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Küppers Elektromechanik GmbH

Certified according to DIN EN ISO 9001

Technical Datasheet

TRICOR Series

Mass Flow Meters

TRICOR
Coriolis Technology

Description

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

Due to a construction free of dead spots the meters are well flushable and can be easily sterilized.

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 version with on site display and remote version with electronis in a wall mount or panel mount housing.

For the compact version an additional remote display (TRD 8001) is available, designed for cable lengths up to 1 km.

Principle

Two parallel flow tubes inside the TCM Flow Meter are vibrating at their resonant frequency in opposite direction. Any mass flow passing through the tubes will delay the vibration at the incoming side and accelerate the vibration at the outgoing side. This causes a small time delay between both ends of the tube. This time delay is measured and used to calculate the mass flow through the tubes.

By measuring the resonant frequency of the tubes the mass of the medium and - given a constant volume inside the tubes - the density of the medium can be calculated.

As both effects are temperature dependent, the temperature is measured via a precise sensor for correcting the temperature effects of flow and density measurement.

As a consequence a Tricor Mass Flow Meter directly measures mass flow, density and temperature of the medium. Knowing the mass flow and the specific cravity, also the volume flow can be calculated.

Application

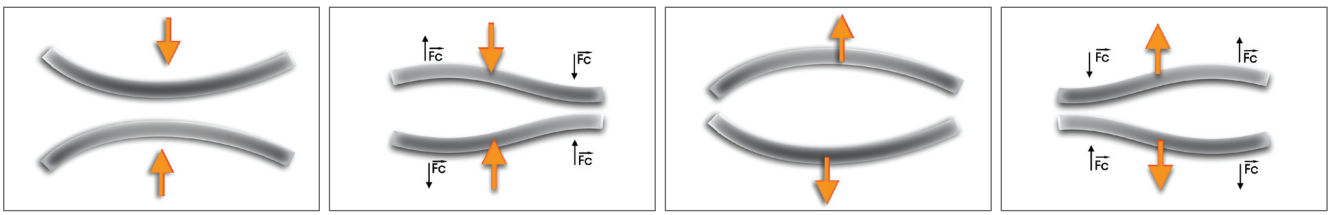
- Flow measurement of PU components and paints
- Flow measurement of aggressive and contaminated media
- Measurement of mass flow, density, temperature and volume flow

Features

- Pmax. 350 bar
- Short response time
- DKD calibration
- Excellent puring and sterilization qualities due to a construction free of dead spots
- Up to +150°C medium temperature
- Individual 8-point-calibration including report
- Ex protection according to ATEX, IECEx, CSA cUs

Cycle of excursion (simplified)

Rotation and deformation of two parallel looped pipes by the Coriolis force Fc.



Movement to the inside no flow | Movement to the inside with flow | Movement to the ouside no flow | Movement to the outside with flow

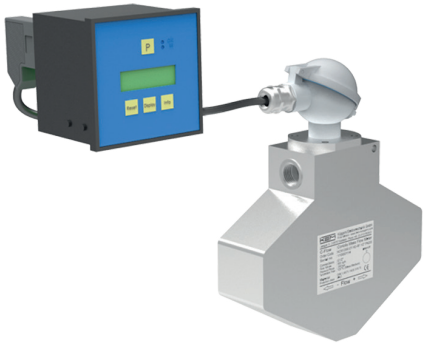
Overview

Compact version with TCE 8000

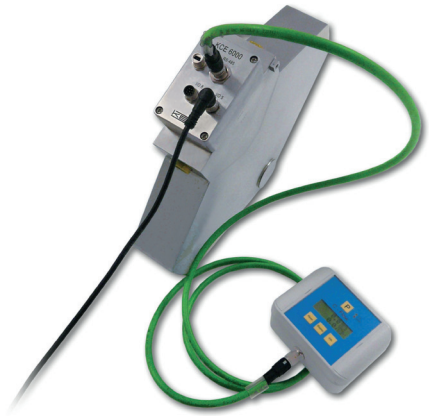
Remote Display TRD 8001

Exd housing for wall-mounting
(separated version, also with flange ends)

Remote panel-mounted housing
(separated version, also with flange ends)



Compact version with TCE 6000 and TRD 8001



Compact version with KCE 8000 ATEX / IECEx

Technical Data - TCM Transducer

	TCM0325	TCM0650	TCM1550	TCM3100	TCM5500	TCM7900	TCM28k	TCM65k
Flow range (kg/h)	3 to 300	6 to 600	15 to 1500	30 to 3000	55 to 5500	79 to 7900	280 to 28 000	650 to 65 000
Flow range (lb/min)	0.11 to 11	0.22 to 22	0.55 to 55	1.1 to 110	2.0 to 200	2.9 to 290	10 to 1030	24 to 2390
Flow range (l/h)	3 to 300	6 to 600	15 to 1500	30 to 3000	55 to 5500	79 to 7900	280 to 28 000	650 to 65 000
Basic Accuracy (% of flow reading)	0.1							
Zero Stability (% of full scale)	0.01							
Zero Drift (% f.s. per °C)	0.001							
Repeatability (% of flow)	0.1							
Density measuring range	0 - 4,500 kg/m³							
Density accuracy	± 0.002 kg/ltr							
Temperature accuracy	±1°C ±0.5% of reading							
Process and Ambient								
Process connections	female thread 1/2“ adaptors for flanges, diary and tri-clamp				flanges EN1092, ANSI B16.5, DIN2512			
Max. pressure	200 bar				350 bar	100 bar		
Max. pressure (Option)	350 bar							
Pressure Drop at max. flow H_20	ask KEM							
Operating Density range	500 - 2,500 kg/m³ (standard) , 5 - 4500 kg/m³ (upon request)							
Process temperature	-40 ... +100°C (standard) / -100 ... +150°C (upon request)							
Ambient temperture	-40 ... +70°C							
Storage temperature	-40 ... +100°C							
Electr. connections remote	screw type terminals							
Electr. connections compact.	none (internally connected to the electronics)							
Ingress Protection	IP65 (IP67 on request)							
General								
Tube arrangement	2 serial	2 parallel	2 serial	2 parallel	2 parallel	2 parallel	2 parallel	2 parallel
Tube inner diameter	4mm	4mm	8mm	8mm	7mm	9mm	16mm	28mm
Tube material	stainless steel DIN 1.4404							
Housing material	stainless steel DIN 1.4301							
Dimensions	see drawings							

