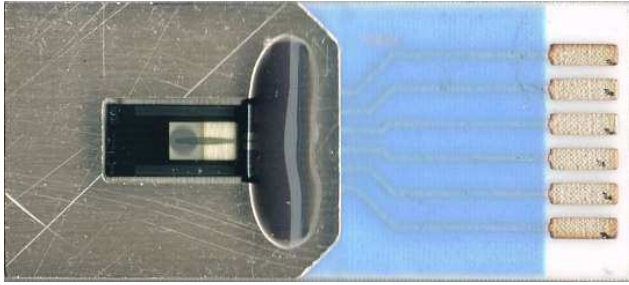


# LMM-H04 Mass Air Flow Sensor



- Hot Film Anemometer Component
- Highly reliable and long term stable
- Uni-directional airflow measurement
- Fast reaction time
- Manufactured according ISO TS16949
- Can be adapted to various flow channel geometries
- Can be used for almost all kind of gases and volatile substances

## DESCRIPTION

LMM-H04 is a thermodynamic sensing element for the unidirectional measurement of mass air flow in a well defined channel. It is intended for applications with high reliability requirements such as automotive, medical or industrial gas flow applications. Mounted directly within the flowing media the LMM-H04 is sensitive against the heat transfer on a micrometer scale. This heat transfer is detected by a micro-machined silicon device which is mounted on ceramic substrate defining the geometry of the sensing element.

The functional principle of the LMM-H04 is a hot film anemometer, which is the thin film version of the hot wire anemometer. A thin film heating element (heater) is heated to a defined temperature difference with respect to the air. At zero flow there is heat dissipation due to the thermal conductivity of the air. With applied flow the heat dissipation increases steadily with the flow rate.

The sensing element can be operated at Constant Power and Constant Voltage mode. However, it is recommended to operate LMM-H04 in the described Constant Temperature Difference (CTD) mode. In the CTD mode the electronics detects any change of the thermal equilibrium very quickly and compensates it by adjusting the power settings through the heaters. This allows a very reliable mass flow measurement with a very short time constant which is in the order of milliseconds.

## FEATURES

- Highly reliable and long term stability
- Fast reaction time
- Can be adapted to various flow channel geometries
- Can be used for almost all kinds of gases and volatile substances

## APPLICATIONS

- Industrial gas flow measurement
- Leak detection in pressurized air systems
- Spirometers
- Air intake of combustion engines

# LMM-H04 Mass Air Flow Sensor

## PERFORMANCE SPECS

Parameter	Min	Typ	Max	Condition
Max. Heater Overtemperature		100 K	< 120 K	approx. RH(Tamb)×1.5
Operating Temperature	-40 °C	+25 °C	+125°C	after bonding, with protected bond pads
Storage Temperature	-40 °C	+25 °C	+125°C	after bonding, with protected bond pads
Storage Temperature	+10 °C	+25 °C	+40°C	before bonding, 3 month

