



FS2 Thermal Mass Flow Sensor

Optimal for measuring gas flow and direction

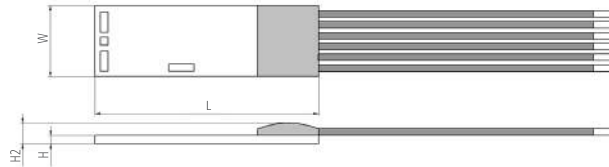


INNOVATIVE SENSOR TECHNOLOGY

Benefits & Characteristics

- Detection of flow direction
- Simple signal processing
- Outstanding sensitivity
- Stable platinum technology
- No moving mechanical parts
- Excellent long-term stability
- Simple calibration
- Bare sensor element resists up to +450 °C (customer specific)
- Excellent reproducibility
- Customer specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

| | |
|-------------------------------------|---|
| Dimensions (L x W x H / H2 in mm):* | 5 x 3.5 x 0.20 / 0.60 |
| Operating measuring range: | 0 ml/min to 50 ml/min (half bridge mode) 0 m/s to 1 m/s (half bridge mode) 0 m/s to 100 m/s (CTA mode) 0 l/min to 5 l/min (CTA mode) |
| Minimum operating range: | 0 ml/min to 2.5 ml/min |
| Response sensitivity: | 0.001 m/s (50 µl/min) |
| Accuracy: | < 2 % of the measured value (dependent on the electronics and calibration) |
| Response time t_{63} : | < 0.5 s |
| Operating temperature range:* | -20 °C to +150 °C |
| Temperature sensitivity: | < 0.1%/K (dependent on the electronics) |
| Connection:* | Cu-wire, enamelled, Ø 0.2 mm |
| Heater:* | $R_H(25\text{ °C}) = 34\ \Omega \pm 10\ %$ |
| Measuring element:* | $R_{S-I}(25\text{ °C}) = 425\ \Omega \pm 10\ %$ |
| Reference element:* | $R_R(25\text{ °C}) = 710\ \Omega \pm 10\ %$ |
| Voltage range (nominal):* | 2 V to 5 V (dependent on flow rate) |

* Customer specific alternatives available



FLOW



TEMPERATURE



HUMIDITY



CONDUCTIVITY

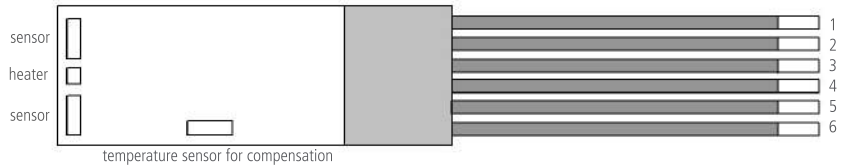
FS2 Thermal Mass Flow Sensor

Optimal for measuring gas flow and direction



INNOVATIVE SENSOR TECHNOLOGY

Pin Assignment



| | | | | | |
|-----|----------------------|--------|--------|----------------------|-------------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| GND | temperature sensor 1 | heater | heater | temperature sensor 2 | temperature sensor for compensation |

Order Information - Cu-wire, enamelled, Ø 0.2 mm

| | | |
|-------------|---------------|---------------|
| Wire length | 25 mm | 300 mm |
| | FS2T.0.1E.025 | FS2T.0.1E.300 |
| Order code | 050.00130 | 350.00053 |



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FS5

Thermal Mass Flow Sensor

Optimal for various gas flow applications

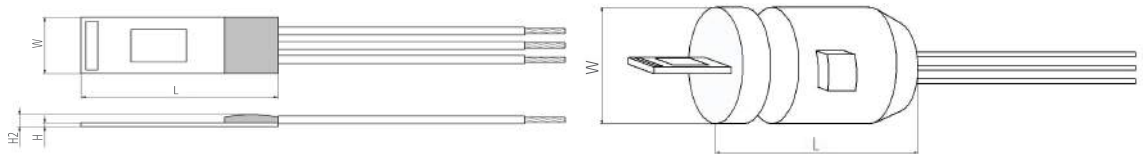


INNOVATIVE SENSOR TECHNOLOGY

Benefits & Characteristics

- Easy adaptation in various applications and housings
- Simple signal processing
- Simple calibration
- No moving mechanical parts
- Excellent reproducibility
- Excellent long-term stability
- Bare sensor element resists up to +450 °C (customer specific)
- Stable platinum technology
- Customer specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

