610 [24.02]
Weld neck flange EN1092-1 D. Pressure PN63	A6										610 [24.02]	610 [24.02]
Weld neck flange EN1092-1 D. Pressure PN100	A7										610 [24.02]	610 [24.02]
Weld neck raised face flange. ASME B16.5 Class 150	D1			270 [10.63]	270 [10.63]			360 [14.17]		365 [14.37]		620 [24.41]
Weld neck raised face flange. ASME B16.5 Class 300	D2			270 [10.63]	270 [10.63]			360 [14.17]		380 [14.96]		620 [24.41]
Weld neck raised face flange ASME B16.5 Class 600	D3			270 [10.63]	285 [11.22]			360 [14.17]		380 [14.96]		620 [24.41]
ST-Pipe thread ISO228-1 G	E1	265 [10.43]		265 [10.43]				365 [14.37]				620 [24.41]
ST-Pipe thread ASME B1.20.1 NPT	E3	265 [10.43]		270 [10.63]				365 [14.37]				620 [24.41]
ST-Hygienic thread DIN 11851	F1		265 [10.43]	265 [10.43]		193 [7.60]		360 [14.17]	360 [14.17]		610 [24.02]	610 [24.02]
ST-Hygienic clamp DIN32676,(inch) (ASME), Row C, („Tri-clamp“)	G1							360 [14.17]		360 [14.17]		
ST-DIN11864-1 GS Form A Row A, Form A = O-ring type hygienic, Asceptic thread connector, Hygienic Class H3	H1			265 [10.43]	265 [10.43]			360 [14.17]			620 [24.41]	610 [24.02]
ST-DIN11864-2 BF Form A Row A, Form A = O-ring type hygienic, Asceptic flange connector, Hygienic Class H3	H2			265 [10.43]	265 [10.43]			360 [14.17]		274 [10.78]	620 [24.41]	610 [24.02]
ST-Hygienic clamp ISO 2852	J1					265 [10.43]		360 [14.17]		274 [10.78]	610 [24.02]	610 [24.02]
ST-Hygienic thread ISO 2853	J5					265 [10.43]		360 [14.17]		274 [10.78]		610 [24.02]
ST-Hygienic thread SMS 1145, male. Pressure PN6	K1			265 [10.43]				360 [14.17]				610 [24.02]
ST-Weld neck raised face flange, JIS B2220/10K	L2			265 [10.43]		265 [10.43]						
ST-Weld neck raised face flange, JIS B2220/20K	L4			265 [10.43]		265 [10.43]						
ST-Weld neck raised face flange, JIS B2220/40K	L6			265 [10.43]		265 [10.43]						610 [24.02]

⁷⁾ Connections without installation length are not possible or need manufacturer release. Please contact the manufacturer.



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