

Coriolis Mass Flow Meter

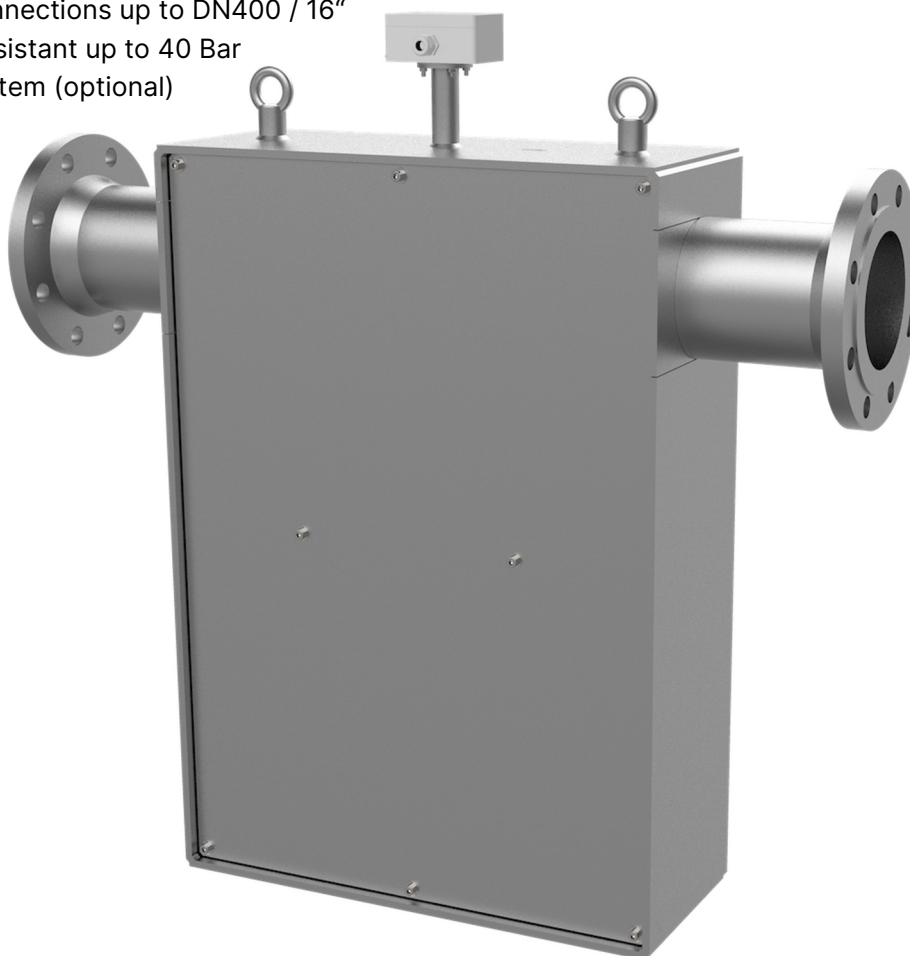
For high flow rates up to 2200 t/h

TMU

High flow

Technical information

- High flow rates up to 2200 t/h
- Process connections up to DN400 / 16"
- Pressure resistant up to 40 Bar
- Heating system (optional)



Function

The TMU Coriolis flow Sensors utilize the Coriolis principle for the direct measurement of mass flow.

The sensor possesses two parallel-arranged tubes, which are continuously force-vibrated at their resonance frequency. When a fluid or gas passes through the tubes, the mass flow momentum in conjunction with the Coriolis effect invokes a change in the tubes deflection, causing the inlet and outlet legs of the tubes to twist out of phase.

Coupled with a UMC transmitter, the phase shift is captured and evaluated. The derived linear output is proportional to the mass-flow.

The TMU Coriolis Mass Flow Sensors are designed for measuring the mass flow, density and calculated volume flow of almost all liquid and gaseous media.

Available as a standard configuration with a variety of process connections, the TMU sensors are optimised for the use in innumerable applications common to chemical, petrochemical, oil and gas, food and pharmaceutical industries.

TMU High Flow Coriolis Mass Flow Meter are used where high flow values in piping systems up to 400 mm / 32 inch and up to 2,200 t/h have to be measured safely and accurate.

The TMU Series also has a proven track record for use in precise dosing systems as well as in loading and unloading applications.

