

# HRO Series

## Precision compensated pressure sensors

### FEATURES

- 10 mbar to 10 bar, 4 inH<sub>2</sub>O to 150 psi, differential pressure
- Precision temperature compensated
- Calibrated offset and span
- RoHS compliant
- Quality Management System according to ISO 13485:2003 and ISO 9001:2008

### MEDIA COMPATIBILITY

Non-corrosive, non-ionic working fluids such as clean dry air, dry gases and the like.

The media wetted materials are:

port 1: front side of silicon sensor chip, glass filled polyamide, RTV, silgel (for devices from 5 psi), ceramic (Al<sub>2</sub>O<sub>3</sub>)

port 2: silicon sensor chip, glass filled nylon, RTV, ceramic (Al<sub>2</sub>O<sub>3</sub>)

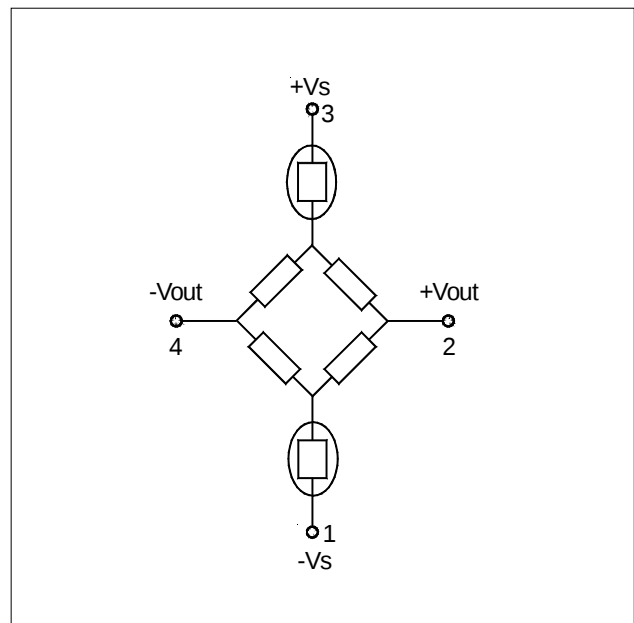


### SPECIFICATIONS

#### Maximum ratings

|                                        |                |
|----------------------------------------|----------------|
| Supply voltage                         | 3 to 16 V      |
| Temperature limits                     |                |
| Compensated                            |                |
| HROM010..., HROH004...                 | 0 ... 50 °C    |
| all others                             | 0 ... 70 °C    |
| Operating                              | -25 ... 85 °C  |
| Storage                                | -40 ... 125 °C |
| Lead temperature (soldering 5 seconds) | 315 °C         |
| Humidity limits (non-condensing)       | 0 ... 95 %RH   |
| Common mode pressure                   | 50 psig        |

### EQUIVALENT CIRCUIT



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**PRESSURE SENSOR CHARACTERISTICS** ( $V_s = 12\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , pressure applied to port P1)

