Digital panel instruments type MD.241 are designed to measure, display, and monitor either DC and AC currents (MDA241), DC and AC voltages (MDV241), or temperature (MDC241) in industrial applications. The instruments are panel mounted with a front frame dimension of 96 x 24 mm and a mounting depth of 89 mm, and are available with 3 1/2 digit 7-segment LED display covering various measuring ranges. The supply voltage range of DC 12 V...26 V, physically isolated from the measuring circuit, allows a wide spread of applications.

### Measuring Ranges

#### DC Current

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution</th>
<th>Input resistance</th>
<th>Overload protection continuous</th>
<th>Pin designation Lo - Hi</th>
</tr>
</thead>
<tbody>
<tr>
<td>±2 mA</td>
<td>1 µA</td>
<td>100 Ω</td>
<td>50 mA</td>
<td>100 mA</td>
</tr>
<tr>
<td>±20 mA</td>
<td>10 µA</td>
<td>10 Ω</td>
<td>160 mA</td>
<td>300 mA</td>
</tr>
<tr>
<td>±200 mA</td>
<td>0.1 mA</td>
<td>1 Ω</td>
<td>600 mA</td>
<td>1.5 A</td>
</tr>
<tr>
<td>±2 A</td>
<td>1 mA</td>
<td>0.1 Ω</td>
<td>3 Ω</td>
<td>5 A</td>
</tr>
</tbody>
</table>

#### AC Current, frequency range 15 Hz...1 kHz

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution</th>
<th>Input resistance</th>
<th>Overload protection continuous</th>
<th>Pin designation Lo - Hi</th>
</tr>
</thead>
<tbody>
<tr>
<td>±2 mA</td>
<td>1 µA</td>
<td>100 Ω</td>
<td>50 mA</td>
<td>100 mA</td>
</tr>
<tr>
<td>±20 mA</td>
<td>10 µA</td>
<td>10 Ω</td>
<td>160 mA</td>
<td>300 mA</td>
</tr>
<tr>
<td>±200 mA</td>
<td>0.1 mA</td>
<td>1 Ω</td>
<td>600 mA</td>
<td>1.5 A</td>
</tr>
<tr>
<td>±2 A</td>
<td>1 mA</td>
<td>0.1 Ω</td>
<td>3 Ω</td>
<td>5 A</td>
</tr>
</tbody>
</table>

#### DC Voltage

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution</th>
<th>Input resistance</th>
<th>Overload protection continuous</th>
<th>Pin designation Lo - Hi</th>
</tr>
</thead>
<tbody>
<tr>
<td>±200 mV</td>
<td>0.1 mV</td>
<td>≥10 MΩ</td>
<td>150 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±2 V</td>
<td>1 mV</td>
<td>≥10 MΩ</td>
<td>500 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±20 V</td>
<td>10 mV</td>
<td>10 MΩ</td>
<td>1000 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±200 V</td>
<td>0.1 V</td>
<td>10 MΩ</td>
<td>1000 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±600 V</td>
<td>1 V</td>
<td>10 MΩ</td>
<td>1000 V</td>
<td>3 - 1</td>
</tr>
</tbody>
</table>

#### AC Voltage, frequency range 15 Hz...1 kHz

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution</th>
<th>Input resistance</th>
<th>Overload protection continuous</th>
<th>Pin designation Lo - Hi</th>
</tr>
</thead>
<tbody>
<tr>
<td>±200 mV</td>
<td>0.1 mV</td>
<td>≥10 MΩ</td>
<td>150 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±2 V</td>
<td>1 mV</td>
<td>≥10 MΩ</td>
<td>500 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±20 V</td>
<td>10 mV</td>
<td>10 MΩ</td>
<td>1000 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±200 V</td>
<td>0.1 V</td>
<td>10 MΩ</td>
<td>1000 V</td>
<td>3 - 1</td>
</tr>
<tr>
<td>±600 V</td>
<td>1 V</td>
<td>10 MΩ</td>
<td>1000 V</td>
<td>3 - 1</td>
</tr>
</tbody>
</table>

#### Temperature

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Measuring range</th>
<th>Resolution in °C</th>
<th>Pin designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt100 (IEC751)</td>
<td>0...+300 °C</td>
<td>1</td>
<td>1 - 2</td>
</tr>
<tr>
<td>Pt100 (IEC751)</td>
<td>+250...+800 °C</td>
<td>1</td>
<td>1 - 2</td>
</tr>
<tr>
<td>Pt100 (IEC751)</td>
<td>-200...+200 °C</td>
<td>1</td>
<td>1 - 2</td>
</tr>
<tr>
<td>Pt100 (IEC751)</td>
<td>-100.0...+100.0 °C</td>
<td>0.1</td>
<td>1 - 2</td>
</tr>
</tbody>
</table>

### Technical Data

#### Display

Red 7-segment LED display
3 1/2 digit, 13 mm high
Full scale range: 1999 digits
Over-range indication: The last 3 digits will extinguish

#### Reading characteristics

Integrating dual-slope
Count rate: 2.5 readings/second
Setting time for a 100 % reading change: < 3 s

#### Accuracy of display (at 23 °C)

- Current/Voltage DC version: ≤ 0.1 % span ± 1 digit
- Current/Voltage AC version: ≤ 0.2 % span ± 1 digit
- Temperature 0.1 K resolution: ≤ 0.1 % span ± 1 digit
- Temperature 1 K resolution: ≤ 0.3 % span ± 1 digit

#### Input

- General (MD.241): Physically isolated from mains
  - Common mode range: input circuit against main circuit ± 600V
  - Common mode rejection: ≥ 60dB
- Temperature instrument MDC241: Pt100 connected in 2-conductor circuit. Line resistance may be corrected between 0...10 Ω by means of the potentiometer accessible from the front.
- Sensor current: approx. 1 mA
- Overload protection: 25 V

#### Environmental requirements

- Temperature drift: ≤ 0.1 % span/10 K
- Warm-up to full accuracy: 15 minutes
- Operating temperature range: 0...+50 °C
- Storage temperature range: -20...+70 °C
- Relative humidity: 0...75 % annual average, 95 % max.
  (without condensation)

#### Voltage supply (voltage rating):

DC 12 V...26 V physically isolated from the measuring input.
Max. allowed residual ripple 10 %, but not less than the minimum voltage or more than the maximum voltage.
Power consumption: ≤ 3 W
## Ordering information

### Type No.

<table>
<thead>
<tr>
<th></th>
<th>Physical dimension</th>
<th>A: Current</th>
<th>V: Voltage</th>
<th>C: Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Case

- Type No. 241: 96 mm x 24 mm

### Display

- Version: D: DC, A: AC
- W: resistance temperature detector (RTD)

### Measuring range

- 11: 2 mA/200 mV
- 12: 20 mA/2 V
- 13: 200 mA/20 V
- 14: 2 A/200 V
- 15: 600 V

### Power supply (rated voltage)

- D1: DC 12 V…26 V physically isolated

### Special marking

- (see below for standard markings)*)

### Special calibration

- **) Specify when ordering.

### Standard markings:

- V, mV, kV, MV, A, mA, kA, kW, MW, °C, %, % r.F., ms, Stück, Ohm, pH, µs, l, N, kN, kg, t, lbf, N, mm, m, km, inch, bar, mbar, Pa, psi, kg/cm², mmWs, mWs, N/mm², Hz, kHz, U/min, min⁻¹, rpm, l/h, l/min, kg/h, m³/h, m/min, m/sec, t/h.

### Power supply (rated voltage)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>DC 12 V...26 V physically isolated</td>
</tr>
</tbody>
</table>

### Ordering example

MD V 241 - A 3 13 D1 ...

* Clearly add desired marking.
** Specify when ordering.

---

## Case

### Display:

- Digital instrument 96 mm x 24 mm (3.78 in. x 0.945 in.)
- 3 1/2 digit

### Function:

- Current
- Voltage
- Temperature

### Input:

- DC
- AC
- PT100

### Measuring range:

- 2 mA
- 20 mA
- 200 mA
- 2 A
- 2 V
- 20 V
- 200 V
- 600 V
- 0...+300 °C
- +250...+800 °C
- -200...+200 °C
- 100...+100 °C

### Power supply: (rated voltage)

- 12 V...26 V physically isolated

### Front glass marking:

- OEM branding

---

**Caution:**

If several instruments are to be fitted, a minimum of 8 mm (5/16 in) between each cut-out must be provided for correct removal of front glass (Fig. 4).

- Degree of protection: glass-fibre reinforced black Noryl SE 1
- Applicable specification: VDE 0411 part 100
- Pollution degree: 3 to IEC 664 and 664 A
- Instrument mass: approx. 150 g

---

**Terminations**

Plug-in screw-terminal strip for max. 1.5 mm² /AWG 16 cables.

**Connector pin assignment**

---

---

**Fig. 1** Side view
---

**Fig. 2** Front view
---

**Fig. 3** Rear view
---

**Fig. 4** Panel cut-out

---

This is a metric design and millimeter dimensions take precedence. All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.
# Description

Digital panel instruments type MD.241 are designed to measure, display, and monitor either pressure (MDR241) or process variables (MDK241) in industrial applications.

The instruments are panel mounted with a front frame dimension of 96 mm x 24 mm and a mounting depth of 89 mm, and are available with 3 1/2 digit 7-segment LED display covering various measuring ranges.

The supply voltage range of DC 12 V...26 V, physically isolated from the measuring circuit, allows a wide spread of applications.

Initial value, full scale range and decimal point may be set by internal jumpers and adjusted by means of the potentiometer accessible from the front.

The pressure measuring instrument MDR241 provides DC 24 V/20 mA to supply a transmitter.

