Zertifiziertes QM-System
DIN EN ISO 9001
Zertifikat-Nr. 01017

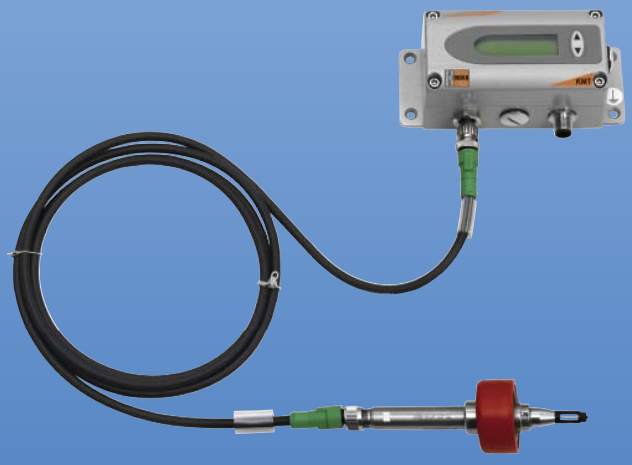
Thermal Mass Flow Meter

for Compressed Air and Gases

measuring • monitoring • analysing

KMT

- Measuring range: 0.32 ... 63 m^3_N/h ... 3.5 ... 1400 m^3_N/h
- Accuracy: ±2,5% of reading + 0,15% of full scale
- p_{max}: 16 bar; t_{max}: 80 °C
- Connection: R½ ... R2 ball valve
- Analogue Output: 0 - 10 V or 0(4) ... 20 mA
- Switching /Pulse output
- Option: Digital Display



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Description

The flowmeter of the series KMT, based on the measurement principle of thermal mass flow, is ideally suited for the measurement of flow of compressed air and gases. Measurement of for instance the usage of compressed air, nitrogen, CO_2 or other non-corrosive gases.

The KMT is setting new standards in terms of measurement accuracy and reproducibility thanks to its application specific adjustment during production. This flow meter is adjusted under a pressure of 7 bar. Adjusting the device specifically for its application has the advantage of keeping the actual flow speed in the pipeline low even with very large flow quantities. Thanks to the more stable flow profile, this low flow speed facilitates a much better degree of reproducibility and accuracy than if the device were adjusted conventionally under normal pressure, as flow speeds up to 200 m_N/s can often no longer be controlled under conventional adjustment pressures.

The core design of the flow meter is based on the hot film sensor element, which is produced using the most modern thin film technology and has already proven itself time and time again in the automotive industry. This flow sensor features excellent long-term stability, a fast response time and an extremely high degree of reliability.

Two outputs are available, for further processing of the measurement data. Depending on the application, these outputs can be configured as analogue (current or voltage), switch output or as pulse output for the measurement of the consumption.

The KMT has an integrated counter for consumption. The consumed amount is shown on the display and the saved value is not lost even after power outage. The availability of the consumption amount as a free configurable pulse output is another helpful feature.

Functions

The flow meter KMT consist of the transmitter and the mounting valve. The transmitter is modular and consist of the probe and the signal conditioner. The measurement probe contains the sensor element and the measurement electronics, in which the data of the factory calibration is stored. The enclosure with the signal conditioning is mounted either on the measurement probe (compact) or is remote with a sensor cable up to 10 meter (33 feet). The mounting valve assembly allows for the easy and reliable installation within the pipeline. The high measurement accuracy is guaranteed by the accurate, reproducible positioning of the probe within the mounting valve.

Areas of Application

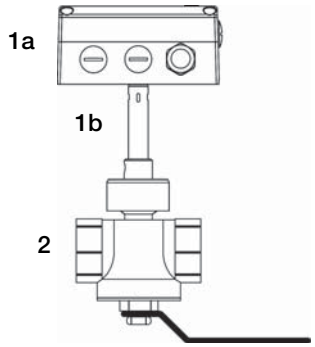
- Measurement of consumption of compressed air
- Compressed air counter
- Mass flow measurement of industrial gases

