

Coriolis Mass Flow Meter

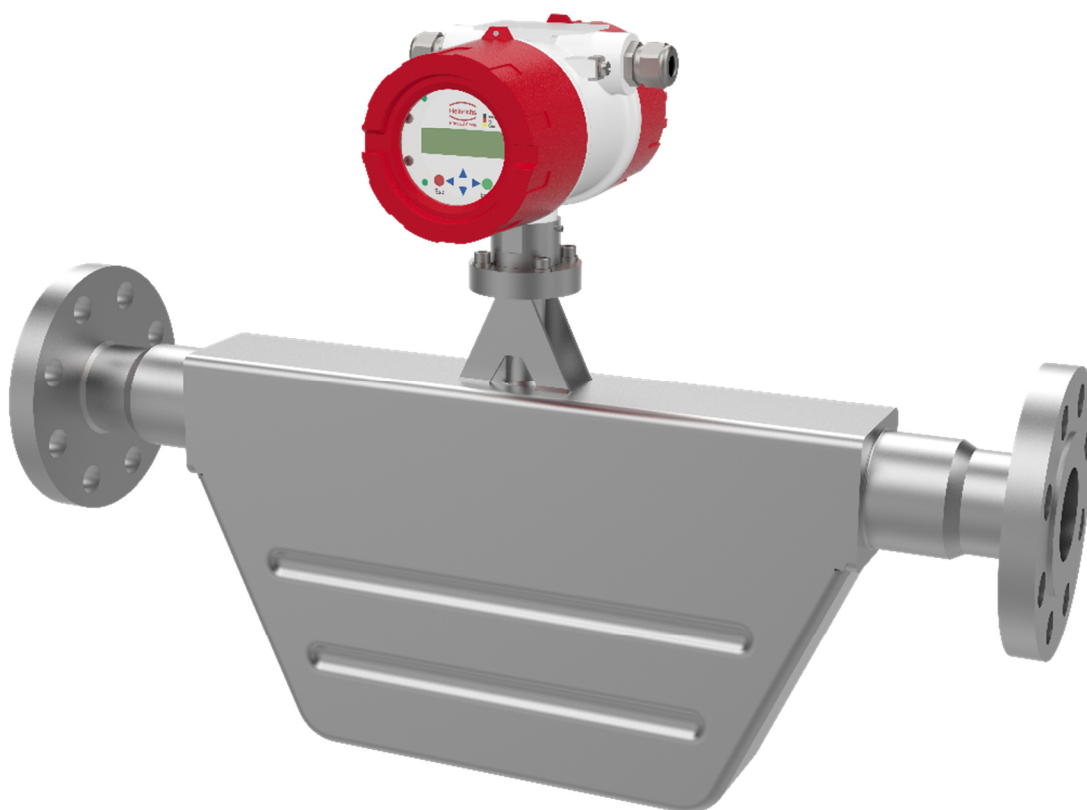
Mass-Flow Meter for standard applications

TMU

Technical information

2nd Generation

- Extreme compact lightweight design.
- Measuring ranges from 60 kg/h to 80 000 kg/h.
- Immune to external vibrations.
- Immune to pipeline induced stresses.
- Variety of tube material available.
- Extensive selection of process connections.
- Optional sensor heating.



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.

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 (2nd Generation)

Coriolis dual-pipe tubes
TMU-X008 bis TMU-X050
(X denotes tube material)

Accuracy

Liquid: 0.1 % of actual flowrate
± ZP stability

Gas: 0.5 % of actual flowrate
± ZP stability

Wetted parts:

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

Process connection:

- Flanges: DIN / ASME / JIS
- Thread: G / NPT
- Others on request

Sensor containment: 1.4301 Stainless Steel

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

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

Process pressure: Dependant on sensor size.