| | |
|-------------------------------------|---|
| Dimensions (L x W x H / H2 in mm):* | 6.9 x 2.4 x 0.20 / 0.60 / Ø 6.0 , L = 14 |
| Operating measuring range: | 0 m/s to 100 m/s |
| Response sensitivity: | 0.01 m/s |
| Accuracy: | < 3 % of the measured value (dependent on the electronics and calibration) |
| Response time t_{63} : | < 2 s |
| Operating temperature range:* | -20 °C to +150 °C |
| Temperature sensitivity: | < 0.1 %/K (dependent on the electronics) |
| Connection:* | 3 pins, AWG 30/7, stranded wire, insulated with PTFE |
| Heater:* | $R_H(0\text{ °C}) = 45\ \Omega \pm 1\ %$ |
| Reference element:* | $R_S(0\text{ °C}) = 1200\ \Omega \pm 1\ %$ |
| Voltage range (nominal):* | 2 V to 5 V (at $\Delta T = 30\text{ K}$ ($0\text{ m/s} \leq v_{\text{gas}} \leq 100\text{ m/s}$)) |
| Maximum heater voltage:* | 3 V (at 0 m/s) |
| Alternative construction:* | Moulded plastic housing |

* Customer specific alternatives available



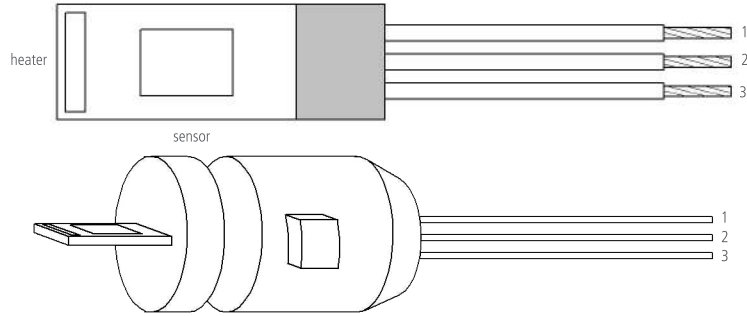
FS5 Thermal Mass Flow Sensor



INNOVATIVE SENSOR TECHNOLOGY

Optimal for various gas flow applications

Pin Assignment



| | | |
|--------|--------------------|-----|
| 1 | 2 | 3 |
| heater | temperature sensor | GND |

Order Information - 3 pins, stranded wire, AWG 30/7, PTFE insulated

| Dimension (L x W x H in mm) | Without plastic housing | With plastic housing |
|-----------------------------|-------------------------|----------------------|
| 6.9 x 2.4 x 0.20 | FS5.0.1L.195 | |
| Order code | 050.00127 | |
| Ø 6.0 (±0.1), L = 14 (±0.2) | | FS5.A.1L.195 |
| Order code | | 050.00128 |

Additional Electronics

| | |
|---------|--------------------------------------|
| Module: | Document name: DFFS5_FSL_Module_E |
|---------|--------------------------------------|



