

Description

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.



MDA241



MDV241



MDC241

Measuring Ranges

DC Current

Measuring range	Resolution	Input resistance	Overload protection		Pin designation Lo - Hi - +
			cont.	max. 3 sec.	
±2 mA	1 µA	100 Ω	50 mA	100 mA	3 - 1
±20 mA	10 µA	10 Ω	160 mA	300 mA	3 - 1
±200 mA	0.1 mA	1 Ω	600 mA	1.5 A	3 - 1
±2 A	1 mA	0.1 Ω	3 A	5 A	3 - 1

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

2 mA	1 µA	100 Ω	50 mA	100 mA	3 - 1
20 mA	10 µA	10 Ω	160 mA	300 mA	3 - 1
200 mA	0.1 mA	1 Ω	600 mA	1.5 A	3 - 1
2 A	1 mA	0.1 Ω	3 A	5 A	3 - 1

DC Voltage

Measuring range	Resolution	Input resistance	Overload protection continuous	Pin designation Lo - Hi - +
±2 V	1 mV	≥10 MΩ	500 V	3 - 1
±20 V	10 mV	10 MΩ	1000 V	3 - 1
±200 V	0.1 V	10 MΩ	1000 V	3 - 1
±600 V	1 V	10 MΩ	1000 V	3 - 1

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

200 mV	0.1 mV	≥10 MΩ	150 V	3 - 1
2 V	1 mV	≥10 MΩ	500 V	3 - 1
20 V	10 mV	10 MΩ	1000 V	3 - 1
200 V	0.1 V	10 MΩ	1000 V	3 - 1
600 V	1 V	10 MΩ	1000 V	3 - 1

Temperature

Sensor	Measuring range	Resolution in °C	Pin designation
Pt100 (IEC751)	0...+300 °C	1	1 - 2
Pt100 (IEC751)	+250...+800 °C	1	1 - 2
Pt100 (IEC751)	-200...+200 °C	1	1 - 2
Pt100 (IEC751)	-100.0...+100.0 °C	0.1	1 - 2

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
(span = full measuring range)

Input

General (MD.241): Physically isolated from mains
Common mode range: input circuit against main circuit ± 600V
Common mode rejection: ≥ 60dB
Temperature instrument MDC 241: 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

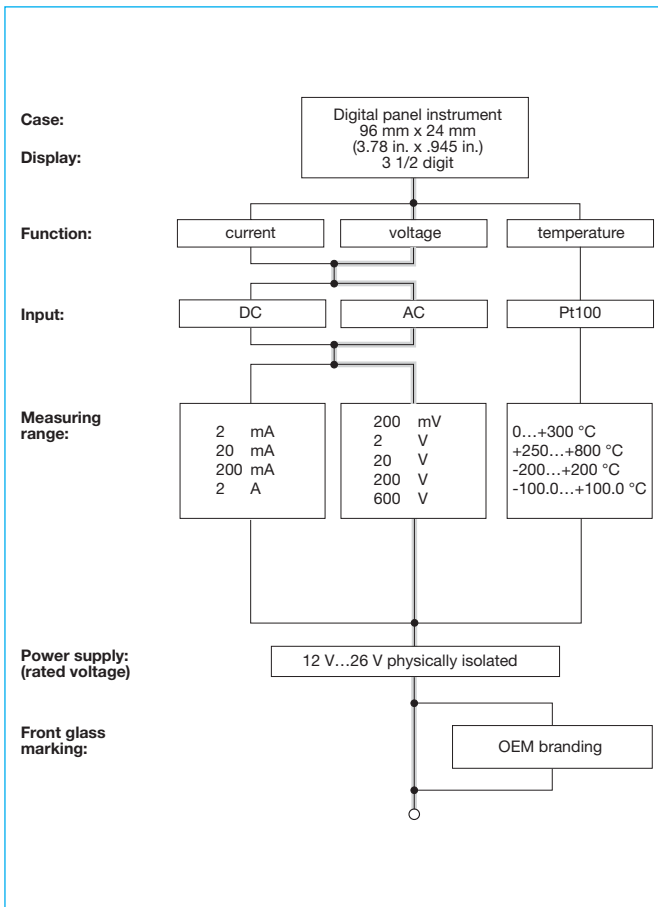
Environmental requirements

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

Selector chart



Ordering information

Type No.