## Measuring Ranges: Process Variables

<table>
<thead>
<tr>
<th>DC Current</th>
<th>Measuring input</th>
<th>Input resistance</th>
<th>Overload protection</th>
<th>Pin designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0...±20 mA</td>
<td>100 Ω</td>
<td>± 50 mA</td>
<td>± 100 mA</td>
<td>1 - 2</td>
</tr>
<tr>
<td>4...±20 mA</td>
<td>100 Ω</td>
<td>± 50 mA</td>
<td>± 100 mA</td>
<td>1 - 2</td>
</tr>
</tbody>
</table>

## Measuring Ranges: Pressure

<table>
<thead>
<tr>
<th>Input</th>
<th>Measuring range</th>
<th>Input resistance</th>
<th>Overload protection</th>
<th>Pin designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>0...±5 V</td>
<td>0.5 MΩ</td>
<td>± 100 V</td>
<td>1 - 2</td>
</tr>
<tr>
<td>Voltage</td>
<td>0...±10 V</td>
<td>1 MΩ</td>
<td>± 100 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>Current</td>
<td>0...±20 mA</td>
<td>100 Ω</td>
<td>± 50 mA</td>
<td>± 100 mA</td>
</tr>
<tr>
<td>Current</td>
<td>4...±20 mA</td>
<td>100 Ω</td>
<td>± 50 mA</td>
<td>± 100 mA</td>
</tr>
</tbody>
</table>

Full scale range: 0...2000 digits
(optionally indicating either in the positive or negative direction)
Initial value: -1170...+1170
User selectable decimal point.
Please specify physical unit when ordering.

## Technical data

### Display

- Red 7-segment LED display, 13 mm high
- 3 1/2 digit
- Over-range indication: The last 3 digits will extinguish

### Reading characteristics

- Integrating dual-slope

### Accuracy of display (at 23°C)

Versions MDK/MDR:

- ≤ 0.1% span ±1 digit
- (span = full measuring range)

### Input

- MDK/MDR: Physically isolated from mains
- Common mode range:
  - input circuit against main circuit: ± 300 V
  - common mode rejection: ≥ 80 dB

### Output

- Pressure instrument MDR241: auxiliary voltage output to supply an electronic transmitter
  - Voltage: DC 24 V ± 15%
  - Current: ≤ 25 mA max.
  - Residual ripple: ≤ 0.5%
  - Pins: 5 (+) and 6 (-)
  - Voltage output physically isolated from measuring input and mains.

### Environmental requirements

- Temperature drift: ≤ 0.1 % span/10 K
- Warm-up to full accuracy: ≤ 15 minutes
- Operating temperature range: 0...+50°C
- Storage temperature range: -20...+70°C
- Relative humidity: 0...75 % annual average, 95 % max. (without condensation)

### Voltage supply (voltage rating):

- DC 12 V...26 V physically isolated from the measuring input.
- Max. allowed residual ripple 10 %, but not less than the minimum voltage or more than the maximum voltage.
- Power consumption:
  - MDK ≤ 3 W
  - MDR ≤ 4 W

---

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Digital Panel Instruments MDK241 / MDR241

Ordering information

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Physical dimension</th>
<th>Standard signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>241</td>
<td>96 mm x 24 mm</td>
<td></td>
</tr>
</tbody>
</table>

**Inputs**
- User selectable standard signals 0...20 mA, 4...20 mA, 0...5 V, or 0...10 V

**Display**
- 3 1/2 digit
- Display range: initial value
- 0...-1170...+1170 digits (user selectable)
- X...Decimal point (user selectable)

**Full scale range**
- 0...20000 digits (user selectable)
- X...Decimal point (user selectable)
- Voltage supply (voltage rating)
- **Voltage supply (voltage rating)**
- K...DC 12...26 V
- D1...DC 12...26 V with physical isolation

**Case**
- Factory pre-set
- K...marking (unit)
- F...OEM branding

MD K 241 - X 3 0 X X D1... ordering example

*) Clearly add desired specification.

**Terminations**
- Plug-in screw-terminal strip for max. 1.5 mm²/AWG 16 cables.

**Connector pin assignment**

**MDK241**
- Signal inputs current DC 0/4...20mA voltage DC 5 V
- Signal inputs voltage DC 10 V

**MDR241**
- Signal inputs current DC 0/4...20mA voltage DC 5 V
- Signal inputs voltage DC 10 V

*) Standard markings:
- V, mV, kV, mA, A, mA, kA, kW, MW, °F, °C, %, % r.F., ms, Stück, Ohm, pH, µs, l, N, Kn, kg, t, lbF Ncm, Nm, m, cm, mm, km, inch, bar, mbar, Pa, hPa, psi, kg/cm², mmWs, mWs, N/m², N/mm², Hz, kHz, U/min, min⁻¹, sec⁻¹, rpm, l/h, l/min, kg/h, m³/h, m/min, m/sec, l/h
- All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.

Caution:
- If several instruments are to be fitted, a minimum of 8 mm (5/16 in) between each cut-out must be provided for correct removal of front glass. (Fig. 4)
- Glass fibre reinforced black Noryl SE1
- Degree of protection: IP50 (front), IP20 (rear)
- Pollution degree: 3 to IEC 664 and 664 A
- Instrument mass: approx. 150 g

Marking (unit)
- F...OEM branding

Standard markings:
- V, mV, kV, mA, A, mA, kA, kW, MW, °F, °C, %, % r.F., ms, Stück, Ohm, pH, µs, l, N, Kn, kg, t, lbF

This is a metric design and millimeter dimensions take precedence mm inch.
### Description

Digital Panel instruments MD.245 are designed to measure and display either DC currents (MDA245), DC voltages (MDV245), or temperature (MDC245). The low supply current requirement (≤ 80 mA) and the large voltage supply ranges permit a wide variety of uses. The full-scale reading of the standard signal instruments is user-adjustable within a range of approximately 500 digits (e.g., between 1000 and 1500), and jumpers for decimal point setting are provided on the display PCB. The instruments are panel mounted with a front frame dimension of 48 mm x 24 mm.

### Measuring ranges

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>DC current</th>
<th>DC voltage</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measuring range</td>
<td>Resolution</td>
<td>Input resistance</td>
</tr>
<tr>
<td>DC current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0...±20 mA</td>
<td>10 µA</td>
<td>10 Ω</td>
</tr>
<tr>
<td></td>
<td>4...20 mA</td>
<td>8 µA</td>
<td>10 Ω</td>
</tr>
<tr>
<td>DC voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring range</td>
<td>0...± 5 V</td>
<td>2.5 mV</td>
<td>&gt;1 MΩ</td>
</tr>
<tr>
<td></td>
<td>0...±10 V</td>
<td>5 mV</td>
<td>&gt;1 MΩ</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor</td>
<td>Temperature sensor KTY-16-6</td>
<td>-30...+100 °C</td>
<td>1 °C</td>
</tr>
</tbody>
</table>

### Technical data

#### Display

Red 7-segment LED display

- 3 1/2 digit (MDA, MDV), or 2 1/2 digit (MDC), 10 mm high
- Automatic mains value indication prefix “-”
- Over-range indication: The last three digits are extinguished.

#### Accuracy of display (at 23°C)

- Current/voltage measuring instrument: ≤ 0.1% span ±1 digit
- Temperature measuring instrument: ≤ 0.8% span
  (span = full measuring range)

#### Reading characteristics

- Integrating dual-slope
- Count rate: 2.5 readings/second
- Auto zero before each conversion.

#### Environmental requirements

- Temperature drift: ≤ 0.01% span/K
- Warm-up to full accuracy: ≤ 15 minutes
- Operating temperature range: 0...+50 °C
- Storage temperature range: -20...+70°C
- Relative humidity: 0...75% annual average, 95% max.
  (without condensation)
- Application class: KWF to DIN 40040
- Instrument mass: approx. 75 g

#### Voltage supply ranges:

- DC 4 V - 7 V
- DC 7 V - 16 V
- DC 16 V - 28 V (standard)

- not physically isolated from measuring input.
- Maximum allowed residual ripple 10 %, but not less than the minimum voltage or more than the maximum voltage.
- Current consumption: ≤ 80 mA
- The instruments are reverse polarity protected.
- Max. wire size (max. wire dia. 1.4 mm):
  - 1.0 mm²/AWG18 stranded wire
  - 1.5 mm²/AWG16 single conductor (solid)
Ordering information for Panel Instruments MDA/MDV 245

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Physical dimensions</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 245</td>
<td>48 mm x 24 mm</td>
<td></td>
</tr>
<tr>
<td>D 245</td>
<td>54 mm x 24 mm</td>
<td></td>
</tr>
<tr>
<td>H21</td>
<td>48 mm x 24 mm</td>
<td></td>
</tr>
</tbody>
</table>

**Case**

- Fig. 1: Side view
- Fig. 2: Front view
- Fig. 3: Rear view
- Fig. 4: Panel cut-out

**Connector pin assignment /Potentiometer setting**

<table>
<thead>
<tr>
<th>Connector pin assignment</th>
<th>Potentiometer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>electrical contact</td>
<td>electrical contact</td>
</tr>
</tbody>
</table>

**Current/voltage instrument**

- Power
- Input

**Decimal point setting**

- Jumper sockets for decimal point setting
- Offset correction

**Temperature instrument**

- Power
- Sensor

**Ordering reference:** MSC KTY-16-6

**Technical data:**

- Sensor: KTY-16-6
- Temperature range: -30...+100°C
- Resistance: 2000 Ω ± 1 % with 25°C
- Operating current: ≤ 0.5 mA
- Temperature coefficient: 0.75 %/K
- Potted into nickel plated brass housing with insulated leadwire connections.

**Case material:**

- Glass fibre reinforced black Noryl GFN SE1

**Degree of protection:**

- IP50 (front)
- IP20 (rear)

---

* Set the final value within the range shown in parenthesis by means of the potentiometer.

** Specify when ordering.

---

This is a metric design and millimeter dimensions take precedence.