Technical Data - TCE 8000 Transmitter

General	
Display	Graphic, 132 x 32 dot
Supply votage	24 VDC, ± 20% and / or 100 - 240 VAC (version dependent)
Programming	via front keyboard
Interface	RS 485, Option HART®, option Foundation Fieldbus
EMC	according to EN 61000-6-4 und 61000-6-2
Power consumption	max. 4 W
Exd housing	
Dimensions	see drawing
Connections	internal clamp terminals cable gland for 7 - 13 mm cables
Material	aluminium diecast
Protection class	IP 65 (IP 67 on request)
Weight	approx. 2 kg
Temperature	operating: - 40 up to 70°C (up to + 80°C on request) storage and transport: -40 up to 80°C
Panel-mounted housing:	
Dimensions	see drawing
Connections	rear clamp terminals
Material	Noryl
Protection class	front: IP 50, rear: IP 30
Weight	< 500g
Temperature	operation: 0 to 60°C storage and transport: -20 up to 70°C
Analog Outputs	
Two current outputs	4-20 mA passive, two-wire, isolated
Resolution	14 bit
Linearity	± 0.05% of full scale
Temperature drift	0.05% per 10K
Load	< 620 Ω (at 24V supply)
Output value	programmable: flow, total, density, temperature
Pulse Output	
Frequency range	0.5-10,000 Hz
Output signal	active push pull output for flow rate
Status In-and Output	
Status output	push pull programmable
Control input	programmable
Analog Input (option)	
Input type	4-20 mA active for two-wire passive pressure sensor
Resolution	12 bit
Linearity	± 0.05% of full scale
Temperature drift	0.05% per 10K
Supply voltage	> 20V (at 20 mA sensor current)

Technical Data - TCE 6000 Transmitter

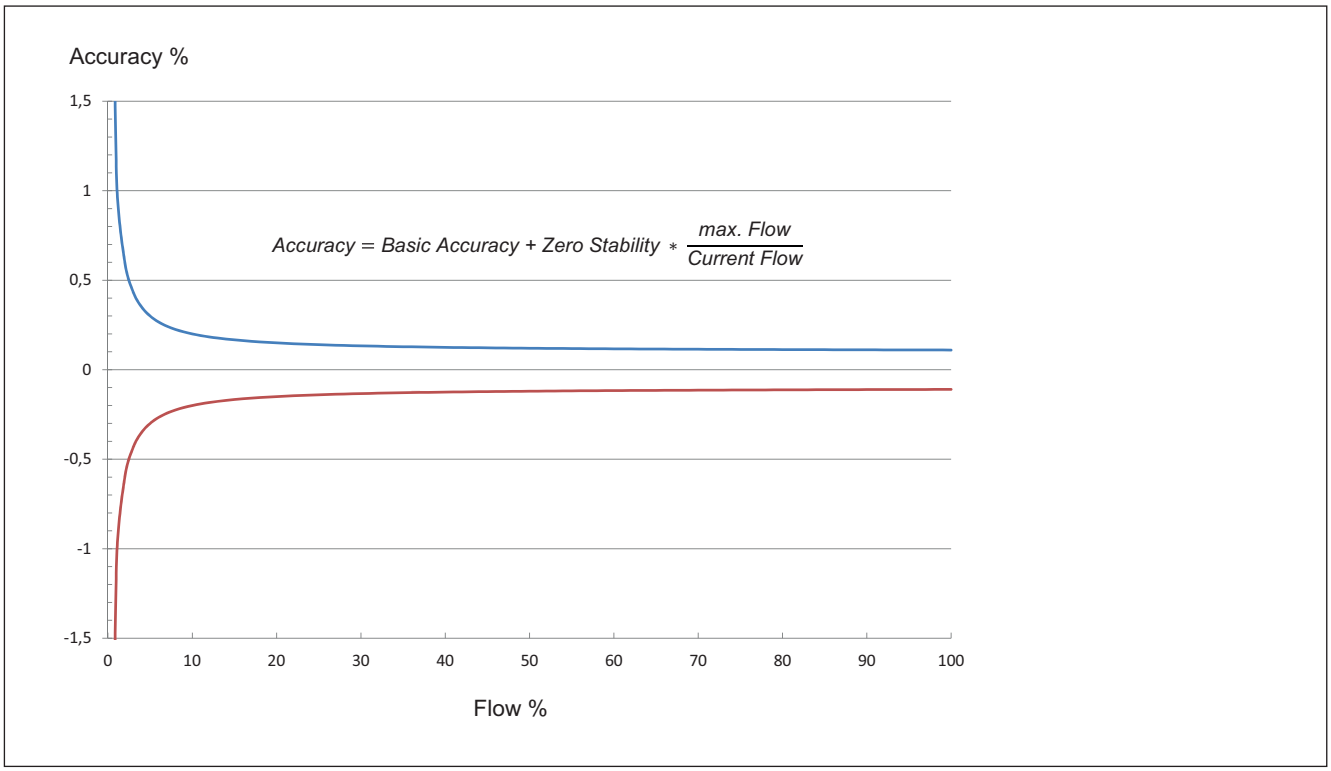
General	
Supply voltage	24 VDC, ±20%
Programming	via interface
Interface	RS485, USB (option)
EMC	according to EN 61000-6-4 and EN 61000-6-2
Power consumption	max. 4 W
Connections	connectors M12
Material	aluminium diecast
Temperature	operation: -40 to +70°C storage: -40 to +80°C
Ingress protection	IP 65
Analog Outputs	
Current output	4-20 mA active
Resolution	14 bit
Linearity	± 0.05%
Temperature drift	0.05% per 10K
Load	< 800 Ω
Output value	programmable: flow, total, density, temperature
Pulse Output	
Frequency range:	0.5-10,000 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