Technical Details

Sensor system: TMU

Coriolis dual-pipe tubes
TMU-X080 ... TMU-X300
(X denotes tube material)

Sensor containment: 1.4301 Stainless steel

Ambient temperature: -40 °C...+80 °C
-40 °F...+176 °F

Accuracy

Liquid: 0.15 % of actual flowrate
± ZP stability

Process temperature: -50 °C ...+220 °C/260 °C*
-58 °F...+428 °F/500 °F*
*(260 °C / 500 °F max. 1h)

Gas: 0.5 % of actual flowrate
± ZP Stability

Process pressure: Dependant on sensor size.

Ingress protection: IP65 (EN 60529)

Wetted parts:

- 316Ti/1.4571
- 316L/1.4404
- Hastelloy C-22
- Others on request

Certificates and Approvals

ATEX/IECEX/UKEX: II 1/2G Ex ia IIC T2...T6 Ga/Gb

cCSA_{US}: Class I, Zone 0, Div.1
AEx ia IIC T5-T2 Ga

Process connection:

- Flanges: DIN / ASME / JIS
- Others on request

NEPSI: Ex ia IIC T2...T6 Ga/Gb

Ships approval: DNV

Available Transmitters UMC4 / UMC4-RM

Transmitter mounting:

- Field housing
local mounted or remote mounted via junction box (1/2"NPT(f), M20x1,5) or connector (Harting Han® R23).
IP67 (EN60529) / NEMA6
- Rack-mount design (RM)
remote, via screw terminals.
IP20 (to be mounted in min. IP54 ATEX certified protective cabinet)

Outputs:

Each output circuit is galvanically isolated from each other as well as to ground.

Analogue: 1x 4...20 mA, passive, with HART®
1x 4...20 mA, passive
Mass flow, volume flow, density, temperature

Binary: passive via optocoupler
Pulse duration: 50 ms
adjustable range 0,1...2000 ms

Power supply:

- 19...36 V_{DC} / 24 V_{AC} (+5%...-20%), 50/60 Hz
- 90...265 V_{AC}, 50/60 Hz

Status: passive via optocoupler
Forward-/Reverse flow, MIN/MAX flow rate, MIN/MAX density, MIN/MAX temperature, alarm, second pulse output (phase shifted to pulse 1 by 90°).

Certificate and Approvals for UMC4 / UMC4-RM



Field housing:

ATEX / IECEx: II (1)2G Ex d [ia Ga] IIC T4-T3 Gb
NEPSI: Ex db [ia Ga] IIC T4/T3 Gb

Type of protection: Ex d

Type of protection signal output:

- Ex [ia Ga] intrinsically safe
- Non-intrinsically safe



Rack mount design (RM):

ATEX / IECEx: II (1)3G Ex ec [ia Ga] IIC T6..T3 Gc

(to be mounted in min. IP54 ATEX certified protective cabinet)

Type of protection signal output:

- Ex [ia Ga] intrinsically safe
- Non-intrinsically safe

Process pressure range

All device sizes are available with standard flanges according to pressure ratings class 150 / 300 and PN40. Depending on the sensor size, other nominal sizes with higher pressure ratings are possible on request.

For further information, please contact our sales department.

Standard – Measuring ranges

Type	Measuring range max.		Nominal ($\Delta p=1\text{bar}$)		Zero point stability (of range)	
	kg/h	[lbs/min]	kg/h	[lbs/min]	kg/h	[lbs/min]
TMU-x080*	120.000	[4.409,2]	118.000	[4.335,7]	12	[0,4]
TMU-x100**	200.000	[7.348,6]	200.000	[7.348,6]	20	[0,7]
TMU-x150**	460.000	[16.901,8]	460.000	[16.901,8]	46	[1,7]
TMU-x200***	700.000	[25.720,2]	700.000	[25.720,2]	70	[2,6]
TMU-x250	1.500.000	[55.114,6]	1.350.000	[49.603,2]	150	[5,5]
TMU-x300	2.200.000	[80.834,8]	1.900.000	[69.811,9]	220	[8,1]