---

*Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com*
### Measuring ranges

#### Current

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution with 3 1/2 digits</th>
<th>Input resistance</th>
<th>Overload protection (cont.) max. 3 s</th>
<th>Pin designation input decimal pt. bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 mA</td>
<td>µA</td>
<td>100 Ω</td>
<td>50 mA</td>
<td>100 mA</td>
</tr>
<tr>
<td>20 mA</td>
<td>µA</td>
<td>10 Ω</td>
<td>160 mA</td>
<td>300 mA</td>
</tr>
<tr>
<td>200 mA</td>
<td>0.1 mA</td>
<td>1 Ω</td>
<td>600 mA</td>
<td>1.5 A</td>
</tr>
<tr>
<td>2 A</td>
<td>1 mA</td>
<td>0.1 Ω</td>
<td>3 A</td>
<td>5 A</td>
</tr>
<tr>
<td>10 A</td>
<td>10 mA</td>
<td>0.01 Ω</td>
<td>10 A</td>
<td>12 A</td>
</tr>
</tbody>
</table>

#### DC, triple/double measuring range

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution with 3 1/2 digits</th>
<th>Input resistance</th>
<th>Overload protection (max. 3 sec)</th>
<th>Pin designation input decimal pt. bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 mA</td>
<td>µA</td>
<td>100 Ω</td>
<td>50 mA</td>
<td>100 mA</td>
</tr>
<tr>
<td>20 mA</td>
<td>µA</td>
<td>10 Ω</td>
<td>160 mA</td>
<td>300 mA</td>
</tr>
<tr>
<td>200 mA</td>
<td>0.1 mA</td>
<td>1 Ω</td>
<td>600 mA</td>
<td>1.5 A</td>
</tr>
<tr>
<td>2 A</td>
<td>1 mA</td>
<td>0.1 Ω</td>
<td>3 A</td>
<td>5 A</td>
</tr>
<tr>
<td>10 A</td>
<td>10 mA</td>
<td>0.01 Ω</td>
<td>10 A</td>
<td>12 A</td>
</tr>
</tbody>
</table>

#### AC, individual measuring range

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution with 3 1/2 digits</th>
<th>Input resistance</th>
<th>Overload protection (max. 3 sec)</th>
<th>Pin designation input decimal pt. bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 mA</td>
<td>µA</td>
<td>100 Ω</td>
<td>50 mA</td>
<td>100 mA</td>
</tr>
<tr>
<td>20 mA</td>
<td>µA</td>
<td>10 Ω</td>
<td>160 mA</td>
<td>300 mA</td>
</tr>
<tr>
<td>200 mA</td>
<td>0.1 mA</td>
<td>1 Ω</td>
<td>600 mA</td>
<td>1.5 A</td>
</tr>
<tr>
<td>2 A</td>
<td>1 mA</td>
<td>0.1 Ω</td>
<td>3 A</td>
<td>5 A</td>
</tr>
<tr>
<td>10 A</td>
<td>10 mA</td>
<td>0.01 Ω</td>
<td>10 A</td>
<td>12 A</td>
</tr>
</tbody>
</table>

#### Voltage

#### DC, individual measuring range

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution with 3 1/2 digits</th>
<th>Input resistance</th>
<th>Overload protection continuously</th>
<th>Pin designation input decimal pt. bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>0.1 mV</td>
<td>1 MΩ</td>
<td>150 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>2 V</td>
<td>1 mV</td>
<td>4 MΩ</td>
<td>500 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>20 V</td>
<td>0.1 mV</td>
<td>10 MΩ</td>
<td>700 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>200 V</td>
<td>0.1 mV</td>
<td>20 MΩ</td>
<td>700 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>600 V</td>
<td>1 V</td>
<td>20 MΩ</td>
<td>1000 V</td>
<td>1 - 3</td>
</tr>
</tbody>
</table>

#### DC, double measuring range

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution with 3 1/2 digits</th>
<th>Input resistance</th>
<th>Overload protection continuously</th>
<th>Pin designation input decimal pt. bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>0.1 mV</td>
<td>440 kΩ</td>
<td>150 V</td>
<td>2 - 5</td>
</tr>
<tr>
<td>2000 mV</td>
<td>1 mV</td>
<td>4 MΩ</td>
<td>500 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>20 V</td>
<td>10 mV</td>
<td>1.8 MΩ</td>
<td>700 V</td>
<td>2 - 5</td>
</tr>
<tr>
<td>200 V</td>
<td>0.1 mV</td>
<td>18 MΩ</td>
<td>700 V</td>
<td>2 - 5</td>
</tr>
<tr>
<td>600 V</td>
<td>1 V</td>
<td>20 MΩ</td>
<td>1000 V</td>
<td>2 - 5</td>
</tr>
</tbody>
</table>

#### AC, individual measuring range

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Resolution with 3 1/2 digits</th>
<th>Input resistance</th>
<th>Overload protection continuously</th>
<th>Pin designation input decimal pt. bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 mV</td>
<td>0.1 mV</td>
<td>&gt;10 MΩ</td>
<td>150 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>2 V</td>
<td>1 mV</td>
<td>&gt;10 MΩ</td>
<td>350 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>20 V</td>
<td>10 mV</td>
<td>2 MΩ</td>
<td>350 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>200 V</td>
<td>0.1 mV</td>
<td>10 MΩ</td>
<td>700 V</td>
<td>1 - 3</td>
</tr>
<tr>
<td>600 V</td>
<td>1 V</td>
<td>10 MΩ</td>
<td>1000 V</td>
<td>1 - 3</td>
</tr>
</tbody>
</table>

### Technical data

- **Display:** Red 7-segment LED display 3 1/2
- 13 mm high
- Full scale range: 1999 digits
- Over-range indication: The last 3 digits will extinguish
- With DC measuring ranges: display test by means of a front button and Hold signal via terminal strip on the rear.

**Accuracy of display (at 23 °C)**

- Individual measuring range: 0.1 % dA ± 1 digit
- Multiple measuring range: 0.15 % dA ± 1 digit
- Current / Voltage, DC version:
  - Individual measuring range: 0.2 % dA ± 1 digit
  - dA = of reading
  - The accuracy given refers to the indicated value.
  - DC input: Potenzial free differential input
  - Common-mode range ± 1 V
  - Common-mode rejection > 60 dB
  - AC input:
    - Input related to instrument mass (Lo = 0 V)
- Reading characteristics: Integrating dual-slope
- Count rate: 2.5 readings/second
- Setting time for a 100 % reading change: < 3sec
- Frequency range:
  - With AC version: 15 Hz...1 kHz
  - Temperature drift: ≤ 0.01 % span/K with 3 1/2 digit display
  - Warm-up to full accuracy: 15 min
- Operating temperature range: 0...+50 °C
- Storage temperature range: -20...+70 °C
- Application class: KWF to DIN 40 040
- Relative humidity: 0...75 % annual average, 95 % max.
  - (without condensation)
- Shock test:
  - 10 g (1 ms), to IEC 68-2-29/DIN 40 046, part 26
  - 3 x shocks in 3 planes
- Vibration test:
  - on duty: 2 g (0.15 mm), 10...55 Hz
  - on transport: 5 g (0.35 mm) 10...150 Hz
  - to IEC 68-2-6/DIN 40 046

**Technical data**

- Voltage supply (voltage rating):
  - AC 230 V (standard) ±10 % 48...62 Hz
  - AC 240 V, 120 V, 115 V ±10 % 48...62 Hz (optional)
  - AC 48 V, 24 V ±10 % 48...62 Hz
  - DC 12 V...28 V (physically isolated)
- Maximum allowed residual ripple 10 %, but not less than the minimum voltage or more than the maximum voltage.
- Power consumption: ≤ 9 VA/6.5 W

---

**Description**

These digital measuring instruments are designed to measure, display and monitor either DC and AC currents (MDA480), or DC and AC voltages (MDV480) in industrial applications.

The instruments are panel mounted with a front frame dimension of 96 mm x 48 mm and a mounting depth of 166 mm and are available with 3 1/2 or 4 1/2 digit 7-segment LED display covering various measuring ranges.

Different supply voltages can be provided for a wide spread of applications. Options include analogue, or relay output with 2 setpoints. These features also add to the application possibilities offered by these compact instruments.

**Technical data**

- Display: Red 7-segment LED display 3 1/2
- 13 mm high
- Full scale range: 1999 digits
- Over-range indication: The last 3 digits will extinguish
- With DC measuring ranges: display test by means of a front button and Hold signal via terminal strip on the rear.

**Accuracy of display (at 23 °C)**

- Individual measuring range: 0.1 % dA ± 1 digit
- Multiple measuring range: 0.15 % dA ± 1 digit
- Current / Voltage, DC version:
  - Individual measuring range: 0.2 % dA ± 1 digit
  - dA = of reading
  - The accuracy given refers to the indicated value.
  - DC input: Potenzial free differential input
  - Common-mode range ± 1 V
  - Common-mode rejection > 60 dB
  - AC input:
    - Input related to instrument mass (Lo = 0 V)

- Reading characteristics: Integrating dual-slope
- Count rate: 2.5 readings/second
- Setting time for a 100 % reading change: < 3sec
- Frequency range:
  - With AC version: 15 Hz...1 kHz
  - Temperature drift: ≤ 0.01 % span/K with 3 1/2 digit display
  - Warm-up to full accuracy: 15 min

**Operating temperature**

- Range: 0...+50 °C
- Storage temperature range: -20...+70 °C

**Application class:** KWF to DIN 40 040

**Relative humidity:**

- 0...75 % annual average, 95 % max.
  - (without condensation)

**Shock test:**

- 10 g (1 ms), to IEC 68-2-29/DIN 40 046, part 26
- 3 x shocks in 3 planes

**Vibration test:**

- on duty: 2 g (0.15 mm), 10...55 Hz
- on transport: 5 g (0.35 mm) 10...150 Hz
- to IEC 68-2-6/DIN 40 046

**Technical data**

- Voltage supply (voltage rating):
  - AC 230 V (standard) ±10 % 48...62 Hz
  - AC 240 V, 120 V, 115 V ±10 % 48...62 Hz (optional)
  - AC 48 V, 24 V ±10 % 48...62 Hz
  - DC 12 V...28 V (physically isolated)
- Maximum allowed residual ripple 10 %, but not less than the minimum voltage or more than the maximum voltage.
- Power consumption: ≤ 9 VA/6.5 W
### Case

