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Find the *Kobold Instruments MAS-2013* at our website: *Click HERE*

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

Mass Flowmeter

for gases

measuring • monitoring • analysing

MAS



- Measuring range: 0 - 10 Nml/min ... 0 - 500 Nl/min
- Accuracy: ±1.5% of full scale
- p_{max} 35 bar; t_{max} 50 °C
- Analogue output: 0 - 5 V or 4 - 20 mA
- Digital display
- Material: Nylon®, stainless steel
- Bypass measuring system laminar flow

S5

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Fields of Application

The KOBOLD MAS model mass flowmeter makes very precise measurements of the mass flow rate of gases in different measuring ranges from 0-10 Nml/min to 0-500 Nl/min nitrogen. The operation of the meter is based on the calorimetric principle. For indication of 98% of the actual flow, the response time is 2 s. The meter may be installed in any position.

In contrast with most volumetric flowmeters, no temperature or pressure correction is required.

This means that the MAS model is ideally suited for almost every gas flow application. Typical industrial applications are process control, laboratory measuring tasks, OEM applications, gas indication panels, leakage and filter monitoring.

The MAS is available either with analogue output only, or in addition with digital indication. The 3½-digit LCD display is infinitely rotatable through 180°. Glass-fibre-reinforced Nylon® or stainless steel may be used in the manufacture of wetted parts. Seal materials is FPM (Kalrez or Neoprene upon request).

The MAS model may be operated with 12-15 V_{DC} (24 V_{DC} optional). MAS-5015 or MAS-5000 are recommended as power supplies.

Typically, a 0-5 V_{DC} (or 4-20 mA optional) analogue signal is available as output signal. This allows recording, data storage, and control functions to be implemented.

Theory of Operation

The medium flows through the bypass measuring system. The resulting differential pressure between P1 and P2 causes a small amount of gas to flow through the overhead measuring tube. The separation ratio is constant.

Two resistance temperature detectors (RTD elements) transferring a constant amount of heat to the gas stream are mounted on the measuring tube.

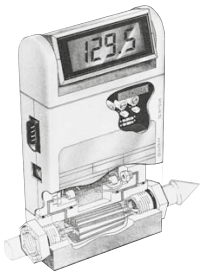
Under flow conditions, the gas molecules absorb and transport the heat away. This gives rise to a temperature difference between the two detector coils, which causes a change in resistance in the detector coils, whereby R1 <> R2. The electronics converts the signal for indication. The temperature difference increases as the flow increases.

Design

Direct indication of mass flow rate
no temperature or pressure correction needed

Tilting indicator
may be tilted through 180°, 9 adjustments

Digital display
shows the mass flow rate in Nml/min or Nl/min. (other units upon request)



Output connector
9 Pin »D« Sub-type, Output signal 0-5 V_{DC} or 4-20 mA optional analogue output

Zero-point and span potentiometers
adjustable from outside

Measuring tube

Mains plug
Input voltage 12 V_{DC} or 24 V_{DC}

Laminar flow bypass
comes in 20 ranges from 0-10 Nml/min to 0-500 l/min

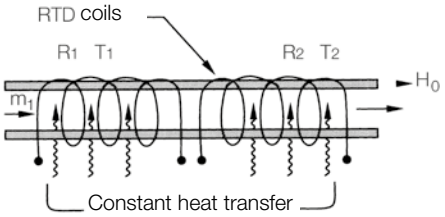
Pipe unions
possible with ¼ FNPT or ¼" Swagelok connections

Flowmeter body
wetted parts either Nylon® or steel

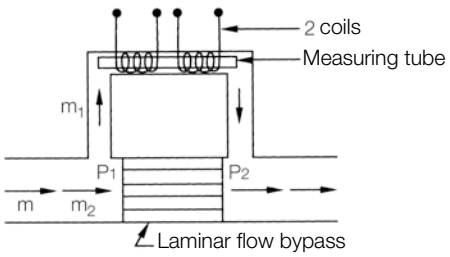
Special Advantages

- Direct mass flow measurement
- No pressure or temperature correction needed
- Large measuring range
- Negligible pressure loss
- May be fitted in any position
- High degree of repeatability
- Analogue output 0-5 V_{DC}, option 4-20 mA

Measuring tube design



Flow diagram



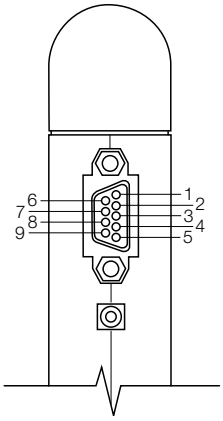
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Technical Details

