

MVD2555

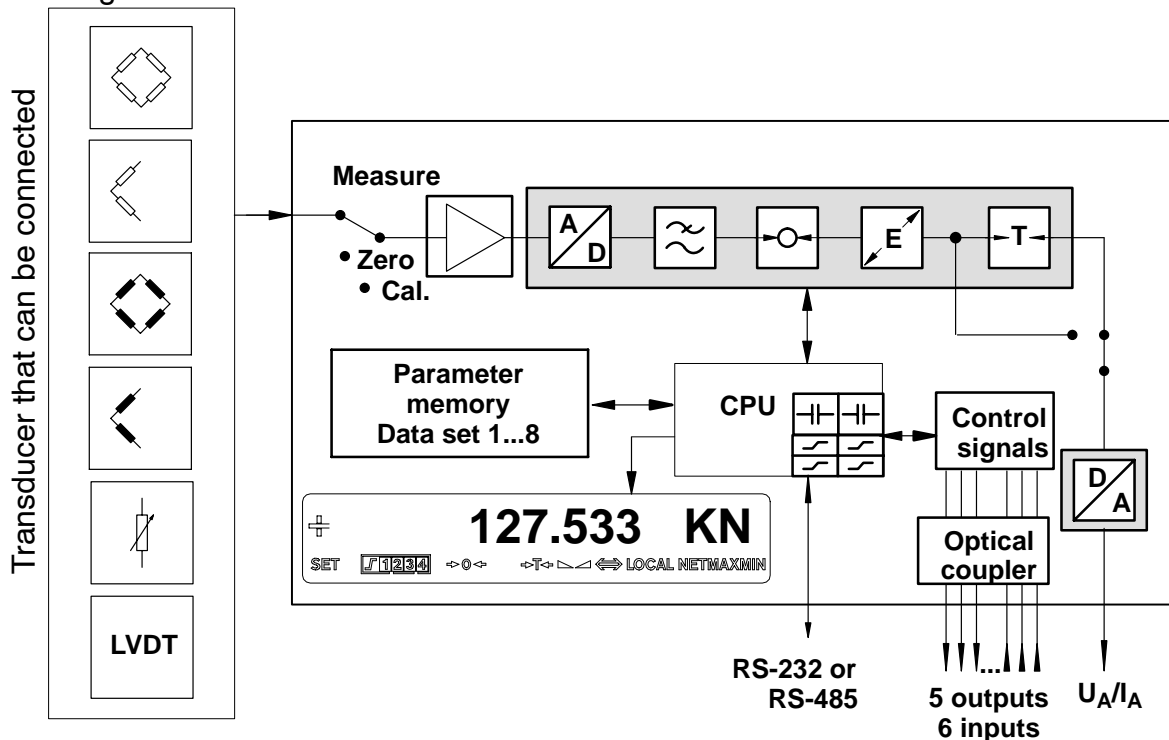
Measuring Amplifier for Panel Mounting



Special features

- For applications in process monitoring and industrial test bench engineering
- 4.8 kHz carrier frequency amplifier for strain-gauge half and full bridges, inductive half and full bridges, LVDTs, piezoresistive and potentiometric transducers,
- Complete control in operator dialogues over the LCD display
- Analog output (current / voltage)
- Four limit switches
- Peak value stores (min./max., peak-to-peak)

