

# TRICOR Series TCM Coriolis Mass Flow Meters

## Technical Datasheet



# TRICOR - Coriolis Mass Flow Meters

## Description

The TRICOR Mass Flow Meters measure simultaneously mass flow, volume flow, temperature and density and consequently can replace different measuring instruments.

The TRICOR Mass Flow Meters do not contain any moving parts and consequently are suited for polluted media as well.

According to the requirements the TRICOR Mass Flow Meters are available as compact versions with on site display and remote version with electronics in a wall mount or panel mount housing.

For the compact version an additional remote display (TRD 8001) is available.

## Features

- Integrated pressure compensation available
- Robust sensor design to minimize downtime
- Customizable installation length
- Mass flow, volumetric flow, density and temperature (all in one)
- High pressure designs available - up to 345 bar/5000 PSI
- High sensitivity for best meter performance even under demanding process conditions
- Integrated meter diagnostics
- Calibration: DAkkS-Accreditation as per DIN EN ISO/IEC 17025:2005
- Special calibrations for an oil viscosity up to 100 mm<sup>2</sup>/s possible
- FAST LANE availability for flexible and fast deliveries (5 days express deliveries)



## Overview

Compact version



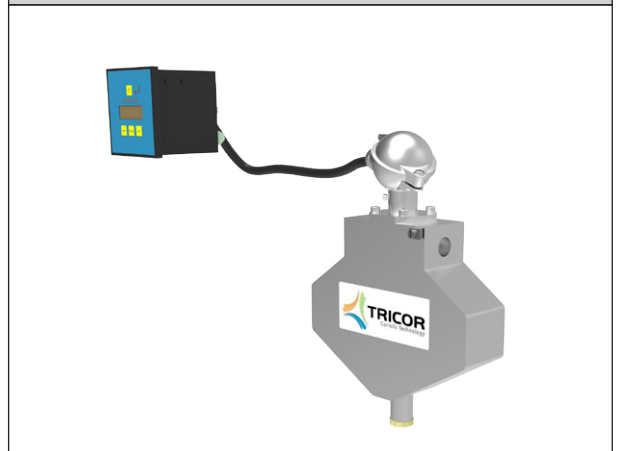
Compact version



Exd housing: Wall mounted (remote version)



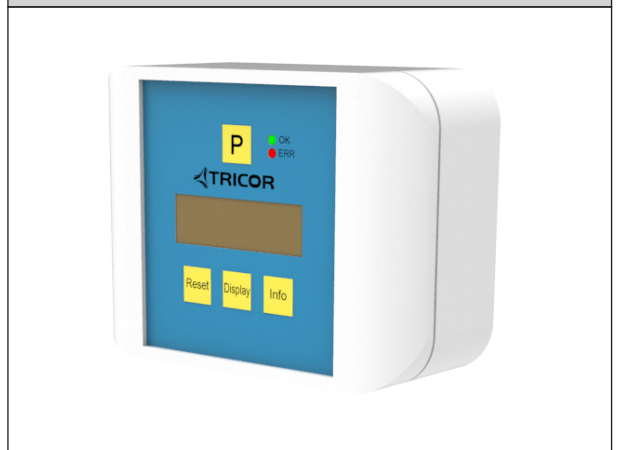
Housing: Panel mounted (remote version)



Version with TCE 6000 and TRD 8001



Remote Display TRD 8001



# TRICOR - Coriolis Mass Flow Meters

## Technical Data - TCM Transducer

	TCM 0325	TCM 0650	TCM 1550	TCM 3100	TCM 5500	TCM 7900	TCM 028K	TCM 065K	TCM 230K
Max. Flow Rate (kg/h)	325	650	1550	3100	5500	7900	28000	65000	230000
Max. Flow Rate (lb/min)	11	22	55	110	200	290	1030	2390	8400
Basic Accuracy (0.1% o.r.)	±0.1								
Zero Stability (% f.s.)	±0.01								
Repeatability (% o.r.)	±0.05								
Density Measuring Range	0 - 2500 kg/m <sup>3</sup> , 2.5 g/cm <sup>3</sup> (higher ranges on request)								
Density Accuracy	±1.0 kg/m <sup>3</sup> , ±0.001 g/cm <sup>3</sup> (special calibration on request)								
Density Repeatability	±0.5 kg/m <sup>3</sup> , ±0.0005 g/cm <sup>3</sup>								
Temperature Accuracy	±1 °C ±0.5 % of reading (±1.8 °F ±0.5 % of reading)								
Temperature Repeatability	±0.2 °C (±0.36 °F)								
Process and Ambient									
Process Connections	female thread 1/2" adaptors for flanges, diaphragm and tri-clamp				flanges EN1092, ANSI B16.5, DIN2512				
Max. Pressure Standard (Option)	200 bar/2900 PSI (345 bar/5000 PSI)				100 bar/1450 PSI				
Pressure Drop at Max. Flow H <sub>2</sub> O	for detail information please contact us								
Process Temperature (non Ex)	-40 °C ... +100 °C (-40 °F ... +212 °F) (standard) / -60 °C ... +200 °C (-76 °F ... +392 °F) (optional)								
Process Temperature (Ex)	meter mount				-40 °C ... +70 °C (-40 °F ... +158 °F)				n/a
	remote version				-40 °C ... +70 °C (-40 °F ... +158 °F) (T4)				-40 °C ... +100 °C (-40 °F ... +212 °F) (T3)
High Temperature (Ex) (only remote version)	T ≤ +135 °C (+275 °F) (T3); T ≤ +150 °C (+302 °F) (T2)								
Ambient Temperature	-40 °C ... +70 °C (-40 °F ... +158 °F)								
Storage Temperature	-40 °C ... +100 °C (-40 °F ... +212 °F)								
Electr. Connections Remote	screw type terminals								
Electr. Connections Meter Mount	none (internally connected to the electronics)								
Ingress Protection	IP65 (IP66/IP67 on request)								
General									
Tube Arrangement	2 serial	2 parallel	2 serial	2 parallel	2 parallel	2 parallel	2 parallel	2 parallel	2 parallel
Tube Inner Diameter	4 mm	4 mm	8 mm	8 mm	7 mm	9 mm	16 mm	28 mm	43 mm
Tube Material	1.4404 / AISI 316L								
Housing Material	1.4404 / AISI 316L								1.4301 / AISI 304
Dimensions	see drawings								