- **Fig. 1** Side view
- **Fig. 2** Front view
- **Fig. 3** Rear view
- **Fig. 4** Panel cut-out

### Connector pin assignment

**Current measuring instrument**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Lo</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
<th>Lo2</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>N</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>N</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>N</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>+</td>
<td>+</td>
<td>N</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>N</td>
<td>-</td>
<td>+</td>
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<td>+</td>
<td>+</td>
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<td>-</td>
</tr>
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<td>+</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>+</td>
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</tr>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Voltage measuring instrument**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Lo</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
<th>Lo2</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>N</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
<td>N</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>N</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>+</td>
<td>+</td>
<td>N</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>N</td>
<td>-</td>
<td>+</td>
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<td>+</td>
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<td>N</td>
<td>-</td>
<td>+</td>
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<td>+</td>
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<td>-</td>
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<td>+</td>
<td>+</td>
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<td>+</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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</tr>
<tr>
<td>10</td>
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<td>+</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Rated voltage**

- AC: 6.54 V
- DC: 5.71 V

**Bridges for:**

- Hold decimal point

---

**Caution:**

If several instruments are to be fitted, a minimum of 8 mm between each cut-out must be provided for correct removal of front glass. (Fig. 4)

**Case material:**

- Glass-fibre reinforced black Noryl SE 1

**Degree of protection:**

- IP20 (front), with external setpoint setting
- IP50 (front), with internal setpoint setting
  (only with DC measurement)
- IP20 (rear)

**Applicable specification:**

- VDE 0411 part 100
- Pollution degree 3 to IEC 664 and 664 A

**Instrument mass (without options):**

- Approx. 500 g

---

**Terminations**

Plug-in screw-terminal strip for max. 1.5 mm² cables.
Analogue output (AA and AB options)

Description
Each of the DC current or voltage measuring instruments accepts a current and a voltage analogue output. The voltage output is a differential output which depends on the negative supply voltage; the current output is ground-related. There is no physical isolation between the analogue outputs and the measuring input.

Technical data
- Current output:
  - Output current: 0...20 mA corresponding to a 0...100 % measuring range or 4...20 mA corresponding to a 0...100 % measuring range.
  - Load resistance: \( R_L \leq 300 \, \Omega \)
- Voltage output:
  - Output voltage: 0...10 V corresponding to a 0...100 % measuring range.
  - Load resistance: \( R_L \geq 10 \, k\Omega \)
- Overload protection: continuous short-circuit or no load

Caution!
Do not electrically connect the inputs and outputs simultaneously when several instruments with analogue outputs are connected, as this will cause ground loops short-circuiting the internal supply across the analogue outputs. Otherwise provide additional interface couplers with physical isolation at the outputs.

Terminations:
12-pole plug-in screw-terminal strip for max. 1.5 mm\(^2\) cables

Connector pin assignment

<table>
<thead>
<tr>
<th>voltage output</th>
<th>current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>( U_+ )</td>
<td>( I_+ )</td>
</tr>
<tr>
<td>( U_- )</td>
<td>( I_- )</td>
</tr>
<tr>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td>34</td>
<td>33</td>
</tr>
<tr>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>28</td>
<td>27</td>
</tr>
<tr>
<td>26</td>
<td>25</td>
</tr>
</tbody>
</table>

Rear view of analogue output option:

```
<table>
<thead>
<tr>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>30</th>
<th>31</th>
<th>32</th>
<th>33</th>
<th>34</th>
<th>35</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>23</td>
<td>22</td>
<td>21</td>
<td>20</td>
<td>19</td>
<td>18</td>
<td>17</td>
<td>16</td>
<td>15</td>
<td>14</td>
<td>13</td>
</tr>
</tbody>
</table>
```

Setpoints

Description
The instruments may be fitted with setpoints. The setpoints are with output relays to provide physical isolation. The response threshold may be set with a potentiometer after removing the front glass. Fade-in reading of the set values with a selector switch accessible from the front.

2 Setpoints (option G1)

Setting the setpoints (after removal of front glass)

```
<table>
<thead>
<tr>
<th>Switch position</th>
<th>Readout</th>
</tr>
</thead>
<tbody>
<tr>
<td>max</td>
<td>measuring value</td>
</tr>
<tr>
<td>or 8</td>
<td>min</td>
</tr>
<tr>
<td>1 or 9</td>
<td>max</td>
</tr>
<tr>
<td>3 or B</td>
<td>overflow</td>
</tr>
<tr>
<td>All other switch positions</td>
<td></td>
</tr>
</tbody>
</table>
```

Setting accuracy: \( \leq 0.2 \% \) span \( \pm 1 \) digit
Hysteresis: \( \leq 0.5 \% \) span \( \pm 1 \) digit
Response: ca. 0.5 s

Switching performance (here “relay de-energized” = self-protection)

```
<table>
<thead>
<tr>
<th>“min”</th>
<th>relay OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>max</td>
<td>relay ON</td>
</tr>
</tbody>
</table>
```

Alarm min: min
Acceptable range: max
Alarm max: measured value

All relay switching conditions are inverted with “relay de-energized”. Three LEDs indicate the switching position of the setpoints:

- Lighted: above max. limit (max) (red LED)
- Lighted: “acceptable range” (green LED)
- Lighted: below min limit (min) (red LED)

Connector pin assignment: 2 setpoints

```
<table>
<thead>
<tr>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
</tr>
</thead>
</table>
```

Output:
- Switching capacity:
  - max: 2-way contact 250 V/ 3 A/660 VA/100 W
  - min: 2-way contact 250 V/ 3 A/660 VA/100 W

Terminations:
12-pole plug-in screw-terminal strip for max. 1.5 mm\(^2\) cables.
2 Setpoints + Analogue output

2 setpoints + analogue output 0...20 mA
2 setpoints + analogue output 4...20 mA
2 setpoints + analogue output 0...10 V
See page 15 for setpoint description

Analogue output:
The voltage or current analogue output is designed as a differential output which depends on the internal negative supply voltage; the current output is ground-related.
There is no physical isolation between the analogue output and the measuring input.

Current output:
Output current 0...20 mA corresponding to a 0...100 % measuring range
or
4...20 mA corresponding to a 0...100 % measuring range
Load resistance $R_L \leq 300 \Omega$

Voltage output:
Output voltage 0...10 V corresponding to a 0...100 % measuring range
Load resistance: $R_L \geq 10 \, k\Omega$

Overload protection: continuous short-circuit or no-load

Caution!
Do not electrically connect the inputs and outputs simultaneously when several instruments with analogue outputs are connected, as this will cause ground loops short-circuiting the internal supply across the analogue outputs. Otherwise provide additional interface couplers with physical isolation at the outputs.

Terminations:
12-pole plug-in screw-terminal strip for max. 1.5 mm² cables.

Connector pin assignment

Contact position shown in the "acceptable range" condition with version "relay de-energized".

Rear view: 2 setpoints and analogue output

terminals for signal outputs, supply voltage
Selector chart

Please select the required type by following the chart below.

MDA480
Digital measuring instrument current
96 mm x 48 mm
(3.78 in. x 1.89 in.)

Version:
DC

Display:
3 1/2 digit

Measuring range:
- Individual measuring ranges:
  - 0...1.999 mA
  - 0...19.99 mA
  - 0...199.9 mA
  - 0...1.999 A
- Special measuring range:

MDV480
Digital measuring instrument voltage
96 mm x 48 mm
(3.78 in. x 1.89 in.)

Version:
AC sinusoidal

Display:
3 1/2 digit

Measuring range:
- Individual measuring ranges:
  - 0...1.999 mV
  - 0...19.99 mV
  - 0...199.9 mV
  - 0...1.999 V
- Special measuring range:

Options:

Power supply:
- AC: 240 V, 230 V
  - 120 V, 115 V
  - 48 V, 24 V
- DC: 12 V...28 V

Example: MDA480-D 3 22 A9 G1 N
Current measuring instrument 96 x 48 mm /3.78 in. x 1.89 in., DC 3 1/2 digit, double measuring range 2 A + 10 A, AC 230 V supply, with E-T-A’ trademark, 2 setpoints, internal setting, IP50, relay de-energized
## Digital Panel Instruments MDA480 / MDV480

**Ordering information**

Please check that combining the options is possible (see Selector Chart on the previous page).

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Physical dimensions</th>
<th>Voltage</th>
<th>Measuring range</th>
<th>Power supply (rated voltage)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>current</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>480</td>
<td>96 mm x 48 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>3 1/2 digit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>2 mA/200 mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>20 mA/2 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>13</td>
<td>200 mA/20 V</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td>2 A/200 V</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>10 A/600 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>21</td>
<td>2 mA + 20 mA + 200 mA/200 mV + 2000 mV</td>
<td>multiple measuring range, with DC input signals only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>22</td>
<td>2 A + 10 A</td>
<td>20 V + 200 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>00</td>
<td>special measuring range*)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Power supply (rated voltage)**

- A1: 240 V AC
- A3: 120 V AC
- A6: 48 V AC
- A7: 24 V AC
- A8: 115 V AC
- A9: 230 V AC (standard)
- D8: 12...28 V DC

**Options (with DC instruments only)**

- AA: analogue output: 0...20 mA + 0...10 V
- AB: analogue output: 4...20 mA + 0...10 V
- G1: 2 setpoints, internal setting, IP50
- G6: 2 setpoints, internal setting, IP65 + analogue output 0...20 mA
- G7: 2 setpoints, internal setting, IP50 + analogue output 0...10 V
- G9: 2 setpoints, internal setting, IP50 + analogue output 4...20 mA

**Special markings:**

- K: special marking (see below for standard markings)
- special marking as required by customer
- special calibration
- special calibration
- special marking as required by customer
- special marking as required by customer

**Special marking:**

- V, mV, kV, A, mA, kA, kW, 1°F, °C, %, % r.f., ms, Stück, Ohm, pH, μs, l, N, kN, kg, t, lbf, Ncm, Nm, mm, km, inch, bar, mbar, Pa, hPa, psi, kg/cm², mmWs, mWs, N/m², N/mm², Hz, kHz, U/min, min⁻¹, sec⁻¹, rpm, l/h, U/min, kg/h, m³/h, m³/min, m/sec, l/h

*) Clearly add desired specifications.