Block diagram



Specifications

| Type | | MVD2555 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-------------|--|---------------------|-----------------|----------------|------------------------|---------|------------|------------|-----------------|----------------|------------------------|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|----|----|----|-----|-----|-----|----|----|----|-----|----|---|----|-----|------|----|----|-----|---|-----|-----|----|----|-----|-----|-----|-----|----|----|---|------|-----|-----|----|-----|---|-----|-----|-----|-----|-----|---|-----|------|-----|-----|------|---|-----|------|------|------|------|---|------|-------|-------|------|------|---|
| Accuracy class | | 0.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mains connection/supply voltage | V | 115/230, +6 %; -10 %; | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Power consumption, max. | Hz | 48...60 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fusible link (slow-blow) | VA | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | mA | 200 (115 V) / 100 (230 V) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Amplifier | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carrier frequency | Hz | 4800 ± 0.32 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bridge excitation voltage U_B (± 5 %) | V_{rms} | 1 or 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measuring transducer | | $U_B = 1 V_{rms}$ | $U_B = 2.5 V_{rms}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Strain-gauge half and full bridge | Ω | 40...5000 | 80...5000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Inductive half and full bridge, LVDT | mH | 6...19 | 2.5...20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Perm. cable length between transducer and amplifier | m | max. 500 | | max. 500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measuring ranges, adjustable (-1 dB) | | 0.05...500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measuring range (Hardware) | | low | medium | high | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measuring ranges | $U_B=2.5 V$ | 0.2...4 | 2...40 | 20...400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $U_B=1 V$ | 0.5...10 | 5...100 | 50...1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bridge balance range | $U_B=2.5 V$ | ± 4 | ± 40 | ± 400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | $U_B=1 V$ | ± 10 | ± 100 | ± 1000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Noise voltage ¹⁾ | 0...200 Hz | 0.5 | 1 | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0...1.25 Hz | 0.025 | 0.1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Effect of a 10 K change of the ambient temperature ¹⁾ on the digital signal (with autocalibration on/off) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sensitivity | % | 0.04/0.1 | 0.04/0.1 | 0.04/0,1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Zero point | $\mu V/V$ | 0.2/2 | 2/20 | 20/200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measuring frequency range | | <table border="1"> <thead> <tr> <th>Nom. val. (Hz)</th> <th>fc (Hz)</th> <th>-1 dB (Hz)</th> <th>-3 dB (Hz)</th> <th>Phase del. (ms)</th> <th>Rise time (ms)</th> <th>Overshoot approx. 10 %</th> </tr> </thead> <tbody> <tr> <td>500</td> <td>485</td> <td>580</td> <td>1.1</td> <td>0.7</td> <td>12</td> </tr> <tr> <td>200</td> <td>245</td> <td>290</td> <td>1.7</td> <td>1.3</td> <td>11</td> </tr> <tr> <td>80</td> <td>78</td> <td>98</td> <td>4.3</td> <td>3.8</td> <td>10</td> </tr> <tr> <td>40</td> <td>38</td> <td>50</td> <td>7.1</td> <td>7.3</td> <td>8</td> </tr> <tr> <td>20</td> <td>19</td> <td>26</td> <td>12</td> <td>14</td> <td>7</td> </tr> <tr> <td>10</td> <td>9.1</td> <td>12.5</td> <td>22</td> <td>28</td> <td>6</td> </tr> <tr> <td>5</td> <td>4.6</td> <td>6.3</td> <td>41</td> <td>56</td> <td>5</td> </tr> </tbody> </table> | | | | Nom. val. (Hz) | fc (Hz) | -1 dB (Hz) | -3 dB (Hz) | Phase del. (ms) | Rise time (ms) | Overshoot approx. 10 % | 500 | 485 | 580 | 1.1 | 0.7 | 12 | 200 | 245 | 290 | 1.7 | 1.3 | 11 | 80 | 78 | 98 | 4.3 | 3.8 | 10 | 40 | 38 | 50 | 7.1 | 7.3 | 8 | 20 | 19 | 26 | 12 | 14 | 7 | 10 | 9.1 | 12.5 | 22 | 28 | 6 | 5 | 4.6 | 6.3 | 41 | 56 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nom. val. (Hz) | fc (Hz) | -1 dB (Hz) | -3 dB (Hz) | Phase del. (ms) | Rise time (ms) | Overshoot approx. 