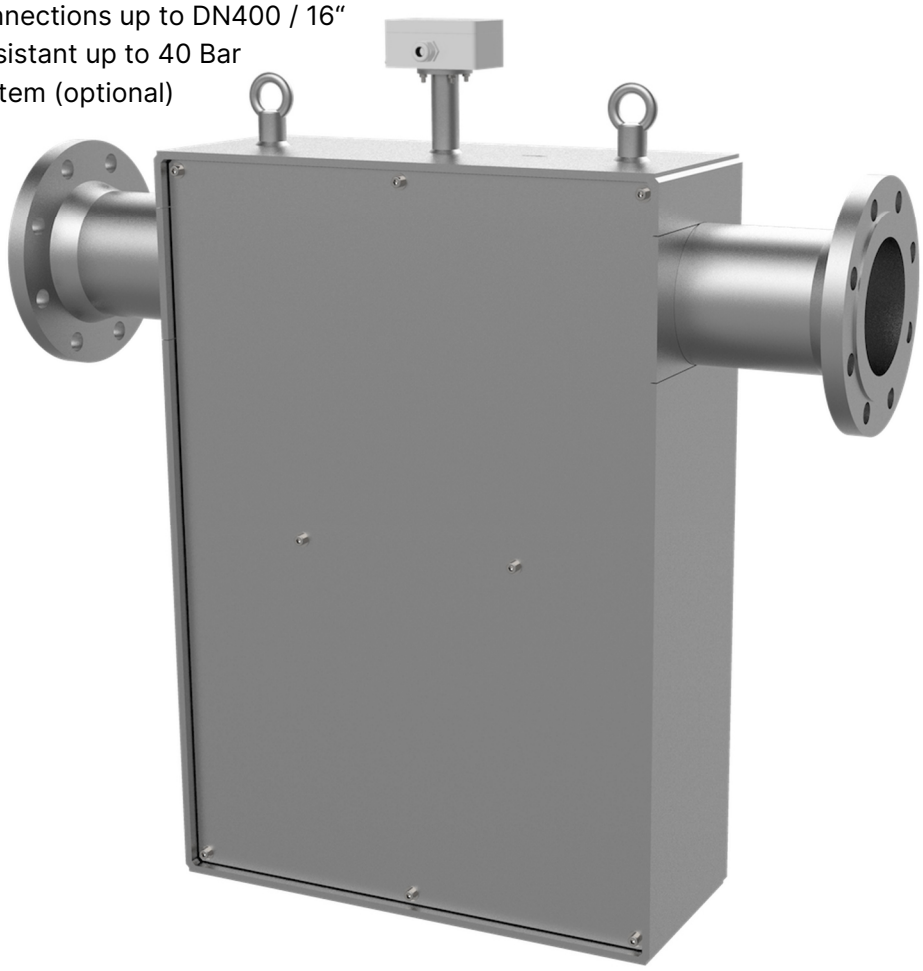
Coriolis Mass Flow Meter

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)

Accuracy

Liquid:	0.15 % of actual flowrate ± ZP stability
Gas:	0.5 % of actual flowrate ± ZP Stability

Wetted parts:

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

Process connection:

- Flanges: DIN / ASME / JIS
- 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:	IP65 (EN 60529)

Certificates and Approvals

ATEX/IECEx/UKEX:	II 1/2G Ex ia IIC T2...T6 Ga/Gb
$_{C}CSA_{US}$:	Class I, Zone 0, Div.1 and Div.2 AEx ia IIC T5-T2 Ga
NEPSI:	Ex ia II C T2...T6 Ga/Gb
OIML (with UMC3):	R117-1 Type Approval
Ships approval:	DNV / ABS

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

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 (Δp=1bar)		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]

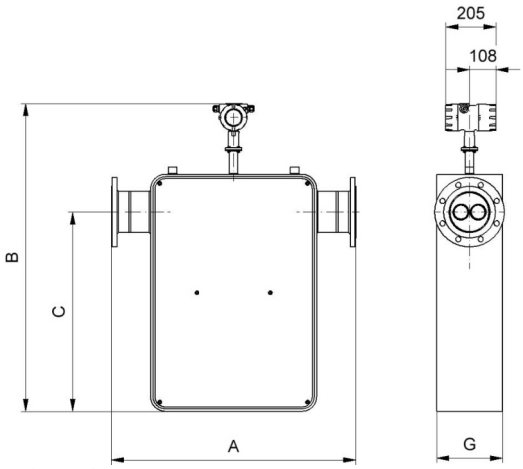
*Δp = 0,95 Bar
**Δp = 0,93 Bar
***Δp = 0,66 Bar