Standard markings:

- general: V, mV, kV, A, mA, kA, kW, °F, °C, %, % r.f., lbf, Ncm, Nm, mm, km, inch, bar, mbar, Pa, hPa, psi, kg/cm², mmWs, mWs, N/m², N/mm², Hz, kHz, U/min, min⁻¹, sec⁻¹, rpm, l/h, U/min, kg/h, m³/h, m³/min, m/sec, l/h

All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.
Adjustable Digital Process Instrument MDK480

Description

The adjustable Digital Process Instrument MDK480 is designed to measure and display process variables in industrial applications. The instrument is panel mounted with front frame dimensions of 96 mm x 48 mm and a mounting depth of 166 mm. It is available with a 3 1/2 digit 7-segment LED display.

Input signal and display range as well as decimal points may be easily set by means of internal jumpers. Fine adjustment is possible by means of the potentiometer accessible from the front.

Different supply voltages can be provided for a wide spread of applications. The instrument is also available with optional analogue output, or with 2 setpoints with output relays. A Hold input is included as standard.

Measuring range/Input signals

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Input resistance</th>
<th>Overload protection</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/10 V</td>
<td>20 MΩ</td>
<td>500 V</td>
<td>-</td>
</tr>
<tr>
<td>10 V</td>
<td>20 MΩ</td>
<td>500 V</td>
<td>-</td>
</tr>
<tr>
<td>20 mA</td>
<td>10 Ω</td>
<td>160 mA</td>
<td>-</td>
</tr>
</tbody>
</table>

Full scale range: 200...3000 Digits (= Endwert-Anfangswert)
Initial value: -1000...+1000
User selectable decimal point.
Specify measuring unit when ordering.

Technical data

Accuracy of display (at 23 °C)
0.1 % of reading ± 1 digit
Input: potential free differential input
common mode range ± 1 V
common mode rejection > 60 dB

Display
Red 7-segment LED display,
3 1/2 digit, 13 mm high
Full scale range: ± 1999 Digits
Overload indication: The last 3 digits will extinguish
Hold signal via terminal strip on the rear

Reading characteristics
Integrating dual slope
Count rate: 2.5 readings/s
Setting time for a 100 % reading change: < 3 s

Environmental requirements
Temperature drift: ≤ 0.01 % span/K
Warm-up to full accuracy: ≤ 15 minutes
Operating temperature range: 0...+50 °C
Storage temperature range: -20...+70 °C
Application class: KWF to DIN 40 040
Relative humidity: 0...75 % annual average, 95 % max.
(without condensation)
Shock test: 10 g (11 ms), to IEC 68-2-29/
DIN 40 046, part 26
3 shocks in 3 planes
Vibration test: on duty: 2 g (0.15 mm), 10...55 Hz
(on transport: 5 g (0.35 mm), 10...150 Hz
to IEC 68-2-6/DIN 40 046, page 8

Voltage supply (voltage rating):
AC 230 V ±10 % 48...62 Hz
other voltages: AC 240 V, 120 V, 115 V ±10 % 48...62 Hz
(optional) AC 48 V, 24 V, ±10 % 48...62 Hz
DC 12 V...28 V* physically isolated
Max. allowed residual ripple 10 %, but not less than the minimum voltage or more than the maximum voltage.

Power consumption: ≤ 9 VA/6.5 W
Connector pin assignment

Electrical connections for standard signals

Current

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>5 V</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>20 mA</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Hold bridge</td>
</tr>
</tbody>
</table>

Voltage

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>10 V</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>0.5 V</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
</tr>
</tbody>
</table>

Case

Fig. 1 Side view

Fig. 2 Front view

Fig. 3 Rear view

Fig. 4 Panel cut-out

This is a metric design and millimeter dimensions take precedence (mm) over inch (in).

Caution:
If several instruments are to be fitted, a minimum of 8 mm between each cut-out must be provided for correct removal of front glass (fig. 4).

Case material: black Noryl SE 1, glass-fibre reinforced
Degree of protection: IP 50 (front), IP 20 (rear)
Applicable specification: VDE 0411 part 100
Pollution degree 3 to IEC 664 and 664 A
Mass: approx. 500 g (without option)

Terminations

Plug-in screw-terminal strip for max. 1.5 mm² cables.
**Analogue output (AA and AB options)**

**Description**
The instrument accepts a current and a voltage analogue output. The voltage output is a differential output which depends on the negative supply voltage; the current output is ground-related. There is no physical isolation between the analogue outputs and the measuring input.

**Technical data**
- **Current output:**
  - Output current: 0...20 mA corresponding to a 0...100 % measuring range
  - Load resistance: $R_L \leq 300 \, \Omega$
- **Voltage output:**
  - Output voltage: 0...10 V corresponding to 0...100 % measuring range
  - Load resistance: $R_L \geq 10 \, k\Omega$
- **Overload protection:** continuous short-circuit or no load

**Caution!**
Do not electrically connect the inputs and outputs simultaneously when several instruments with analogue outputs are connected, as this will cause ground loops short-circuiting the internal supply across the analogue outputs. Otherwise provide additional interface couplers with physical isolation at the outputs.

**Terminations:**
12 pole plug-in screw-terminal strip for max. 1.5 mm² cables

---

**Connector pin assignment**

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>U₁, U₂</td>
<td>I₁, I₂</td>
</tr>
<tr>
<td>36</td>
<td>35, 34, 33</td>
</tr>
<tr>
<td>32</td>
<td>31, 29, 28</td>
</tr>
<tr>
<td>27</td>
<td>26, 25</td>
</tr>
</tbody>
</table>

Rear view with analogue output option:

**Setpoints**

**Description**
The instrument may be fitted with setpoints. The setpoints are output relays to provide physical isolation. The response threshold may be set with a potentiometer after removing the front glass. Fade-in reading of the set values with a selector switch accessible from the front.

**2 Setpoints (option G1)**

**Setting the setpoints (after removal of front glass)**

```
<table>
<thead>
<tr>
<th>Switch position</th>
<th>Readout</th>
</tr>
</thead>
<tbody>
<tr>
<td>min</td>
<td>measuring value</td>
</tr>
<tr>
<td>max</td>
<td>overflow</td>
</tr>
</tbody>
</table>
```

**Setting accuracy:** $\pm 0.2 \%$ span + 1 digit

**Accuracy of response:** $\pm 0.5 \%$ span + 1 digit

**Response:** ca. 0.5 s

**Switching performance** (here “relay de-energized” = self-protection)

```
| “min” relay OFF | ON         |
| “max” relay ON  | OFF        |
```

All relay switching conditions are inverted with “relay de-energized”.

**Three LEDs indicate the switching position of the setpoints:**

- Lighted: above max. limit (max) (red LED)
- Lighted: “acceptable range” (green LED)
- Lighted: below min limit (min) (red LED)

**Connector pin assignment: 2 setpoints**

<table>
<thead>
<tr>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>14</td>
<td>13</td>
</tr>
</tbody>
</table>

Contact position shown in the “acceptable range” condition with version “relay de-energized”.

**Outputs:**
- Switching capacity
  - max: 2-way contact 250 V/ 3 A/660 VA/100 W
  - min: 2-way contact 250 V/ 3 A/660 VA/100 W

**Terminations:**
12 pole plug-in screw-terminal strip for max. 1.5 mm² cables.
### 2 Setpoints + Analogue output

- 2 setpoints + analogue output 0...20 mA
- 2 setpoints + analogue output 4...20 mA
- 2 setpoints + analogue output 0...10 V

See page 27 for setpoint description.

**Analogue output:**
The voltage or current analogue output is designed as a differential output which depends on the internal negative supply voltage; the current output is ground related.

There is no physical isolation between the analogue output and the measuring input.

**Current output:**
- Output current 0...20 mA corresponding to a 0...100 % measuring range
- Or 4...20 mA corresponding to a 0...100 % measuring range
- Load resistance $R_L \leq 300 \, \Omega$

**Voltage output:**
- Output voltage 0...10 V corresponding to a 0...100 % measuring range
- Load resistance: $R_L \geq 10 \, k\Omega$

**Overload protection:** continuous short-circuit or no-load

**Caution!**
Do not electrically connect the inputs and outputs simultaneously when several instruments with analogue outputs are connected, as this will cause ground loops short-circuiting the internal supply across the analogue outputs. Otherwise provide additional interface couplers with physical isolation at the outputs.

**Terminations:**
- 12 pole plug-in screw-terminal strip for max. 1.5 mm² cables.

### Connector pin assignment:

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_1$</td>
<td>$I_1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$U_2$</td>
<td>$I_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contact position shown in the “acceptable range” condition with version “relay de-energized.”

**Rear view:** 2 setpoints and analogue output

- Analogue output terminals
- Setpoint terminals
- Terminals for signal outputs, supply voltage
Adjustable Digital Process Instrument MDK480

Selector chart

Please select the required type by following the chart below.

Function:
Housing:
Display:

Measuring range (adjustable):
- Initial value: 0 to 10,000
- Full scale range: 200 to 3000

Decimal point (adjustable):

Power supply:
- AC: 240 V, 230 V
- DC: 12 V to 28 V

Options:
- Analogue output: 0 to 10 V, 4 to 20 mA
- 2 setpoints
- Relay de-energized
- Relay energized

Example: MDK480-X 3 D X A9 G9 N
Digital measuring instrument 96 x 48 mm / 3.78 in. x 1.89 in., 3 1/2 digit, for standard signals 0...5/10 V; 0/4...20 mA, user selectable initial value, full scale range and decimal point, AC 230 V supply, E-T-A trademark, 2 setpoints, internal setting, IP50, relay de-energized, analogue output 0...20 mA, marking m3/h.
# Ordering information

Please check that combining the options is possible (see Selector Chart on the previous page).

