



# ME509 datasheet

## FLUSH DIAPHRAGM, PIEZORESISTIVE CERAMIC PRESSURE SENSOR

Metallux ME509 pressure sensors are made with a ceramic base plate and a flush diaphragm, based on the piezoresistive principle. Metallux ME509 pressure sensors are specifically designed to measure very low pressure.

The Wheatstone bridge is screen printed on one side of the flush ceramic diaphragm which is, in turn, glued to the sensor's body. The bridge faces the inside where a cavity is made and the diaphragm's opposite side can therefore be exposed directly to the medium to be measured. Higher sensitivity is reached thanks to a larger diameter (32.4 mm), thus allowing the measure of pressure values as low as 200 mbar.

Because of the Al<sub>2</sub>O<sub>3</sub> ceramic excellent chemical resistance (aggressive gases, most of solvents and acids, etc.), no additional protection is normally required.

Metallux ME509 sensors are thermally compensated by laser-adjustable PTC resistors and the use of ceramic ensures a high linearity across the entire range of measurement, reducing effects of hysteresis to a minimum.

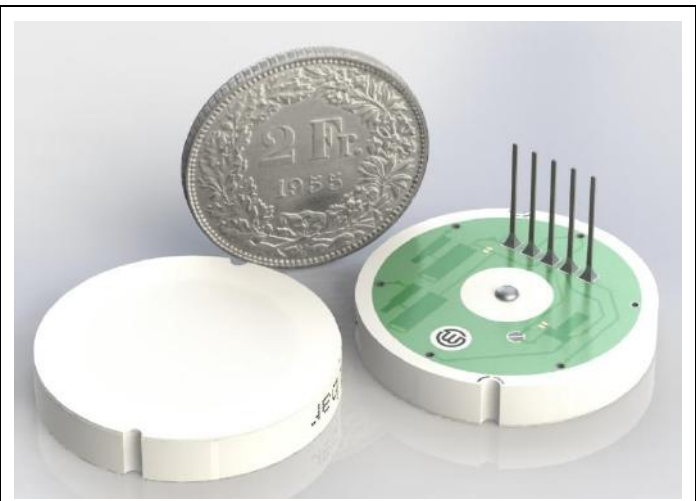
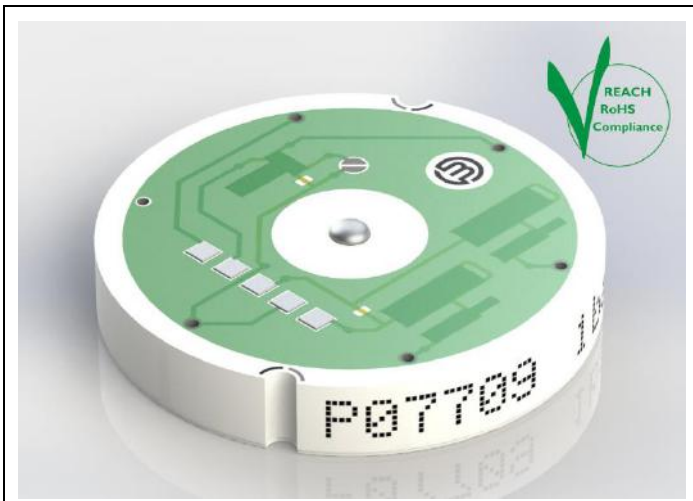
### FEATURES