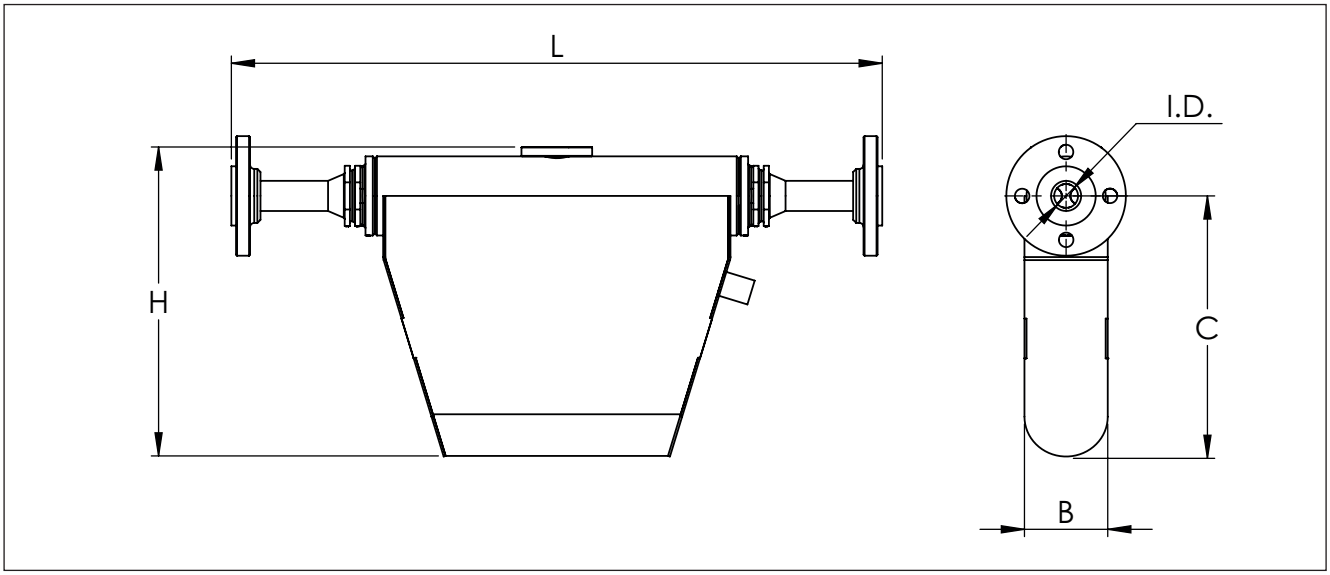
Display	Graphic, 132 x 32 dot
Supply voltage	via interface
Programming	via front keyboard
Interface to TCE	RS 485
EMC	according to EN 61000-6-4 und 61000-6-2
Dimensions	90 x 120 x 50 mm3 (h x w x d)
Connections	connector M12, B coded
Material	ABS-FR
Protection class	IP 64
Weight	approx. 500g
Temperature	operation: 0 to 60°C storage and transport: -20 up to 80°C
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
CSA Ex	Division 1: Group C,D, T4



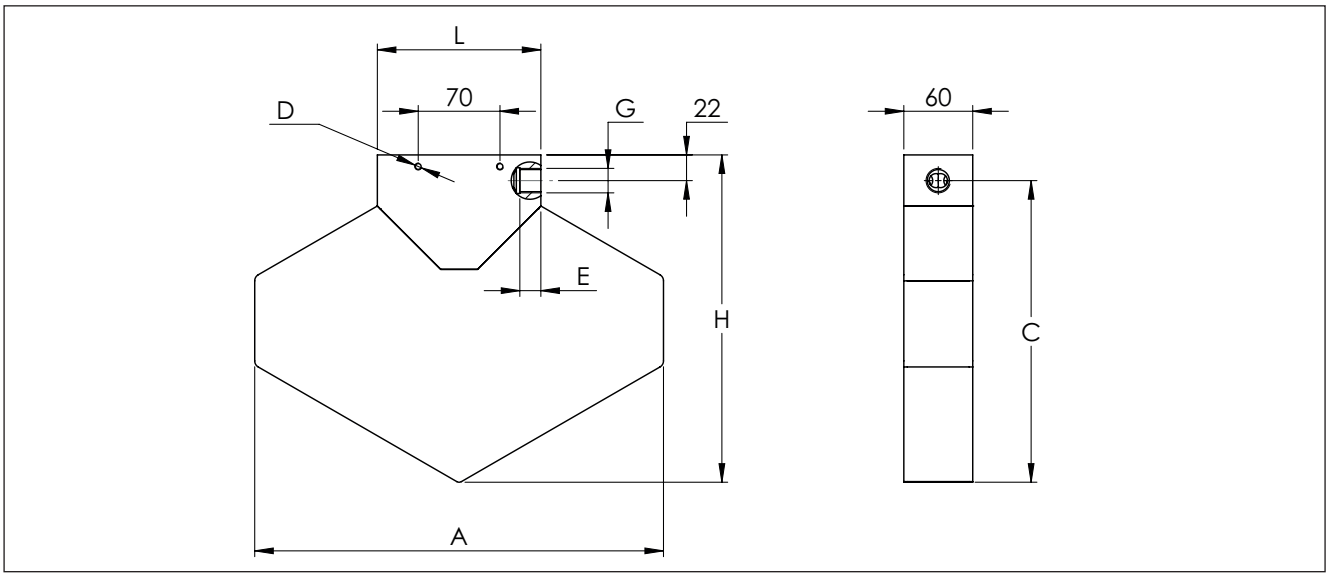
Dimensional drawing (mm) TCM 5500 to TCM 65k



Sensor Type	B	C	H	L*	I.D.	Connection**
TCM 5500, 7900	61	204	260	460	Ø 13	a. N.
TCM 28k	80	253	315	625	Ø 23	a. N.
TCM 65k	151	387	480	830	Ø 40	a. N.