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Physical dimension</th>
<th>K standard signal</th>
<th>Case</th>
<th>96 mm x 48 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
<td>X standard signal 0...5 V, 0...10 V, 0...20 mA, 4...20 mA (to be set by user)</td>
</tr>
<tr>
<td>Display</td>
<td></td>
<td></td>
<td></td>
<td>3 1/2 digit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Initial value of display</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Full scale range</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Decimal point</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Voltage supply (voltage rating)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A1 240 V AC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A6 48 V AC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A8 115 V AC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D8 12...28 V DC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>K factory pre-set*)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>special marking as requested by customer*)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F OEM branding *)</td>
</tr>
<tr>
<td>Options</td>
<td></td>
<td></td>
<td></td>
<td>AA analogue output: 0...20 mA + 0...10 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A8 analogue output: 4...20 mA + 0...10 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>G1 2 setpoints, internal setting, IP50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>G6 2 setpoints, internal setting, IP50 + analogue output 0...20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>G7 2 setpoints, internal setting, IP50 + analogue output 0...10 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>G9 2 setpoints, internal setting, IP50 + analogue output 4...20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N Relay de-energized, standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I Relay energized</td>
</tr>
</tbody>
</table>

MD K 480 - X 3 0 X X A9 . . G9 N ordering example

*) Clearly add desired specifications

**Standard markings:**
- V, mV, kV, MV, A, mA, kA, kW, MW, °F, °C, %, % r.F., ms, Stück, Ohm, pH, µs, l, N, kN, kg, t, lbf, Ncm, Nm, m, cm, mm, kn, inch, bar, mbar, Pa, hPa, psi, kg/cm², mmWs, mWs, N/m², N/mm², Hz, kHz, U/min, min⁻¹, sec⁻¹, rpm, l/h, l/min, kg/h, m³/h, m³/min, m³/sec, t/h

All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.
Description

The digital panel instrument MDR480 is designed to measure, display, and monitor pressures in industrial applications. The instrument is panel mounted with a front frame dimension of 96 mm x 48 mm and a mounting depth of 166 mm. It is available with a 3 1/2 digit 7-Segment LED display covering various measuring ranges.

An auxiliary voltage output of 24 V/25 mA, physically isolated from the measuring input, is provided to supply a pressure transmitter. The resistance bridges (sensors) may be directly fed by applying a constant voltage (U_ref) of 10 V or a constant current (I_const) of 1 mA. The input range for standard signals and the display range (initial value, full scale range and decimal point) may be selected by internal jumpers and adjusted by means of the potentiometer accessible from the front. Different supply voltages allow a wide spread of applications. The instrument is also available with optional analogue output, or with two setpoints with output relays. A Hold input is included as standard.

Measuring ranges

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Input resistance</th>
<th>Overload protection</th>
<th>Pin designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard signal from pressure transmitters 0...5/10 V or 0/4...20 mA</td>
<td>20 MΩ</td>
<td>500 V</td>
<td>1 - 2</td>
</tr>
<tr>
<td>5/10 V</td>
<td>10 Ω</td>
<td>160 mA</td>
<td>3 - 4</td>
</tr>
<tr>
<td>20 mA</td>
<td>880 kΩ</td>
<td>150 V</td>
<td>1 - 2</td>
</tr>
<tr>
<td>Pressure sensors (strain gauge sensors/solid-state sensors)</td>
<td>20 mV...200 mV*</td>
<td>880 kΩ</td>
<td></td>
</tr>
</tbody>
</table>

*The measuring range is a function of the sensor sensitivity (in mV/V). Please specify this value when ordering.

Standard display ranges for pressure (in bar):

| 0...250 | 0...1000 | 200...1000 |
| 0...400 | 0...1600 | 300...1500 |
| 0...600 | 0...1999 |

and decimal multiples (set decimal points as required)

Adjustable display:

- Full scale range: 200...3000 digits (= final value - initial value)
- Initial value: -1000...+1000
- Decimal point: selectable

Please specify measuring unit when ordering.

Technical data

Accuracy of display (at 23 °C) 0.1 % of reading ± 1 digit

<table>
<thead>
<tr>
<th>Input</th>
<th>Potential-free differential input</th>
<th>± 1 V</th>
</tr>
</thead>
</table>
|     | Common-mode range | ± 1 V
|     | Common-mode rejection > 60 dB |

Display:

- Red 7-segment LED display
- 3 1/2 digit
- 13 mm high

Full scale range: ± 1999 digits

Over-range indication: The last 3 digits will extinguish

Hold signal via terminal strip on the rear

Reading characteristics: Integrating dual-slope

Count rate: 2.5 readings/s

Setting time for a 100 % reading change: < 3 s

Sensor supply voltage

Output physically isolated from the signal input and voltage supply.

Overload protection: short-circuit proof

Auxiliary voltage supply for the electronic transmitter (standard):

- Voltage: DC 24 V ± 10 %
- Current: 25 mA
- Residual ripple: ≤ 0.5 %
- Terminals: S(-) and G(+)

Connection of resistance bridges (strain gauge sensors, piezoresistive sensors, etc.):

- Constant voltage: U_ref = 10 V
- Bridge resistance: ≥ 330 Ω
- or
- Constant current: I_const = 1 mA

Environmental requirements

- Temperature drift: ≤ 0.01 % span/K (span = full measuring range)
- Warm-up to full accuracy: ≤ 15 min.
- Operating temperature range: 0...+50 °C
- Storage temperature range: -20...+70 °C
- Applications class: KWF to DIN 40 040
- Relative humidity: 0...75 % annual average, 95 % max. (without condensation)
- Shock test: 10 g (11 ms), to IEC 68-2-29/DIN 40 046 part 26, 3 x shocks in 3 planes
- Vibration test: on duty: 2 g (0.15 mm), 10...55 Hz on transport: 5 g (0.35 mm), 10...150 Hz to IEC 68-2-6/DIN 40 046, page 8

Voltage supply (voltage rating):

- AC 230 V ±10 % 48...62 Hz
- other voltages: AC 240 V, 120 V, 115 V ±10 % 48...62 Hz (optional)
- AC 48 V, 24 V ±10 % 48...62 Hz
- DC 12 V...28 V (physically isolated)

Max. allowed residual ripple 10 %, but not less than the minimum voltage or more than the maximum voltage.

Power consumption: ≤ 8 VA/6.5 W
**Connector pin assignment**

Connection of pressure transmitters

- **2 conductor circuit, current: 4 … 20 mA**

- **3 conductor circuit, voltage: 0/1 … 5 V or 0/2 … 10 V**

- **3 conductor circuit, current: 0 … 20 mA or 4 … 20 mA**

- **4 conductor circuit, voltage: 0/1 … 5 V or 0/2 … 10 V**

- **4 conductor circuit, current: 0 … 20 mA or 4 … 20 mA**

**Connection of resistance bridges**

- **Inputs**
- **Outputs**
- **Rated voltage**
- **Case**

**Case material:** glass-fibre reinforced black Noryl SE 1

**Degree of protection:** IP 50 (front), IP 20 (rear)

**Applicable specification:** VDE 0411 part 100

**Pollution degree:** 3 to IEC 664 and 664 A

**Mass:** approx. 500 g (without option)

**Terminations**

Plug-in screw-terminal strip for max. 1.5 mm² cables.

Caution:

If several instruments are to be fitted, a minimum of 8 mm between each cut-out must be provided for correct removal of front glass (fig. 4).

- **Supply input signal**
- **Pressure transmitter**

This is a metric design and millimeter dimensions take precedence (mm).
Description
The pressure measuring instrument accepts a current and a voltage analogue output. The voltage output is a differential output which depends on the negative supply voltage; the current output is ground-related. There is no physical isolation between the analogue outputs and the measuring input.

Technical data
Current output:
- Output current: 0...20 mA corresponding to a 0...100 % measuring range
- Load resistance: $R_L \leq 300 \Omega$

Voltage output:
- Output voltage: 0...10 V corresponding to a 0...100 % measuring range
- Load resistance: $R_L \geq 10 \text{k}\Omega$

Overload protection: continuous short-circuit or no load

Caution!
Do not electrically connect the inputs and outputs simultaneously when several instruments with analogue outputs are connected, as this will cause ground loops short-circuiting the internal supply across the analogue outputs. Otherwise provide additional interface couplers with physical isolation at the outputs.

Terminations:
12-pole plug-in screw-terminal strip for max. 1.5 mm² cables

Connector pin assignment

<table>
<thead>
<tr>
<th>voltage output</th>
<th>current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_+ \quad U_- \quad I_+ \quad I_-$</td>
<td>36 35 34 33 32 31 30 29 28 27 26 25</td>
</tr>
</tbody>
</table>

Rear view with analogue output option:

analogue output terminals

terminals for signal outputs, supply voltage

Setpoints
Description
The instrument may be fitted with setpoints. The setpoints are with output relays to provide physical isolation. The response threshold may be set with a potentiometer after removing the front glass. Fade-in reading of the set values with a selector switch accessible from the front.

Setting the setpoints (after removal of front glass)

<table>
<thead>
<tr>
<th>Switch position</th>
<th>Readout</th>
</tr>
</thead>
<tbody>
<tr>
<td>or B 1 or 9 3 or B All other switch positions</td>
<td></td>
</tr>
</tbody>
</table>

Setting accuracy: = accuracy of readout
Accuracy of response: $\leq 0.2 \% \text{ span} \pm 1 \text{ digit}$
Hysteresis: $\leq 0.5 \% \text{ span} \pm 1 \text{ digit}$
Response: ca. 0.5 s

Switching performance (here "relay de-energized" = self-protection)

alarm min acceptable range alarm max

All relay switching conditions are inverted with "relay de-energized".

Three LEDs indicate the switching position of the setpoints:

- lighted: above max. limit (max) (red LED)
- lighted: "acceptable range" (green LED)
- lighted: below min limit (min) (red LED)

Connector pin assignment: 2 setpoints

<table>
<thead>
<tr>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 23 22 21 20 19 18 17 16 15 14 13</td>
<td></td>
</tr>
</tbody>
</table>

Contact position shown in the "acceptable range" condition with version "relay de-energized".