Physical dimension

- A Current
- V Voltage
- C Temperature

Case

241 96 mm x 24 mm

Version

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

Display

3 3 1/2 digit

Measuring range

- 11 2mA/200 mV
- 12 20 mA/2 V
- 13 200 mA/20 V
- 14 2 A/200 V
- 15 600 V
- 54 IEC 751 Pt100 0...+300 °C
- 55 IEC 751 Pt100 +250...+800 °C
- 56 IEC 751 Pt100 -200...+200 °C
- 57 IEC 751 Pt100 -100.0...+100.0 °C

Power supply (rated voltage)

D1 DC 12 V...26 V physically isolated

K Special marking
(see below for standard markings*)

Special calibration**)

F OEM branding*)

MD V 241 - A 3 13 D1 ordering example

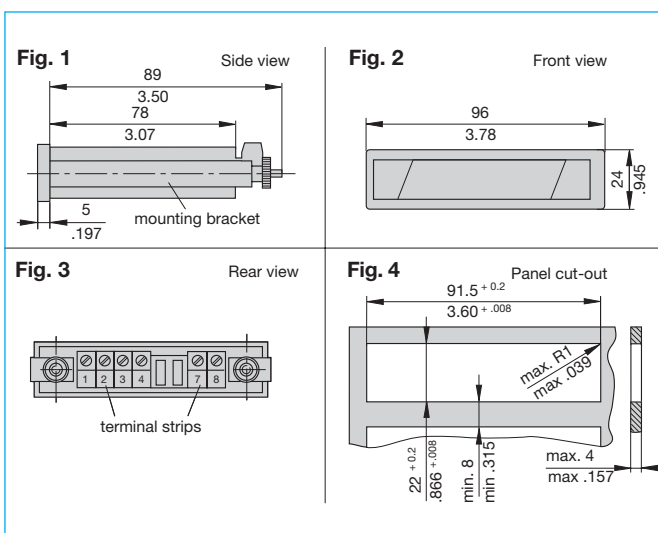
*) Clearly add desired marking.

**) 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, 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, t/h.

Case



This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

Caution:

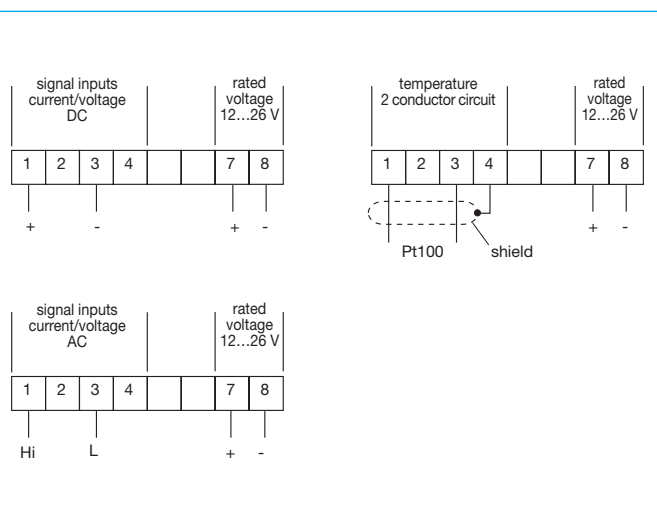
If several instruments are to be fitted, a minimum of 8 mm (5/16 in) between each cut-out must be provided for correct removal of front glass (Fig. 4).

Case material: glass-fibre reinforced black Noryl SE 1
 Degree of protection: IP50 (front), IP20 (rear)
 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



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.



MDK241



MDR241

Measuring ranges: Process Variables

DC Current

Measuring input	Input resistance	Overload protection		Pin designation + -
		cont.	max. 3 s	
0...±20 mA	100 Ω	± 50 mA	± 100 mA	1 - 2
4...20 mA	100 Ω	± 50 mA	± 100 mA	1 - 2

DC Voltage

Measuring input	Input resistance	Overload protection		Pin designation + -
		continuous	_____	
0...±5 V	0,5 MΩ	± 100 V		1 - 2
0...±10 V	1 MΩ	± 100 V		1 - 3

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.