**High sensitivity, low nominal pressure values**

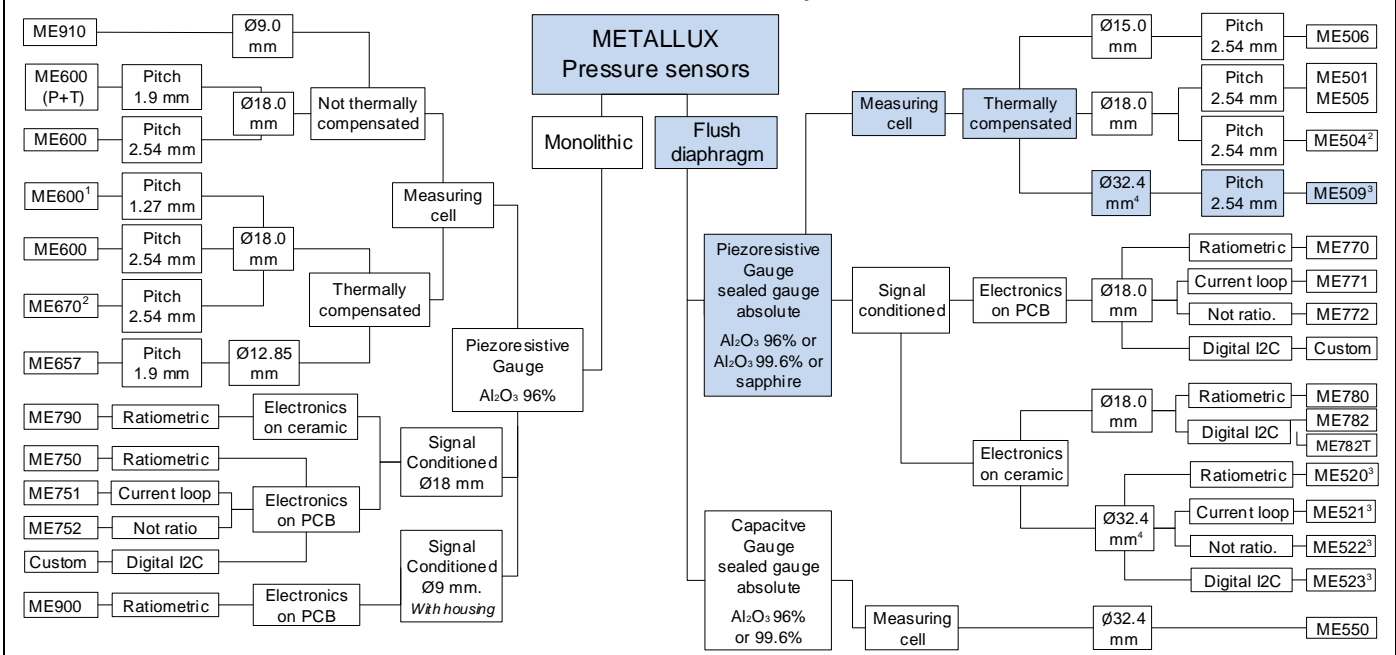
**Excellent resistance to corrosion and abrasion**

**Thermally compensated**

**Extended customization**



### Pressure sensors family tree



<sup>1</sup> Also available in not thermally compensated version  
<sup>2</sup> Digitally trimmed offset, also available not thermally compensated

<sup>3</sup> Not available with sapphire diaphragm.  
<sup>4</sup> Suitable for low pressure range (≤1 bar)

## Technical characteristics

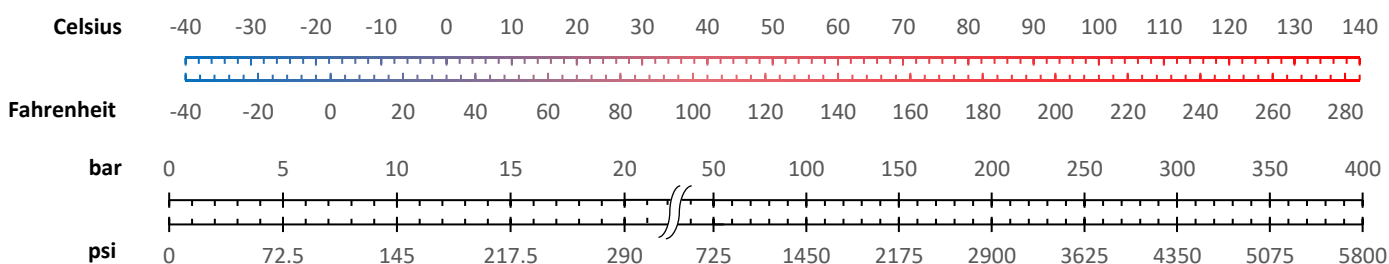
| Parameters            | Units | Description   |
|-----------------------|-------|---|
| Sensor type           | -     | Flush diaphragm, gauge (absolute version available only for 1 bar version)            |
| Technology            | -     | Piezoresistive  |
| Diaphragm material    | -     | Ceramic Al <sub>2</sub> O <sub>3</sub> 96% (standard), 99.6% or sapphire (on request) |
| Weight                | g     | ≤ 17 (ceramic cell only)  |
| Response time         | ms    | ≤ 1   |
| Supply voltage        | VDC   | 2...30  |
| Offset                | mV/V  | - 0.1 ± 0.1 (Other nominal values available on request)                               |
| Current cons.         | mA    | ≤ 1.3 @ 10V   |
| Operating temperature | °C    | -40...+135 (-40 °F...+275 °F)   |
| Storage temperature   | °C    | -40...+150 (-40 °F...+302 °F)   |
| Bridge impedance      | kΩ    | 11 ± 30%  |
| Compliant with        | -     | REACH, RoHS, Conflict Minerals Free   |