10 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 500 | 485 | 580 | 1.1 | 0.7 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 200 | 245 | 290 | 1.7 | 1.3 | 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 | 78 | 98 | 4.3 | 3.8 | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | 38 | 50 | 7.1 | 7.3 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 19 | 26 | 12 | 14 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 9.1 | 12.5 | 22 | 28 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 4.6 | 6.3 | 41 | 56 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Butterworth low pass | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bessel low pass | | <table border="1"> <thead> <tr> <th>Nom. val. (Hz)</th> <th>fc (Hz)</th> <th>-1 dB (Hz)</th> <th>-3 dB (Hz)</th> <th>Phase del. (ms)</th> <th>Rise time (ms)</th> <th>Overshoot approx. 10 %</th> </tr> </thead> <tbody> <tr> <td>400</td> <td>400</td> <td>750</td> <td>0.8</td> <td>0.6</td> <td>2</td> </tr> <tr> <td>200</td> <td>215</td> <td>395</td> <td>1.3</td> <td>1.0</td> <td>2</td> </tr> <tr> <td>100</td> <td>111</td> <td>190</td> <td>2.5</td> <td>2.1</td> <td>2.5</td> </tr> <tr> <td>40</td> <td>39</td> <td>68</td> <td>5</td> <td>5.5</td> <td>1.1</td> </tr> <tr> <td>20</td> <td>21</td> <td>37</td> <td>8.1</td> <td>10</td> <td>1</td> </tr> <tr> <td>10</td> <td>11</td> <td>19</td> <td>14</td> <td>19</td> <td>0.7</td> </tr> <tr> <td>5</td> <td>5.3</td> <td>9.7</td> <td>25</td> <td>38</td> <td>0.3</td> </tr> <tr> <td>2.5</td> <td>2.7</td> <td>4.9</td> <td>48</td> <td>75</td> <td>0</td> </tr> <tr> <td>1.25</td> <td>1.4</td> <td>2.4</td> <td>90</td> <td>150</td> <td>0</td> </tr> <tr> <td>0.5</td> <td>0.7</td> <td>1.2</td> <td>180</td> <td>300</td> <td>0</td> </tr> <tr> <td>0.2</td> <td>0.17</td> <td>0.3</td> <td>700</td> <td>1200</td> <td>0</td> </tr> <tr> <td>0.1</td> <td>0.09</td> <td>0.16</td> <td>1400</td> <td>2300</td> <td>0</td> </tr> <tr> <td>0.05</td> <td>0.044</td> <td>0.075</td> <td>2900</td> <td>4700</td> <td>0</td> </tr> </tbody> </table> | | | | Nom. val. (Hz) | fc (Hz) | -1 dB (Hz) | -3 dB (Hz) | Phase del. (ms) | Rise time (ms) | Overshoot approx. 10 % | 400 | 400 | 750 | 0.8 | 0.6 | 2 | 200 | 215 | 395 | 1.3 | 1.0 | 2 | 100 | 111 | 190 | 2.5 | 2.1 | 2.5 | 40 | 39 | 68 | 5 | 5.5 | 1.1 | 20 | 21 | 37 | 8.1 | 10 | 1 | 10 | 11 | 19 | 14 | 19 | 0.7 | 5 | 5.3 | 9.7 | 25 | 38 | 0.3 | 2.5 | 2.7 | 4.9 | 48 | 75 | 0 | 1.25 | 1.4 | 2.4 | 90 | 150 | 0 | 0.5 | 0.7 | 1.2 | 180 | 300 | 0 | 0.2 | 0.17 | 0.3 | 700 | 1200 | 0 | 0.1 | 0.09 | 0.16 | 1400 | 2300 | 0 | 0.05 | 0.044 | 0.075 | 2900 | 4700 | 0 |
| Nom. val. (Hz) | fc (Hz) | -1 dB (Hz) | -3 dB (Hz) | Phase del. (ms) | Rise time (ms) | Overshoot approx. 10 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 400 | 400 | 750 | 0.8 | 0.6 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 200 | 215 | 395 | 1.3 | 1.0 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 | 111 | 190 | 2.5 | 2.1 | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | 39 | 68 | 5 | 5.5 | 1.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 21 | 37 | 8.1 | 10 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 11 | 19 | 14 | 19 | 0.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 5.3 | 9.7 | 25 | 38 | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.5 | 2.7 | 4.9 | 48 | 75 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.25 | 1.4 | 2.4 | 90 | 150 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.5 | 0.7 | 1.2 | 180 | 300 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.2 | 0.17 | 0.3 | 700 | 1200 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.1 | 0.09 | 0.16 | 1400 | 2300 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.05 | 0.044 | 0.075 | 2900 | 4700 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max. permissible common-mode voltage | V | ± 5 V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Common-mode rejection | dB | typ. 110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max. differential voltage DC | V | ± 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Linearity deviation | % | typ. 0.05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Long term drift over 48 hours, measuring range 2 mV/V, 30 min. after power up (warm-up time) | $\mu V/V$ | with autocalibration on/off <0.2 / <0.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