Ingress protection: IP67 (EN 60529) / NEMA 6

Certificates and Approvals

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

cCSAus: Class I, Zone 0, Div.1
AEx ia IIC T5-T2 Ga

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 (½"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)

Power supply:

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

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

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

Terminal compartment: Ex d

Type of protection signal output:

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



Rack mount design:

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-x008	600	[22,0]	330	[12,1]	0,06	[0,002]
TMU-x010	2.500	[91,9]	1.150	[42,3]	0,25	[0,01]
TMU-x015	12.000	[440,9]	5.250	[192,9]	1,2	[0,04]
TMU-x025	30.000	[1.102,3]	20.000	[734,9]	3	[0,1]
TMU-x040	60.000	[2.204,6]	55.000	[2.020,9]*	6	[0,2]
TMU-x050	80.000	[2.939,4]	74.000	[2.719,0]	8	[0,3]

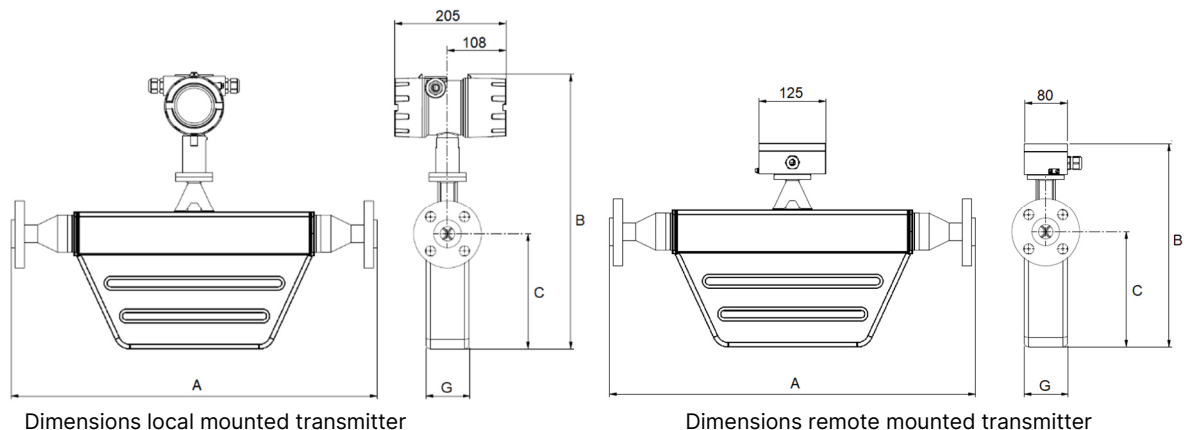
* $\Delta p = 0,87\text{bar}$

Measuring ranges for approvals

Type	DNV ¹⁾ [kg/h]
TMU-x008	0...600
TMU-x010	0...2.500
TMU-x015	0...12.000
TMU-x025	0...30.000
TMU-x040	0...60.000
TMU-x050	0...80.000

1) Must be used with approved transmitter (UMC3) for system approval.

Dimensions



Type	Local mounted transmitter		Remote mounted transmitter			C	G
	-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)		
TMU-x008	318 / 12,52	418 / 16,46	233 / 9,17	333 / 13,11	433 / 17,04	82 / 3,23	35 / 1,38
TMU-x010	338 / 13,31	438 / 17,24	245 / 9,65	345 / 13,58	445 / 17,52	100 / 3,94	40 / 1,57
TMU-x015	408 / 16,06	508 / 20,00	315 / 12,40	415 / 16,34	515 / 20,28	160 / 6,30	60 / 2,36
TMU-x025	469 / 18,46	569 / 22,40	376 / 14,80	476 / 18,74	576 / 22,68	211 / 8,31	80 / 3,15
TMU-x040	628 / 24,72	728 / 28,66	535 / 21,06	635 / 20,00	735 / 28,94	312 / 12,28	136 / 5,35
TMU-x050	628 / 24,72	728 / 28,66	535 / 21,06	635 / 20,00	735 / 28,94	312 / 12,28	136 / 5,35