Measuring Ranges: Pressure

Input	Measuring range	Input resistance	Overload protection		Pin designation + -
			cont.	max. 3 s	
Voltage	0...5 V	0,5 MΩ	± 100 V	-	1 - 2
Voltage	0...10 V	1 MΩ	± 100 V	-	1 - 3
Current	0...20 mA	100 Ω	± 50 mA	± 100 mA	1 - 2
Current	4...20 mA	100 Ω	± 50 mA	± 100 mA	1 - 2

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
Count rate: 2.5 readings/s
Setting time for a 100% reading change: < 2 s

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

Ordering information

Type No.												
Physical dimension												
K	Standard signals											
Case												
241	96 mm x 24 mm											
Inputs												
X	User selectable standard signals (0...20 mA; 4...20 mA; 0.5 V; or 0...10 V)											
0	Special measuring range *)											
Display												
3	3 1/2 digit											
Display range: initial value												
0	-1170...+1170 digits (user selectable)											
Full scale range												
X	0...2000 digits (user selectable)											
Decimal point												
X	Decimal point (user selectable)											
Voltage supply (voltage rating)												
D1	DC 12...26 V											
K	factory pre-set marking (unit)											
F	OEM branding *)											
MD	K	241	-	X	3	0	X	X	D1	ordering example

*) Clearly add desired specification.

Ordering information

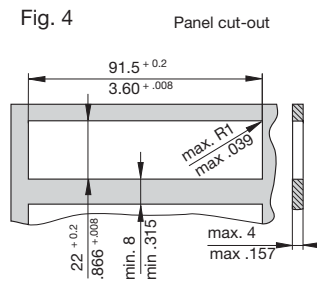
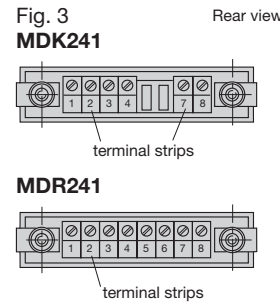
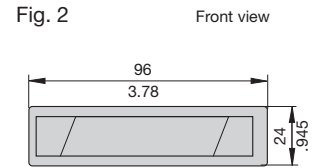
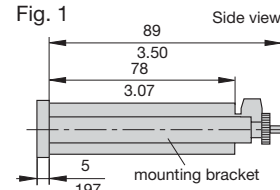
Type No.												
Physical dimension												
R	Pressure											
Case												
241	96 mm x 24 mm											
Input												
A	Standard signal 0...10 V											
B	Standard signal 0...20 mA											
C	Standard signal 4...20 mA											
E	Standard signal 0...5 V											
X	User selectable standard signals 0...20 mA; 4...20 mA; 0.5 V or 0...10 V											
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											
0	Special measuring range *)											
X	User selectable: initial value -1170...+1170 digits full scale range 0...2000 digits											
Decimal point												
T	1999											
H	199.9											
Z	19.99											
E	1.999											
X	Decimal point (user selectable)											
Marking (physical unit)												
1	bar											
2	mbar											
3	kPa											
4	psi											
5	N/m ²											
6	N/mm ²											
9	blank											
0	special marking (see below for standard markings *)											
Supply voltage (voltage rating)												
D1	DC 12...26 V with physical isolation											
K	special calibration*)											
F	OEM branding*)											
MD	R	241	-	A	3	2	H	4	D1	.	F	ordering example

*) Clearly add desired specification.

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, 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, t/h

Case



This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

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)

Case material:

glass-fibre reinforced black Noryl SE1

Degree of protection:

IP50 (front), IP20 (rear)

Applicable specification:

VDE 0411, part 100

Pollution degree:

3 to IEC 664 and 664 A

Instrument mass:

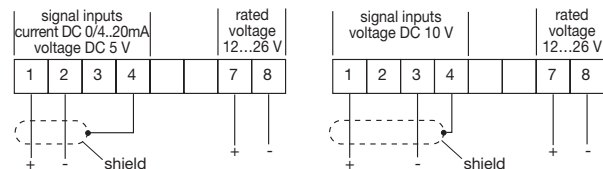
approx. 150 g

Terminations

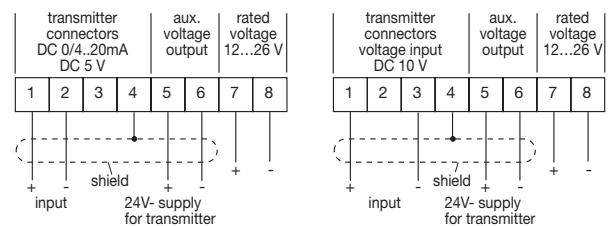
Plug-in screw-terminal strip for max. 1.5 mm²/AWG 16 cables.

Connector pin assignment

MDK241:



MDR241:



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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 instrument are panel mounted with a front frame dimension of 48 mm x 24 mm.