### HRO...P devices (Prime Grade)

| Part no.    | Operating pressure    | Proof pressure <sup>1</sup> | Burst pressure <sup>2</sup> | Full scale span <sup>3</sup> |          |         |
|-------------|-----------------------|-----------------------------|-----------------------------|------------------------------|----------|---------|
|             |                       |                             |                             | Min.                         | Typ.     | Max.    |
| HROM025...P | 25 mbar               | 200 mbar                    | 350 mbar                    | 19.6 mV                      | 20.1 mV  | 20.6 mV |
| HROM050...P | 50 mbar               | 250 mbar                    | 750 mbar                    | 12.9 mV                      | 13.05 mV | 13.2 mV |
| HROM100...P | 100 mbar              | 500 mbar                    | 1.5 bar                     | 25.8 mV                      | 26.1 mV  | 26.4 mV |
| HROM250...P | 250 mbar              | 1 bar                       | 1.7 bar                     | 42.8 mV                      | 43.5 mV  | 44.2 mV |
| HROB001...P | 1 bar                 | 3 bar                       | 5 bar                       | 86.1 mV                      | 87.0 mV  | 88.0 mV |
| HROB002...P | 2 bar                 | 6 bar                       | 10 bar                      | 86.1 mV                      | 87.0 mV  | 88.0 mV |
| HROB005...P | 5 bar                 | 17 bar                      | 27 bar                      | 71.8 mV                      | 72.5 mV  | 73.2 mV |
| HROB010...P | 10 bar                | 17 bar                      | 27 bar                      | 86.1 mV                      | 87.0 mV  | 88.0 mV |
| HROH010...P | 10 inH <sub>2</sub> O | 3 psi                       | 5 psi                       | 19.5 mV                      | 20 mV    | 20.5 mV |
| HROP001...P | 1 psi                 | 3 psi                       | 5 psi                       | 17.8 mV                      | 18 mV    | 18.2 mV |
| HROP005...P | 5 psi                 | 15 psi                      | 25 psi                      | 59 mV                        | 60 mV    | 61 mV   |
| HROP015...P | 15 psi                | 45 psi                      | 75 psi                      | 89 mV                        | 90 mV    | 91 mV   |
| HROP030...P | 30 psi                | 90 psi                      | 150 psi                     | 89 mV                        | 90 mV    | 91 mV   |
| HROP060...P | 60 psi                | 180 psi                     | 300 psi                     | 89 mV                        | 90 mV    | 91 mV   |
| HROP100...P | 100 psi               | 250 psi                     | 400 psi                     | 99 mV                        | 100 mV   | 101 mV  |
| HROP150...P | 150 psi               | 250 psi                     | 400 psi                     | 89 mV                        | 90 mV    | 91 mV   |

### HRO...H devices (High Grade)

| Part no.    | Operating pressure    | Proof pressure <sup>1</sup> | Burst pressure <sup>2</sup> | Full scale span <sup>3</sup> |          |         |
|-------------|-----------------------|-----------------------------|-----------------------------|------------------------------|----------|---------|
|             |                       |                             |                             | Min.                         | Typ.     | Max.    |
| HROM010...H | 10 mbar               | 200 mbar                    | 350 mbar                    | 23.1 mV                      | 25.1 mV  | 27.1 mV |
| HROM025...H | 25 mbar               | 200 mbar                    | 350 mbar                    | 19.1 mV                      | 20.1 mV  | 21.1 mV |
| HROM050...H | 50 mbar               | 250 mbar                    | 750 mbar                    | 12.3 mV                      | 13.05 mV | 13.8 mV |
| HROM100...H | 100 mbar              | 500 mbar                    | 1.5 bar                     | 24.6 mV                      | 26.1 mV  | 27.6 mV |
| HROM250...H | 250 mbar              | 1 bar                       | 1.7 bar                     | 41.3 mV                      | 43.5 mV  | 45.7 mV |
| HROB001...H | 1 bar                 | 3 bar                       | 5 bar                       | 82.2 mV                      | 87.0 mV  | 91.9 mV |
| HROB002...H | 2 bar                 | 6 bar                       | 10 bar                      | 82.2 mV                      | 87.0 mV  | 91.9 mV |
| HROB005...H | 5 bar                 | 17 bar                      | 27 bar                      | 68.9 mV                      | 72.5 mV  | 76.1 mV |
| HROB010...H | 10 bar                | 17 bar                      | 27 bar                      | 82.2 mV                      | 87.0 mV  | 91.9 mV |
| HROH004...H | 4 inH <sub>2</sub> O  | 3 psi                       | 5 psi                       | 23 mV                        | 25 mV    | 27 mV   |
| HROH010...H | 10 inH <sub>2</sub> O | 3 psi                       | 5 psi                       | 19 mV                        | 20 mV    | 21 mV   |
| HROP001...H | 1 psi                 | 3 psi                       | 5 psi                       | 17 mV                        | 18 mV    | 19 mV   |
| HROP005...H | 5 psi                 | 15 psi                      | 25 psi                      | 57 mV                        | 60 mV    | 63 mV   |
| HROP015...H | 15 psi                | 45 psi                      | 75 psi                      | 85 mV                        | 90 mV    | 95 mV   |
| HROP030...H | 30 psi                | 90 psi                      | 150 psi                     | 85 mV                        | 90 mV    | 95 mV   |
| HROP060...H | 60 psi                | 180 psi                     | 300 psi                     | 85 mV                        | 90 mV    | 95 mV   |
| HROP100...H | 100 psi               | 250 psi                     | 400 psi                     | 95 mV                        | 100 mV   | 105 mV  |
| HROP150...H | 150 psi               | 250 psi                     | 400 psi                     | 85 mV                        | 90 mV    | 95 mV   |