* $\Delta p = 0,95 \text{ Bar}$

** $\Delta p = 0,93 \text{ Bar}$

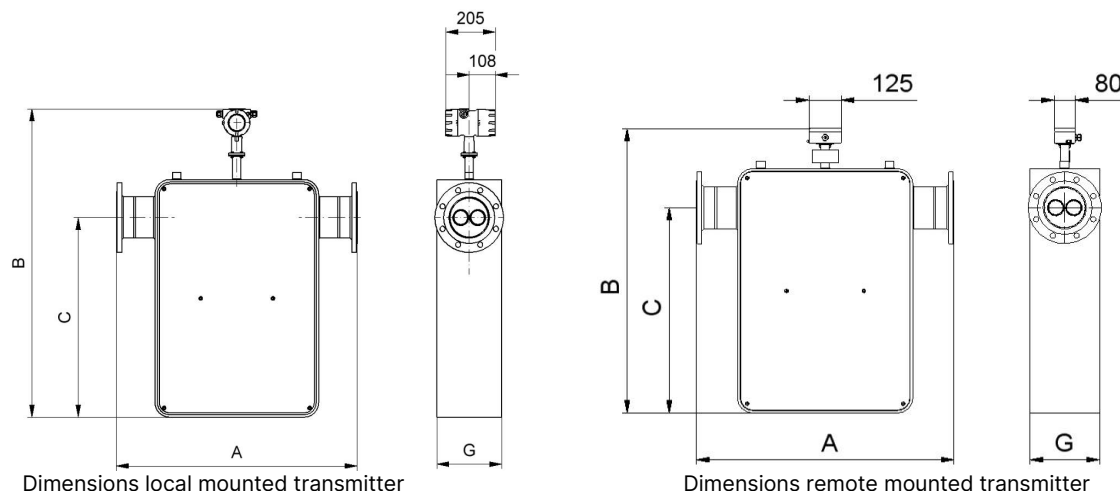
*** $\Delta p = 0,66 \text{ Bar}$

Measuring ranges for approvals

Type	DNV ¹⁾ [kg/h]
TMU-x080	0...120.000
TMU-x100	0...200.000
TMU-x150	0...460.000
TMU-x200	0...700.000
TMU-x250	N / V
TMU-x300	N / V

1) Must be used with approved transmitter (UMC4) for system approval.

Dimensions



	B				C	G
	Local mounted transmitter		Remote mounted transmitter			
	-40°C ... 100°C (-40°F ... 212°F)	-40°C ... 150°C (-40°F ... 302°F)	-40°C ... 100°C (-40°F ... 212°F)	-40°C ... 180°C (-40°F ... 356°F)	-40°C ... 260°C (-40°F ... 500°F)	
Type	mm / inch	mm / inch	mm / inch	mm / inch	mm / inch	mm / inch
TMU-x080	1241 / 48,9	1343 / 82,9	1110 / 43,7	1212 / 47,7	1312 / 51,7	800 / 31,5 250 / 9,8
TMU-x100	1261 / 49,6	1363 / 53,7	1130 / 44,5	1232 / 48,5	1332 / 52,4	1070 / 42,1 270 / 10,6
TMU-x150	1591 / 62,6	1693 / 66,7	1460 / 57,5	1562 / 61,5	1662 / 65,4	1070 / 42,1 380 / 15,0
TMU-x200	1751 / 68,9	1853 / 73,0	1620 / 63,8	1722 / 67,8	1822 / 71,7	1210 / 47,6 400 / 15,7
TMU-x250	1891 / 74,4	1993 / 78,5	1760 / 69,3	1862 / 73,3	1962 / 77,2	1300 / 51,2 550 / 21,7
TMU-x300	1896 / 74,6	1998 / 78,7	1765 / 69,5	1867 / 73,5	1967 / 77,4	1400 / 55,1 510 / 20,1

Installation length dimension "A" see Order details sensor on page 5.

Heated sensors

Sensors equipped with heating plates can have different dimensions depending on the mounted heating plate and the associated connection.

Necessary data for the sizing of the meter.

Medium: _____

	Nominal	Minimum	Maximum	Unit
Flow rate:	_____	_____	_____	_____
Process pressure:	_____	_____	_____	_____
□abs. / □gauge	_____	_____	_____	_____
Process temperature:	_____	_____	_____	_____
Density:	_____	_____	_____	_____
(at process condition)	_____	_____	_____	_____
Viscosity:	_____	_____	_____	_____
(at process condition)	_____	_____	_____	_____

Requirements for the ship approval

For the use of the sensor in combination with the ship approval the following conditions according to **DNV Rules: DNVGL RU Ship Pt.4 Ch.6 Sec.1** have to be fulfilled:

- Max. process temperature: 150°C
- Max. process pressure: 16 Bar
- Materials 1.4401 (AISI 316) or 1.4404 (AISI 316L) cannot be used for salt water applications.
- Only in combination with 3.1 Certificate (DIN EN 1024:2004).
- Only in combination with approved remote mounted transmitter.

