



# TE SENSOR SOLUTIONS



# FLOW SENSORS

We manufacture reliable and accurate mass air flow (MAF) sensors for a variety of automotive, medical and industrial gas flow applications. Our flow switches are suitable for hot and cold potable water due to rugged brass housings and the ability to operate from a small head of water. They are typically mounted in a well-defined channel, directly in the flowing media. Our flow switches are designed for water control, power shower, central heating systems, circulation pump protection, cooling and leak detection. They feature reed switch reliability and are easy to install.



## MASS AIR FLOW SENSORS



### MEAS LMM-H03

Package	Hybrid
Type	<ul style="list-style-type: none"> <li>Hot film anemometer component</li> <li>Bidirectional</li> </ul>
Operating Temp.	-40°C to 125°C
Unique Features	High sensitivity at low heater temperatures, fast response time, true air temperature sensor
Calibration / Accuracy	Dependent on electronics
Dimensions (mm)	23 x 10.15 x 1.1
Typical Applications	Air intake of combustion engine, spirometer, industrial gas flow



### MEAS LMM-H04

Package	Hybrid
Type	<ul style="list-style-type: none"> <li>Hot film anemometer component</li> <li>Unidirectional</li> </ul>
Operating Temp.	-40°C to 125°C
Unique Features	High sensitivity at low heater temperatures, fast response time, true air temperature sensor
Calibration / Accuracy	Dependent on electronics
Dimensions (mm)	24 x 10.15 x 1.1
Typical Applications	Air intake of combustion engine, spirometer, industrial gas flow

## FLOW SWITCHES



### MEAS FS-01

Package	Noryl®
Type	Flow switch for direction of liquid and gas flow
Max. Pressure	10 bar at 20°C
Operating Temp.	-30°C to 85°C
Unique Features	SPST reed switch, normally open, close on flow
Dimensions (mm)	106 x 32 x 32
Typical Applications	Mains water control, power shower, central heating systems, circulation pump protection, cooling systems



### MEAS FS-02

Package	Noryl®
Type	Flow switch for direction of liquid and gas flow
Max. Pressure	10 bar at 20°C
Operating Temp.	-30°C to 85°C
Unique Features	Triac, normally open, close on flow
Dimensions (mm)	106 x 32 x 32
Typical Applications	Mains water control, power shower, central heating systems, circulation pump protection, cooling systems



### MEAS FS-05

Package	Brass
Type	Flow switch for direction of liquid and gas flow
Max. Pressure	10 bar at 20°C
Operating Temp.	-30°C to 100°C
Unique Features	SPST reed switch, normally open, close on flow
Dimensions (mm)	113 x 53 x 36
Typical Applications	Mains water control, power shower, central heating systems, circulation pump protection, cooling systems



### MEAS FS-06

Package	Brass
Type	Flow switch for direction of liquid and gas flow
Max. Pressure	10 bar at 20°C
Operating Temp.	-30°C to 100°C
Unique Features	Triac, normally open, close on flow
Dimensions (mm)	113 x 53 x 36
Typical Applications	Mains water control, power shower, central heating systems, circulation pump protection, cooling systems



### MEAS FS-90/1

Package	Copper
Type	Flow switch for direction of liquid and gas flow
Max. Pressure	10 bar at 20°C
Operating Temp.	-30°C to 85°C
Unique Features	SPST reed switch, normally open, close on flow
Dimensions (mm)	153 x 25 x 15
Typical Applications	Leak detection, flow sensing, mains water control, cooling systems, circulation pump protection

## EVERY CONNECTION COUNTS

TE Connectivity is a global technology leader. Our connectivity and sensor solutions are essential in today's increasingly connected world. If data, signal or power moves through it, TE connects and senses it.



TE designs, manufactures and delivers products, systems and solutions in over 150 countries. This global reach enables us to work closely with our customers and identify and act on local needs quickly. By leveraging our global scale, we can deliver the highest levels of quality, innovation and service at a local level.

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## Calibration

Testing of a sensor to confirm output is within a specified range for particular values of the input.

## Compensated Temperature Range

The temperature range in which the sensor meets the specifications for Thermal Zero Shift and Thermal Sensitivity Shift.

## DeviceNet™

Device level network for industrial automation.

## Excitation

The recommended voltage with which a standard sensor should be excited.

## Full Scale Output (FSO)

Full Scale Output (FSO) is the span between the lowest range limit and the highest range limit of the sensor. Published values are approximate values and may vary with each sensor.