|                                   |                  |                                     |   |           |  |
|-----------------------------------|------------------|-------------------------------------|---|-----------|--|
| Nominal pressure FSO              | bar              | 0.2                                 | 0.5   | 1.0       |  |
|                                   | psi <sup>1</sup> | 3                                   | 7   | 14        |  |
| Overload pressure                 | bar              | 0.4                                 | 1.0   | 2.0       |  |
|                                   | psi <sup>1</sup> | 6                                   | 14  | 29        |  |
| Burst pressure                    | bar              | 0.5                                 | 1.3   | 2.5       |  |
|                                   | psi <sup>1</sup> | 7                                   | 19  | 36        |  |
| Vacuum capability                 | bar              | NA                                  | -0.1  | -0.3      |  |
|                                   | psi <sup>1</sup> | NA                                  | -1  | -4        |  |
| Total thickness                   | mm               | 5.22                                | 5.29  | 5.37      |  |
|                                   | in               | 0.206                               | 0.208   | 0.211     |  |
| Sensitivity <sup>2</sup>          | mV/V             | ≥ 2.0                               | ≥ 2.0   | ≥ 2.0     |  |
| Accuracy <sup>3</sup> (typ./max.) | %FS              | 1.3 / 2.5                           | 1.3 / 2.5   | 1.3 / 2.5 |  |
| Thermal offset shift (typ./max.)  | %FS/K            | ± 0.02 / ± 0.06                     | +25 °C...+85 °C (+77 °F...+185 °F)                                |           | Not compensated                            |
|                                   |                  | ± 0.05 / ± 0.15                     | -40°C...+25°C (-40 °F...+77°F) / +85°C...+135°C (+185°F...+275°F) |           |  |
| Thermal span shift                | %FS/K            | ± 0.005 / ± 0.02 <sup>5</sup>       | +25 °C...+85 °C (+77 °F...+185 °F)                                |           | Compensated                                |
|                                   |                  | ± 0.03 / ± 0.06                     | -40°C...+25°C (-40 °F...+77°F) / +85°C...+135°C (+185°F...+275°F) |           |  |
| Thermal span shift                | %FS/K            | Min.                                | Typ.  | Max.      | -40 °C...+135 °C (-40 °F... / ... +275 °F) |
|                                   |                  | -0.030                              | -0.016  | 0         |  |
| Reliability tests <sup>4</sup>    | -                | 1000 hours @85 °C (185 °F) & 85 %RH | 500 thermal shocks -40°C...+150 °C (-40 °F... +302 °F)            |           |  |
|                                   |                  | 1000 hours burn-in @150 °C (302 °F) | 10 million 0 bar to P <sub>nom</sub> pressure cycles              |           |  |

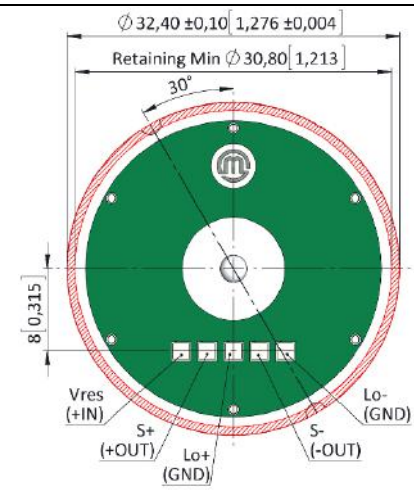
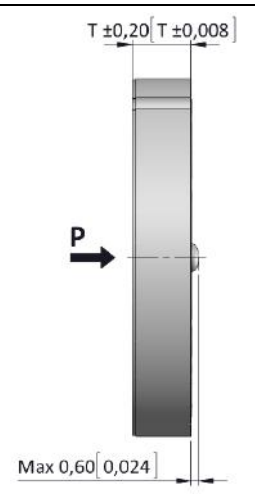
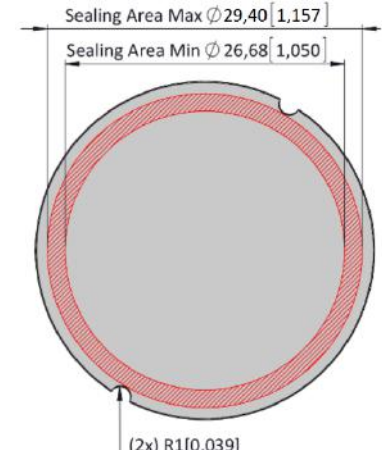
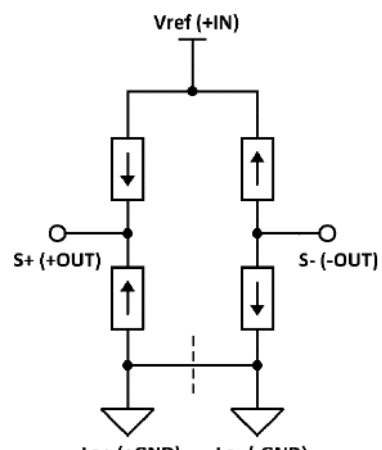
Tests performed at 25°C in Metallux housings, unless otherwise specified. Different housings may affect performances.