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

## Technical Data - TCE 8000 Transmitter

<b>General</b>	
Display	graphic, 132 x 32 dot
Supply Voltage	24 V DC, $\pm 20\%$ or 90 ... 264 V (version dependent)
Programming	via front keyboard
Interface	RS 485 (MODBUS-RTU), Option HART®, other options on request
EMC	according to EN 61000-6-4 and 61000-6-2
Power Consumption	max. 6 W
<b>ExD Housing: Wall-mounted</b>	
Dimensions	see drawing
Electrical Connections	cage clamp terminals
Cable Glands	for 7-13 mm cables
Housing Material	aluminium diecast
Protection Class	IP65 (IP66/IP67 on request)
Weight	3.8 kg/8.3 lb with 3 m cable
Temperature	ambient: -40 °C up to +70 °C (-40 °F ... +158 °F) storage and transport: -40 °C up to +80 °C (-40 °F up to +176 °F)
<b>Housing: Panel-mounted</b>	
Dimensions	see drawing
Electrical Connections	cage clamp terminals
Housing Material	Noryl
Protection Class	front: IP50, rear: IP30
Weight	0.4 kg/0.88 lb
Temperature	operation: 0 °C to +60 °C (32 °F to +140 °F) storage and transport: -20 °C up to +70 °C (-4 °F up to +158 °F)
<b>Analog Output</b>	
Current Outputs (2x)	4 ... 20 mA passive, two-wire, isolated
Resolution	14 bit
Linearity	$\pm 0.05\%$ of full scale
Temperature Drift	0.05 % per 10 K
Load	< 620 $\Omega$ (at 24 V supply)
Output Value	programmable: flow, total, density, temperature
<b>Pulse Output</b>	
Frequency Range	0.5 - 10000 Hz
Output Signal	active push pull output for flow rate
<b>Status In-and Output</b>	
Status Output	push pull programmable
Control Input	programmable
<b>Analog Input (option)</b>	
Input Type	4-20 mA active for two-wire passive pressure sensor
Resolution	12 bit
Linearity	$\pm 0.05\%$ of full scale
Temperature Drift	0.05 % per 10 K
Supply Voltage	> 20 V (at 20 mA sensor current)

# TRICOR - Coriolis Mass Flow Meters

## Technical Data - TCE 6000 Transmitter

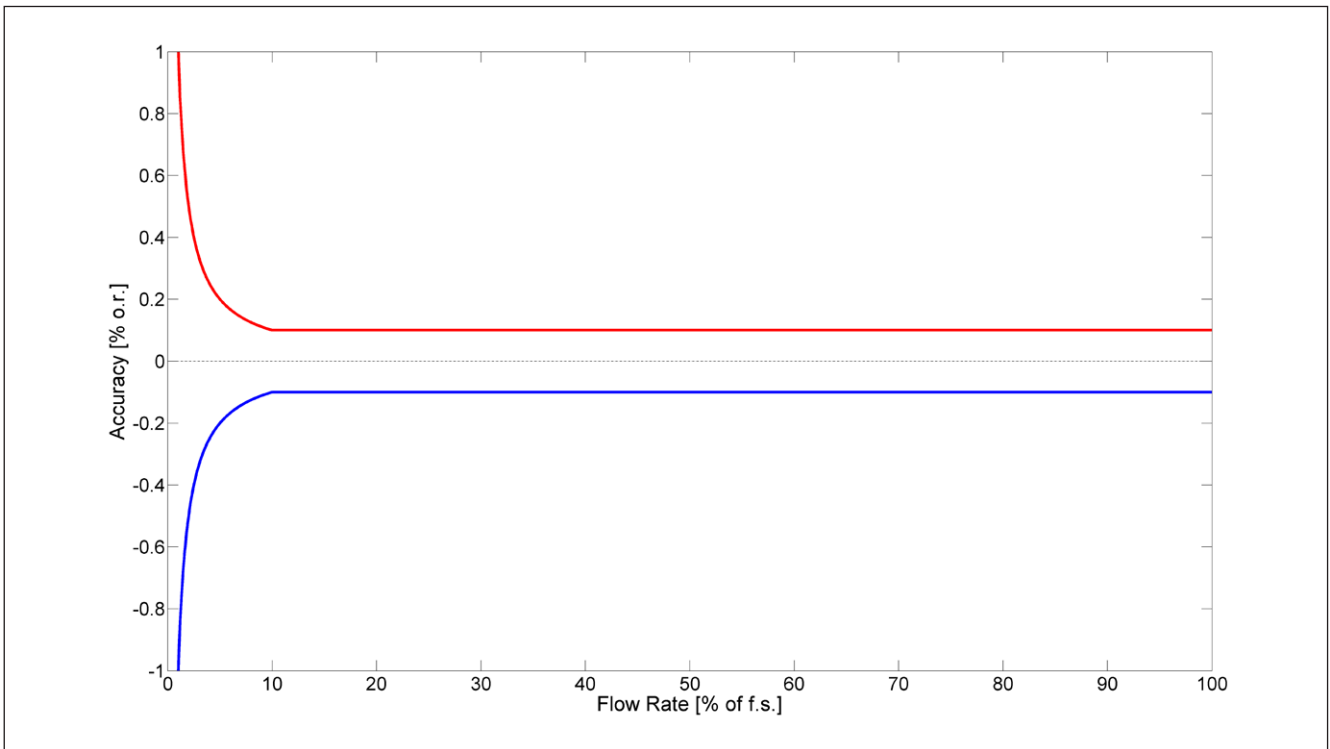
General	
Supply Voltage	24 V DC, $\pm 20\%$
Programming	via interface
Interface	RS485, USB (option)
EMC	according to EN 61000-6-4 and EN 61000-6-2
Power Consumption	max. 4 W
Connections	connectors M12
Housing Material	aluminium diecast
Temperature	operation: $-40\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$ ( $-40\text{ }^{\circ}\text{F}$ to $+158\text{ }^{\circ}\text{F}$ ) storage: $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$ ( $-40\text{ }^{\circ}\text{F}$ to $+176\text{ }^{\circ}\text{F}$ )
Protection Class	IP65
Analog Output	
Current Output	4 ... 20 mA active
Resolution	14 bit
Linearity	$\pm 0.05\%$
Temperature Drift	0.05 % per 10 K
Load	$< 800\ \Omega$
Output Value	programmable: flow, total, density, temperature
Pulse Output	
Frequency Range	0.5 - 10000 Hz
Output Signal	active push pull output for flow rate
Status In-and Output	
Status Output	push pull programmable (option)
Control Input	programmable (standard: 1 input/option: 2 inputs)