Measuring ranges

DC current

Measuring range	Resolution	Input resistance	Overload protection	Pin designation - +
0...±20 mA	10 µA	10 Ω	±150 mA	3 - 1
4...20 mA	8 µA	10 Ω	±150 mA	3 - 1

DC voltage

Measuring range	Resolution	Input resistance	Overload protection	Pin designation - +
0...± 5 V	2.5 mV	>1 MΩ	±60 V	3 - 1
0...±10 V	5 mV	>1 MΩ	±60 V	3 - 1

Temperature

Sensor	Measuring range	Resolution	Terminals
Temperature sensor KTY-16-6	-30...+100 °C	1 °C	1 - 3



**MDA245
MDV245**



MDC245



**Temperature sensor
MSC KTY-16-6**

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: $\leq 0.1\%$ span ± 1 digit
Temperature measuring instrument: $\leq 0.8\%$ 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: $\leq 0.01\%$ 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

Type No.	
Physical dimensions	
A	current
V	voltage
Case	
245	48 mm x 24 mm
Version	
D	DC current/voltage
Display	
3	3 1/2 digit
Input	
1	0...5 V
2	0...10V
3	0...20 mA
4	4...20 mA
Display range	
1	0... (0...500)*
2	0... (500...1000)*
3	0... (1000...1500)*
4	0... (1500...1999)*
Supply voltage (rated voltage)	
D1	DC 4...7 V
D2	DC 7...16 V
D3	DC 16...28 V (standard)
K	Special calibration**)
MD A 245 - D 3 4 3 D3 ...	ordering example

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

**) Specify when ordering.

Ordering information for Panel Instrument MDC 245

Type No.	
Physical dimension	
C	temperature
Case	
245	48 mm x 24 mm
Version	
H21	for temperature sensor KTY-16-6 Measuring range: -30...+100°C 2 1/2 digit display
Supply voltage (rated voltage)	
D1	DC 4...7 V
D2	DC 7...16 V
D3	DC 16...28 V (standard)
MD C 245 - H21 D3	ordering example

Temperature Sensor MSC (suitable for Instrument MDC 245)

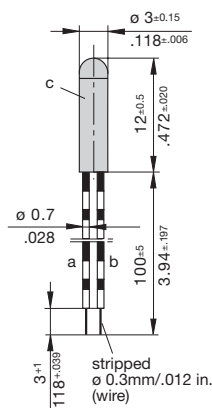
Ordering reference: MSC KTY-16-6

Technical data:

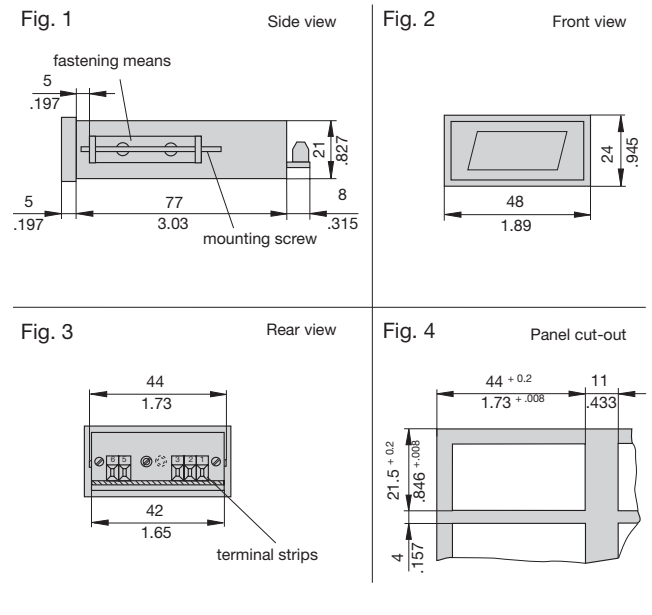
Sensor	KTY-16-6
Temperature range	-30...+100°C
Resistance	2000 Ω ±1 % with 25°C
Operating current	≤ 0.5 mA
Temperature coefficient	0.75 %/K
Potted into nickel plated brass housing with insulated leadwire connections.	

Terminal selection

- a electrical contact
- b electrical contact
- c housing: potential free



Case

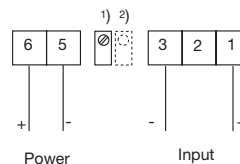


This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

Case material: glass fibre reinforced black Noryl GFN SE1
 Degree of protection: IP50 (front) IP20 (rear)

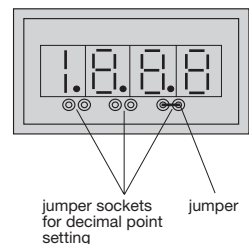
Connector pin assignment / Potentiometer setting

Current/voltage instrument

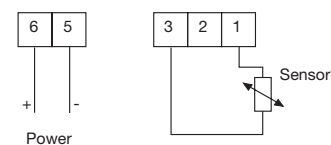


- 1) potentiometer to set reading range
- 2) offset correction (only with measuring range 4...20 mA)

Decimal point setting



Temperature instrument



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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.