## Hysteresis

Hysteresis is the difference in sensor output signal at a specific input when applied in the increasing and then decreasing sectors of a single cycle of short time duration at constant temperature. It is expressed as a percentage of FSO.

## Natural Frequency

Natural Frequency is the frequency at which the sensor's active sensing element goes into resonance and responds with maximum movement for a specific applied input.

## Non-linearity

Non-linearity is the deviation of the sensor output signal from a theoretical straight line which has been fitted to the data points of an actual calibration. It expresses the maximum deviation of all data points in that calibration and is sometime expressed as a percentage of FSO, usually as a  $\pm\%$  error band, or % of reading.

## Non-Repeatability

Non-repeatability is the deviation in sensor output signal levels when a specific input is applied in consecutive cycles of short time duration under the same conditions, such as temperature and direction of increasing or decreasing input. It can be determined by performing two consecutive short time duration calibration cycles and can be expressed as  $\pm\%$ FSO.

## Operating Temperature

The temperature range within which a sensor will meet all of its stated specifications while powered and in operation.

## Over-range Limit

The over-range limit is the maximum input to which the sensor can be exposed without damage.

## Plug and Play

Sensors designed for end-users who expect sensors to meet calibration performance standards once power and signal cables are properly connected to instrumentation.

## Root Mean Square

The square root of the arithmetical mean of a set of squared instantaneous values

## Sealing

Sealing is the assembly method by which the sensor is protected from moisture in the surrounding environment. The most desirable sealing method is hermetically seal. This can be achieved by joining the individual piece parts together by soldering, welding, brazing, glassing, or other commonly accepted manufacturing processes. Another common sealing method is epoxy seal. It is achieved by joining the piece parts by applying adhesive or potting compound to mitigate the incursion of moisture into the sensor assembly.

## Sensitivity

The sensor's change in output per the unit change in the physical parameter being measured. The change may be linear or non-linear.

## Thermal Sensitivity Shift (TSS)

The change in sensitivity of the sensor as a function of temperature. It is usually expressed as a percent reading change in sensitivity for a specified change in temperature such as  $\pm 0.01\%/^{\circ}\text{C}$  and is generally linear with moderate temperature changes. The Thermal Sensitivity Shift can be eliminated or minimized by using sensitivity numbers determined at or near the temperature of use.

## Thermal Zero Shift (TZS)

The change in the Zero Offset as a function of temperature is the Thermal Zero Shift. It may be expressed as either a %FSO for a specific temperature change such as  $\pm 0.01\%\text{FSO}/^{\circ}\text{C}$  or in voltage units such as  $\pm 0.2\text{ mV}/^{\circ}\text{C}$  and it is not a linear function.

## Total Error Band (TEB)

Typically expressed as a percentage, the TEB is the combination of possible errors for a sensing device within its measurement range and temperature of operation.