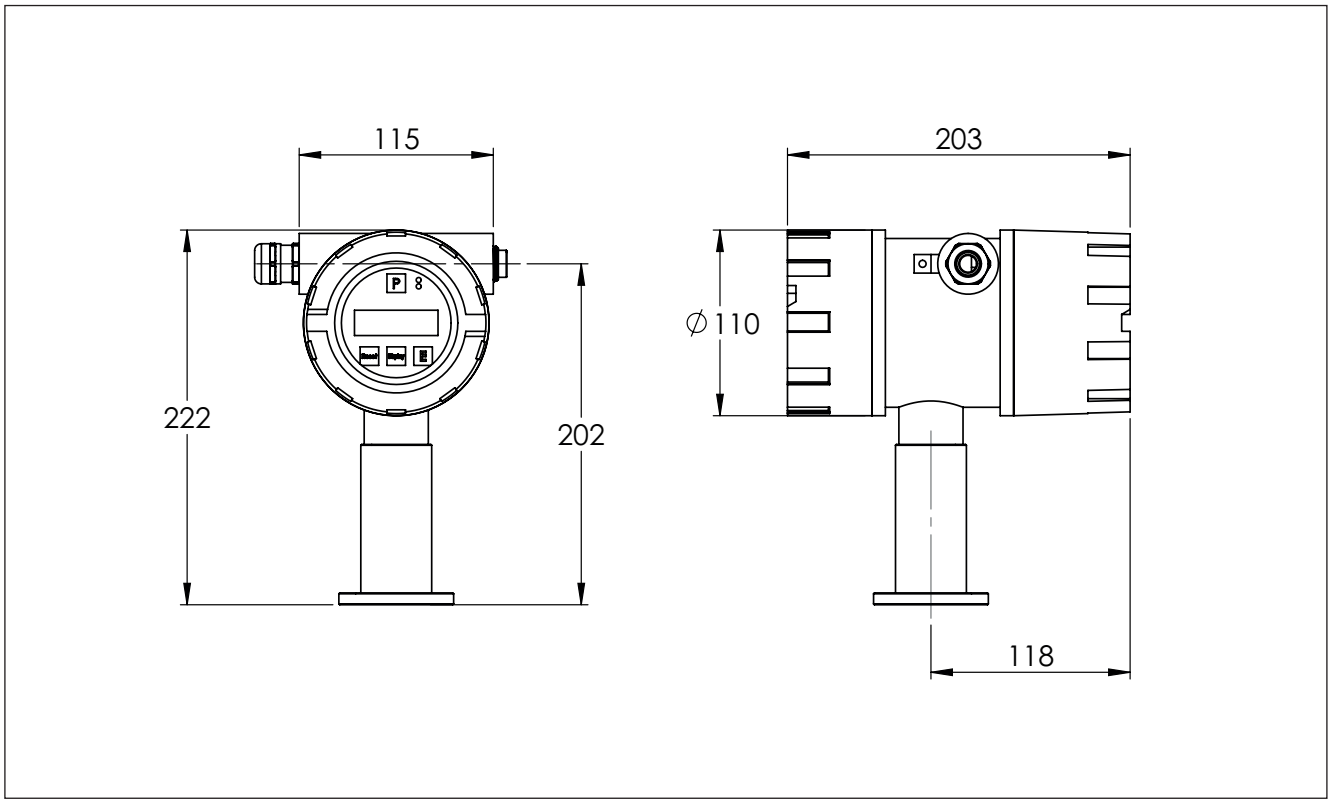
* further lengths on request
** flange types on request

Dimensional drawing (mm) TCM 0325 to TCM 3100

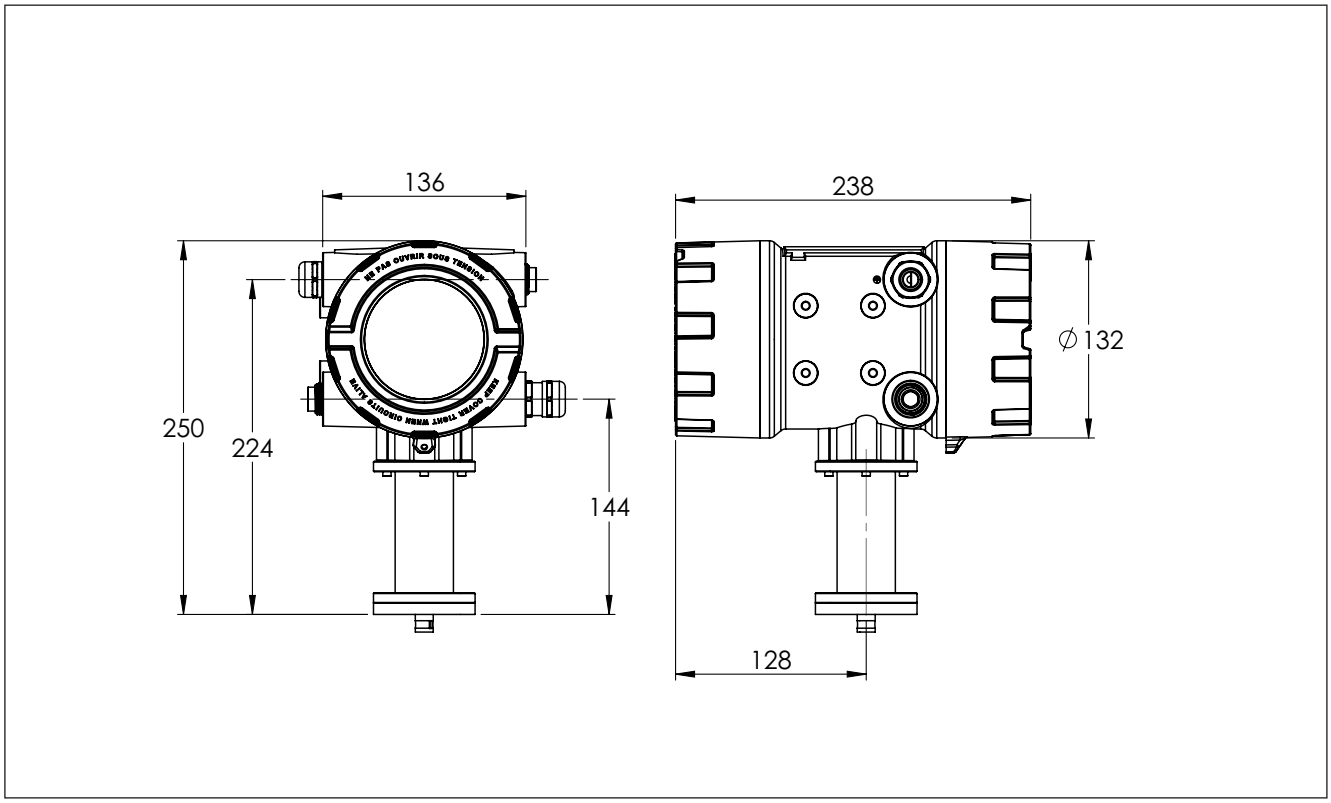


Sensor Type	A	C	D	E	H	L	G
TCM 0325	214	160	M6 ↧ 10	15	182	110	G ½“
TCM 0650	214	160	M6 ↧ 10	15	182	87	G ½“
TCM 1150	350	258	M6 ↧ 10	18	280	140	G ½“
TCM 3100	350	258	M6 ↧ 10	18	280	140	G ½“