1. Psi values for reference only.
2. The sensitivity of each production batch is constant, within the indicated range and with minimal dispersion.
3. Accuracy =  $\sqrt{\text{NonLinearity}^2 + \text{Hysteresis}^2 + \text{NonRepeatability}^2}$ , terminal based.
4. All technical characteristics will remain within indicated ranges performing the above-mentioned reliability tests.
5. See Ordering Code for compensation level


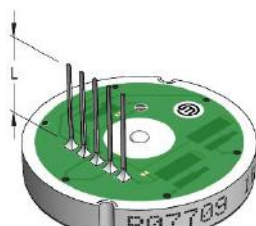
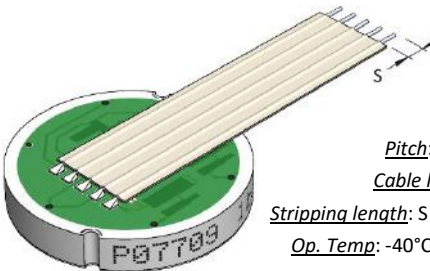
## Conversion tools



## Mechanical drawings and electrical schematics

|   |  |
|---|--|
| <p style="text-align: center;"><b>Top View</b></p>  <p style="text-align: center;"> <math>\varnothing 32,40 \pm 0,10</math> [<math>1,276 \pm 0,004</math>]<br/>       Retaining Min <math>\varnothing 30,80</math> [<math>1,213</math>]<br/> <math>30^\circ</math><br/> <math>8</math> [<math>0,315</math>]<br/>       Vres (+IN)<br/>       S+ (+OUT)<br/>       Lo+ (GND)<br/>       S- (-OUT)<br/>       Lo- (GND)<br/>       (5x) Pads <math>1,6 \times 1,6</math> [<math>0,063 \times 0,063</math>] Pitch=<math>2,54</math> [<math>0,1</math>]     </p> | <p style="text-align: center;"><b>Side View</b></p>  <p style="text-align: center;"> <math>T \pm 0,20</math> [<math>T \pm 0,008</math>]<br/>       P<br/>       Max <math>0,60</math> [<math>0,024</math>]<br/>       T = sensor total thickness (see pag.2)     </p> |
| <p style="text-align: center;"><b>Bottom View</b></p>  <p style="text-align: center;">       Sealing Area Max <math>\varnothing 29,40</math> [<math>1,157</math>]<br/>       Sealing Area Min <math>\varnothing 26,68</math> [<math>1,050</math>]<br/>       (2x) R1 [<math>0,039</math>]     </p>  | <p style="text-align: center;"><b>Schematics</b></p>  <p style="text-align: center;">       Vref (+IN)<br/>       S+ (+OUT)<br/>       S- (-OUT)<br/>       Lo+ (+GND)<br/>       Lo- (-GND)     </p>   |
| <p>All quotes are in mm [inch] – General tolerance ISO 2768-1 M</p>   |  |