If you have different requirements for a measuring device, please contact our sales department.

Order details sensor

Example: TMU-S080-321B-A00-A0-10-0-H

Model code		Description
TMU		
-	Wetted materials	
S	Stainless steel	1.4404 / 1.4571
H	Hastelloy C-22	2.4602
Meter line size and process connection		
080		25.000...120.000 kg/h
-	Process connection	Installation length
321B	DN50 PN40 Form B1 DIN EN 1092-1	1150 mm
321D	DN50 PN40 Form D DIN EN 1092-1	1150 mm
331B	DN80 PN40 Form B1 DIN EN 1092-1	1196 mm
331D	DN80 PN40 Form D DIN EN 1092-1	1196 mm
335B	DN100 PN16 Form B1 DIN EN 1092-1	1184 mm
335D	DN100 PN16 Form D DIN EN 1092-1	1184 mm
340B	DN125 PN16 Form B1 DIN EN 1092-1	925 mm
345B	DN150 PN16 Form B1 DIN EN 1092-1	on request
206R	2" Class 150 RF ASME B16.5-2003	1200 mm
246R	2" Class 600 RF ASME B16.5-2003	1225 mm
208R	3" Class 150 RF ASME B16.5-2003	1218 mm
248R	3" Class 600 RF ASME B16.5-2003	1243 mm
210R	4" Class 150 RF ASME B16.5-2003	1230 mm
230R	4" Class 300 RF ASME B16.5-2003	1250 mm
211R	5" Class 150 RF ASME B16.5-2003	1000 mm
231R	5" Class 300 RF ASME B16.5-2003	1000 mm
212R	6" Class 150 RF ASME B16.5-2003	on request
232R	6" Class 300 RF ASME B16.5-2003	on request
XXXX	Special, customer specified	
100		30.000...200.000 kg/h
-	Process connection	Installation length
331B	DN80 PN40 Form B1 DIN EN 1092-1	1350 mm
331D	DN80 PN40 Form D DIN EN 1092-1	1350 mm
335B	DN100 PN16 Form B1 DIN EN 1092-1	1350 mm
335D	DN100 PN16 Form D DIN EN 1092-1	1350 mm
345B	DN150 PN16 Form B1 DIN EN 1092-1	1090 mm
345D	DN150 PN16 Form D DIN EN 1092-1	1090 mm
208R	3" Class 150 RF ASME B16.5-2003	1375 mm
248R	3" Class 600 RF ASME B16.5-2003	1413 mm
210R	4" Class 150 RF ASME B16.5-2003	1400 mm
230R	4" Class 300 RF ASME B16.5-2003	1420 mm
212R	6" Class 150 RF ASME B16.5-2003	1154 mm
232R	6" Class 300 RF ASME B16.5-2003	1173 mm
XXXX	Special, customer specified	
150		60.000...460.000 kg/h
-	Process connection	Installation length
335B	DN100 PN16 Form B1 DIN EN 1092-1	1700 mm
335D	DN100 PN16 Form D DIN EN 1092-1	1700 mm
345B	DN150 PN16 Form B1 DIN EN 1092-1	1725 mm
345D	DN150 PN16 Form D DIN EN 1092-1	1725 mm
350B	DN200 PN16 Form B1 DIN EN 1092-1	1448 mm
350D	DN200 PN16 Form D DIN EN 1092-1	1448 mm
210R	4" Class 150 RF ASME B16.5-2003	1770 mm
230R	4" Class 300 RF ASME B16.5-2003	1775 mm
212R	6" Class 150 RF ASME B16.5-2003	1796 mm
232R	6" Class 300 RF ASME B16.5-2003	1815 mm
213R	8" Class 150 RF ASME B16.5-2003	1525 mm
233R	8" Class 300 RF ASME B16.5-2003	1545 mm
XXXX	Special, customer specified	