Outputs:
Switching capacity
max: 2-way contact 250 V/3 A/660 VA/100 W
min: 2-way contact 250 V/3 A/660 VA/100 W

Terminations:
12-pole plug-in screw-terminal strip for max. 1.5 mm² cables
2 Setpoints + Analogue output

2 setpoints + analogue output 0...20 mA
2 setpoints + analogue output 4...20 mA
2 setpoints + analogue output 0...10 V
See page 21 for setpoint description

Analogue output:
The voltage or current analogue output is designed as a differential output which depends on the internal negative supply voltage; the current output is ground related.
There is no physical isolation between the analogue output and the measuring input.

Current output:
Output current 0...20 mA corresponding to a 0...100 % measuring range
or 4...20 mA corresponding to a 0...100 % measuring range
Load resistance \( R_L \leq 300 \, \Omega \)

Voltage output:
Output voltage 0...10 V corresponding to a 0...100 % measuring range
Load resistance: \( R_L \geq 10 \, k\Omega \)

Overload protection: continuous short-circuit or no-load

Caution!
Do not electrically connect the inputs and outputs simultaneously when several instruments with analogue outputs are connected, as this will cause ground loops short-circuiting the internal supply across the analogue outputs. Otherwise provide additional interface couplers with physical isolation at the outputs.

Terminations:
12-pole plug-in screw-terminal strip for max. 1.5 mm² cables.

Connector pin assignment:

![Connector pin assignment diagram]

Contact position shown in the “acceptable range” condition with version “relay de-energized”.

Rear view: 2 setpoints and analogue output

analogue output
terminals

setpoint
terminals

terminals for signal outputs, supply voltage
Digital Pressure Measuring Instrument MDR480

Selector chart

Please select the required type by following the chart below.

**Function:**
- MDR480
- Digital measuring instrument
- Pressure

**Housing:**
- 96 mm x 48 mm (3.78 in. x 1.89 in.)
- 3 1/2 digits

**Input:**
- Standard input:
  - 0...5 V
  - 0...10 V
  - 1...5 V
  - 2...10 V

**Measuring range:**
- 0...250 bar
- 0...400 mbar
- 0...800 kPa
- 0...1000 special range
- 0...1600

**Decimal point:**
- 1999
- 199.9
- 1.999

**Marking (unit):**
- Bar
- N/m²
- N/mm²
- psi
- Without unit
- Special marking

**Power supply:**
- (Rated voltage)
  - AC: 240 V, 230 V, 120 V, 115 V, 48 V, 24 V
  - DC: 12 V...28 V

**Options:**
- Analogue output:
  - 0...10 V
  - 0...20 mA
  - 4...20 mA

- Setpoints:
  - 2

- Relay:
  - De-energized
  - Energized

Example: MDR480-B 3 2 Z 1 A9 G7 N:
- Pressure measuring instrument 96 x 48 mm / 3.78 in. x 1.89 in., 3 1/2 digit, for standard signal 0...20 mA, measuring range 0.00...4.00 bar, AC 230 V supply, with E-T-A trademark, 2 setpoints, internal setting, IP50, relay de-energized, analogue output 0...10 V
**Digital Pressure Measuring Instrument MDR480**

### Ordering Information

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Physical dimension</th>
<th>R Pressure Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>480</td>
<td>96 mm x 48 mm</td>
<td>480</td>
</tr>
</tbody>
</table>

**Input**
- **A** standard signal 0...10 V
- **B** standard signal 0...20 mA
- **C** standard signal 4...20 mA
- **D** resistance bridge, fed with constant voltage\(^\ast\) \((U_{\text{ref}} = 10 \text{ V})\)
- **E** standard signal 0...5 V
- **F** standard signal 1...5 V
- **G** standard signal 2...10 V
- **H** resistance bridge, fed with constant current\(^\ast\)\(^\ast\) \((I_{\text{const}} = 1 \text{ mA})\)
- **X** user selectable standard signal 0...5 V, 0...10 V, 0...20 mA, 4...20 mA

**Display**
- **3 3 1/2 digit**

**Measuring range**
- 1 0...250
- 2 0...400
- 3 0...600
- 4 0...1000
- 5 0...1600
- 6 0...1999
- 7 200...1000
- 8 300...1500
- 9 special measuring range\(^\ast\)
- **X** user selectable display: initial value between -1000 and +1000 digits, full scale range between 200 and 3000 digits

**Decimal point**
- **T** 1999
- **H** 199.9
- **Z** 19,99
- **E** 1,999
- **X** user selectable decimal point

**Marking (unit)**
- 1 bar
- 2 mbar
- 3 kPa
- 4 psi
- 5 N/m²
- 6 N/mm²
- 7 without unit
- 8 special marking (see below for standard markings)\(^\ast\)
- 9 special marking as requested by customer\(^\ast\)

**Power supply (rated voltage)**
- **A1** AC 240 V
- **A3** AC 120 V
- **A6** AC 48 V
- **A7** AC 24 V
- **A8** AC 115 V
- **A9** AC 230 V (standard)
- **D8** DC 12...28 V physically isolated

**K** special measuring range\(^\ast\)

**Options**
- **A1** analogue output: 0...20 mA + 0...10 V
- **A2** analogue output: 4...20 mA + 0...10 V
- **G1** 2 setpoints, internal setting, IP50
- **G2** 2 setpoints, internal setting, IP50 + analogue output 0...20 mA
- **G7** 2 setpoints, internal setting, IP50 + analogue output 0...10 V
- **G9** 2 setpoints, internal setting, IP50 + analogue output 4...20 mA

**N** Relay de-energized, standard

**I** Relay energized

MD R 480 - B 3 2 Z 1 A9 . . . G7 N ordering example

\(^{\ast\ast\ast}\) Clearly add desired specifications.

\(^{\ast\ast}\) Please indicate the signal voltage range and the bridge resistance when ordering.

**Standard markings:**
- V, mV, kV, A, mA, kA, kW, MW, °F, °C, %, r.F., ms, Stück, Ohm, µs, I, N, kN, kg, t, lbf, Ncm, Nm, m, cm, mm, inch, bar, mbar, Pa, hPa, psi, kg/cm², mmHg, mbar, mmHg, N, N/mm², Hz, kHz, U/min, min⁻¹, sec⁻¹, rpm, l/h, l/min, kg/h, m³/h, m³/min, m/sec, t/h

All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.

---

**Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com**
Panel Instrument MDZ480 with programmable controller

Description

The MDZ480 Panel Instrument with programmable controller is designed for industrial applications and has a front frame dimension of 96 mm x 48 mm.

Selection of the following operating modes is menu driven by means of the keys on the front:

- FREQUENCY MEASUREMENT
- VELOCITY MEASUREMENT
- TIME MEASUREMENT
- IMPULSE MEASUREMENT
- SPECIAL FUNCTION

In the "special function" operating mode an optional readout value may be assigned to an input frequency.

The measuring input of the instrument is physically isolated and is designed to process digital signals between 5 and 40 V with max. 100 kHz (TTL/OC-PNP, -NPN/Namur/PLC/Universal) or AC voltages between 15 and 430 Vrms with max. 10 kHz. A physically isolated supply voltage of 24 V/40 mA is provided for signal sensors.

To increase the precision of the instrument, the measuring method - either time measurement or impulse counting - is automatically switched over when in the frequency or velocity measuring mode.

An optional feature available is setpoint monitoring with peak value storage. Programming of the instrument is also menu driven via the front keys.

Technical data

**Measuring ranges**

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Digital signals</th>
<th>AC-Eingangssignale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency measurement</td>
<td>0.1 Hz...100 kHz</td>
<td>0.1 Hz...10 kHz</td>
</tr>
<tr>
<td>Velocity measurement</td>
<td>6...99999 min⁻¹</td>
<td>6...9999 min⁻¹</td>
</tr>
<tr>
<td>Time measurement</td>
<td>max. 1 kHz</td>
<td>max. 1 kHz</td>
</tr>
<tr>
<td>Impulse counting</td>
<td>1 ms...9999 ms</td>
<td>1 ms...9999 ms</td>
</tr>
<tr>
<td>Special function</td>
<td>0.1 Hz...100 kHz</td>
<td>0.1 Hz...10 kHz</td>
</tr>
</tbody>
</table>

**Signal inputs**

<table>
<thead>
<tr>
<th>Digital signals</th>
<th>TTL</th>
<th>SPS</th>
<th>OC-PNP</th>
<th>OC-NPN</th>
<th>Universal</th>
<th>Namur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulse duration</td>
<td>4 μs</td>
<td>4 μs</td>
<td>4 μs</td>
<td>4 μs</td>
<td>4 μs</td>
<td>4 μs</td>
</tr>
<tr>
<td>Input voltage</td>
<td>5</td>
<td>24</td>
<td>max. 40</td>
<td>max. 40</td>
<td>max. 40</td>
<td>1.2...2.1 mA</td>
</tr>
<tr>
<td>Trigger level typically</td>
<td>2.4</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Overload/Reverse polarity protection</td>
<td>R = 2.5 kΩ</td>
<td>DC 50 V</td>
<td>DC 50 V</td>
<td>DC 50 V</td>
<td>DC 50 V</td>
<td>R ≤ 1 mA</td>
</tr>
</tbody>
</table>

**AC input signals**

<table>
<thead>
<tr>
<th>U_rms</th>
<th>Input resistance</th>
<th>Overload protection continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 V...50 V</td>
<td>13 kΩ</td>
<td>120 V</td>
</tr>
<tr>
<td>50 V...150 V</td>
<td>43 kΩ</td>
<td>350 V</td>
</tr>
<tr>
<td>150 V...430 V</td>
<td>120 kΩ</td>
<td>600 V</td>
</tr>
</tbody>
</table>

**Signal sensor supply:**

DC 24 V ± 10 %, I_max = 40 mA, short-circuit proof, physically isolated

**Control input (terminals 7/8):**

- input resistance: R = 2.5 kΩ
- voltage range: DC 5 V...35 V

**Signal relay (terminals 9/10):**

Max. contact load: 24 V/0.8 A

Max. reading error: 0.1 %

Operating temperature range: 0...50 °C

Storage temperature: -20...70 °C

Admissible humidity: ≤ 75 % annual average, 95 % max. non-condensing

Power supply:

- AC 230 V ± 10 % 48...62 Hz
- AC 115 V ± 10 % 48...62 Hz

Power consumption: ≤ 9.5 VA

**Version (Display):**

- **Version V:** selectable operating modes, programmable, full-scale range of max. 5 digits.
- **Version F:** frequency measurement, factory pre-set, full-scale range of max. 4 digits.

