

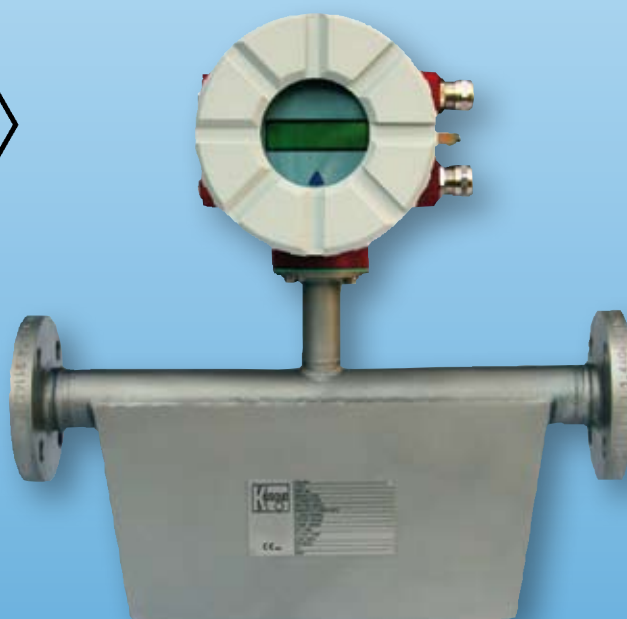


Coriolis Massflowmeter

for liquids and gas



measuring
•
monitoring
•
analysing



- Measuring range:
0 - 60 kg/h ... 0 - 1 900 000 kg/h water
- Accuracy: ± 0.1 of reading
 \pm zero point stability
(from liquids up to TMU-x040)
- p_{max}: PN40 t_{max}: -40 ... +260 °C
- Connection: flange DN10... DN300,
1/2" ... 12" class 150/300
- Material: 1.4404 (316 L)/1.4571 (316 Ti)/
Hastelloy C-22
- Options: contacts, analogue output with
HART®, PROFIBUS PA or Modbus RTU



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Model:
TMU



Description

The Kobold Mass Flow Meter model TMU utilizes the Coriolis principle of operation to measure mass flow. Density and temperature are simultaneously monitored and volumetric flow is additionally calculated with these parameters. The TMU Series is available with a direct mounted transmitter or in a remote mounted configuration. The unit can be used to meter nearly all liquid or gaseous media and was especially designed to operate in many standard applications. It is applied in many different industrial branches. The TMU Series is also used for precise dosing as well as in loading and unloading applications. Approvals for service in custody transfer (fiscal metering) applications are also available.

Application Areas

- chemical industry
- petrochemical industry
- food industry
- oil industry
- gas industry

Technical Data

Sensor

Measuring principle::	Coriolis
Measurable media:	liquids and gases
Materials:	
- flow tubes, splitter, flanges:	st. st. 1.4404 (316 L)/ 1.4571 (316 Ti) Hastelloy C-22
- housing:	st.st. 1.4301 (304) up to TMU-x040 st 37.2/1.4301 (304) from TMU-x050
Process connections:	acc. to EN 1092, ASME B16.5, DIN2512, special connections on request

Nominal pressure:	PN 40, ASME CI 150/300 higher pressures on request
Process temperature:	-40...+260 °C
Ambient temperature:	-20...+60 °C (standard) -20...+80 °C (with approval 5 or 6 and remotable, seperate board)

Protection class: IP 66/68 (EN60529)

Certificates and approvals

- explosion protection: sensor circuits: intrinsically safe
DMT 01 ATEX E 149 X
Ⓔ II ½ G EEx ia IIC T6-T2
(approval for zone 0 inside
flow tubes available)
- CE-marking: pressure equipment directive
97/23/EC