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FS5 Flowmodule

Thermal Mass Flow Sensor

Optimal for gas flow sensor evaluation

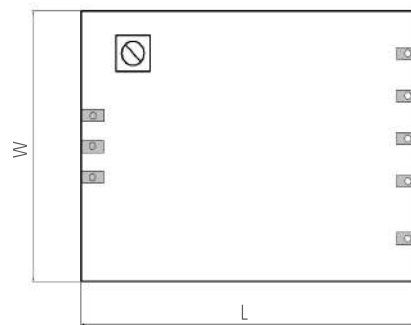


INNOVATIVE SENSOR TECHNOLOGY

Benefits & Characteristics

- Easy to use plug & play module (not calibrated)
- Simple CTA (constant temperature anemometer)
- Simple gain adjustment
- No microprocessor or software influenced signal
- Customer specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

| | |
|---|---|
| Dimensions (L x W in mm): * | 45 x 25 |
| Operating measuring range: | 0 m/s to 50 m/s |
| Accuracy: | < 5 % of the measured value (dependent on calibration) |
| Operating temperature range: | -40 °C to +85 °C (module) |
| Temperature sensitivity: | < 0.5 %/K (dependent on calibration) |
| Connection: | solder pads on PCB |
| Heater ²⁾ : * | $R_H(0\text{ °C}) = 45\ \Omega \pm 1\ \%$ |
| Reference element ³⁾ : * | $R_s(0\text{ °C}) = 1200\ \Omega \pm 1\ \%$ |
| Voltage range (nominal): * | 5 V DC $\pm 5\ \%$ (internal main voltage is 10 V) |
| Warm-up time: | < 30 s |
| Analog output, non linear ⁴⁾ : | 0 V (2) to 10 V; 50 mA (operating point at still air = 3.5 V) |

2) Related to the F55 sensor

3) Related to the F55 sensor

4) Can be adjusted with potentiometer

* Customer specific alternatives available



FS5 Flowmodule

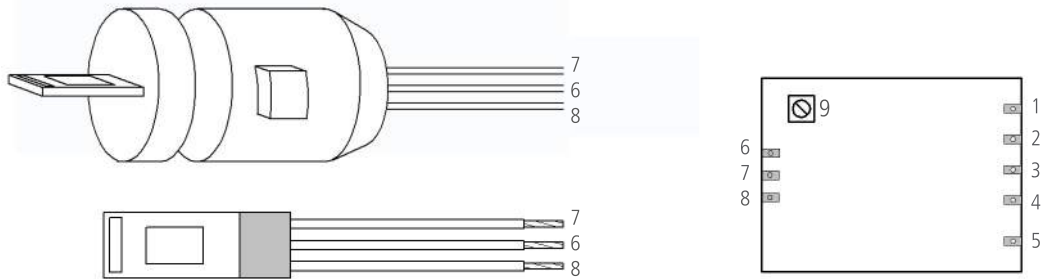
Thermal Mass Flow Sensor

Optimal for gas flow sensor evaluation



INNOVATIVE SENSOR TECHNOLOGY

Pin Assignment



| | | | | |
|--------------------|--------|-----|---------------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| flow output | | | GND | $U_{supply} +5 V$ |
| 6 | 7 | 8 | 9 | |
| temperature sensor | heater | GND | potentiometer | |

Order Information³⁾

| | |
|------------|----------------------------|
| Order code | FS5-Flowmodul 160.00001 |
|------------|----------------------------|

³⁾ The module does not contain any sensor. The sensor should be ordered separately.

Additional Documents

| | |
|------------|---------------------------|
| Datasheet: | Document name: DFFS5_E |
|------------|---------------------------|