## Technical Data - TRD 8001 Remote Display

Display	graphic, 132 x 32 dot
Supply Voltage	via interface
Programming	via front keyboard
Interface to TCE	RS 485
EMC	according to EN 61000-6-4 and 61000-6-2
Dimensions	90 x 120 x 50 mm (h x w x d)
Connections	connectors M12, B coded
Housing Material	ABS- FR (plastic, flame retardant)
Protection Class	IP64
Weight	0.4 kg/0.88 lb
Temperature	operation: $0\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$ ( $32\text{ }^{\circ}\text{F}$ to $+140\text{ }^{\circ}\text{F}$ ) storage and transport: $-20\text{ }^{\circ}\text{C}$ up to $+80\text{ }^{\circ}\text{C}$ ( $-4\text{ }^{\circ}\text{F}$ to $+176\text{ }^{\circ}\text{F}$ )
Wall Mount	hidden screws

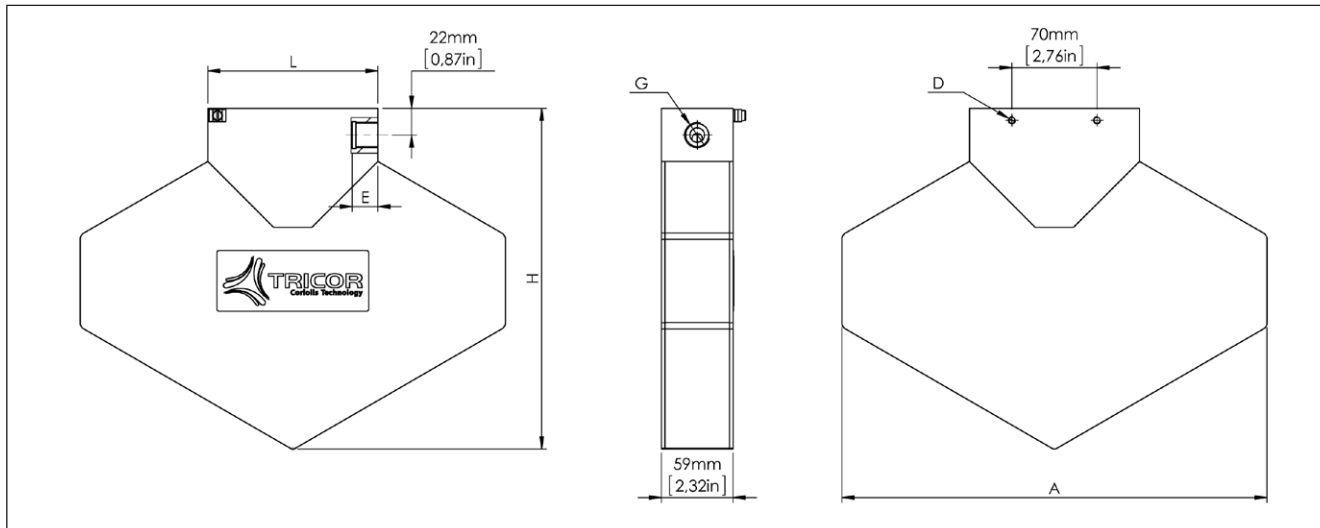
## Ex Certifications

ATEX	Zone 1: Group IIC or IIB, T4 Zone 2: II 3G Ex nA IIC T4 Gc
IECEX	Zone 1: Group IIC or IIB, T4
cCSAus Ex	Class I, Division 1: Group A, B, C, D, T4 or Group C, D, T4



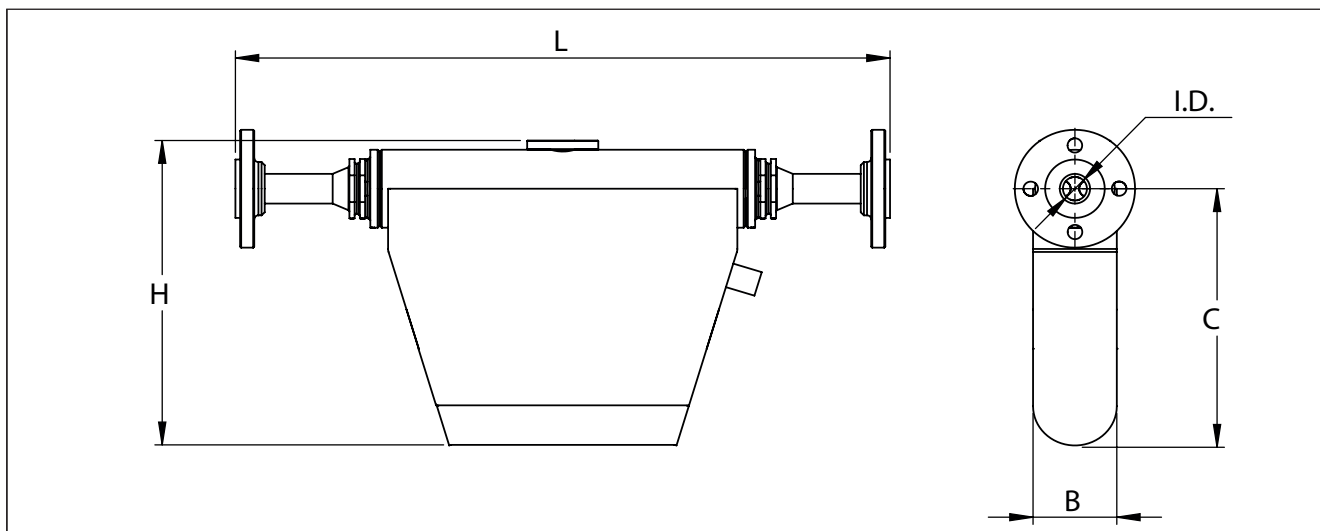
Flowrate (in % consistent with the zero point stability value)	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} * 100$	$\pm \text{BaseAccu}$
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} * 100$	$\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} * 100$