Measuring ranges for approvals

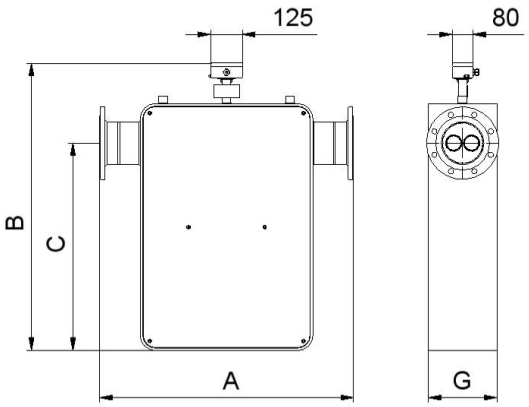
Type	ABS [1), 2)]	DNV [3)]	OIML [1)]
	[kg/h]	[kg/h]	[kg/h]
TMU-x080	6.000...120.000	0...120.000	6.000...120.000
TMU-x100	10.000...200.000	0...200.000	10.000...200.000
TMU-x150	23.000...460.000	0...460.000	23.500...460.000
TMU-x200	35.000...700.000	0...700.000	35.000...700.000
TMU-x250	N / V	N / V	N / V
TMU-x300	N / V	N / V	N / V

1) Must be used with approved transmitter (UMC3) for system approval.
2) Measuring accuracy ±0.15 % ±NP
Repeatability ±0.05 % ± ½NP
3) Must be used with approved transmitter (UMC4) for system approval.

Dimensions



Dimensions local mounted transmitter



Dimensions remote mounted transmitter

	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	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		
	-	**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			
300			400.000...2.200.000 kg/h		
	-	**Process connection**	**Installation length**		
	355B	DN250 PN10 Form B1 DIN EN 1092-1	2875 mm		
	362B	DN300 PN10 Form B1 DIN EN 1092-1	2875 mm		
	369B	DN350 PN10 Form B1 DIN EN 1092-1	2875 mm		
	375B	DN400 PN10 Form B1 DIN EN 1092-1	2200 mm		
	214R	10" Class 150 RF ASME B16.5-2003	2950 mm		
	234R	10" Class 300 RF ASME B16.5-2003	3008 mm		
	215R	12" Class 150 RF ASME B16.5-2003	3000 mm		
	235R	12" Class 300 RF ASME B16.5-2003	3030 mm		
	216R	14" Class 150 RF ASME B16.5-2003	3000 mm		
	236R	14" Class 300 RF ASME B16.5-2003	3050 mm		
	217R	16" Class 150 RF ASME B16.5-2003	on request		
	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	
N	Remote mounted transmitter	not specified	Without junction box		2), 3)
X	Special, customer specified				

	Approvals		
0	without		
B	NEPSI	Ex ia IIC T6...T2 Ga/Gb	4)
D	CSA Class I Zone 0/Div1+2	AEx ia IIC T5...T2 Ga/Gb / Group A,B,C,D	4)
K	KCS (Korea)	Ex ia IIC T6...T2 Ga/Gb	4)
L	ATEX / IECEx / UKEX	II 1/2G Ex ia IIC T2...T6 Ga/Gb	4)
S	Ships approval	DNV / ABS	4), 5), 6), 7), 9)
U	ATEX Component certificate	II 1G Ex ia IIC T6...T2 Ga	4), 8)
9	Multiple approvals	B, D, K, L	
-	**Calibration flow**		
1	Standard, 3-point		
2	10-point		
3	External lab		
7	7-point, OIML-calibration (R117-1)		9)
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. Not for OIML R117-1.
2) Temperature specification is applicable for whole device only.
3) applicable only with approval "U".
4) Must be used with approved transmitter for system approval.
5) Includes ATEX and IECEx approvals. See Requirements for the ship approval on page 4.
6) Only in combination with 3.1 certificate.
7) Only in combination with a remote mounted transmitter.
8) Applicable only with sensor configuration “N”.
9) Only for TMU-S for device line sizes 080, 100, 150, 200. Varied measuring range. See Measuring ranges for approvals on page 3