Automatic decimal point setting so that the readout ranges are as follows:

<table>
<thead>
<tr>
<th>Version</th>
<th>Version</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDZ480-V5...</td>
<td>MDZ480-F4...</td>
<td>MDZ480-F3...</td>
</tr>
<tr>
<td>0.100...9.999</td>
<td>0.100...9.999</td>
<td>0.100...9.999</td>
</tr>
<tr>
<td>10.00...99.99</td>
<td>10.00...99.99</td>
<td>10.00...99.99</td>
</tr>
<tr>
<td>100.0...999.9</td>
<td>100.0...999.9</td>
<td>100.0...999.9</td>
</tr>
<tr>
<td>1000...9999</td>
<td>1000...9999</td>
<td>1000...9999</td>
</tr>
<tr>
<td>10000...99999</td>
<td>10000...99999</td>
<td>10000...99999</td>
</tr>
</tbody>
</table>

Housing

- Housing material: black Noryl SE 1, glass fibre reinforced
- Protection degree of housing: IP50 (front), IP20 (rear)
- Applicable basic standard: VDE 0411, part 100
- Pollution degree 3 to IEC 664 and 664 A
- Mass: approx. 300 g

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Panel Instrument MDZ480 with programmable controller

Connector pin assignment

Connection diagrams for signal sensors

Terminal selection as for version V: selectable operating mode with digital input

Operation

Operating modes

Frequency measuring instrument
The measuring time can be selected between 0.5 and 9 s.

Velocity measuring instrument
The number of impulses ("teeth") per rotation - values between 1 and 999 - can be entered by the user.

Time measuring instrument
This operating mode measures the time between 2 impulses (rising curve). The user may select a measuring time between 0.5 and 9 s.

Forward counter
Counting from 0 by the front key or control input. The counter will overflow when reaching 100,000, with the signal relay being actuated for approx. 100 ms and the next decimal points being set so that a max. counting value of 9,999,999, i.e. 499,999, may be read.

Backward counter
Preload values are entered by the keyboard. Starting is by key or control input. The signal relay will switch and the counter will stop when reaching 0.

Special function
In the “Special Function” operating mode an optional readout value may be assigned to an input frequency.

Readout value = Input frequency x multiplication factor + offset. The multiplication factor may be selected between 0.001 and 9999, the offset between -9999 and +9999. A negative result obtained from the above formula will result in a "-----" readout. Negative values are not indicated.

Two procedures are available to increase the accuracy of measurement: impulse counting when the input frequency fon is > 1000 Hz, and cycle period measurement when it is < 1000 Hz.

Cycle period measurement:
The time between two subsequent incoming impulses (cycle period) is measured by means of an internally generated reference frequency of 1 MHz. The number of periods which is used to set up the measuring value is a function of the measuring time selected:

- Measuring time 0: readout update after each 0.5 s, with the last measuring period being shown.
- Measuring time 1...9: readout update after each 1...9 s.

Mean value calculated from the number of cycle periods measured during the measuring period.

Impulse counting:
The number of periods which is used to set up the measuring value is a function of the measuring time selected:

- Measuring time 0: readout update after each 0.5 s.
- Measuring time 1...9: readout update after each 1...9 s.

Error diagram (see next page):
The max. possible measuring error referred to the input frequency can be determined from the error diagram. The possible error maximum of 0.1 % will show up when switching from cycle period measurement to impulse counting at an input frequency of 1 kHz.
Panel Instrument MDZ480 with programmable controller

Option: Limit Values

An upper and a lower limit value may be set between 0.001 and 9999.8. The signal relay (either N/C or N/O to order) will operate when these values are exceeded or when they are below the set limit.

Closed circuit mode:
The relay carries no-load when one of the limit values is exceeded or not reached; it is switched off.

Open circuit mode:
The relay carries current when one of the limit values is exceeded or not reached; it is switched on.

Enter "00000" if no lower limit value is desired.
Enter "99999" if no upper limit value is desired.
The controller will automatically adjust the entry format to the display format, i.e. entry "00010" will be "010,00", and "00345" will be "0345.0".
The set limit values and the selected relay mode are even stored after disconnection of the power supply.

When starting the measuring operation, the relay is switched to "acceptable range" until the first value measured is available (depending on the set measuring time).

Option: Peak values

The maximum and the minimum readings measured are stored and may be indicated. If the limit value is exceeded during a peak value reading, it is indicated by LEDs. The two peak values may be simultaneously deleted via the control input. To do this, instrument MDZ480 must be either in the measuring mode or peak value indication. Deletions cannot be made during the adjustment.

The peak values stored are deleted in the event of power failure or disconnection of instrument MDZ480.

Adjustment

Instrument MDZ480-F.. (frequency measurement with AC voltage input) is preset in the factory and ready for immediate operation.

Instrument MDZ480-V.. (selectable operating modes) may be adjusted by means of keys T1 to T6 (see next page).

If the keys are sited behind the front glass, remove it as described as follows:

1. Remove the bezel by pushing the upper or lower bezel edges outwards.

2. Use a screwdriver to ease the front glass out of the lower recess.

When adjusting or entering parameters, the display flashes at the positions which may be changed by pressing the relevant keys. Decimal points may be set by pressing the applicable key beyond "9". Repeat this procedure to delete the decimal point. To change the position of a decimal point, first delete the existing decimal point.

Operating mode, parameters and measuring input are stored even if the supply voltage is switched off.

Upon power connection all display elements will be activated for approx. 1 s.

Left-hand zeros are suppressed during the measuring mode.

Readout when the measuring range has not been reached: "-----" Readout when the measuring range has been exceeded: "E E E E E"
Programming

1. Select measuring input

Key 2

- PLC input
- TTL level
- OC - PNP
- OC - NPN
- Namur input
- Universal input

Transfer/Enter

2. Select operating mode

Key 1

- Frequency measurement
- Velocity measurement
- Forward counter
- Backward counter
- Time measurement
- Universal input

Limit values

Key 4

- Lower limit
- Upper limit

Relay operation

Key 4

- Closed circuit
- Open circuit

Peak values

Key 5

- Lower peak value
- Upper peak value
- Measuring value

Alternative: The two peak values may be simultaneously deleted via the control input. To do this, the instrument must be either in the measuring mode or peak value indication.
Panel Instrument MDZ480 with programmable controller

Please select the required type by following the chart below:

**Housing:**
- MDZ480
  - Panel instrument with programmable controller
  - 96 mm x 48 mm / 3.78 in. x 1.89 in.

**Function:**
- Variable:
  - Frequency, velocity, cycle period, forward and backward counting, special function
- Frequency measurement with AC input

**Display:**
- 5 digit
- 4 digit with max. 2 fractional digits
- 4 digit with max. 3 fractional digits

**Keyboard:**
- Internally (behind front glass)
- Externally (touch pad)

**Input signal (measuring range):**
- Digital (selectable):
  - TTL, PLC, PNP, NPN, Namur
- AC: 15 V...50 V
- AC: 50 V...150 V
- AC: 150 V...430 V

**Marking:**
- Hz, U/min, min⁻¹, sec⁻¹, rpm, pieces, ms, no unit indication
- Special marking

**Power supply (voltage rating):**
- AC: 230 V, 115 V
- AC: 220 V, 110 V
- AC: 115 V

**Options:**
- (Only with variable version)
  - Limit values/peak values

**Relay contacts:**
- NC
- NO

Example: MDZ480 V 5 H 1 1 A9 G0
- Panel instrument with programmable operating modes (keyboard behind front glass)
- 96 x 48 mm / 3.78 in. x 1.89 in., 5 digit, digital input, Hz marking, AC 230 V voltage rating, limit and peak values, NO relay contact

Ordering information

**Type No.**
- MDZ
- MDZ 480

**Housing**
- 96 mm x 48 mm

**Function**
- V variable

**Display**
- 3 digit with max. 2 fractional digits
  - Readout: 0.00...9.9
  - 10.00...99.9 Hz
- 4 digit with max. 3 fractional digits
  - Readout: 0.000...9.999
  - 10.00...99.99 Hz / 100.0...999.9 Hz
- 5 digit (only with ...-V version)

**Keyboard**
- H: internal
- E: external (only with ...-V version)

**Input signal (measuring range):**
- Digital (only with ...-V version)
- 1 digit
- 2 digit
- 3 digit
- 4 digit
- 5 digit
- 6 digit
- 7 digit
- 8 digit
- 9 digit

**Power supply (voltage rating):**
- A9: AC 230 V (standard)
- A8: AC 115 V

**Options:**
- (Only with ...-V version)
  - Limit values/peak values
  - NC relay contact

**Accessory:**
- Velocity Sensor MSZ 214/218, see product group 4

* Standard markings:
  - V, mV, kV, MV, A, mA, kA, kW, MW, °C, °F, %, % r.F., µs, Stück, Ohm, pH, µA, l, N, kN, kg, t, lbf, Ncm, Nm, m, cm, mm, in, inch, bar, mbar, Pa, kPa, psi, kg/cm², mN/m, mWs, mVs, N/m², N/mm², Hz, kHz, U/min, min⁻¹, sec⁻¹, rpm, l/h, l/min, kg/h, m³/h, m/min, m/sec, t/h

*) Clearly add desired marking.

All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.

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