## Dimensional Drawing TCM 0325 to TCM 3100



Sensor Type	A	C	D	E	H	L*	G**
TCM 0325	214 mm (8.4 in)	160 mm (6.3 in)	M6 ↓ 10	15 mm (0.6 in)	182 mm (7.2 in)	110 mm (4.3 in)	G 1/2"
TCM 0650	214 mm (8.4 in)	160 mm (6.3 in)	M6 ↓ 10	15 mm (0.6 in)	182 mm (7.2 in)	110 mm (4.3 in)	G 1/2"
TCM 1550	350 mm (13.8 in)	258 mm (10.2 in)	M6 ↓ 10	18 mm (0.7 in)	280 mm (11 in)	140 mm (5.5 in)	G 1/2"
TCM 3100	350 mm (13.8 in)	258 mm (10.2 in)	M6 ↓ 10	18 mm (0.7 in)	280 mm (11 in)	140 mm (5.5 in)	G 1/2"

## Dimensional Drawing TCM 5500 to TCM 065K

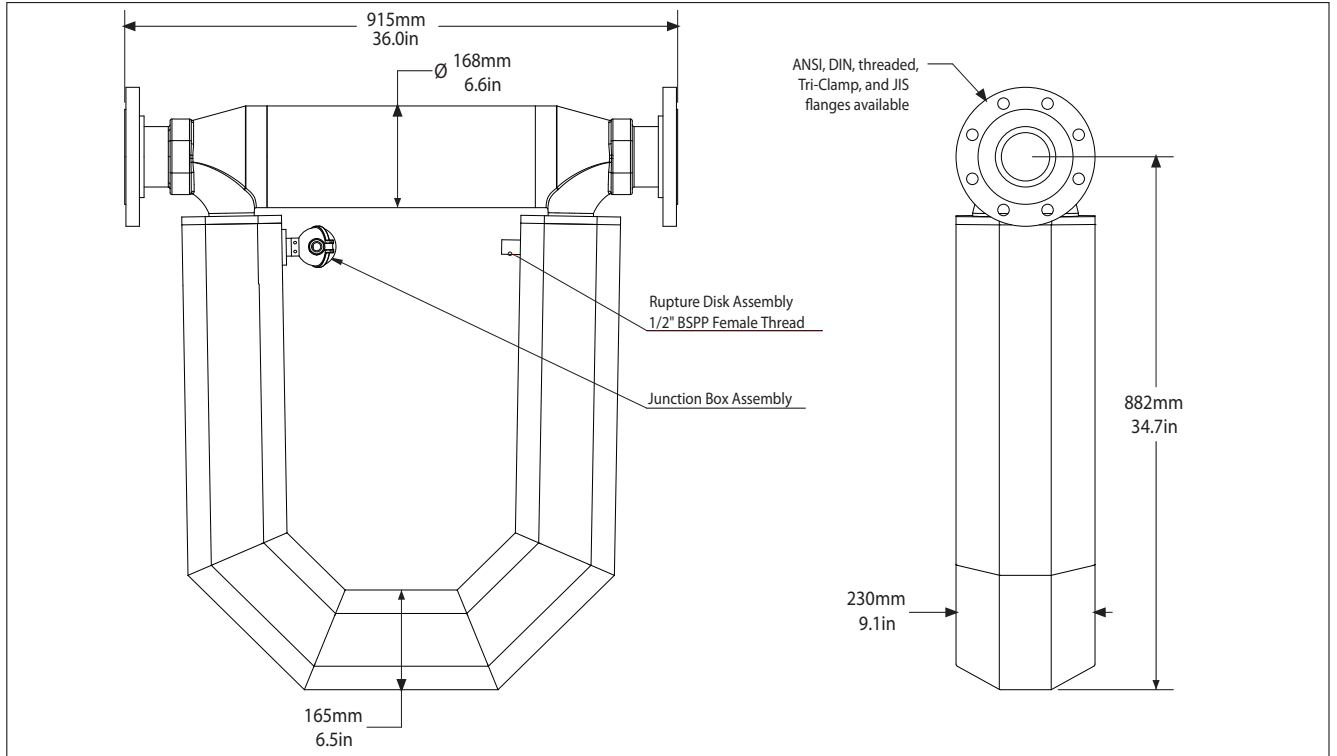


Sensor Type	B	C	H	L*	I.D.	Connection**
TCM 5500, 7900	61 mm (2.4 in)	204 mm (8 in)	260 mm (10.2 in)	460 mm (18.1 in)	∅ 13 mm (∅ 0.5 in)	on request
TCM 028K	80 mm (3.5 in)	253 mm (10 in)	315 mm (12.4 in)	625 mm (24.6 in)	∅ 23 mm (∅ 0.9 in)	on request
TCM 065K	151 mm (5.4 in)	387 mm (18.9 in)	480 mm (32.7 in)	830 mm (32.7 in)	∅ 40 mm (∅ 1.6 in)	on request