Measuring ranges

Current

DC, individual measuring range

Measuring range	Resolution with 3 1/2 digits	Input resistance	Overload protection cont. max. 3 s		Pin designation input decimal pt. bridge	
					-	+
2 mA	1 µA	100 Ω	50 mA	100 mA	1 - 3	---
20 mA	10 µA	10 Ω	160 mA	300 mA	1 - 3	---
200 mA	0.1 mA	1 Ω	600 mA	1.5 A	1 - 5	---
2 A	1 mA	0.1 Ω	3 A	5 A	1 - 5	---
10 A	10 mA	0.01 Ω	10 A	12 A	1 - 5	---

DC, triple/double measuring range

2 mA	1 µA	100 Ω	50 mA	100 mA	1 - 6	7-10
20 mA	10 µA	10 Ω	160 mA	300 mA	1 - 5	8-10
200 mA	0.1 mA	1 Ω	600 mA	1.5 A	1 - 3	7-10,8-10
2 A	1 mA	0.1 Ω	3 A	5 A	1 - 5	7-10
10 A	10 mA	0.01 Ω	10 A	12 A	1 - 3	8-10

AC, individual measuring range

Measuring bereich	Resolution with 3 1/2 digits	Input resistance	Overload protection cont. max. 3 sec		Pin designation input decimal pt. bridge		
					Lo	Hi	bridge
2 mA	1 µA	100 Ω	50 mA	100 mA	1 - 3	---	
20 mA	10 µA	10 Ω	160 mA	300 mA	1 - 3	---	
200 mA	0.1 mA	1 Ω	600 mA	1.5 A	1 - 5	---	
2 A	1 mA	0.1 Ω	3 A	5 A	1 - 5	---	
10 A	10 mA	0.01 Ω	10 A	12 A	1 - 5	---	

Voltage

DC, individual measuring range

Measuring range	Resolution with 3 1/2 digits	Input resistance	Overload protection continuously	Pin designation input decimal pt. bridge	
				-	+
200 mV	0.1 mV	1 MΩ	150 V	1 - 3	---
2 V	1 mV	4 MΩ	500 V	1 - 3	---
20 V	10 mV	20 MΩ	700 V	1 - 3	---
200 V	0.1 V	20 MΩ	700 V	1 - 3	---
600 V	1 V	20 MΩ	1000 V	1 - 3	---

DC, double measuring range

200 mV	0.1 mV	440 kΩ	150 V	2 - 5	7-10, 8-10
2000 mV	1 mV	4 MΩ	500 V	1 - 3	---
20 V	10 mV	1.8 MΩ	700 V	2 - 5	8-10
200 V	0.1 V	18 MΩ	700 V	1 - 3	7-10, 8-10

AC, individual measuring range

Measuring range	Resolution with 3 1/2 digits	Input resistance	Overload protection continuously	Pin designation input decimal pt. bridge		
				Lo	Hi	bridge
200 mV	0.1 mV	>10 MΩ	150 V	1 - 3	---	
2 V	1 mV	>10 MΩ	350 V	1 - 3	---	
20 V	10 mV	2 MΩ	350 V	1 - 3	---	
200 V	0.1 V	10 MΩ	700 V	1 - 3	---	
600 V	1 V	10 MΩ	1000 V	1 - 3	---	



MDA480



MDV480

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)

Current / Voltage, DC version:
individual measuring range
0.1 % dA ± 1 digit
multiple measuring range
0.15 % dA ± 1 digit

Current / Voltage, AC version:
individual measuring range
0.2 % dA ± 1 digit

dA = of reading

The accuracy given refers to the indicated value.