1 Transmitter

1 a Enclosure with signal conditioning and optional display

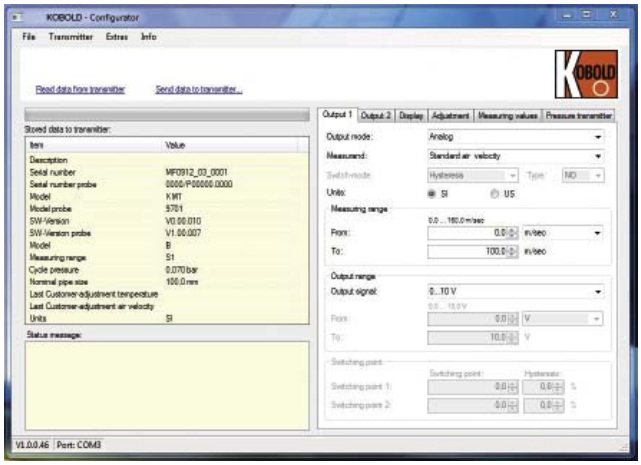
1 b Measurement probe with sensor and measurement electronics

2 Mounting ball valve



The ball valve assembly allows for the exact alignment of the sensing head within seconds during instalment and removal, with only interrupting the process flow for a short moment. The ball valve assembly is suitable for pressures up to 16 bar (PN 16) and available for pipe diameters DN15 (½") to DN 50 (2"). During installation in the pipeline, observe the required inlet and outlet paths as given in the operating instructions.

Configuration software



The flowmeter can be configured conveniently, to meet the requirements of the application with the standard configuration software and the integrated USB interface.

Functionality:

- Configuration of the output (scale / set point)
- 2-point user calibration for flow and temperature
- Readout of the counter values
- Reset of min / max values and counter
- Indication of the measurement value

1/02-2012

Technical Details

Measured Flow: Volumetric flow at standard conditions acc. DIN 1343
P_0 = 1013.25 mbar;
t_0 = 0 °C (273.15 K)

Measuring range		KMT-x1...	KMT-x2...
Standardised volumetric flow (air)	DN 15	0.32 ... 63 m^3_N/h	0.32 ... 126 m^3_N/h
	DN 20	0.57 ... 113 m^3_N/h	0.57 ... 226 m^3_N/h
	DN 25	0.90 ... 176 m^3_N/h	0.90 ... 352 m^3_N/h
	DN 32	1.45 ... 289 m^3_N/h	1.45 ... 578 m^3_N/h
	DN 40	2.26 ... 452 m^3_N/h	2.26 ... 904 m^3_N/h
	DN 50	3.50 ... 700 m^3_N/h	3.50 ... 1400 m^3_N/h
Standardised flow (air, nitrogen, CO_2)	≤DN 50	0.5 ... 100 m_N/s	0.5 ... 200 m_N/s
Standardised flow (Helium)	≤DN 50	0.5 ... 100 m_N/s	0.5 ... 120 m_N/s
Standardised flow (Oxygen)	≤DN 25	0.5 ... 100 m_N/s	0.5 ... 200 m_N/s

Accuracy (in air at 7bar (abs) and 23 °C)*: ±2.5% of reading + 0.15% of full scale
Temperature coefficient: ±0.1% of reading / °C
Pressure coefficient**: ±0.5% bar
Response time t_{90}: typ. 1 s
Sample rate: 0.1 s
Measuring range: -20 ... 80 °C
Accuracy (at 20 °C): ±0.7 °C
Input: Optional pressure compensation 4 - 20 mA (2-wire; 14,2 ... 16 V_{DC}) for pressure sensor
Outputs: Output signal and display ranges are freely scalable
Analogue output
voltage: 0 - 10 V max. 1 mA
current (3-wire): 0 - 20 mA and 4 - 20 mA RL < 500 Ω
Switching output: potential-free max. 44 V_{DC}, 500 mA switching capacity
Pulse output: Totaliser, pulse length: 0.02 ... 2 sec.
Digital interface: USB (for configuration)
Electrical Connection: Cable Power supply: 18 - 30 $V_{AC/DC}$
Current consumption: max. 200 mA (with display)
Temperature range
Ambient temperature: -20 ... 60 °C (-4 ... 140 °F)
Medium temperature: -20 ... 80 °C (-4 ... 176 °F)
Storage temperature: -20 ... 60 °C (-4 ... 140 °F)
Nominal pressure: PN16 (232 PSI)
Humidity: no condensation
Medium: compressed air or non corrosive gases
Display: 2 lines LC-Display, backlighting

Electromagnetic compatibility: EN61326-1 EN61326-2-3 Industrial Environment
Material
housing: metal ($AlSi_3Cu$)
probe: stainless steel
sensor head: plastic (PBT)
sensor head: brass
Housing protection class: IP65 / Nema 4

The following gases can be measured by the flowmeter KMT:

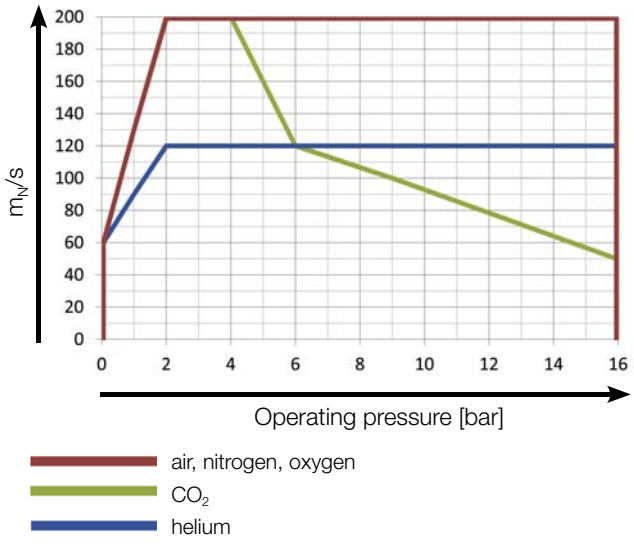
- Air
- Nitrogen
- Carbon dioxide
- Helium
- Oxygen

The units must be factory calibrated with the respective gas. Use only oil and fat free units for medium oxygen and follow the corresponding safety regulations.

* The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation). The accuracy was culated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

** The pressure dependence is +0,5%/bar. The KMT is calibrated at 7 bar (abs). Thus the error at 7 bar = 0 (e. g. additional error at 10 bar = +1,5% of reading. This error can be corrected by entering the actual system pressure (with the configuration software).

Flow measuring range in dependence on operating pressure



Formula to calculate the standard volumetric flow:

$\dot{V}_0 = V_0 \times id^2 \times \pi/4 \times 3600$
$\dot{V}_0$ = standardised volumetric flow [m^3/h]
V_0 = standardised flow [m/s]
id = inner pipe diameter [m]
π = 3,1415

Order details (Example: **KMT-1 14 R 0 0 L 1 N Q 1**)

Model	Measuring range / Installation length	Connection	Display	Cable length Sensor / Electronic
KMT-1... Sensor compact, direction of flow from right to left **KMT-2...** Sensor compact, direction of flow from left to right **KMT-3...** remote probe, according to installation	**14** = 0,32 ... 63 m^3_N/h for pipe DN 15 (½") **24** = 0,32 ... 126 m^3_N/h for pipe DN 15 (½") **15** = 0,57 ... 113 m^3_N/h for pipe DN 20 (¾") **25** = 0,57 ... 226 m^3_N/h for pipe DN 20 (¾") **16** = 0,90 ... 176 m^3_N/h for pipe DN 25 (1") **26** = 0,90 ... 352 m^3_N/h for pipe DN 25 (1") **17** = 1,45 ... 289 m^3_N/h for pipe DN 32 (1 ¼") **27** = 1,45 ... 578 m^3_N/h for pipe DN 32 (1 ¼") **18** = 2,26 ... 452 m^3_N/h for pipe DN 40 (1 ½") **28** = 2,26 ... 904 m^3_N/h for pipe DN 40 (1 ½") **19** = 3,50 ... 700 m^3_N/h for pipe DN 50 (2") **29** = 3,50 ... 1400 m^3_N/h for pipe DN 50 (2")	**R** = thread-ball valve with G thread **N** = thread-ball valve with NPT thread (on request)	**0** = without Display **1** = LCD-Display	**0** = without **2*** = 2 m with plug M12, 4 pin **5*** = 5 m with plug M12, 4 pin **Z*** = 10 m with plug M12, 4 pin

Medium	Unit	Physical Size Output 1	Physical Size Output 2	Output 1 / Output 2
L = air **N** = nitrogen **C** = CO_2 **H** = Helium **S**** = Oxygen (only up to DN25) **Y** = other gases (on request)	**1** = SI units **2** = US units (e. g. SCFM, SFPM)	**N** = Standard volume flow (Standard m^3_N/h) **T** = Temperature **M** = Mass flow (kg/h) **V** = Standard flow (m_N/s)	**Q** = Consumption (Standard m^3_N) **N** = Standard volume flow (Standard m^3_N/h) **T** = Temperature **M** = Mass flow (kg/h) **V** = Standard flow (m_N/s)	**1** = 2 x Switching output **2** = Switching-/counting pulse output **3** = Analogue output 0-10 V/ counting pulse output **4** = Analogue output 4-20 mA/ counting pulse output (Standard) **7** = Analogue output 0-10 V/ switching output **8** = Analogue output 4-20 mA/ switching output

* only for KMT-3...