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( $V_s = 12\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , pressure applied to port P1)

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### HRO...P devices (Prime Grade)

| Characteristics                                    |                                       | Min. | Typ.  | Max. | Unit |
|----------------------------------------------------|---------------------------------------|------|-------|------|------|
| Zero pressure offset                               |                                       | -0.5 | 0     | +0.5 | mV   |
| Combined non-linearity and hysteresis <sup>4</sup> |                                       |      | ±0.25 | ±0.5 | %FSS |
| Temperature effects (0...70 °C) <sup>5</sup>       | Span                                  |      |       | ±1.0 |      |
|                                                    | Offset                                |      |       | ±0.5 | mV   |
| Input resistance                                   |                                       | 5    |       |      | kΩ   |
| Output resistance                                  |                                       |      | 3     |      |      |
| Response time (10 to 90 %FSS)                      | 25 mbar/10 inH <sub>2</sub> O devices |      | 500   |      | μs   |
|                                                    | all other devices                     |      | 100   |      |      |
| Common mode voltage <sup>6</sup>                   |                                       |      | 6     |      | V    |

### HRO...H devices (High Grade)

| Characteristics                                    |                                             | Min. | Typ.  | Max. | Unit |
|----------------------------------------------------|---------------------------------------------|------|-------|------|------|
| Zero pressure offset                               | 10 mbar/4 inH <sub>2</sub> O devices        | -1.0 | 0     | +1.0 | mV   |
|                                                    | all other devices                           | -0.5 | 0     | +0.5 |      |
| Combined non-linearity and hysteresis <sup>4</sup> |                                             |      | ±0.25 | ±1.0 | %FSS |
| Temperature effects (0...70 °C) <sup>5</sup>       | Span                                        |      |       | ±2.0 |      |
|                                                    | Offset                                      |      |       | ±1.0 | mV   |
| Input resistance                                   |                                             | 5    |       |      | kΩ   |
| Output resistance                                  |                                             |      | 3     |      |      |
| Response time (10 to 90 %FSS)                      | devices up to 25 mbar/10 inH <sub>2</sub> O |      | 500   |      | μs   |
|                                                    | all other devices                           |      | 100   |      |      |
| Common mode voltage <sup>6</sup>                   |                                             |      | 6     |      | V    |