Transmitter

Material	
- housing:	aluminium (painted)
- display cover:	safety class
Mounting:	integrated or remote mounted (junction box or plug in connector)
Power supply:	19-36 V _{DC} , 24 V _{AC} +/-20%, 90-265 V _{AC}
Outputs:	galvanically isolated
Current:	2 x 0(4)-20 mA
Binary 1:	active, potential free 24 V=, max. 200 mA passive, optocoupler, U _i =30 V, I _i =200 mA, P _i =3 W
Frequency:	1 kHz
Binary 2:	passive, optocoupler, U _i =30 V, I _i =200 mA, P _i =3 W
Status:	passive, optocoupler, U _i =30 V, I _i =200 mA, P _i =3 W
Input binary:	counter reset
Ambient temperature:	-20...+60 °C (-4...+140 °F) (standard) -20...+80 °C (remote mounted transmitter with approvals 5 and 6)
Protection class:	IP 68 (EN60529)
Communication:	HART® PROFIBUS PA Modbus RTU (RS 485)
Accuracy	
Liquid:	±0.1 % of reading ± zero point stability up to TMU-x040



Technical Data Continuation

	±0.15 % of reading ± zero point stability from TMU-x050	Signal output/input:	intrinsically safe or not intrinsically safe
Gas:	±0.5 % of reading ± zero point stability		FM XP-AIS/I/1/A B C D/T*: CD 06100
Density (liquid):	±0.005 g/cm ³ with density calibration ±0.001 g/cm ³ with special density calibration up to TMU-x040 ±0.002 g/cm ³ with special density calibration from TMU-x050		FMC XP-AIS/I/1/CD/T*: CD 06101 NEPSI approval cert no. GYJ06477
		CE-marking:	explosion protection directive 94/9/EC EMV-Directive 2004/108/EC
Volume:	±0.2 % of reading ± zero point stability	Electromagnetic compatibility:	EN 61000-6-3:2001 (emissions residential environments) EN 61000-6-2:1999 (immunity for industrial environments) EN 55011:1998+A1:1999 group 1, class B (radio interference) EN 61000-4-2 bis DIN EN 61000-4-6 EN 61000-4-8 EN 61000-4-11 EN 61000-4-29 EN 61326

Certifications and Approvals

Explosion protection: BVS 05 ATEX E 021 X
Increased safety
EEx e (connection): Ex II (1)2G EEx de [ia] IIC/
IIB T6–T3
Explosion proof
EEx d (connection): Ex II (1)2G EEx d [ia] IIC / IIB T6–T3

Measuring Ranges

	Min. measuring range	Max. measuring range	Nominal (Dp=1bar)	Zero point stability (of range)
Model	kg/h [lbs/min]	kg/h [lbs/min]	kg/h [lbs/min]	kg/h [lbs/min]
TMU-x008	60 [2.2]	600 [22.0]	330 [12.1]	0.06 [0.002]
TMU-x010	250 [9.2]	2500 [91.9]	1150 [42.3]	0.25 [0.01]
TMU-x015	1200 [44.1]	12000 [440.9]	5250 [192.9]	1.2 [0.04]
TMU-x025	3000 [110.2]	30 000 [1102.3]	20 000 [734.9]	3 [0.1]
TMU-x040	6000 [220.5]	60 000 [2204.6]	55 000 [2020.9]*	6 [0.2]
TMU-x050	20 000 [734.9]	80 000 [2939.4]	74 000 [2719.0]	8 [0.3]
TMU-x080	25 000 [918.6]	120 000 [4409.2]	118 000 [4335.7]**	12 [0.4]
TMU-x100	30 000 [1102.3]	200 000 [7348.6]	200 000 [7348.6]***	20 [0.7]
TMU-x150	60 000 [2204.6]	460 000 [16901.8]	460 000 [16901.8]***	46 [1.7]
TMU-x200	150 000 [5511.5]	700 000 [25 720.2]	700 000 [25 720.2]****	70 [2.6]
TMU-x250	300 000 [11 022.9]	1 500 000 [55 114.6]	1 350 000 [49 603.2]	150 [5.5]
TMU-x300	400 000 [14 697.2]	2 200 000 [80 834.8]	1 900 000 [69 811.9]	220 [8.1]

Reference condition: according to IEC 770: water at 20 °C

* (Δp=0,87bar)

** (Δp=0,95bar)

*** (Δp=0,93bar)

**** (Δp=0,66bar)



Order Details Sensor (Example: **TMU-S008 6010 A00 A 0 1 0**)