## MECHANICAL DIMENSIONS AND CONNECTIONS

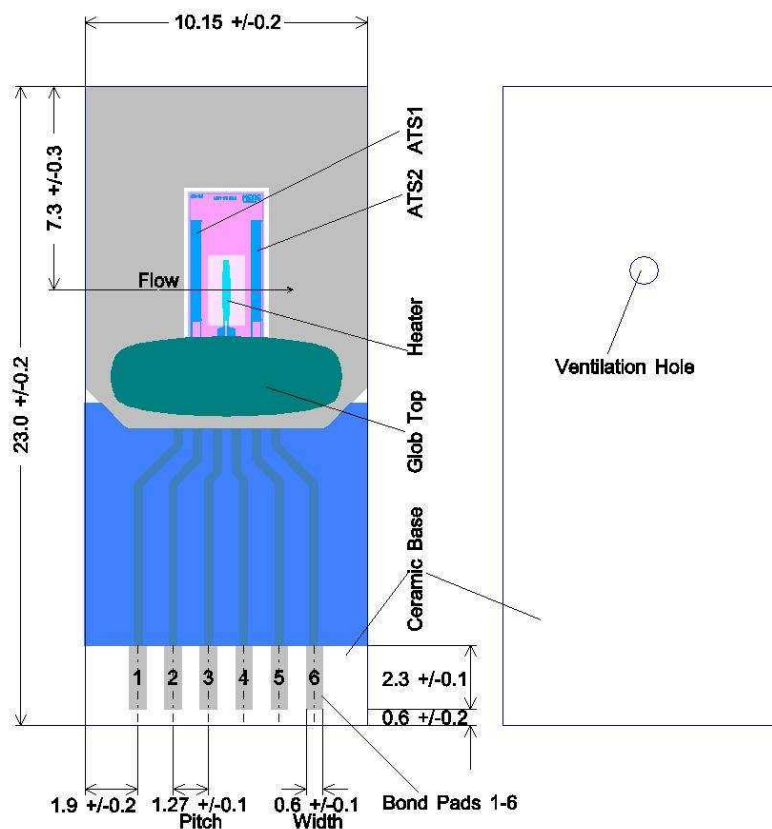


Figure 1: Mechanical dimensions and connections of LMM-H04

The sensor membrane has a thickness of about ~2 µm. Therefore it should not be exposed to any mechanical stress. One has to take care of a filter unit around the measurement device. High speed particles coming directly to the surface of the membrane can result in damages or shortage of the life time. The ventilation holes shall be kept open to release air pressure built up due to heating.

Parameter	Min	Typ	Max	Condition
Package Type		Hybride		25°C
Height Ceramics	0.48 mm	0.63 mm	0.78 mm	25°C
Height Ceramics + Metal	0.90 mm	1.10 mm	1.30 mm	25°C, at Glob Top position
max. overall Height			1.80 mm	25°C, including Glob Top
Bond Pad Material		AgPt		bondable with 150µm Al-wire

# LMM-H04 Mass Air Flow Sensor

## ELECTRICAL PARAMETERS

Parameter	Min	Typ	Max	Condition
RATS1*	650 $\Omega$	850 $\Omega$	1050 $\Omega$	Pad 1+2, 25°C
RHeater	40.0 $\Omega$	45.0 $\Omega$	50.0 $\Omega$	Pad 3+4, 25°C
RATS2*	650 $\Omega$	850 $\Omega$	1050 $\Omega$	Pad 5+6, 25°C
Temperatur Coefficients R <sub>ATS</sub> and R <sub>Heater</sub>	5500 ppm/K	6000 ppm/K	6500 ppm/K	0°C → 100°C
TCR Match			100 ppm/K	0°C → 100°C

\*ATS = Ambient Temperature Sensor

## APPLICATION EXAMPLE

One application of the LMM-H04 is to measure the amount of air coming into an engine. The actual mass air flow sensor module consists of a flow channel and a measurement channel, the so called Venturi channel. The measurement channel with the LMM-H04 should be placed in the center of the flow channel because at this place the flow is almost laminar and the flow velocity reaches its maximum. The cross sections of both channels can be adjusted to the amount of air which is supposed to be measured. For reproducible measurement results it is strictly required to avoid any turbulence at the surface of the sensing element.