Installation length dimension "A" see "Order details" 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-S008-301B-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		
008		60...600 kg/h
-	Process connection	Installation length
6010	1/4" NPT (f)	320 mm
6030	1/2" NPT (f)	320 mm
301B	DN10 PN40 Form B1 DIN EN 1092-1	300 mm
201R	1/2" Class 150 RF ASME B16.5-2003	300 mm
221R	1/2" Class 300 RF ASME B16.5-2003	310 mm
241R	1/2" Class 600 RF ASME B16.5-2003	330 mm
010		250...2500 kg/h
-	Process connection	Installation length
6010	1/4" NPT (f)	380 mm
6030	1/2" NPT (f)	380 mm
301B	DN10 PN40 Form B1 DIN EN 1092-1	390 mm
305B	DN15 PN40 Form B1 DIN EN 1092-1	410 mm
309B	DN25 PN40 Form B1 DIN EN 1092-1	410 mm
201R	1/2" Class 150 RF ASME B16.5-2003	380 mm
221R	1/2" Class 300 RF ASME B16.5-2003	390 mm
241R	1/2" Class 600 RF ASME B16.5-2003	390 mm
202R	3/4" Class 150 RF ASME B16.5-2003	380 mm
222R	3/4" Class 300 RF ASME B16.5-2003	380 mm
242R	3/4" Class 600 RF ASME B16.5-2003	390 mm
203R	1" Class 150 RF ASME B16.5-2003	380 mm
223R	1" Class 300 RF ASME B16.5-2003	380 mm
243R	1" Class 600 RF ASME B16.5-2003	400 mm
015		1200...12000 kg/h
-	Process connection	Installation length
6030	1/2" NPT (f)	460 mm
305B	DN15 PN40 Form B1 DIN EN 1092-1	500 mm
309B	DN25 PN40 Form B1 DIN EN 1092-1	500 mm
321B	DN50 PN40 Form B1 DIN EN 1092-1	500 mm
201R	1/2" Class 150 RF ASME B16.5-2003	460 mm
221R	1/2" Class 300 RF ASME B16.5-2003	460 mm
241R	1/2" Class 600 RF ASME B16.5-2003	460 mm
202R	3/4" Class 150 RF ASME B16.5-2003	480 mm
222R	3/4" Class 300 RF ASME B16.5-2003	490 mm
242R	3/4" Class 600 RF ASME B16.5-2003	500 mm
203R	1" Class 150 RF ASME B16.5-2003	490 mm
223R	1" Class 300 RF ASME B16.5-2003	500 mm
205R	1 1/2" Class 150 RF ASME B16.5-2003	600 mm
225R	1 1/2" Class 300 RF ASME B16.5-2003	600 mm
025		3000...30000 kg/h
-	Process connection	Installation length
309B	DN25 PN40 Form B1 DIN EN 1092-1	600 mm
317B	DN40 PN40 Form B1 DIN EN 1092-1	600 mm
321B	DN50 PN40 Form B1 DIN EN 1092-1	600 mm
203R	1" Class 150 RF ASME B16.5-2003	650 mm
223R	1" Class 300 RF ASME B16.5-2003	660 mm
243R	1" Class 600 RF ASME B16.5-2003	675 mm
205R	1 1/2" Class 150 RF ASME B16.5-2003	650 mm
225R	1 1/2" Class 300 RF ASME B16.5-2003	660 mm
245R	1 1/2" Class 600 RF ASME B16.5-2003	675 mm
206R	2" Class 150 RF ASME B16.5-2003	650 mm
226R	2" Class 300 RF ASME B16.5-2003	660 mm
246R	2" Class 600 RF ASME B16.5-2003	675 mm