Field of application:	suited only for dry, oil-free gases
Measuring accuracy:	±1.5% of full scale (with calibrated performance characteristics, otherwise observe pressure and temperature coefficients)
Option:	±1 % of full scale (only to 0-100 Nml/min measuring range with stainless steel case)
Standard calibration:	1013.25 mbar abs., 0 °C option: to customer specification
Temperature coefficient:	0.15% of full scale /°C
Pressure coefficient:	0.3% of full scale / bar
Repeatability:	± 0.5% of full scale
Response time:	800 ms time constant; 6 s (typical) to within ±2% of final value over 25-100% of full scale
Max. medium, and ambient temperature:	50 °C
Max.operating pressure:	Nylon®: 10 bar stainless steel: 35 bar
Installation position:	any
Gas leak rate:	1 x 10-^{4} ml/s He (Nylon®) 1 x10-^{7} ml/s He (st. steel case)
Wetted parts:	5% either glass-fibre-reinforced Nylon® or stainless steel material no. 1.4401
Seals:	FPM (others upon request)
Supply voltage:	12-15 V_{DC}, 24 V_{DC} optional
Output:	linear 0 - 5 V_{DC} (load min. 2000 Ω) option: 4 - 20 mA (load max. 500 Ω)

Connection diagram



PIN No. function

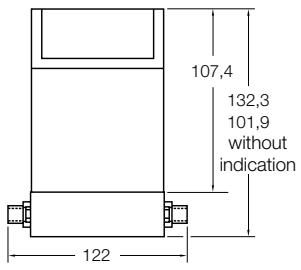
1 No connection
2 Flow rate signal ground
3 0 - 5 V_{DC} flow rate signal
4 + mains supply (12 or 24 V_{DC}) [1) 2)]
5 External display signal
6 External display ground
7 Mains supply ground
8 Analogue output 4 - 20 mA ground
9 Analogue output 4 - 20 mA signal

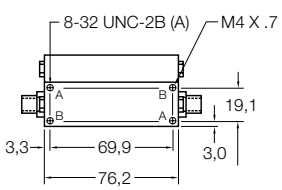
[1)] Devices powered with 24 V_{DC} only, when the 24 V-feature is built in, otherwise damage may be caused by overvoltage!

[2)] Do not connect if the device is already supplied from the mains socket.

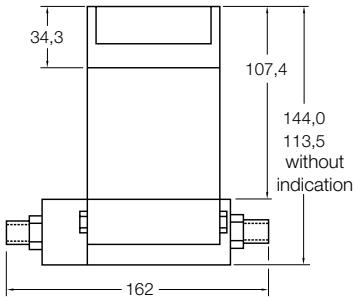
Dimensions [mm]

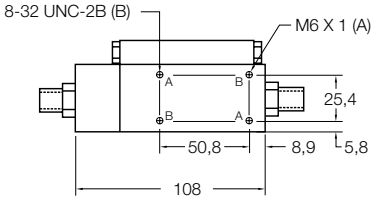
Case L (Stainless steel and Nylon®)



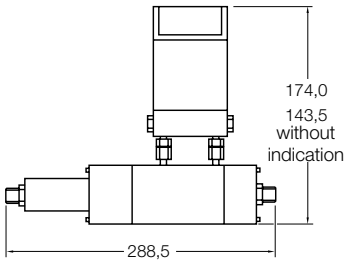


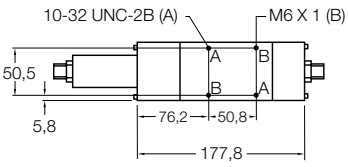
Case M (Stainless steel)





Case H (Stainless steel)





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Order details Nylon® version (example: **MAS-1002 00 V2 0**)

Measuring range for N_2	Max. pressure loss	Model			Connection	Voltage supply	Output
		with display	with counter	without display			
0 - 20 Nml/min	1 mbar	**MAS-1002**	**MAS-1102**	**MAS-2002**	**00** = ¼" NPT female **C2** = Swagelok ¼"	**00** = 12 V_{DC} **V2** = 24 V_{DC}	**0** = 0-5 V_{DC} **A** = 4-20 mA
0 - 50 Nml/min	1 mbar	**MAS-1003**	**MAS-1103**	**MAS-2003**			
0 - 100 Nml/min	1 mbar	**MAS-1004**	**MAS-1104**	**MAS-2004**			
0 - 200 Nml/min	1 mbar	**MAS-1005**	**MAS-1105**	**MAS-2005**			
0 - 500 Nml/min	1 mbar	**MAS-1006**	**MAS-1106**	**MAS-2006**			
0 - 1 Nl/min	1 mbar	**MAS-1007**	**MAS-1107**	**MAS-2007**			
0 - 2 Nl/min	6 mbar	**MAS-1008**	**MAS-1108**	**MAS-2008**			
0 - 5 Nl/min	6 mbar	**MAS-1009**	**MAS-1109**	**MAS-2009**			
0 - 10 Nl/min	6 mbar	**MAS-1010**	**MAS-1110**	**MAS-2010**			
0 - 20 Nl/min	25 mbar	**MAS-1011**	**MAS-1111**	**MAS-2011**			
0 - 30 Nl/min	47 mbar	**MAS-1012**	**MAS-1112**	**MAS-2012**			
0 - 40 Nl/min	88 mbar	**MAS-1013**	**MAS-1113**	**MAS-2013**			
on customer specification		**MAS-10XX**	**MAS-11XX**	**MAS-20XX**			