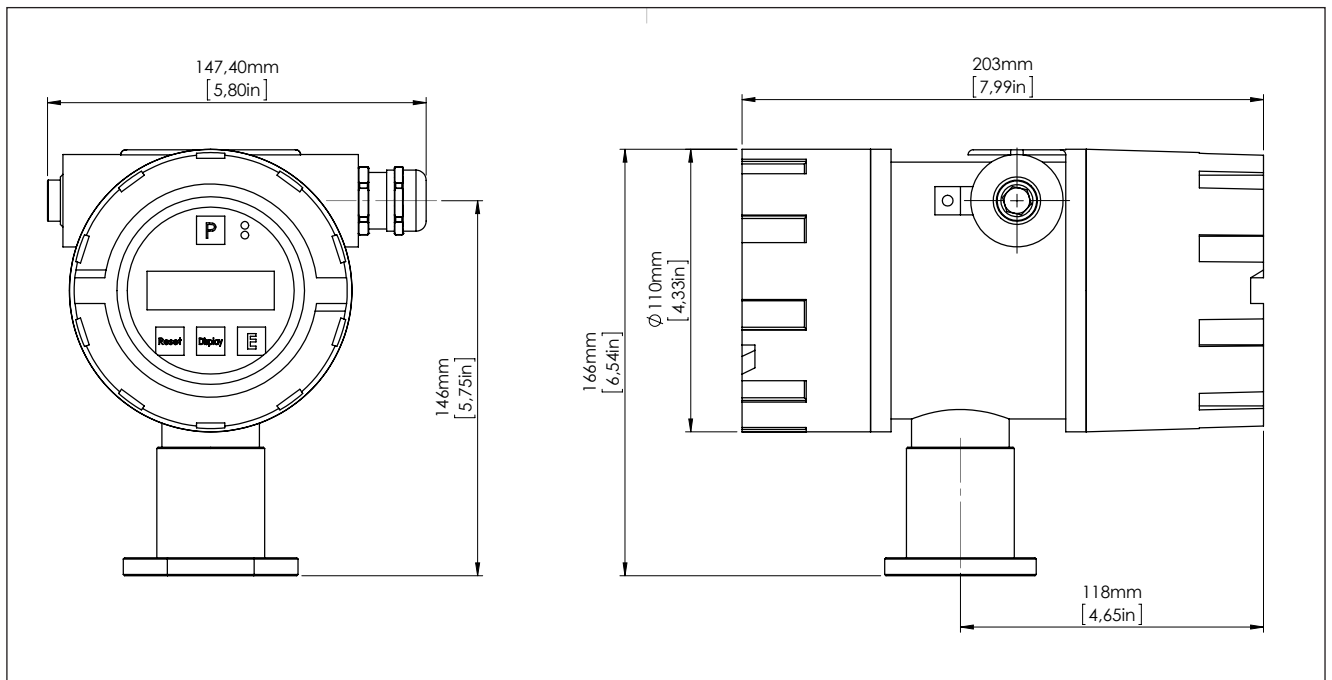
\* further lengths on request  
 \*\* other connections on request