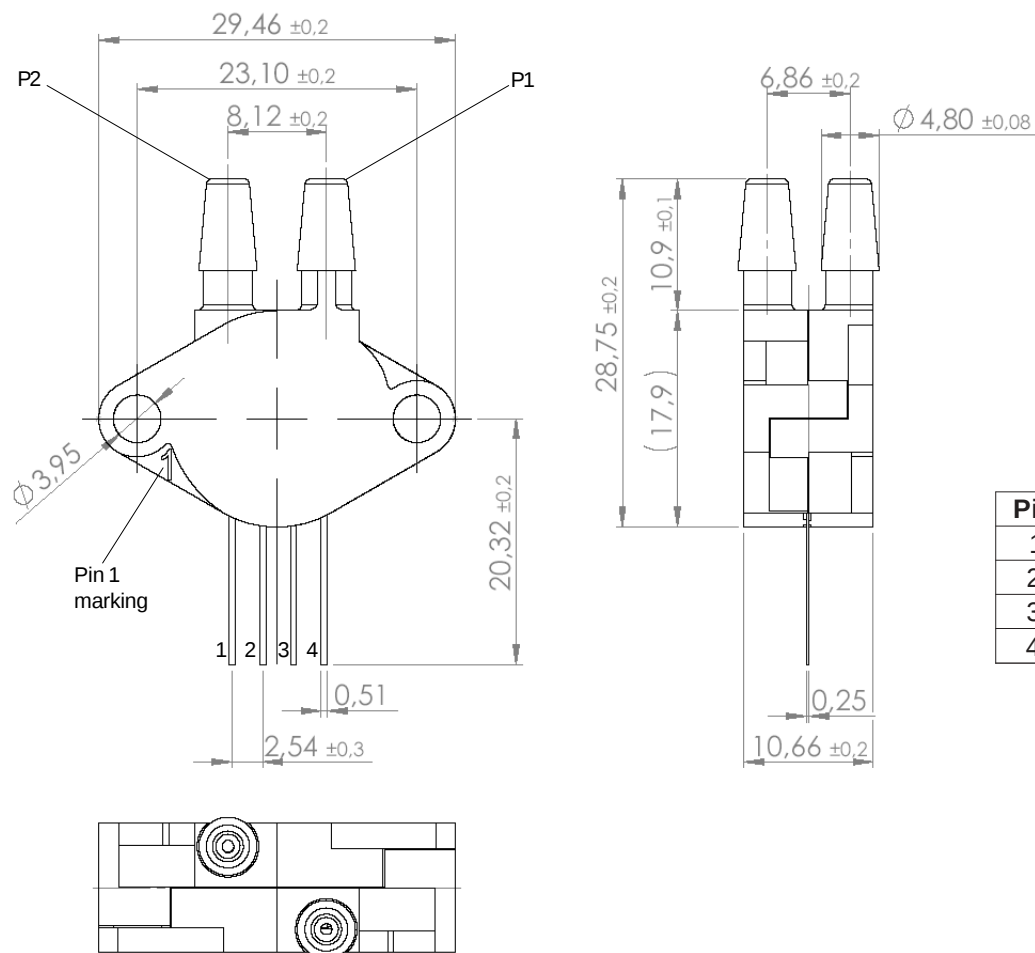
**Specification notes:**

1. Proof pressure is the maximum pressure which may be applied without causing durable shifts of the electrical parameters of the sensing element.
2. Burst pressure is the maximum pressure which may be applied without causing damage to the sensing element or leaks from the housing.
3. Full scale span is the algebraic difference between the output voltage at full-scale pressure and the output at zero pressure. The span is ratiometric to the supply voltage.
4. Non-linearity refers to the Best Straight Line fit measured for offset pressure, full-scale pressure and ½ full-scale pressure.
5. Shift is relative to 25 °C. The HROM010.../HROH004... have a compensated temperature range from 0...50 °C.
6. This is the common-mode voltage of the output arms (pins 2 and 4) for  $V_s = 12\text{ V}$ .

# HRO Series

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### OUTLINE DRAWING AND ELECTRICAL CONNECTION



mass: approx. 5 g

dimensions in mm

# HRO Series

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### ORDERING INFORMATION

| Options  | Series                | Pressure range              |         | Pressure mode |              | Housing |                       | Grade  |               |   |  |    |  |   |  |
|----------|-----------------------|-----------------------------|---------|---------------|--------------|---------|-----------------------|--------|---------------|---|--|----|--|---|--|
|          | HRO                   | M010*                       | 10 mbar | D             | Differential | TM      | SIL, 2 ports top side | H<br>P | High<br>Prime |   |  |    |  |   |  |
| M025     | 25 mbar               |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| M050     | 50 mbar               |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| M100     | 100 mbar              |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| M250     | 250 mbar              |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| B001     | 1 bar                 |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| B002     | 2 bar                 |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| B005     | 5 bar                 |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| B010     | 10 bar                |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| H004*    | 4 inH <sub>2</sub> O  |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| H010     | 10 inH <sub>2</sub> O |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| P001     | 1 psi                 |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| P005     | 5 psi                 |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| P015     | 15 psi                |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| P030     | 30 psi                |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| P060     | 60 psi                |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| P100     | 100 psi               |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| P150     | 150 psi               |                             |         |               |              |         |                       |        |               |   |  |    |  |   |  |
|          |                       | * only available as H-grade |         |               |              |         |                       |        |               |   |  |    |  |   |  |
| Example: | HRO                   | M100                        |         |               |              |         |                       |        |               | D |  | TM |  | P |  |

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