Model/ Material	Sensor/Measuring range	Process connection ¹⁾ (flange acc. to DIN EN1092-1 form B1)	Containment	Connection for heating / cooling
TMU-S = stainless steel TMU-H = Hastelloy C-22	008 = DN8, 0 - 600 kg/h (min. 0 - 60 kg/h)	6010 = ¼ NPT female 6030 = ½ NPT female 301B = flange DN10 PN40	A = standard containment* B = standard containment with drain connection ½ NPT female	00 = without heating / cooling element BA = heating element with Ermeto EO12 BB = heating element with Swagelok 12 mm BC = heating element with DN15 PN40 DIN EN 1092-1 form B1 BD = heating element with flange ½" class 150 RF ASME B16.5 BE = heating element with ½ NPT female BF = heating element with DN25 PN40 DIN EN 1092-1 form B1 BG = heating element with flange 1" class 150 RF ASME B 16.5 BH = heating element with 1 NPT female
	010 = DN10, 0 - 2500 kg/h (min. 0 - 250 kg/h)	6010 = ¼ NPT female 6030 = ½ NPT female 301B = flange DN10 PN40 305B = flange DN15 PN40 309B = flange DN25 PN40		
	015 = DN15, 0 - 12 000 kg/h (min. 0 - 1200 kg/h)	6030 = ½ NPT IG 305B = flange DN15 PN40 309B = flange DN25 PN40 321B = flange DN50 PN40		
	025 = DN25, 0 - 30 000 kg/h (min. 0 - 3000 kg/h)	309B = flange DN25 PN40 317B = flange DN40 PN40 321B = flange DN50 PN40		
	040 = DN40, 0 - 60 000 kg/h (min. 0 - 6000 kg/h)	317B = flange DN40 PN40 321B = flange DN50 PN40 331B = flange DN80 PN40		
	050 = DN50, 0 - 80 000 kg/h (min. 0 - 20 000 kg/h)	317B = flange DN40 PN40 321B = flange DN50 PN40 331B = flange DN80 PN40 335B = flange DN100 PN16		
	080 = DN80, 0 - 120 000 kg/h (min. 0 - 25 000 kg/h)	321B = flange DN50 PN40 331B = flange DN80 PN40 335B = flange DN100 PN16 340B = flange DN125 PN16 345B = flange DN150 PN16		
	100 = DN100, 0 - 200 000 kg/h (min. 0 - 30 000 kg/h)	331B = flange DN80 PN40 335B = flange DN100 PN16 345B = flange DN150 PN16		
	150 = DN150, 0 - 460 000 kg/h (min. 0 - 60 000 kg/h)	335B = flange DN100 PN16 345B = flange DN150 PN16 350B = flange DN200 PN16		
	200 = DN200, 0 - 700 000 kg/h (min. 0 - 150 000 kg/h)	345B = flange DN150 PN16 350B = flange DN200 PN16 356B = flange DN250 PN16		
	250 = DN250, 0 - 1 500 000 kg/h (min. 0 - 300 000 kg/h)	350B = flange DN200 PN16 356B = flange DN250 PN16 363B = flange DN300 PN16		
	300 = DN300, 0 - 2 200 000 kg/h (min. 0 - 400 000 kg/h)	355B = flange DN250 PN10 362B = flange DN300 PN10 369B = flange DN350 PN10 375B = flange DN400 PN10		

*stainless steel 1.4301 up to sensor 040
steel for sensor 050 and bigger



Sensor / Process temperature / Thread junction box	Approvals	Calibration massflow	Calibration density
A = integrated transmitter, -20...+100 °C B = integrated transmitter, -20...+150 °C C²⁾ = remote mounted transmitter, -40...+100 °C, ½ NPT D²⁾ = remote mounted transmitter, -40...+180 °C, ½ NPT E²⁾ = remote mounted transmitter, -40...+260 °C, ½ NPT F²⁾ = remote mounted transmitter, -40...+100 °C, M 20x1.5 G²⁾ = remote mounted transmitter, -40...+180 °C, M 20x1.5 H²⁾ = remote mounted transmitter, -40...+260 °C, M 20x1.5	0 = without A = II ½ G EEx ia IIC T6 - T2, FM/FMC CL I, DIV 1, GPS ABCD T B = NEPSI	1 = standard, 3-point 2 = 10-point 3 = outside lab	0 = without 1 = standard, 3-point 2 = special, 5-point