Order details stainless steel version (example: **MAS-3001 C1 V2 0**)

Measuring range for N_2	Max. pressure loss	Case size	Model			Connection	Voltage supply	Output
			with display	with counter	without display			
0 - 10 Nml/min	6 mbar	L	**MAS-3001**	**MAS-3101**	**MAS-4001**	**C1**= Swagelok ⅛" **C2**=Swagelok ¼" **C3**=Swagelok ⅜"	**00** = 12 V_{DC} **V2** = 24 V_{DC}	**0** = 0 - 5 V_{DC} **A** = 4 - 20 mA
0 - 20 Nml/min	6 mbar	L	**MAS-3002**	**MAS-3102**	**MAS-4002**			
0 - 50 Nml/min	6 mbar	L	**MAS-3003**	**MAS-3103**	**MAS-4003**			
0 - 100 Nml/min	6 mbar	L	**MAS-3004**	**MAS-3104**	**MAS-4004**			
0 - 200 Nml/min	6 mbar	L	**MAS-3005**	**MAS-3105**	**MAS-4005**			
0 - 500 Nml/min	6 mbar	L	**MAS-3006**	**MAS-3106**	**MAS-4006**			
0 - 1 Nl/min	6 mbar	L	**MAS-3007**	**MAS-3107**	**MAS-4007**			
0 - 2 Nl/min	6 mbar	L	**MAS-3008**	**MAS-3108**	**MAS-4008**			
0 - 5 Nl/min	6 mbar	L	**MAS-3009**	**MAS-3109**	**MAS-4009**			
0 - 10 Nl/min	105 mbar	L	**MAS-3010**	**MAS-3110**	**MAS-4010**	**C2**=Swagelok ¼" **C3**=Swagelok ⅜"		
0 - 15 Nl/min	105 mbar	L	**MAS-3011**	**MAS-3111**	**MAS-4011**			
0 - 20 Nl/min	40 mbar	M	**MAS-3012**	**MAS-3112**	**MAS-4012**	**C2**=Swagelok ¼" **C3**=Swagelok ⅜" **C4**=Swagelok ½"		
0 - 30 Nl/min	60 mbar	M	**MAS-3013**	**MAS-3113**	**MAS-4013**			
0 - 50 Nl/min	80 mbar	M	**MAS-3014**	**MAS-3114**	**MAS-4014**			
0 - 100 Nl/min	105 mbar	M	**MAS-3015**	**MAS-3115**	**MAS-4015**	**C3**=Swagelok ⅜" **C4**=Swagelok ½"		
0 - 100 Nl/min	6 mbar	H	**MAS-3016**	**MAS-3116**	**MAS-4016**			
0 - 200 Nl/min	6 mbar	H	**MAS-3017**	**MAS-3117**	**MAS-4017**			
0 - 300 Nl/min	140 mbar	H	**MAS-3018**	**MAS-3118**	**MAS-4018**			
0 - 400 Nl/min	140 mbar	H	**MAS-3019**	**MAS-3119**	**MAS-4019**	**C4**=Swagelok ½"		
0 - 500 Nl/min	140 mbar	H	**MAS-3020**	**MAS-3120**	**MAS-4020**			
on customer specification		L	**MAS-30LX**	**MAS-31LX**	**MAS-40LX**	**C1 / C2 / C3**		
on customer specification		M	**MAS-30MX**	**MAS-31MX**	**MAS-40MX**	**C2 / C3 / C4**		
on customer specification		H	**MAS-30HX**	**MAS-31HX**	**MAS-40HX**	**C3 / C4**		

When placing an order, please specify detailed service conditions (type of gas, flow rate, pressure, temperature etc.)

Accessories: Connector power supply

Model	Input	Output
MAS-5000	110 V_{AC}	12 V_{DC} /1.9 W
MAS-5015	230 V_{AC}	15 V_{DC} /6 W
MAS-5024	90 - 264 V_{AC}	24 V_{DC} /12 W

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