## Electrical terminations

|   |   |
|---|---|
| <p><b>Example: type 03</b>, pre-tinned soldering pads</p>  <p style="text-align: right;">       Pitch: <math>2,54 \pm 0,05</math> [<math>0,1 \pm 0,002</math>]<br/>       Max. tin thickness: <math>0,3</math> [<math>0,01</math>]<br/>       Op. Temp: <math>-40^\circ\text{C} \dots +135^\circ\text{C}</math> (<math>-40^\circ\text{F} \dots 275^\circ\text{F}</math>)     </p>  | <p><b>Example: type 01</b>, 5 pins <math>L = 13,0 \pm 0,5</math> [<math>0,51 \pm 0,02</math>]</p>  <p style="text-align: right;">       Pitch: <math>2,54 \pm 0,05</math> [<math>0,1 \pm 0,002</math>]<br/>       Pin section: <math>0,51 \times 0,25</math> [<math>0,02 \times 0,01</math>]<br/>       Pin length: <math>L = 13,0 \pm 0,5</math> [<math>0,51 \pm 0,02</math>]<br/>       Op. Temp: <math>-40^\circ\text{C} \dots +135^\circ\text{C}</math> (<math>-40^\circ\text{F} \dots 275^\circ\text{F}</math>)     </p> |
| <p><b>Example: type 4</b> NOMEX™ cable</p>  <p style="text-align: right;">       Wire section: AWG24<br/>       Pitch: <math>2,54 \pm 0,05</math> [<math>0,1 \pm 0,002</math>]<br/>       Cable length: <math>50,8 \pm 2</math> [<math>2 \pm 0,08</math>]<br/>       Stripping length: <math>S = 3,2 \pm 0,7</math> [<math>0,13 \pm 0,028</math>]<br/>       Op. Temp: <math>-40^\circ\text{C} \dots +125^\circ\text{C}</math> (<math>-40^\circ\text{F} \dots 257^\circ\text{F}</math>)     </p> | <p><b>Other types available</b></p> <p><b>Type 02</b> : 4 pins <math>L = 13 \pm 0,5</math> (without LO (-))<br/> <b>Type 05</b> : PVC flat cable, 50.8 mm, Op. Temp: <math>-20^\circ\text{C} \dots +105^\circ\text{C}</math><br/> <b>Type 99</b> : customization on request</p>   |
| <p>All quotes are in mm [inch] – General tolerance ISO 2768-1 M</p>   |   |

## Ordering code

|  | ME509   | - | --- | - | - | --- | - |
|--|---|---|-----|---|---|-----|---|
| <b>Sensor type</b>                     | Absolute (only 1000 mbar version)                     | A |     |   |   |     |   |
|  | Gauge   | R |     |   |   |     |   |
| <b>Pressure range</b>                  | 0...200 mbar [0...3 psi]                              |   | 200 |   |   |     |   |
|  | 0...500 mbar [0...7 psi]                              |   | 500 |   |   |     |   |
|  | 0...1000 mbar [0...14 psi]                            |   | 101 |   |   |     |   |
|  | Others on request (please specify)                    |   | 999 |   |   |     |   |
| <b>Sensitivity adjustment</b>          | Without   |   |     | 0 |   |     |   |
|  | On request  |   |     | 9 |   |     |   |
| <b>Thermal offset shift adjustment</b> | ≤ ± 0.06 % FS/K (not thermally compensated)           |   |     |   | 0 |     |   |
|  | ≤ ± 0.04 % FS/K                                       |   |     |   | 1 |     |   |
|  | ≤ ± 0.02 % FS/K                                       |   |     |   | 2 |     |   |
|  | Others on request (please specify)                    |   |     |   | 9 |     |   |
| <b>Termination type</b>                | 5 pins 13 mm ± 0.5 mm, pitch 2.54 mm                  |   |     |   |   | 01  |   |
|  | 4 pins 13 mm (without LO (-)) ± 0.5 mm, pitch 2.54 mm |   |     |   |   | 02  |   |
|  | 5 pre-tinned soldering pads, pitch 2.54 mm            |   |     |   |   | 03  |   |
|  | NOMEX™ cable 50.8 mm – 5 wires, pitch 2.54 ± 0.5 mm   |   |     |   |   | 04  |   |
|  | PVC flat cable 50.8 mm – 5 wires, pitch 1.27 mm       |   |     |   |   | 05  |   |
|  | Others on request (please specify)                    |   |     |   |   | 99  |   |
| <b>Additional coating</b>              | Without   |   |     |   |   |     | 1 |
|  | Parylene coating                                      |   |     |   |   |     | 2 |
|  | Others on request (please specify)                    |   |     |   |   |     | 9 |



To be disposed of according to local regulations (OTRif 16 02 97 for Switzerland, CER 16 02 16 for European Union)