## Dimensional Drawing TCM 230K

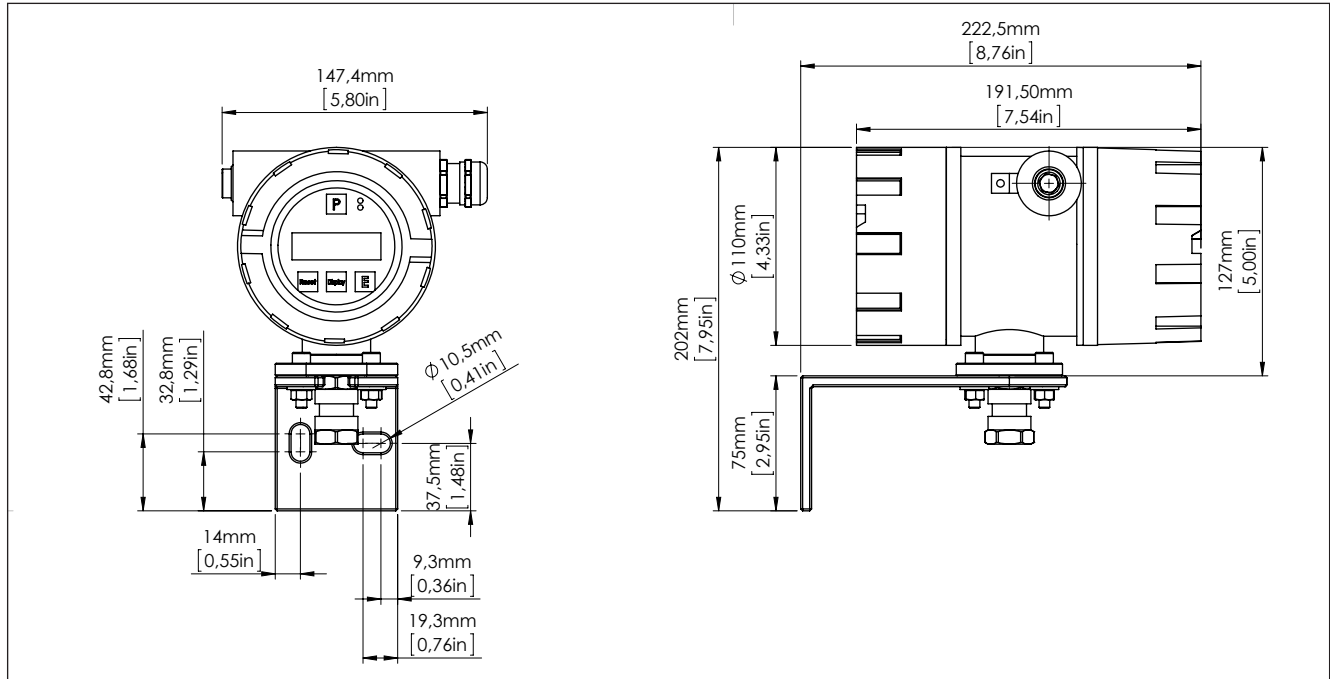


## Dimensional Drawing Meter Mount Electronics TCE 8000 (C)

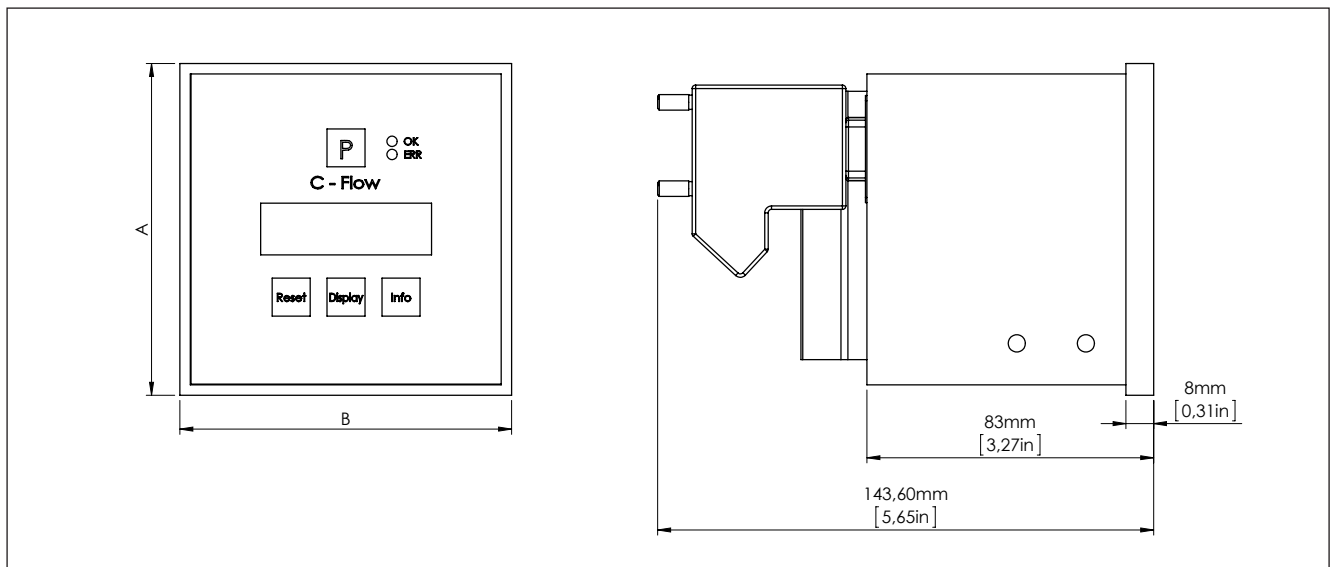


# TRICOR - Coriolis Mass Flow Meters

## Dimensional Drawing TCE 80xx - W

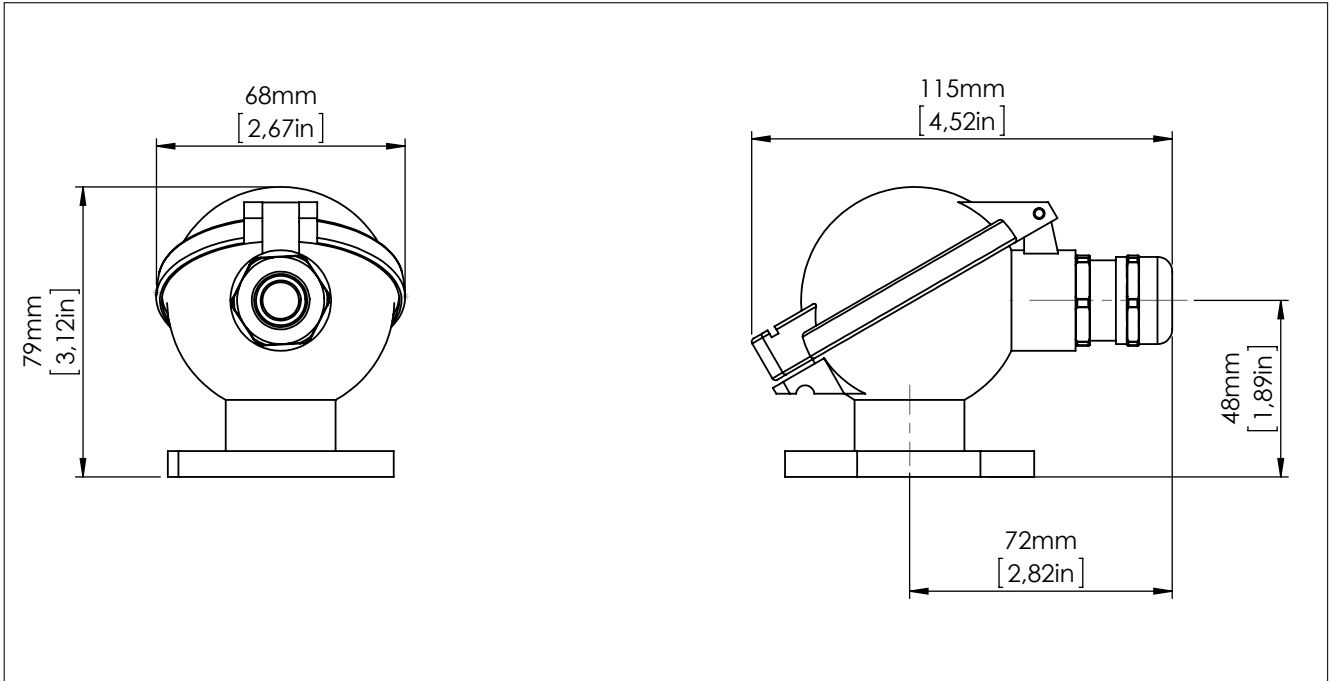