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MFS 02

Thermal Mass Flow Sensor



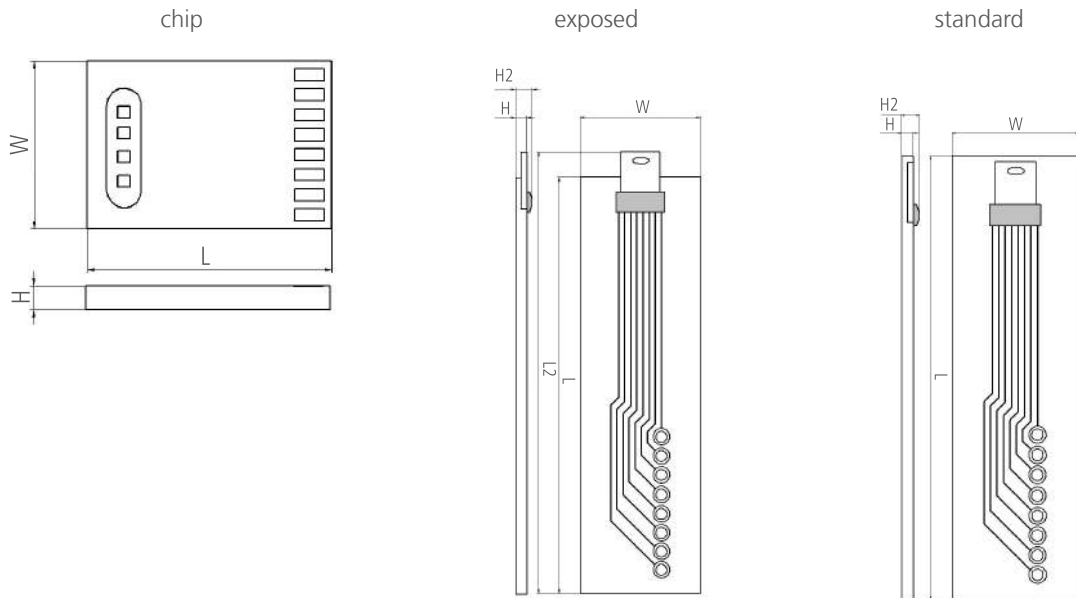
INNOVATIVE SENSOR TECHNOLOGY

Optimal for ultra fast measuring of gas flow and direction

Benefits & Characteristics

- Detection of flow direction
- Ultra fast response time
- Excellent for low mass flow
- Low power consumption
- Small thermal mass
- Robust construction
- Excellent long term stability
- Bare sensor element resists short-term up to +275 °C
- Customer specific sensor available upon request

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

| | | |
|---|--|--------------------------------|
| Dimensions (L / L2 x W x H / H2 in mm): | chip | 3.5 x 5.1 x 0.5 |
| | standard | 38.2 x 10.8 x 1.0 / 2.0 |
| | exposed | 34.2 / 37.4 x 10.8 x 1.0 / 2.0 |
| Operating measuring range: | 0 m/s to 1.5 m/s (full bridge mode) | |
| | 0 ml/min to 100 ml/min (full bridge mode) | |
| | 0 m/s to 150 m/s (CTA mode) | |
| | 0 l/min to 10 l/min (CTA mode) | |
| Minimum operating range: | 0 ml/min to 1 ml/min | |
| Response sensitivity: | 0.0003 m/s (20 microliter/min) | |
| Accuracy: | < 2 % of the measured value (dependent on the electronics and calibration) | |
| Response time t_{63} : | < 10 ms | |



MFS02

Thermal Mass Flow Sensor



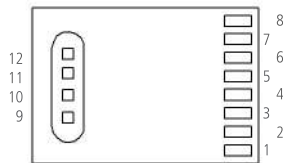
INNOVATIVE SENSOR TECHNOLOGY

Optimal for ultra fast measuring of gas flow and direction

| | |
|---------------------------------------|--|
| Temperature range (chip): | -40 °C to +160 °C |
| Temperature range (gas): | -40 °C to +80 °C (maximal +80 °C less than chip temperature) |
| Temperature sensitivity: | < 0.1 % / K (dependent on the electronics) |
| Connection: | bonding pads |
| 2 elements: | $R_{high}(0\text{ °C}) = 710\ \Omega \pm 10\ %\ R_A, R_D$ |
| 2 elements: | $R_{low}(0\text{ °C}) = 530\ \Omega \pm 10\ %\ R_B, R_C$ |
| Matching between elements: | < 2 % |
| 1 element: | Pt RTD similar to Pt1000 |
| Voltage range (nominal):* | 2 V to 6 V (full bridge mode) |
| Bridge offset (full bridge mode): | Maximal $\pm 50\text{ mV}$ at $V_{CC} = 5\text{ V}$; typical $\pm 10\text{ mV}$ |
| TCR bridge offset (full bridge mode): | Maximal $\pm 50\text{ ppm/K} \times V_{CC}/2$ |
| Power consumption (no flow): | 10 mW to 50 mW (resp. chip temperature +50 °C to +160 °C) |