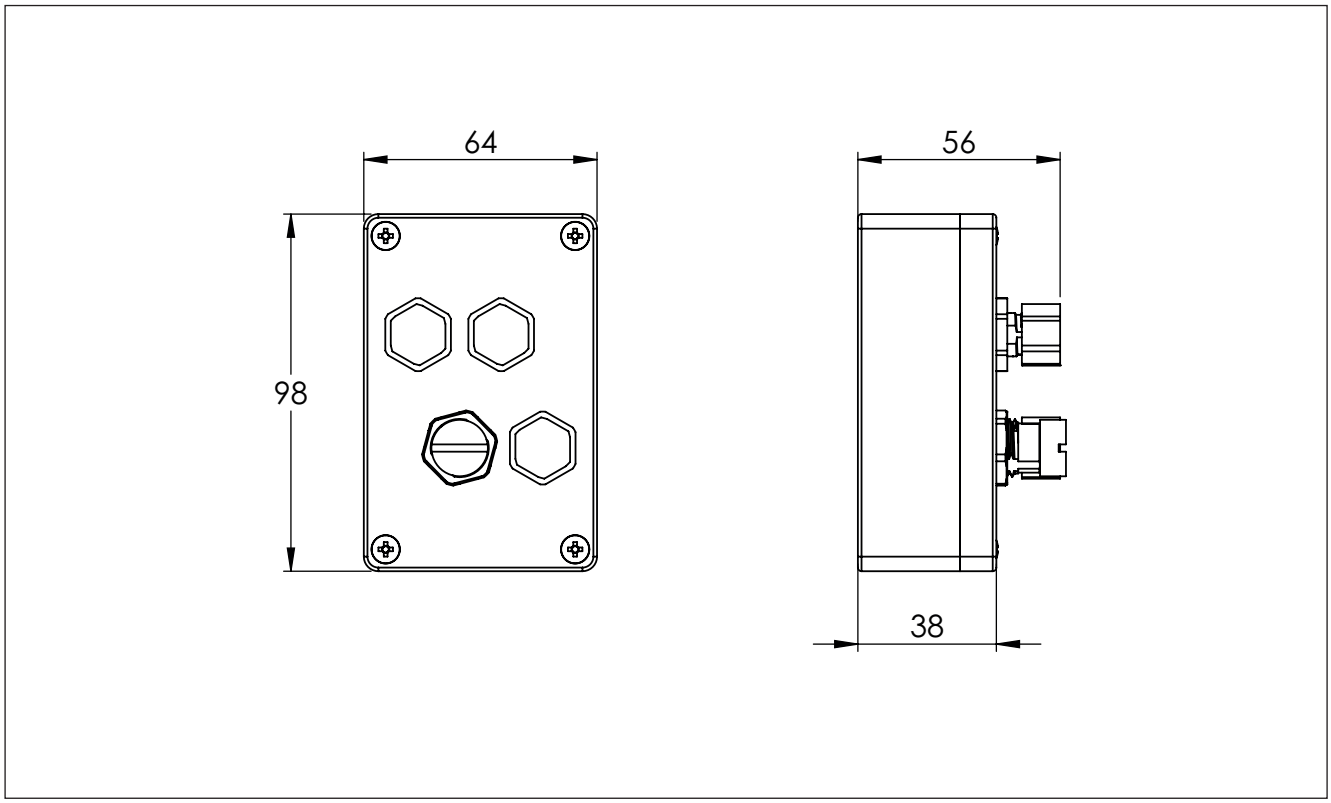
Dimensional drawing (mm) On site Electronics „C“



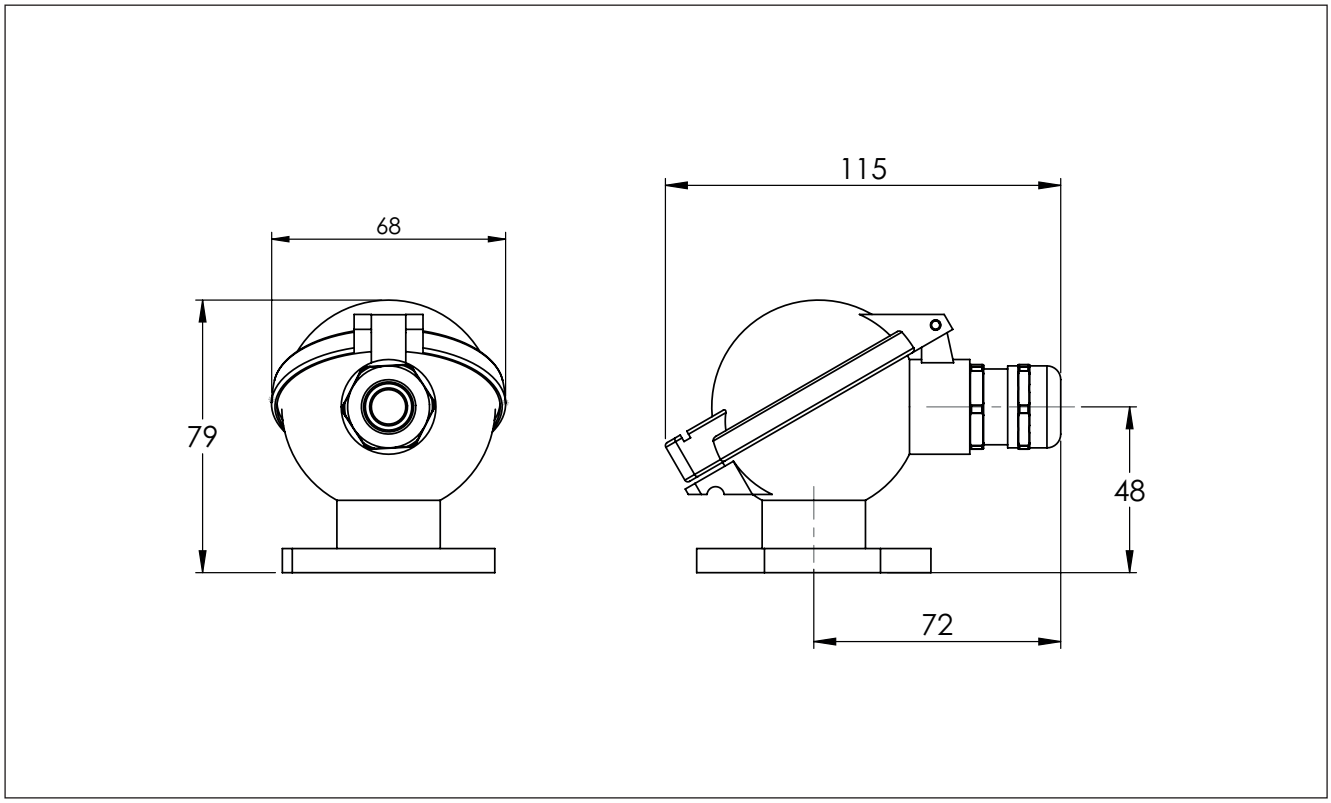
Dimensional drawing (mm) Big on site Electronics „E“