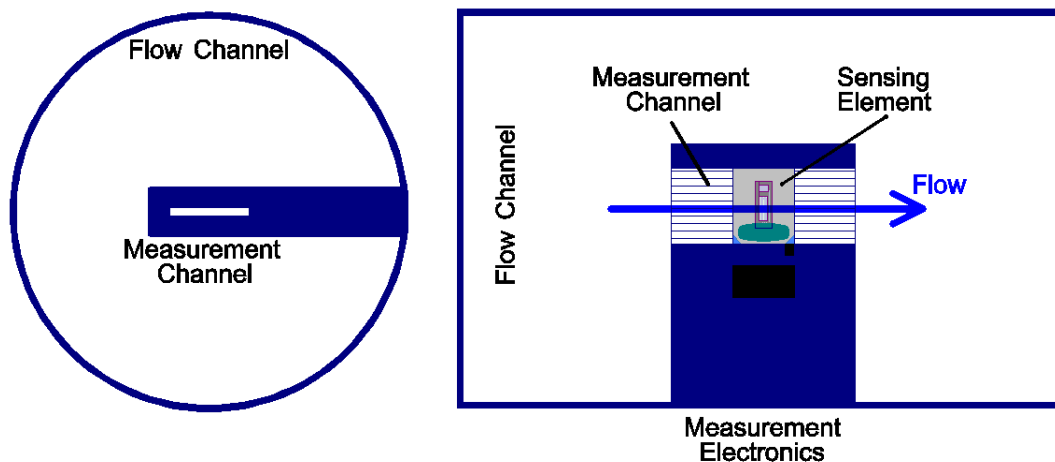


Figure 2: Flow channel of application example of a mass air flow sensor

# LMM-H04 Mass Air Flow Sensor

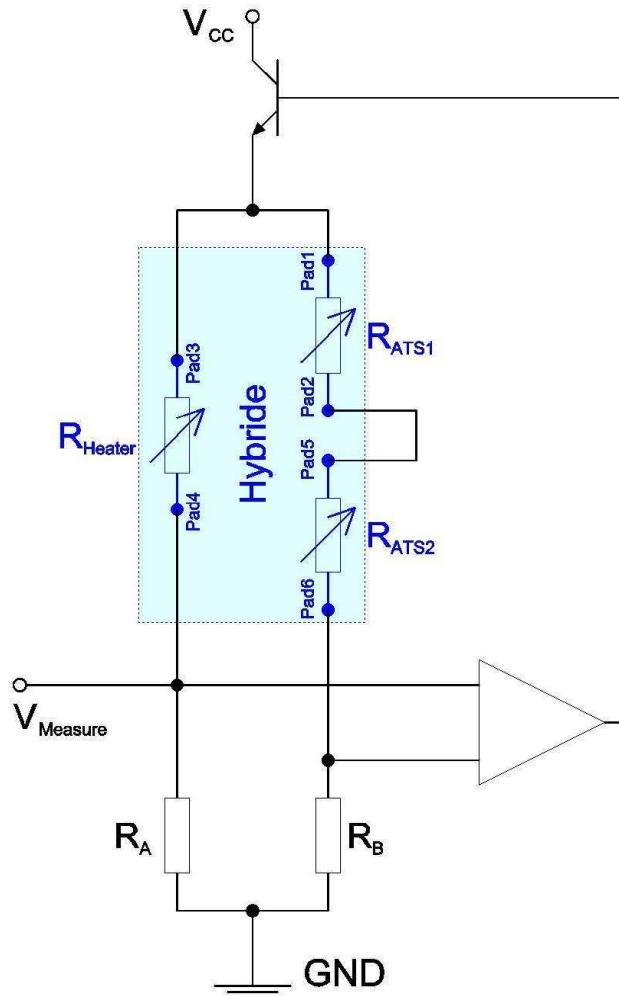


Figure 3: Outline of a measurement electronics using a Wheatstone-bridge.  
NOTE: This drawing shows only the basic functionality. This is not a ready to use circuit diagram!

Above is shown an example of a measurement electronics using a Wheatstone-bridge. The resistors  $R_A$  and  $R_B$  need to be trimmed to operate the heater at a defined over-temperature

With a given electronics and measurement channel the measurement range can be easily adjusted by modifying the size of the flow channel. For higher or lower flow ranges the flow channel needs to be made larger or smaller, respectively.

# LMM-H04 Mass Air Flow Sensor

---

## ORDERING INFORMATION

---

Product	Part Number
LMM-H04	G-MAFCO-004

---

## TECHNICAL CONTACT INFORMATION

---

### NORTH AMERICA

Measurement Specialties, Inc.  
1000 Lucas Way  
Hampton, VA 23666  
Tel: 1-800-745-8008  
Fax: 1-757-766-4297  
Email: [sales@meas-spec.com](mailto:sales@meas-spec.com)  
Web: [www.meas-spec.com](http://www.meas-spec.com)

### EUROPE

Europe  
MEAS Deutschland GmbH  
Hauert 13, D-44227 Dortmund,  
Germany  
Phone: +49-(0)231-9740-0  
Fax: +49-(0)231-9740-20  
Email: [info.de@meas-spec.com](mailto:info.de@meas-spec.com)  
Web: [www.meas-spec.com](http://www.meas-spec.com)

### ASIA

Measurement Specialties China Ltd.  
No. 26, Langshan Road,  
Shenzhen High-tech Park (North)  
Nanshan District, Shenzhen,  
China 518057  
Phone: +86-755-33305088  
Fax: +86-755-33305099  
Email: [info.cn@meas-spec.com](mailto:info.cn@meas-spec.com)  
Web: [www.meas-spec.com](http://www.meas-spec.com)

The information in this sheet has been carefully reviewed and is believed to be accurate; however, no responsibility is assumed for inaccuracies. Furthermore, this information does not convey to the purchaser of such devices any license under the patent rights to the manufacturer. Measurement Specialties, Inc. reserves the right to make changes without further notice to any product herein. Measurement Specialties, Inc. makes no warranty, representation or guarantee regarding the suitability of its product for any particular purpose, nor does Measurement Specialties, Inc. assume any liability arising out of the application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Typical parameters can and do vary in different applications. All operating parameters must be validated for each customer application by customer's technical experts. Measurement Specialties, Inc. does not convey any license under its patent rights nor the rights of others.