¹⁾ other flange-form or ANSI-flange on request
²⁾ please order cable glands separately, see accessories

Necessary details for dimensioning the TMU instrument

- medium
- process temperature min./max.
- ambient temperature min./max.
- measuring range
- operating pressure
- viscosity
- density

Order Details Transmitter (Example: UMC3 - A 0 1 A 0 0 K)

Model	Sensor	Display/Interface board	Power supply	Output
UMC3-	A = integrated transmitter, ½ NPT B = integrated transmitter, M20x1.5 C¹⁾ = remote mounted transmitter with terminal block, ½ NPT D¹⁾ = remote mounted transmitter with terminal block, M20x1.5 E¹⁾ = remote mounted transmitter with plug-in connector, ½ NPT F¹⁾ = remote mounted transmitter with plug-in connector, M20x1.5	0 = without 1 = integrated in transmitter housing, ambient temperature up to 60 °C 2²⁾ = removable, separate board plus panel mounting adapter set	1 = 90 - 265 V _{AC} , 50/60 Hz 2 = 19 - 36 V _{DC} , 24 V _{AC} (± 20 %), 50/60 Hz	A = analogue output, 0(4) - 20 mA with/without HART®, pulse output passive U _m = 30 V _{DC} , status output passive U _m = 30 V _{DC} B³⁾ = analogue output 0(4) - 20 mA with/without HART®, pulse output active 24V _{DC} , status output passive U _m = 30 V _{DC} D⁴⁾ = PROFIBUS PA (EEx ia IIC), all analogue and binary outputs disabled F⁵⁾ = Modbus*RTU (RS485) analogue output 0(4) - 20 mA



Approvals	Protection (signal output)
0 = without	0 = without
1 = II(1)2G Eex de [ia] IIB/IIC T3-T6 ambient temperature up to 60 °C	1 = EEx ia 2 = EEx e (not intrinsically safe)
2 = II(1)2G Eex d [ia] IIB/IIC T3-T6 ambient temperature up to 60 °C	
3 = FM CL I, DIV 1, GPS ABCD, T* / FMC CL I, BPS CD, T* ambient temperature up to 60 °C	
4 = NEPSI for ambient temperature up to 60 °C	
5 = II(1)2G Eex de [ia] IIB/IIC T3-T6 ambient temperature up to 80 °C	
6 = II(1)2G Eex de [ia] IIB/IIC T3-T6 for ambient temperature up to 80 °C	

- ¹⁾ - incl. wall mounting bracket, pipe mounting bracket must be ordered separately (see accessories)
- connection cable (sensor to transmitter) and cable gland must be ordered separately (see accessories)
- ²⁾ connection cable must be ordered separately
- ³⁾ signal output in EEx ia not possible
- ⁴⁾ not available with approval 3 und 4
- ⁵⁾ not available with approval 3, 4, 5, or 6 and not with signal output protection 2

Order Details Accessories (Example: TMU - BL KK 005)

Order number	Model	Version	Cable length / Application area
TMK-	BL = connection cable	KK = sensor-transmitter with connection cable SK = sensor-transmitter cable end 1: plug (Harting Han® R23) cable end 2: cable connect SS = plug connection on both sides (Harting Han® R23) UB = transmitter-interface board plug connection	Cable length 005 = 5 meter 010 = 10 meter 015 = 15 meter 030 = 30 meter 075 = 75 meter 150 = 150 meter 300 = 300 meter XXX = special length
	V = cable gland set	AU = integrated transmitter GU = remote mounted transmitter	Application area NEM 20 = not Ex, M20x1.5 NENPT = not Ex, ½ NPT DEIAM 20 = EEx de - EEx ia, M20x1.5 DEIANPT = EEx de - EEx ia, ½ NPT DEEM 20 = EEx de - EEx e, M20x1.5 DEENPT = EEx de - EEx e, ½ NPT
TM-	ROHRMONT = accessory for 2" pipe mounting		