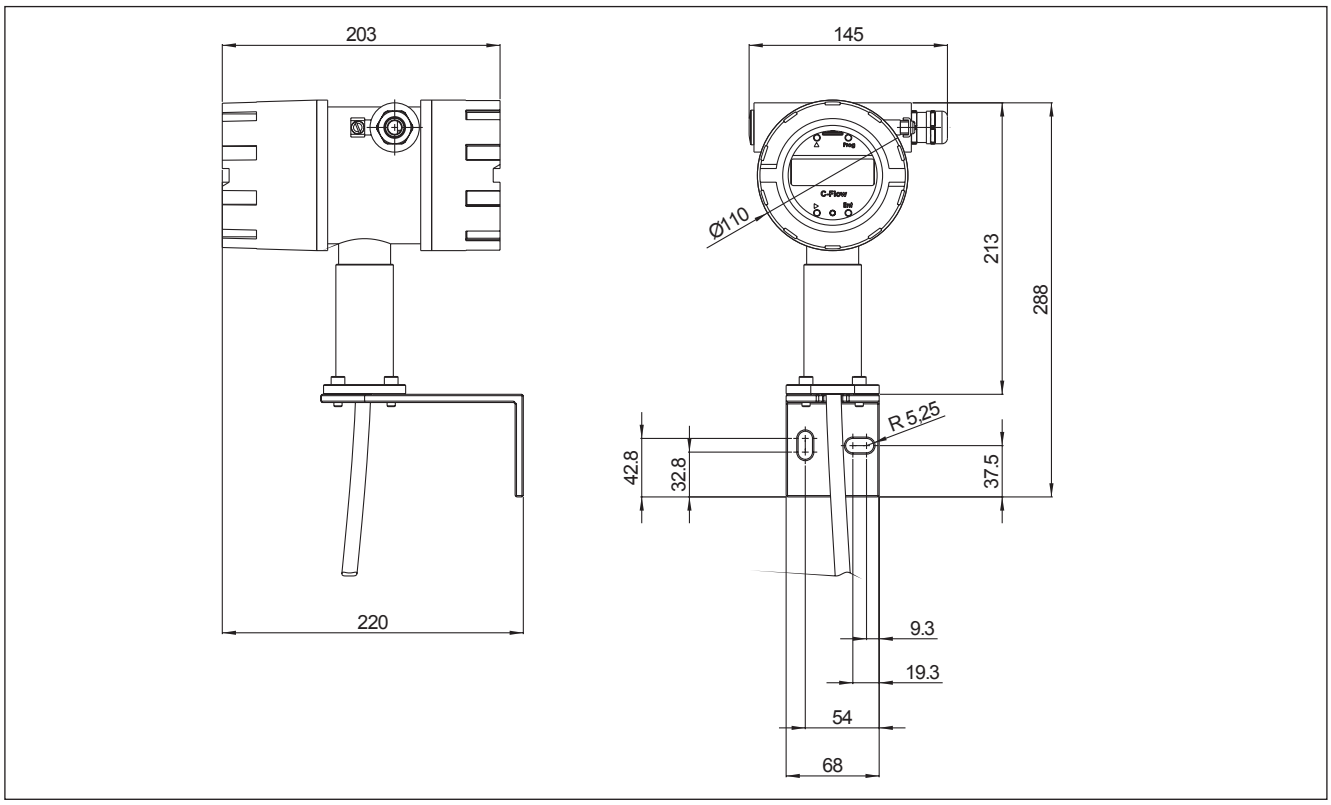
Dimensional drawing (mm) On site Electronics TCE 6000



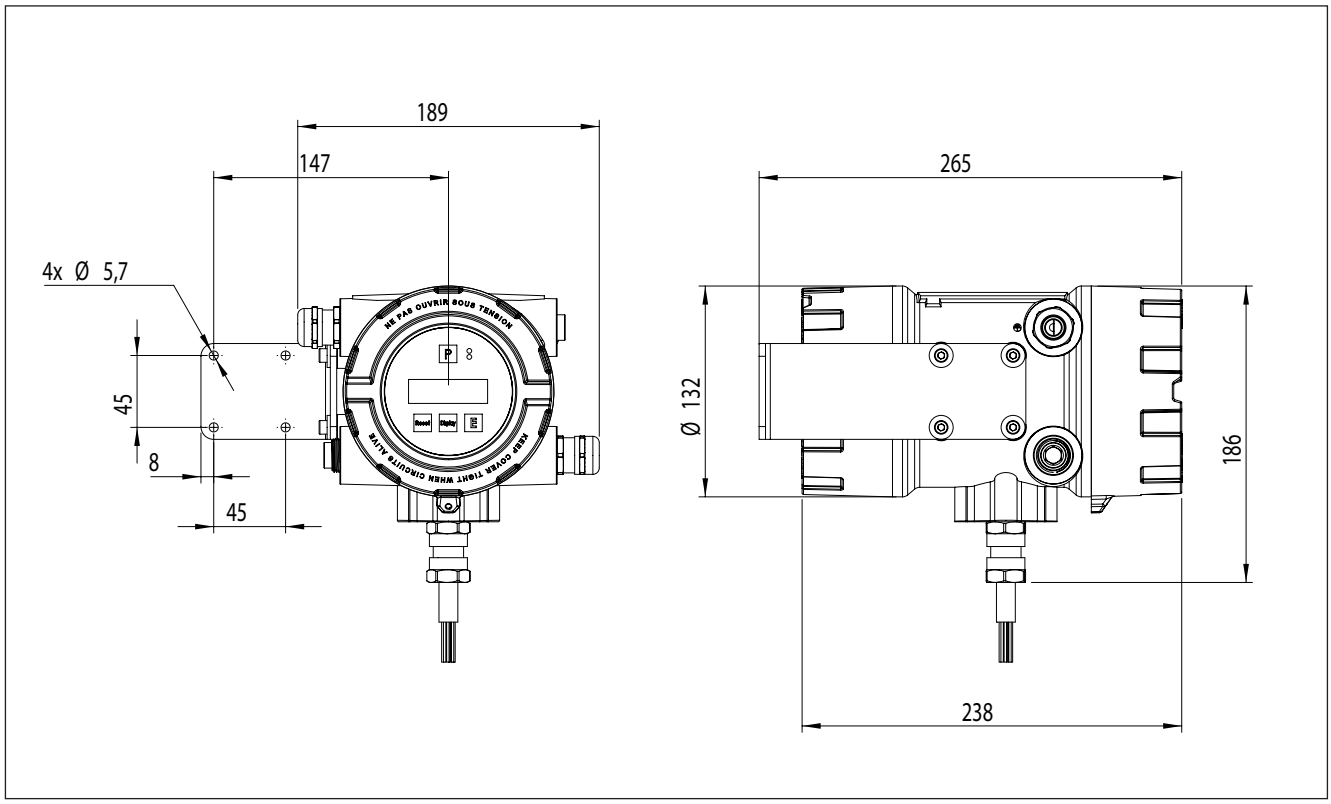
Dimensional drawing (mm) Connection Head