200	150.000...700.000 kg/h		
-	Process connection	Installation length	
345B	DN150 PN16 Form B1 DIN EN 1092-1	2175 mm	
345D	DN150 PN16 Form D DIN EN 1092-1	2175 mm	
350B	DN200 PN16 Form B1 DIN EN 1092-1	2175 mm	
350D	DN200 PN16 Form D DIN EN 1092-1	2175 mm	
356B	DN250 PN16 Form B1 DIN EN 1092-1	1850 mm	
356D	DN250 PN16 Form D DIN EN 1092-1	1850 mm	
212R	6" Class 150 RF ASME B16.5-2003	2225 mm	
232R	6" Class 300 RF ASME B16.5-2003	2250 mm	
213R	8" Class 150 RF ASME B16.5-2003	2270 mm	
233R	8" Class 300 RF ASME B16.5-2003	2275 mm	
214R	10" Class 150 RF ASME B16.5-2003	1925 mm	
234R	10" Class 300 RF ASME B16.5-2003	1957 mm	
XXXX	Special, customer specified		
250	300.000...1.500.000 kg/h 1)		
-	Process connection	Installation length	
350B	DN200 PN16 Form B1 DIN EN 1092-1	2275 mm	
356B	DN250 PN16 Form B1 DIN EN 1092-1	2275 mm	
363B	DN300 PN16 Form B1 DIN EN 1092-1	1925 mm	
213R	8" Class 150 RF ASME B16.5-2003	2350 mm	
233R	8" Class 300 RF ASME B16.5-2003	2375 mm	
214R	10" Class 150 RF ASME B16.5-2003	2348 mm	
234R	10" Class 300 RF ASME B16.5-2003	2375 mm	
215R	12" Class 150 RF ASME B16.5-2003	1975 mm	
235R	12" Class 300 RF ASME B16.5-2003	2025 mm	
XXXX	Special, customer specified		
-	Containment option		
A	Stainless steel		
X	Special, customer specified		
-	Heating / Cooling		
0	without		
B	Heater / cooler		
X	Special, customer specified		
-	Connection for heating / cooling		
0	without		
A	Ermeto EO12		
B	Swagelok 12mm		
C	DN15 PN40 Form B1 DIN EN 1092-1		
D	½" Class 150 RF ASME B16.5-2003		
E	½" NPT (f)		
F	DN25 PN40 Form B1 DIN EN 1092-1		
G	1" Class 150 RF ASME B16.5-2003		
H	1" NPT (f)		
X	Special, customer specified		
-	Transmitter mounting	Process temperature	Sensor cable connection
A	Integral mounted transmitter	-20...100°C (-4...212°F)	- IP65 1)
B	Integral mounted transmitter	-20...150°C (-4...302°F)	- IP65 1)
C	Remote mounted transmitter	-50...100°C (-58...212°F)	Junction box via ½" NPT (f) IP65
D	Remote mounted transmitter	-50...180°C (-58...356°F)	Junction box via ½" NPT (f) IP65
E	Remote mounted transmitter	-50...260°C (-58...500°F)	Junction box via ½" NPT (f) IP65
F	Remote mounted transmitter	-50...100°C (-58...212°F)	Junction box via M20x1,5 IP65
G	Remote mounted transmitter	-50...180°C (-58...356°F)	Junction box via M20x1,5 IP65
H	Remote mounted transmitter	-50...260°C (-58...500°F)	Junction box via M20x1,5 IP65
K	Remote mounted transmitter	-50...100°C (-58...212°F)	Connector (Harting Han® R 23) IP65
L	Remote mounted transmitter	-50...180°C (-58...356°F)	Connector (Harting Han® R 23) IP65
M	Remote mounted transmitter	-50...260°C (-58...500°F)	Connector (Harting Han® R 23) IP65
X	Special, customer specified		

Approvals	
0	without
B	NEPSI Ex ia IIC T6...T2 Ga/Gb 2)
D	CSA Class I Zone 0/Div1 AEx ia IIC T5...T2 Ga/Gb / Group A,B,C,D 2)
K	KCS (Korea) Ex ia IIC T6...T2 Ga/Gb 2)
L	ATEX / IECEx / UKEX II 1/2G Ex ia IIC T2...T6 Ga/Gb 2)
S	Ships approval DNV 2), 3), 4), 5)
9	Multiple approvals B, D, K, L
Calibration flow	
1	Standard, 3-point
2	10-point
3	External lab
X	Special, customer specified
Calibration density	
0	without
1	Standard, 3-point
2	5-point
X	Special, customer specified
Supplementary equipment	
0	without
X	Special, customer specified
Design	
H	Heinrichs
K	Kobold

Notes:

- 1) Not for ships approval.
- 2) Must be used with approved transmitter for system approval.
- 3) Includes ATEX and IECEx approvals. See Requirements for the ship approval on page 4.
- 4) Only in combination with 3.1 certificate.
- 5) Only in combination with a remote mounted transmitter.