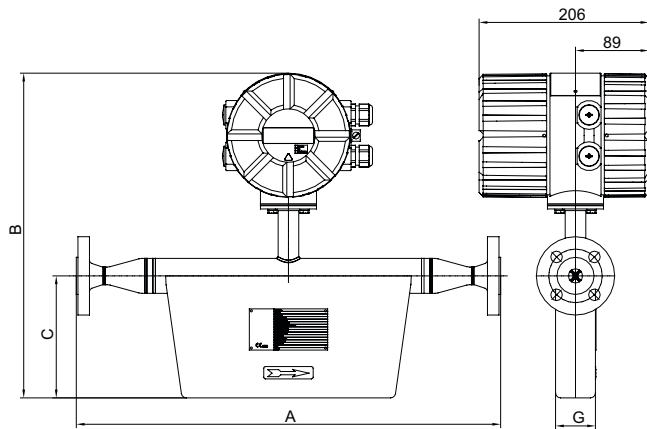
Installation Length

Model	A (installation length)								
	end connection	mm	[inch]	end connection	mm	[inch]	end connection	mm	[inch]
TMU-x008	DN10	360	[14.2]	¼ NPT (f)	300	[11.8]	½" CI150	366	[14.4]
	-	-	-	½ NPT (f)	300	[11.8]	½" CI600	375	[14.8]
TMU-x010	DN10	390	[15.4]	DN15	396	[15.6]	DN25	424	[16.7]
	¼ NPT (f)	300	[11.8]	½" CI150	416	[16.4]	¾" CI150	350	[13.8]
	½ NPT (f)	300	[11.8]	½" CI600	425	[16.7]	¾" CI600	360	[14.2]
TMU-x015	DN15	515	[20.3]	DN25	520	[20.5]	DN50	586	[23.1]
	½ NPT (f)	450	[17.7]	½" CI150	535	[21.1]	¾" CI150	546	[21.5]
	-	-	-	½" CI600	546	[21.5]	¾" CI600	556	[21.9]
TMU-x025	DN25	632	[24.9]	DN40	642	[25.3]	DN50	500	[19.7]
	¾" CI150	657	[25.9]	1" CI150	664	[26.1]	1½" CI150	676	[26.6]
	¾" CI600	667	[26.3]	1" CI600	676	[26.6]	1½" CI600	692	[27.2]
TMU-x040	DN40	770	[30.3]	DN50	776	[30.6]	DN80	600	[23.6]
	1½" CI150	804	[31.7]	2" CI150	810	[31.9]	-	-	-
	1½" CI600	820	[32.3]	2" CI600	828	[32.6]	-	-	-
TMU-x050	DN40	1018	[40.1]	DN50	1024	[40.3]	DN80	1044	[41.1]
	DN100	804	[31.7]	-	-	-	-	-	-
	1½" CI150	1050	[41.3]	2" CI150	1053	[41.5]	3" CI150	1066	[42.0]
	1½" CI600	1066	[42.0]	2" CI600	1072	[42.2]	3" CI600	1091	[43.0]
TMU-x080	DN50	1176	[46.3]	DN80	1196	[47.1]	DN100	1184	[46.6]
	DN125	1094	[43.1]	DN150	on request	-	-	-	
	2" CI150	1207	[47.5]	3" CI150	1218	[48.0]	4" CI150	1230	[48.4]
	2" CI600	1226	[48.3]	3" CI600	1243	[48.9]	4" CI300	1250	[49.2]
TMU-x100	DN80	1370	[53.9]	DN100	1358	[53.5]	DN150	1090	[42.9]
	3" CI150	1388	[54.6]	4" CI150	1400	[55.1]	6" CI150	1154	[45.4]
	3" CI300	on request	4" CI300	1420	[55.9]	6" CI300	1173	[46.2]	
	3" CI600	1413	[55.6]	4" CI600	on request	6" CI600	on request		
TMU-x150	DN100	1726	[68.0]	DN150	1732	[68.2]	DN200	1448	[57.0]
	4" CI150	1770	[69.7]	6" CI150	1796	[70.7]	8" CI150	1525	[60.0]
	4" CI300	1790	[70.5]	6" CI300	1815	[71.5]	8" CI300	1545	[60.8]
	4" CI600	on request	6" CI600	on request	8" CI600	on request			
TMU-x200	DN150	2184	[86.0]	DN200	2198	[86.5]	DN250	1864	[73.4]
	6" CI150	2250	[88.6]	8" CI150	2270	[89.4]	10" CI150	1925	[75.8]
	6" CI300	2270	[89.4]	8" CI300	2287	[90.0]	10" CI300	1957	[77.1]
	6" CI600	on request	8" CI600	on request	10" CI600	on request			
TMU-x250	DN200	2268	[89.3]	DN250	2284	[89.9]	DN300	1900	[74.8]
	8" CI150	2348	[92.4]	10" CI150	2348	[92.4]	12" CI150	1945	[76.6]
	8" CI300	2363	[93.0]	10" CI300	2375	[93.5]	12" CI300	1977	[77.8]
	8" CI600	on request	10" CI600	on request	12" CI600	on request			
TMU-x300	DN250	2913	[114.7]	DN300	2925	[115.2]	DN350	2933	[115.5]
	DN400	on request	-	-	-	-	-	-	
	10" CI150	2976	[117.2]	12" CI150	2995	[117.9]	14" CI150	3020	[118.9]
	10" CI300	3008	[118.4]	12" CI300	3030	[119.3]	14" CI300	3050	[120.1]
	10" CI600	on request	12" CI600	on request	14" CI600	on request			