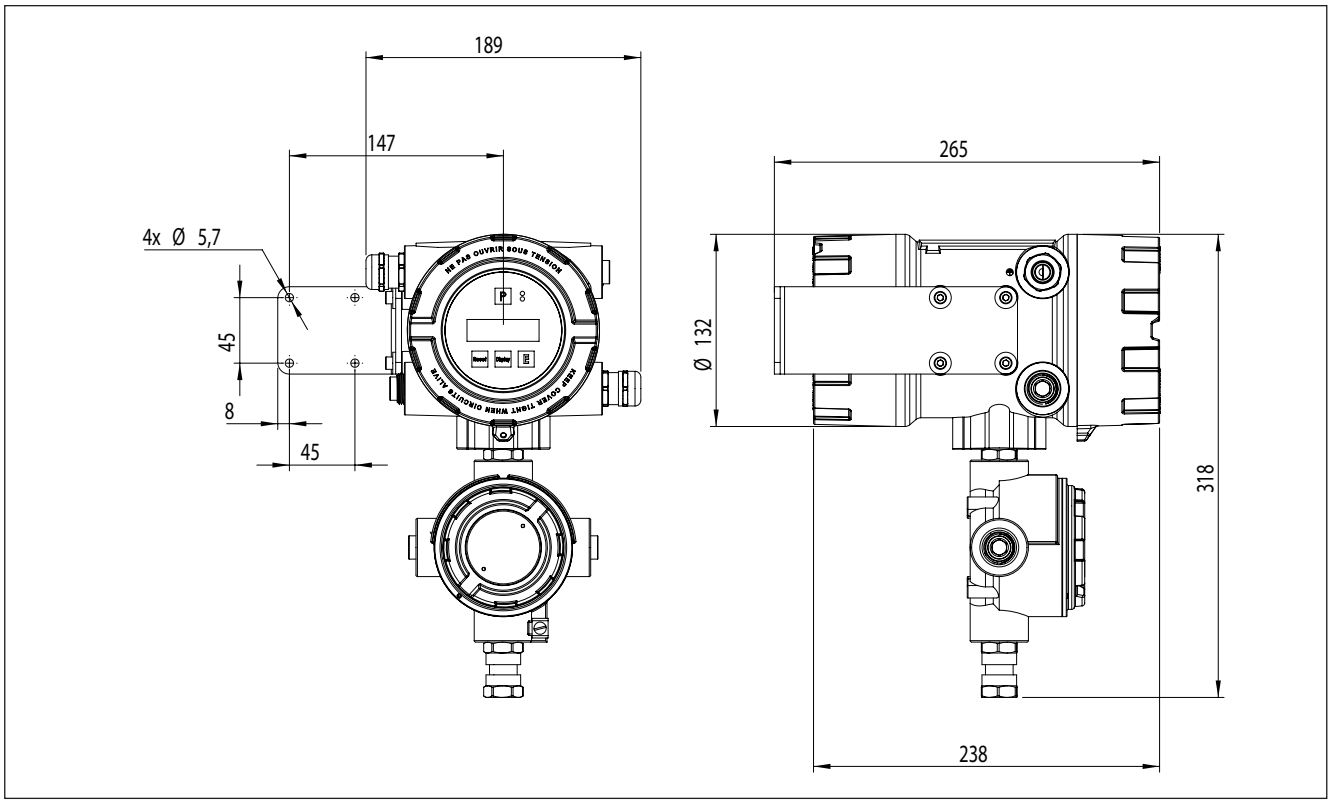
Dimensional drawing (mm) TCE 80xx - W



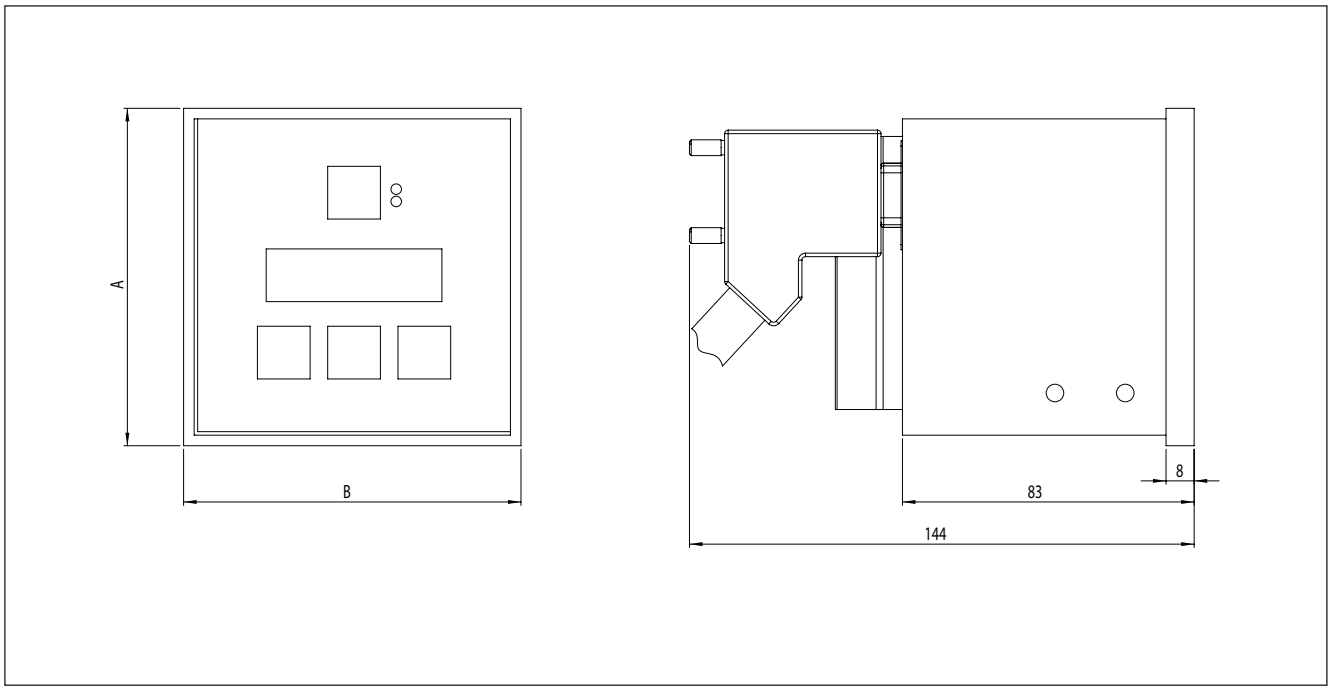
Dimensional drawing (mm) TCE 80xx - E with cable connection