# GLOSSARY OF COMMON SENSOR ABBREVIATIONS

<b>ABS</b>	American Bureau of Shipping	<b>IP</b>	Ingress Protection	<b>PSIS</b>	Pounds Per Square Inch-Sealed Gage Reference
<b>AC</b>	Alternating Current	<b>ISO</b>	International Organization for Standardization	<b>PTFE</b>	Polytetrafluoroethylene
<b>ANSI</b>	American National Standards Institute	<b>ITAR</b>	International Traffic in Arms Regulations	<b>PUDF</b>	Public Use Data File
<b>ASIC</b>	Application-Specific Integrated Circuit	<b>KHZ</b>	Kilohertz	<b>PWM</b>	Pulse Width Modulation
<b>ATEX</b>	Appareils destinés à être utilisés en ATMosphères EXplosibles	<b>LED</b>	Light Emitting Diode	<b>R&amp;D</b>	Research and Development
<b>BOP</b>	Blow Out Prevention	<b>LIN</b>	Local Interconnect Network	<b>RDT&amp;E</b>	Research, Development, Test & Evaluation
<b>CAN</b>	Controller Area Network	<b>LVD</b>	Low Voltage Differential	<b>RFI</b>	Radio Frequency Interference
<b>CE</b>	Communauté Européenne	<b>LVDT</b>	Linear Variable Displacement Transducers	<b>RH</b>	Relative Humidity
<b>CENELEC</b>	European Committee for Electrotechnical Standardization	<b>mA</b>	Milliamp	<b>RMS</b>	Root Mean Square
<b>CSA</b>	Canadian Standards Association	<b>MAF</b>	Mass Air Flow	<b>RoHS</b>	Restriction of Hazardous Substances
<b>CT</b>	Computed Tomography	<b>mbar</b>	Millibar	<b>RPM</b>	Revolutions Per Minute
<b>cUL</b>	Tested to Canadian Standards by Underwriters' Laboratories	<b>MCR</b>	Main Control Room	<b>RTD</b>	Resistance Temperature Detector
<b>DC</b>	Direct Current	<b>MEMS</b>	Microelectromechanical Systems	<b>RTU</b>	Remote Terminal Unit
<b>DCS</b>	Distributed Control System	<b>mHZ</b>	Megahertz	<b>RVDT</b>	Rotary Variable Differential Transformer
<b>DEF</b>	Diesel Exhaust Fluid	<b>mm</b>	Millimeter	<b>SAE</b>	Society of Automotive Engineering
<b>DTC</b>	Digital Temperature Compensation	<b>MQS</b>	Military Qualification Standards	<b>SCADA</b>	Supervisory Control and Data Acquisition
<b>ECU</b>	Engine Control Unit	<b>MR</b>	Magnetostrictive	<b>SCR</b>	Selective Catalytic Reduction
<b>EGR</b>	Exhaust Gas Recirculation	<b>mV</b>	Millivolt	<b>SDI-12</b>	Serial Data Interface at 1200 Baud
<b>EMC</b>	Electromagnetic Compatibility	<b>NAV</b>	Navigation	<b>SMD</b>	Surface Mount Device
<b>EMI</b>	Electromagnetic Interference	<b>NASA</b>	National Aeronautics and Space Administration	<b>SpO<sub>2</sub></b>	Pulse Oximeter Oxygen Saturation
<b>ESA</b>	European Space Agency	<b>NEMA</b>	National Electrical Manufacturers Association	<b>SPDT</b>	Single Pole, Double Throw
<b>FLS</b>	Field Loadable Software	<b>NIST</b>	National Institute of Standards and Technology	<b>SPI</b>	Serial Peripheral Interface
<b>FM</b>	Factory Mutual	<b>NOx</b>	Nitrogen Oxide	<b>SPST</b>	Single Pole, Single Throw
<b>FPGA</b>	Field Programmable Gate Array	<b>NPT</b>	National Pipe Tapered	<b>T&amp;M</b>	Test & Measurement
<b>FS</b>	Full Scale	<b>NSF</b>	National Science Foundation	<b>TDFN</b>	Thin Dual Flats No Leads
<b>FSO</b>	Full Scale Output	<b>NTC</b>	Negative Temperature Coefficient	<b>TE</b>	TE Connectivity
<b>FT LBS</b>	Foot Pounds	<b>OEM</b>	Original Equipment Manufacturer	<b>TEB</b>	Total Error Band
<b>GPS</b>	Global Positioning System	<b>PCB</b>	Printed Circuit Board	<b>TESS</b>	TE Sensor Solutions
<b>HUMS</b>	Health Usage and Monitoring System	<b>PDF</b>	Portable Document Format	<b>THSA</b>	Trimmable Horizontal Stabilizer Actuators
<b>HVACR</b>	Heating, Ventilation, Air Conditioning, and Refrigeration	<b>PDM</b>	Pulse Density Modulation	<b>TPMS</b>	Tire Pressure Monitoring System
<b>HVD</b>	High-Voltage Differential	<b>PE</b>	Piezoelectric	<b>TSYS</b>	Temperature System Sensor
<b>HZ</b>	Hertz	<b>PLCD</b>	Permanent Magnet Linear Displacement Sensor	<b>UAV</b>	Unmanned Aerial Vehicle
<b>I<sup>2</sup>C</b>	Inter-Integrated Circuit	<b>PPS</b>	Polyphenylene Sulfide	<b>uC</b>	Microcontroller
<b>IEC</b>	International Electrical Commission	<b>PSI</b>	Pounds Per Square Inch	<b>UL</b>	Underwriters Laboratories
<b>IECEX</b>	International Electrotechnical Commission Explosive	<b>PSIA</b>	Pounds Per Square Inch-Absolute Reference	<b>USB</b>	Universal Serial Bus
<b>IEEE</b>	Institute of Electrical and Electronics Engineers	<b>PSID</b>	Pounds Per Square Inch-Differential Reference	<b>VAV</b>	Variable Air Volume
<b>IEPE</b>	Integral Electronic Piezoelectric	<b>PSIG</b>	Pounds Per Square Inch-Gage Reference	<b>VDC</b>	Volts Direct Current
				<b>WEEE</b>	Waste Electrical and Electronic Equipment

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SS-TS-TE100 01/2016

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