## Dimensional Drawing Panel-Mounted Housing (drawing not to scale)

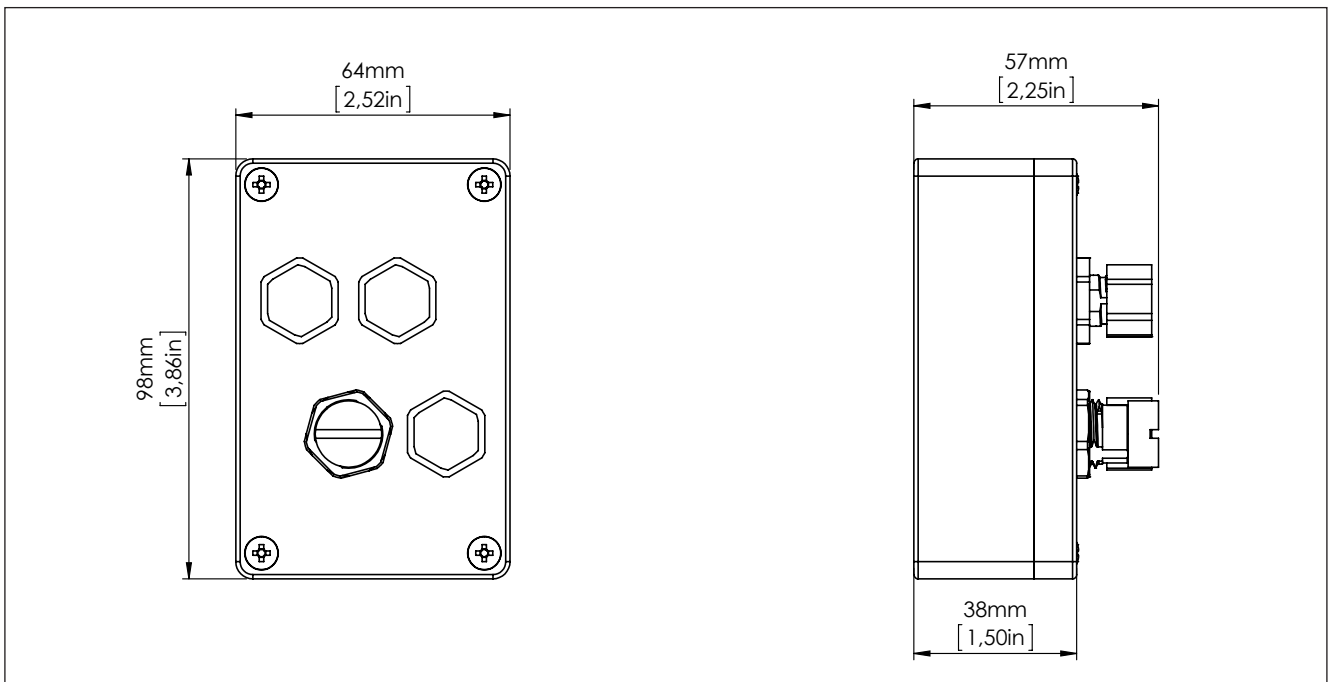


Type	A	B	-	-	-	-	-
TCE 80** - S	96 mm (3.8 in)	96 mm (3.8 in)	-	-	-	-	-
TCE 80** - L	96 mm (3.8 in)	144 mm (5.7 in)	-	-	-	-	-