¹⁾ for $U_B=2.5 V$, referred to input signal

Specifications (continued):

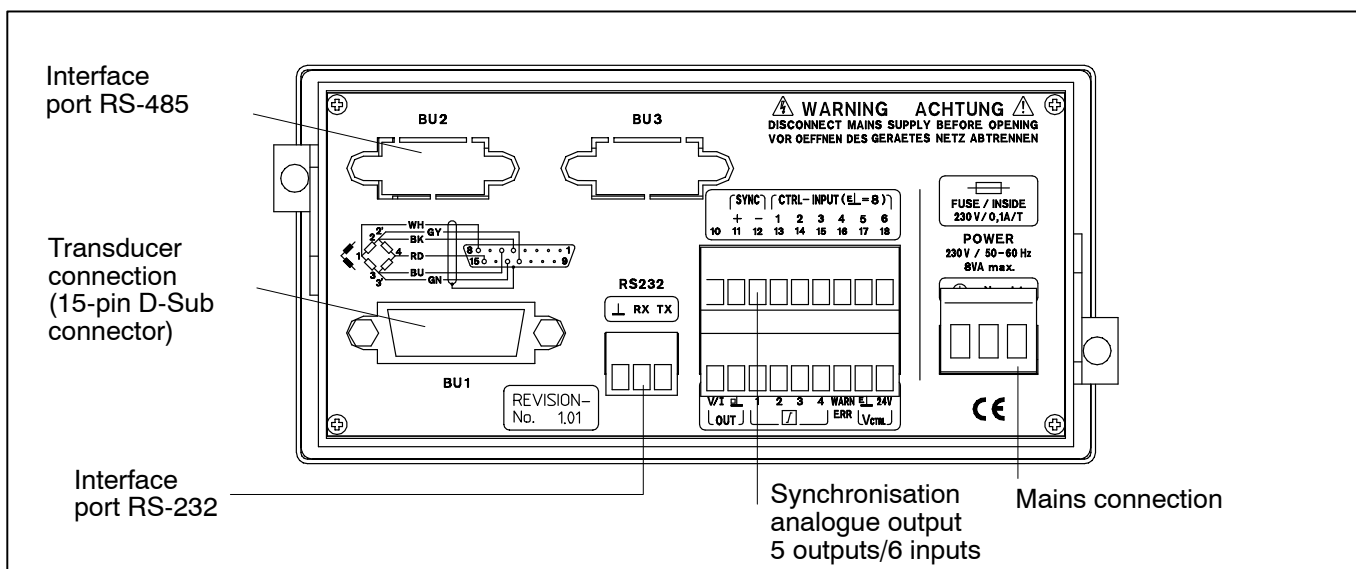
| | | |
|--|---|---|
| Analogue output Applied voltage Permissible load resistance, min. Internal resistance, max. Applied current Permissible load resistance, max. Internal resistance, min. The analogue output can show gross, net, positive and negative peaks and peak/peak values. | V kOhm Ohm mA Ohm kOhm | ± 10 V (asymmetric) 5 1.5 ± 20; 4...20 500 100 |
| Interference voltage at the output, typ. Residual carrier voltage 38.4 kHz Residual carrier voltage 4800 Hz Long-term drift (over 48 h) (30 minutes after switching on) Effect of 10 K change in ambient temperature (additional effect to digital value) Zero point Sensitivity | mV _{PP} mV _{PP} mV _{PP} mV mV % | 4 3 2 < 3 < 3 < 0.05 |
| Limit value switch Number Reference level Reference voltage (independently adjustable) Factory settings, hysteresis Adjustment accuracy Response time | V V V mV ms | 4 Gross, Net, Peak value -10 ... +10 0.1 0.33 0.83 (all Butterworth filter frequencies and Bessel filters >1.25 Hz. The values double each time for the next lower measurement frequency) |
| Peak value stores Number Function Update rate Clearing the peak value store Recording of the current value/peak value Time constant for envelopes | ms ms ms | 2 positive; negative; peak-to-peak 0.03 (with Butterworth filter and Bessel filter ≥ 100 Hz) 3.3 (control inputs) 3.3 (control inputs) 100 ... 60 000 (± 6 %) |
| Control outputs (limit value 1...4, Warning V_{CTRL}) Nominal voltage, external power supply Permissible supply voltage range Output current, max. Short-circuit current, typ. Short-circuit period Isolation voltage, typ. Control inputs Input voltage range, LOW Input voltage range, HIGH Input current, typ., HIGH level = 24 V | V V A A V _{rms} V V mA | 24 11...30 0.5 0.8 unlimited 350 0...5 10...24 12 |

Specifications (continued):

| | | |
|---|---|---|
| Serial Interface RS-232 (MVD2555) Measuring rate, ASCII output binary output Number of data bits Baud rate Parity Stop-Bit Serial Interface RS-485, Four-wire (MVD2555-RS485) Device-address | Meas./s Meas./s Bit Baud | approx. 10 approx. 50 8 300, 600, 1200, 2400, 4800, 9600 ¹⁾ odd, even ¹⁾ no 1 ¹⁾ ; 2 0...31, set via keypad or from computer |
| Parameter store (EEPROM) | | 8 (data set 1 ... 8) |
| Display Number of digits Digit height Type Keyboard Dialogue languages standard on request | mm | ± 10 (16 digit, plus various special characters) 12.5 LCD (inverted with LED back lighting) Foil keyboard with 7 key elements layed on the circuit board German/English English/French English/Spanish English/Italian |
| Effect of the operating voltage in the case of changes within the stated range, rel. to full -scale Zero point Sensitivity Nominal temperature range Service temperature range Storage temperature range Protection, to IEC60 529 Protection class Dimensions, over all (w x h x d) Front panel Front panel cut-out (to DIN 43 700) Weight, app. | % % °C [°F] °C [°F] °C [°F] | 0.01 0.01 -20...+45 [-4...113] -20...+45 [-4...113] -20...+70 [-4...158] IP40 (whole instrument) IP51 (front, foil keyboard) I 153 x 72 x 212 (220) 144 x 72 138 x 68 1 |

1) Setup

Back of the device and dimensions



Modifications reserved.

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