** Sensor head (wetted parts) is oil-and grease-free. Warning: only oil-and grease-free cleaned devices may be used for oxygen.

Order details Replacement sensor (Example: **ERS-KMT-S 1 1 4 K**)

Model	Design	Measuring range	Measuring section pipe diameter	Mounting
ERS-KMT-S	**1** = Sensor compact (direction of flow right to left) **2** = Sensor compact (direction of flow left to right) **3** = remote probe	**1** = low **2** = high	**4** = DN15 **5** = DN20 **6** = DN25 **7** = DN32 **8** = DN40 **9** = DN50	**K** = for ball valve

Order details Replacement sensor cable (Version KMT-3) (Example: **ERS-KMT-K 2**)

Model
ERS-KMT-K 2 = 2 m with plug M12, 4-pin
ERS-KMT-K 5 = 5 m with plug M12, 4-pin
ERS-KMT-K Z = 10 m with plug M12, 4-pin

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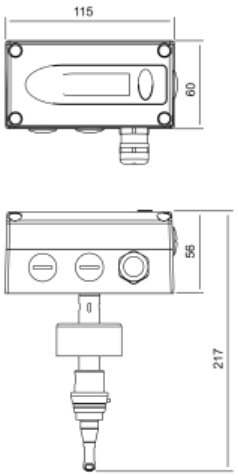
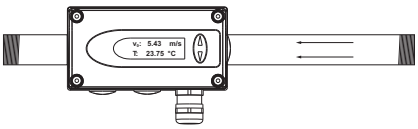
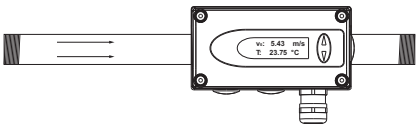
Dimensions

Compact



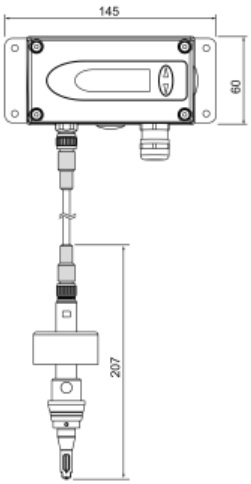


direction of flow is right to left

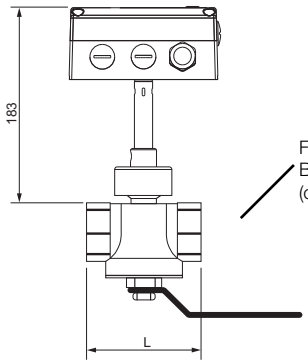


direction of flow is left to right

Remote probe KMT-3...



Ball valve (Standard delivery scope)

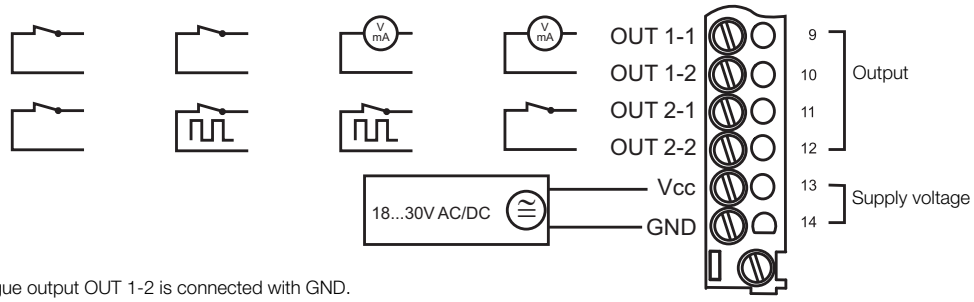


Female thread:
BSP thread acc. EN 10226
(old DIN 2999)

Ball valve	Thread	L [mm]
DN 15	R ½"	83.7
DN 20	R ¾"	72.7
DN 25	R 1"	88
DN 32	R 1 ¼"	100
DN 40	R 1 ½"	110
DN 50	R 2"	131

Connection

Output 1	switching output	switching output	analogue output	analogue output
Output 2	switching output	pulse output	pulse output	switching output



With analogue output OUT 1-2 is connected with GND.
Switching and pulse output are potential-free.