## Dimensional Drawing Connection Head (A)

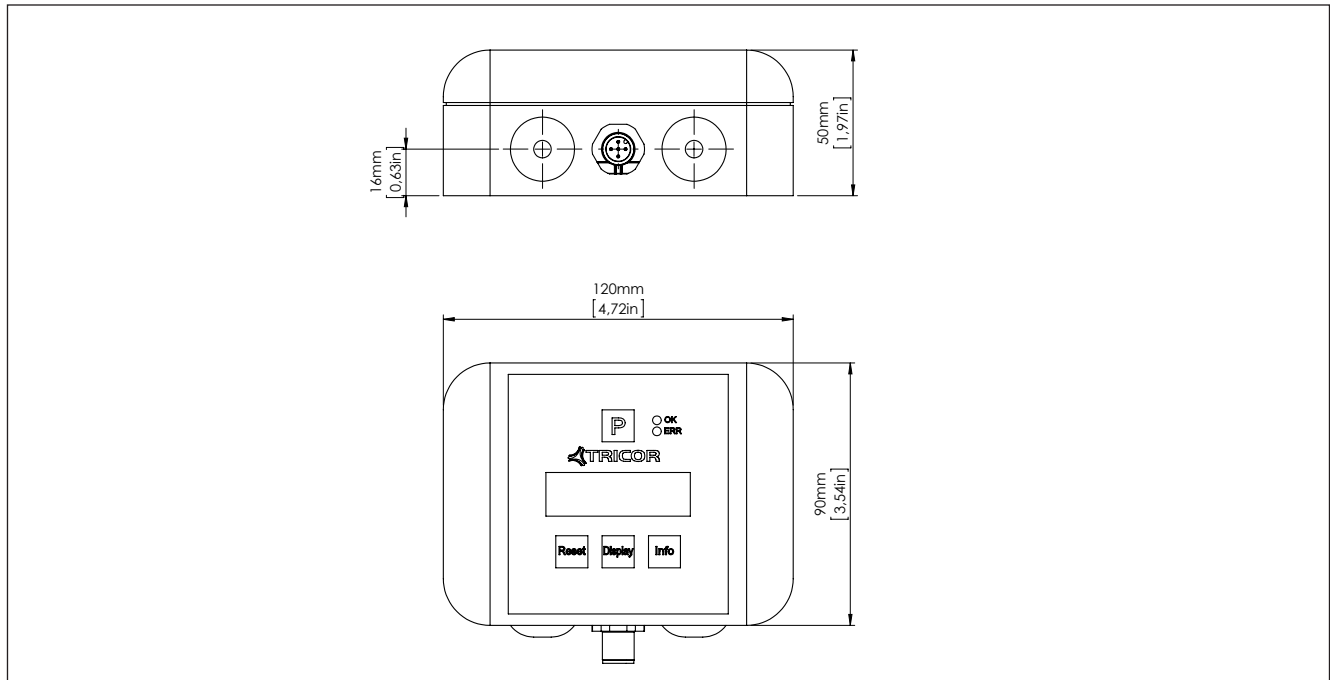


## Dimensional Drawing Meter Mount Electronics TCE 6000 (F)



# TRICOR - Coriolis Mass Flow Meters

## Dimensional Drawing Remote Display TRD 8001



## Ordering Information TCM Meter (Series TRICOR)

TCM	X X X X	-	XX	-	X X X X	-	X X X X	-	Ex	-	XX
<b>Process Connections<sup>1)</sup></b>											
ANSI flange			A*								
ANSI flange			B*								
DIN flange			D*								
Female thread			F*								
<b>Mechanical Options</b>											
<b>Medium Temperature Range:</b>											
-40 °C ... +100 °C (-40 °F ... +212 °F)					S						
-60 °C ... +150 °C (-76 °F ... +302 °F)					H						
-40 °C ... +70 °C (-40 °F ... +158 °F) Ex, compact					E						
<b>Pressure</b>											
With rupture disc max. 5 BAR (72,5 PSI)					G						
<b>Mechanical Design</b>											
Standard					S						
<b>Face to Face-Lenght</b>											
Standard (other lengths on request)					S						
<b>Electronics Options</b>											
<b>Electronics Type</b>											
Junction box						A	Z	Z	S		
Meter mount electronics (TCE 8000)						C					
Meter mount electronics (TCE 6000) <sup>2)3)</sup>						F					
<b>Interface<sup>4)</sup></b>											
RS485 (MODBUS RTU)						S					
RS485 (MODBUS RTU) and HART						A					
RS485 (MODBUS RTU) +FF (not with Ex)						B					
FF (Foundation Fieldbus)						D					
RS485 (MODBUS RTU) + USB (only TCE 6000)						F					
Not used						Z					
<b>Supply Voltage</b>											
24 V DC							D				
90 ... 264 V AC							M				
Not used							Z				
<b>Options</b>											
Pressure compensation +4 ... 20 mA input (TCE 8000)										A	
8 pin I/O connector (TCE 6000 only)										B	
No option										S	
<b>Ex-Protection</b>											
ATEX + IECEX zone 1: Group IIC or IIB, T4										Ex	
cCSAus: Class 1, Div. 1: Group C, D, T4										Ex1	
ATEX zone 2: II3G Ex nA IIC T4 Gc										Exn	
Without Ex-protection											
<b>Special Options</b>											
NOC (Net Oil Computer)											01

1) Ask KEM/AWL for technically possible flanges

2) Only in the following options: FS DS (5 PIN I/O and RS485 MODBUS RTU or FFDB (5&8 PIN I/O, RS 485 MODBUS RTU, USB)

3) Ex-protection only available in the option Exn

4) Other interfaces on request

# TRICOR - Coriolis Mass Flow Meters

## Ordering Information TCE Transmitter (Series 8000)

TCE	8 0 X X	- X	- X X X X	- XX	- XX
For TCM 0325 to TCM 7900	8 0 0 1				
For TCM 028K to TCM 065K	8 0 1 1				
For TCM 230K	8 0 1 2				
<b>Housing</b>					
Wall mounted		W			
Panel mounted		S			
Panel mounted, wide for "Ex", "associated equipment"		L			
<b>Options</b>					
<b>Interface<sup>1)</sup></b>					
RS485 (MODBUS RTU)			S		
RS485 (MODBUS RTU) + HART			A		
<b>Supply Voltage</b>					
24 V DC + 90 ... 264 V AC (only housing S+L)				B	
24 V DC				D	
90 ... 264 V AC (only housing W)				M	
<b>Electronic Options</b>					
Standard				S	
Pressure compensation and 4-20mA input				A	
<b>Length, Cable</b>					
3 Meters (≈ 10 ft.), Standard (housing W)					S
6 Meters (≈ 20 ft.), (housing W)					B
10 Meters (≈ 33 ft.), (housing W)					C
15 Meters (≈ 49 ft.), (housing W)					D
20 Meters (≈ 65 ft.), (housing W)					E
D-SUB Connector, (housing L+S) separate cable required					N
<b>EX-Protection</b>					
ATEX+IECEX zone 1: Group IIC or IIB, T4					Ex
cCSAus: Class 1, Div. 1: Group C, D, T4					Ex1
ATEX Zone 2: II3G Ex nA IIC T4 Gc					Exn
No Ex-protection					
<b>Special Options</b>					
NOC (Net Oil Computer)					

01

1) Other interfaces on request

## Accessories

### Connection Cable for TCE 8000-S or TCE 8000-L to TCM

		TCC	0	2	-	X	X
<b>Lenght</b>							
3 Meter (Standard)	(≈ 10 ft.)					0	3
6 Meter	(≈ 20 ft.)					0	6
10 Meter	(≈ 33 ft.)					1	0
15 Meter	(≈ 49 ft.)					1	5
20 Meter	(≈ 66 ft.)					2	0

## Additional Accessories

IPS9-9	Front cover IP65 for TCE 80**-S-*
IPS9-14	Front cover IP65 for TCE 80**-L-*
<b>TRD 8001</b>	Add. Remote display for meter mount version
TRD-TCE-6-2	Connection cable TRD-TCE 6000, 2 meter
TRD-TCE-6-5	Connection cable TRD-TCE 6000, 5 meter
<b>TCD 4600</b>	Gauge Volume Totalizer
KAB-USB-TCE	USB Cable, USB to mini USB M12, 2 meter, for TCE 6000
CON.USB.RS	Adaptor cable USB to RS 485, 1.8 meter

### Flange Adapter for TCM 0325 through TCM 3100

		ZA -	F	X	-	X	X
<b>Connections</b>							
G 1/2"			F	A			
<b>Process Connections</b>						*	*
Technically possible flanges on request							

\*\* : Suitable flanges on request