040		6000...60000 kg/h
-	Process connection	
317B	DN40 PN40 Form B1 DIN EN 1092-1	800 mm
321B	DN50 PN40 Form B1 DIN EN 1092-1	800 mm
331B	DN80 PN40 Form B1 DIN EN 1092-1	850 mm
205R	1½" Class 150 RF ASME B16.5-2003	900 mm
245R	1½" Class 600 RF ASME B16.5-2003	900 mm
206R	2" Class 150 RF ASME B16.5-2003	900 mm
226R	2" Class 300 RF ASME B16.5-2003	900 mm
228R	3" Class 300 RF ASME B16.5-2003	900 mm
050		8000...80000 kg/h
-	Process connection	
317B	DN40 PN40 Form B1 DIN EN 1092-1	800 mm
321B	DN50 PN40 Form B1 DIN EN 1092-1	800 mm
331B	DN80 PN40 Form B1 DIN EN 1092-1	850 mm
335B	DN100 PN16 Form B1 DIN EN 1092-1	850 mm
205R	1½" Class 150 RF ASME B16.5-2003	900 mm
245R	1½" Class 600 RF ASME B16.5-2003	900 mm
206R	2" Class 150 RF ASME B16.5-2003	900 mm
226R	2" Class 300 RF ASME B16.5-2003	900 mm
208R	3" Class 150 RF ASME B16.5-2003	900 mm
248R	3" Class 600 RF ASME B16.5-2003	900 mm
210R	4" Class 150 RF ASME B16.5-2003	900 mm
230R	4" Class 300 RF ASME B16.5-2003	900 mm
-	Containment option	
A	Stainless steel	
X	Special, customer specified	
-	Heating / Cooling	
0	without	
A	Heating plate	
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
A	Integral mounted transmitter	-20...100°C (-4...212°F)
B	Integral mounted transmitter	-20...150°C (-4...302°F)
C	Remote mounted transmitter	-50...100°C (-58...212°F)
D	Remote mounted transmitter	-50...180°C (-58...356°F)
E	Remote mounted transmitter	-50...260°C (-58...500°F)
F	Remote mounted transmitter	-50...100°C (-58...212°F)
G	Remote mounted transmitter	-50...180°C (-58...356°F)
H	Remote mounted transmitter	-50...260°C (-58...500°F)
K	Remote mounted transmitter	-50...100°C (-58...212°F)
L	Remote mounted transmitter	-50...180°C (-58...356°F)
M	Remote mounted transmitter	-50...260°C (-58...500°F)
N	Remote mounted transmitter	not specified
X	Special, customer specified	
-	Approvals	
0	without	
B	NEPSI	Ex ia IIC T6...T2 Ga/Gb 1)
D	CSA Class I Zone 0/Div1	AEx ia IIC T5...T2 Ga/Gb / Group A,B,C,D 1)
K	KCS (Korea)	Ex ia IIC T6...T2 Ga/Gb 1)
L	ATEX / IECEx / UKEX	II 1/2G Ex ia IIC T2...T6 Ga/Gb 1)
S	Ships approval	DNV 1), 2), 6), 7)
U	ATEX Component certificate	II 1G Ex ia IIC T6...T2 Ga 1), 5)
9	Multiple approvals	B, D, K, L 1)
-	Calibration flow	
1	Standard, 3-point	
2	10-point	
3	External lab	
X	Special, customer specified	

Calibration density	
0	without
1	Standard, 3-point 9)
2	5-point 9)
X	Special, customer specified
Supplementary equipment	
0	without
X	Special, customer specified
Design	
H	Heinrichs
K	Kobold

Notes:

- 1) Must be used with approved transmitter for system approval.
Order cable glands separately.
- 2) Includes ATEX and IECEx approvals. See **Requirements for the ship approval** on page 4
- 3) Temperature specification is applicable for whole device only.
- 4) Applicable only with approval "U".
- 5) Applicable only with sensor configuration "N"
- 6) Only in combination with 3.1 certificate.
- 7) Only in combination with a remote mounted transmitter. Only for approved process conditions. See documentation.
- 8) Not for ship approval.
- 9) Not for device line size 008
- 10) Only for device sizes up to 025