Dimensions

Model	B										C		G	
	Integrated transmitter					Remote mounted transmitter								
	-40...+100 °C (-40...+212 °F)		-40...+150 °C (-40...+302 °F)		-40...+100 °C (-40...+212 °F)		-40...+180 °C (-40...+356 °F)		-40...+260 °C (-40...+500 °F)					
mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]	mm	[inch]	
TMU-x008	328	[12.9]	430	[16.9]	225	[8.9]	327	[12.9]	427	[16.8]	85	[3.3]	40	[1.6]
TMU-x010	343	[13.5]	445	[17.5]	240	[9.4]	342	[13.5]	442	[17.4]	100	[3.9]	40	[1.6]
TMU-x015	395	[15.6]	497	[19.6]	292	[11.5]	394	[15.5]	494	[19.4]	148	[5.8]	48	[1.9]
TMU-x025	460	[18.1]	562	[22.1]	357	[14.1]	459	[18.1]	559	[22.0]	200	[7.9]	74	[2.9]
TMU-x040	528	[20.8]	630	[24.8]	425	[16.7]	527	[20.7]	627	[24.7]	255	[10.0]	101	[4.0]
TMU-x050	1010	[39.8]	1112	[43.8]	907	[35.7]	1009	[39.7]	1109	[43.7]	615	[24.2]	230	[9.1]
TMU-x080	1210	[47.6]	1312	[51.7]	1107	[43.6]	1209	[47.6]	1309	[51.5]	800	[31.5]	250	[9.8]
TMU-x100	1230	[48.4]	1332	[52.4]	1127	[44.4]	1229	[48.4]	1329	[52.3]	815	[32.1]	270	[10.6]
TMU-x150	1560	[61.4]	1662	[65.4]	1457	[57.4]	1559	[61.4]	1659	[65.3]	1070	[42.1]	380	[15.0]
TMU-x200	1720	[67.7]	1822	[71.7]	1617	[63.7]	1719	[67.7]	1819	[71.6]	1210	[47.6]	400	[15.7]
TMU-x250	1860	[73.2]	1962	[77.2]	1757	[69.2]	1859	[73.2]	1959	[77.1]	1300	[51.2]	550	[21.7]
TMU-x300	1865	[73.4]	1967	[77.4]	1762	[69.4]	1864	[73.4]	1964	[77.3]	1400	[55.1]	510	[20.1]

Integrated Transmitter



Remote Mounted Transmitter