* Customer specific alternatives available

Pin Assignment



| | | | | | |
|--------|--------|-----------|-------|-------|-----------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Pt1000 | R_D | R_A/R_D | R_A | R_B | R_C/R_B |
| 7 | 8 | 9 | 10 | 11 | 12 |
| R_C | Pt1000 | R_A | R_B | R_C | R_D |

RB, RC - heater / RA, RD - temperature sensor

Order Information - Bonding Pads

| | |
|-----------------------|--------------------------------|
| Sensor element | MFS 02 |
| Order code | 350.00069 |
| Sensor element on PCB | MFS 02 auf PCB_Standardversion |
| Order code | 350.00093 |
| Sensor element on PCB | MFS 02 auf PCB_Exposedversion |
| Order code | 350.00095 |



MFS02

Thermal Mass Flow Sensor

Optimal for ultra fast measuring of gas flow and direction



INNOVATIVE SENSOR TECHNOLOGY

Additional Electronics

| | |
|-------------------|--------------------------|
| | Document name: |
| Evakit: | MFS02 EvaKit_E |
| Amplifier module: | DFMFS_Amplifier_Module_E |



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MicroflowSens EvaKit

Thermal Mass Flow Sensor

Optimal for easy evaluation of the MFS02

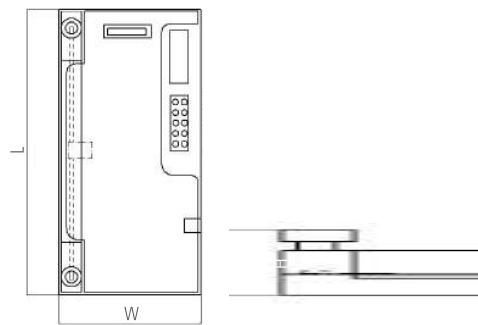


INNOVATIVE SENSOR TECHNOLOGY

Benefits & Characteristics

- High sensitivity
- Excellent measuring dynamics
- Fully calibrated and with USB connection
- Software included with graphical signal representation
- Data logging function
- Integrated flow channel with pneumatic connections

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

| | |
|--------------------------------|---|
| Abmessungen (W x L x H in mm): | 55 x 70 x 33.5 |
| Operating measuring range: | 0 ml/min to 200 ml/min |
| Power supply: | USB |
| Accuracy: | ±1 % at +25 °C |
| Pneumatic connection: | Hose with $\varnothing_{\text{inner}} = 4 \text{ mm}$ |
| PC connection: | USB 1.1 or 2.0 compatible |



MicroflowSens EvaKit

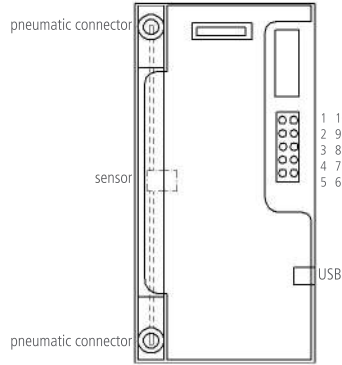
Thermal Mass Flow Sensor



INNOVATIVE SENSOR TECHNOLOGY

Optimal for easy evaluation of the MFS02

Pin Assignment



| | | | | |
|---|------|-------|------|------|
| 1 | 2 | 3 | 4 | 5 |
| | | 3.6 V | DA_D | GND |
| 6 | 7 | 8 | 9 | 10 |
| | 15 V | 12 V | DA_A | DA_B |

DA_B: temperature sensor / DA_D: flow low / DA_A: U_{Right} (flow high)

Order Information

| | |
|------------|------------------------------------|
| Order code | Microflowsens EVA-KIT 250.00007 |
|------------|------------------------------------|