Dimensional drawing (mm) TCE 80xx - E with Junction Box

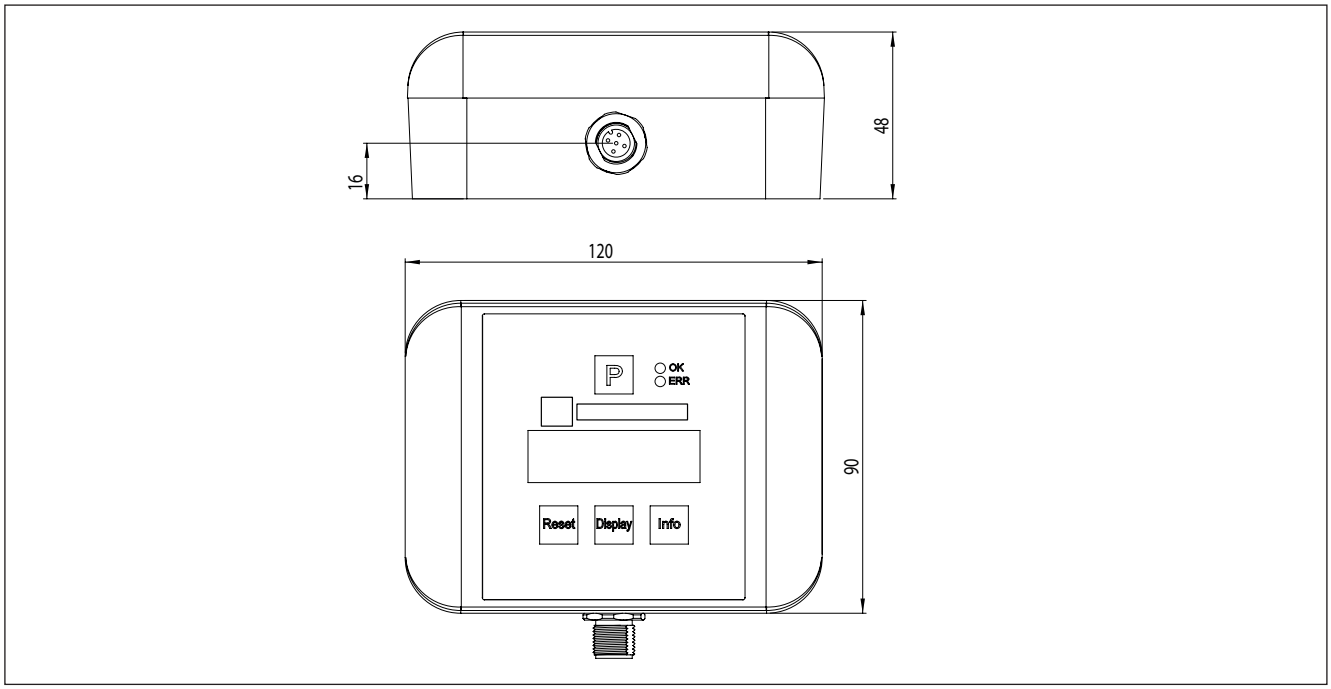


Dimensional drawing (mm) Panel-Mounted Housing (drawing not to scale)



Type	A	B	-	-	-	-	-
TCE 80** - S	96	96	-	-	-	-	-
TCE 80** - L	96	144	-	-	-	-	-

Dimensional drawing (mm) Remote Display TRD 8001



Ordering Code

	code	(4 digit)	
TCM	028k		Maximum Flow in kg/h

code	process connections (2 digits)	
Ax	ANSI flange	x = size of flange, contact KEM / AWL for code
Dx	DIN flange	x = size of flange, contact KEM / AWL for code
Fx	Female thread	x = size of thread, contact KEM / AWL for code

code	Mechanical options (4 digits)	
X000	Temperature range	S = -20 to 100°C H = -20 to 150°C
0X00	Pressure range	G = 100bar with rupture disc For other ranges contact KEM
00X0	Accuracy (S = standard)	
000X	Flange to flange length, contact KEM/AWL for code	

code	Electronics / terminal (4 digits)	
X000	Electronics	A = junction box C = C = On site electronics TCE 8000 E = Big on site electronics TCE 8000 (Ex) F = On site electronics TCE 6000
CX00	Interface	S = RS 485 only A = Hart + RS 485 B = Foundation Fieldbus and RS 485 C = HART and Foundation Fieldbus and RS 485 D = Foundation Fieldbus only E = Hart and Foundation Fieldbus Z = not used
C0X0	Supply voltage	D = 24V DC M = 90 - 264V AC Z = no used
C00X	Options	S = none A = Pressure compensation, 4-20 mA input

code	Ex-protection
Ex	ATEX + IECEx
Ex1	cCSAus
Exn	ATEX zone 2
empty	no Ex-protection

TCM 028k - DC - SGSS - EADS - Ex

Please ask KEM/AWL or your nearest dealer for the possible combinations and the best solution for your application.

code (4 digits)		
8001	Low Power Electronics	for TCM 0325 to TCM 7900
8011	High Power Electronics	for TCM 28K to TCM 65K

code	housing (1 digit)
W	Wall-mounted housing with fixed cable to TCM
S	Panel-mounted housing (separate cable required)
E	Big wall-mounted housing with fixed cable to TCM or with junction box
L	Wide panel-mounted housing (separate cable required) (Ex)

code	Options (4 digits)
X000	Interface S = RS 485 only A = Hart + RS 485 B = Foundation Fieldbus + RS485 C = HART + Foundation Fieldbus + RS485 D = Foundation Fieldbus only E = Hart + Foundation Fieldbus Z = not used
0X00	Power Supply B = 24V DC + 90-264V AC (Housing S only) D = 24V DC M = mains (90 - 264V AC)
00X0	Options (S=none) A = Pressure compensation and 4-20mA input
000X	Cable length Housing "E": S = 3m, for other lengths contact KEM/AWL A = junction box, separate cable required Housing "L": N = no cable included

code	Ex-protection
Ex	ATEX + IECEx
Ex1	cCSAus
Exn	ATEX zone 2
empty	no Ex-protection

TCE [ ] - [ ] - [ ] - [ ]

Example:

TCE [8011] - [E] - [BDSS] - [Ex]