

## Sensors

# Integrated Mass Airflow Sensor (MAF)



Our innovative sensors are helping customers meet increasing global performance requirements and emissions regulations. Our Integrated Mass Airflow (MAF) Sensor is used to measure the mass-flow of fresh air entering the engine.

### Product application

For gasoline engines, the mass airflow (MAF) measurement is used in combination with other sensor measurements to adjust the amount of fuel injected to the engine. For diesel engines, the MAF sensor is used to control the exhaust gas recirculation (EGR) rate. In addition, the MAF sensor provides information for system diagnosis.

### Main advantages of new MAF concept

- High system accuracy
- Design flexibility
- Exceptional reliability
- Lean design

### Reduction of emissions

The accuracy and dynamic measurement capability of this engine management component are crucial in reducing vehicle emissions.

### Operating principle

The MAF sensor is based on the principle of a hot-film anemometer. Two sensing elements consisting of temperature dependent metal film resistors are mounted in the sensor flow channel and are connected in a bridge circuit. Sensing element  $R_T$  provides bridge tracking so that the flow sensing element  $R_S$  is heated to a fixed temperature offset relative to the incoming air temperature. The electrical current required to maintain the fixed offset temperature of  $R_S$  is a measure of the mass airflow and is acquired by the sensor electronics as a voltage drop across the fixed bridge resistor  $R_2$ .

The sensor electronics conditions this signal into an analog or frequency output signal delivered to the engine management system.

Technical data see back page

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**Product features**

- Direct measurement of mass airflow
- Calibration using programmable ROM
- Wide measurement range
- Low pressure drop
- Short switch on time
- Signal output options:  
frequency, analog, analog-ratiometric
- Hybrid technology:  
ensures highest reliability of sensor electronics
- No moving mechanical parts: wear free
- Optional intake air temperature sensor
- Flexible connector designs
- Options: plug-in or in-tube design

**Product benefits**

- Highest accuracy
- Long term stability due to our proven sensor technology
- Pulsation compensation
- Signal output options enable to serve all market standards
- Resistant to contamination and adverse operating conditions
- Minimal dimensions and weight
- Fulfills toughest EMC requirements
- Excellent dynamic response
- Dynamic temperature stability
- System support for gasoline & diesel engine management systems

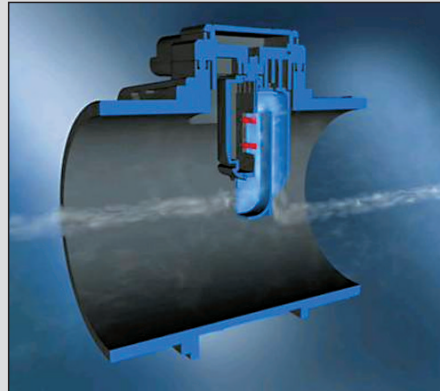
**Backflow compensation**

Internal combustion engines with 4 or fewer cylinders often develop high amplitude intake air oscillations. With an integrated flow channel this pulsation error can be compensated.

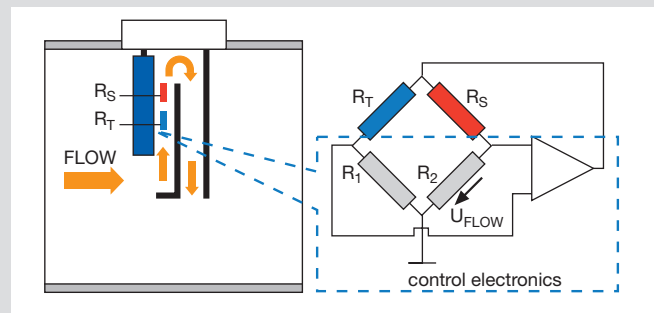
The compensation is independent of system resonant frequencies, temperature, air pressure, and intake manifold length switching.

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MAF „in-tube“ design Measurement simulation

**Operating principle****Product technical specifications**

- Operational temperature range: -40...125°C
- IC-Type: DSP-based
- calibration by: programmable ASIC
- calibration by: programmable ROM
- number of calibration points: max. 9
- sensor tolerance:  $\pm 2\%$
- backflow compensation:  $\pm 5\%$  for  $m < 200\%$
- min. number of pins: 3
- response time:  $63\% < 30\text{ ms}$
- switch on time: 200 ms

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