Additional Documents

| | |
|------------|--|
| Datasheet: | Document name: DFMFS02 + DFMFS02 on PCB_E |
|------------|--|



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Microflow Amplifier Module

Thermal Mass Flow Sensor



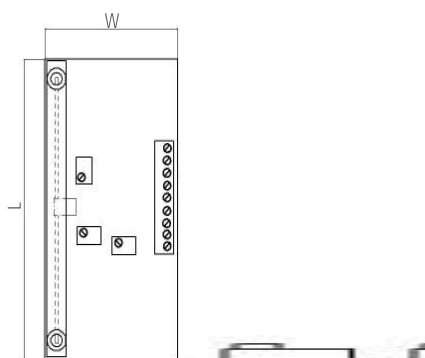
INNOVATIVE SENSOR TECHNOLOGY

Optimal for demonstration and evaluation of the MFS02

Benefits & Characteristics

- Single supply 12 V_{DC}
- Separate temperature sensor on chip
- Interfacing with screw termination block
- Flow channel and pneumatic connectors mounted
- Monitoring for internal supply, offset and heater voltages at termination block
- Adjustment with three trimming potentiometers (gain, offset, heater voltage)

Illustration¹⁾



1) For actual size, see dimensions

Technical Data

| | |
|-------------------------------|---|
| Dimensions (L x W x H in mm): | 70 x 35 x 30 |
| Operating measuring range: | ≥ 0 m/s to 2 m/s (0 ml/min to 240 ml/min) |
| Integrated sensor: | MFS02 |
| Temperature sensor: | PT1000 (DIN IEC 60751) (passive - directly wired to output) |
| Voltage range (heater): | 2 V _{DC} to 5 V _{DC} |
| Current consumption: | < 50 mA |
| Supply voltage: | 12 V _{DC} external supply (no reverse polarity protection) |
| Output signal range (flow): | -1.8 V _{DC} to 12 V _{DC} (not linearized), adjustable with trimming potentiometer |
| Gain: | 23 to 10000, adjustable with trimming potentiometer |
| Analog output load: | R _L ≥ 25 kΩ (output short circuit protected) |
| Heater power: | approx. 6.6 mW at 2 V heater voltage, 14.9 mW at 3 V heater voltage approx. 26.4 mW at 4 V heater voltage, 41.3 mW at 5 V heater voltage |
| Channel cross section: | 2 mm ² |
| Mounting: | 4 x M3 screw |
| Operating mode: | full bridge mode |



Microflow Amplifier Module

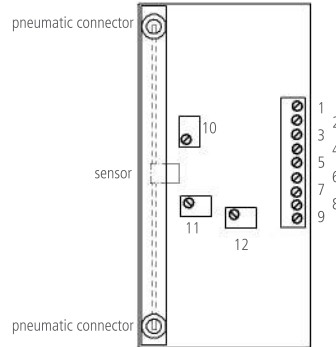
Thermal Mass Flow Sensor



INNOVATIVE SENSOR TECHNOLOGY

Optimal for demonstration and evaluation of the MFS02

Pin Assignment



| | | | | | |
|----------------------|--|---|---------------------------|---------------------------|------------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| $V_{CC} = 12 V_{DC}$ | GND | $V_{out, diff}$ [-1.8 V_{DC} to 12 V_{DC}] | temperature sensor PT1000 | temperature sensor PT1000 | 5.5 V_{DC} out |
| 7 | 8 | 9 | 10 | 11 | 12 |
| -5 V_{DC} out | Heater voltage output [0 V_{DC} to 5.7 V_{DC}] | Offset voltage output [-1.8 V_{DC} to 5.7 V_{DC}] | R_G (gain) | R_O (offset) | R_H (heater) |

Order Information

| | |
|------------|--|
| Order code | IST_A05_Flowmodul mit MFS02 350.00097 |
|------------|--|

Additional Documents

| | |
|------------|--|
| Datasheet: | Document name: DFMFS02 + DFMFS02 on PCB_E |
|------------|--|



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