DC input: Potential 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 (11ms), 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

(span = full measuring range)

Voltage supply (voltage rating):

AC 230 V (standard) ±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

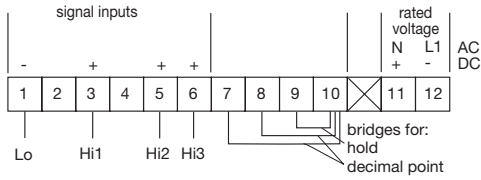
DC 12 V...28 V (physically isolated)

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

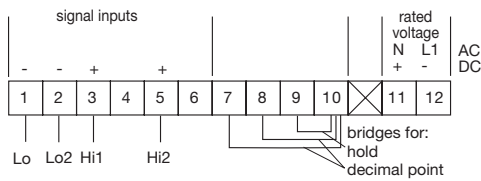
Power consumption: ≤ 9 VA/6.5 W

Connector pin assignment

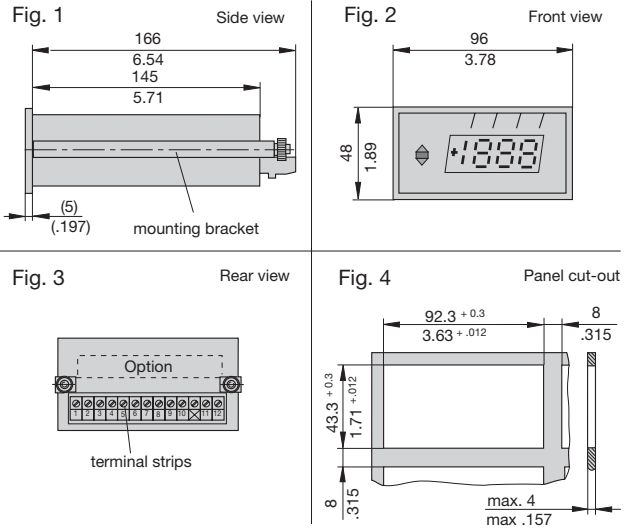
Current measuring instrument



Voltage measuring instrument



Case



This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

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: $R_L \geq 10 \text{ k}\Omega$

Overload protection: continuous short-circuit or no load

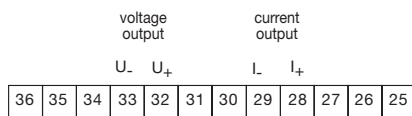
Caution!

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.

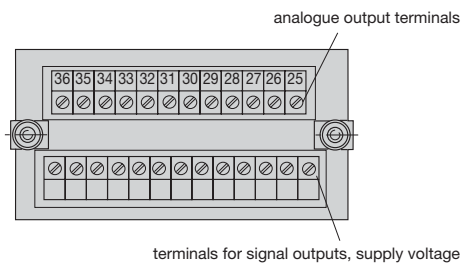
Terminations:

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

Connector pin assignment



Rear view of analogue output option:



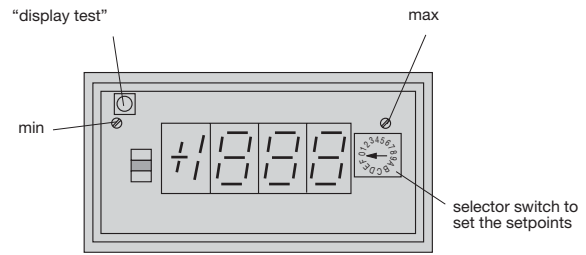
Setpoints

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)

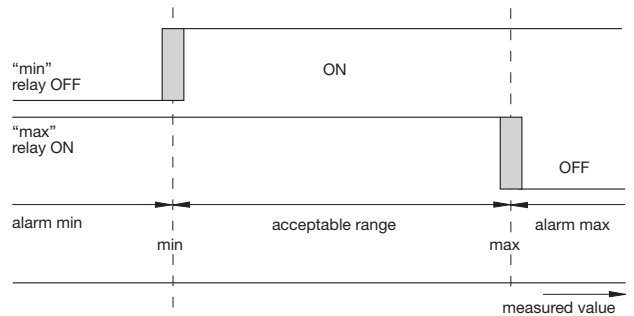
Setting the setpoints (after removal of front glass)



Switch position	Readout
or 8	measuring value
1 or 9	min
3 or B	max
All other switch positions	overflow

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)

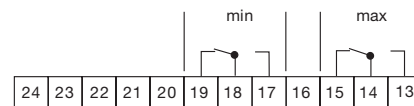


All relay switching conditions are inverted with "relay de-energized".

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



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

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 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 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: $R_L \geq 10 \text{ k}\Omega$

Overload protection: continuous short-circuit or no-load

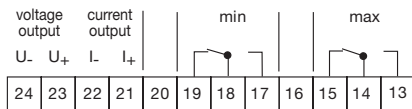
Caution!

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:

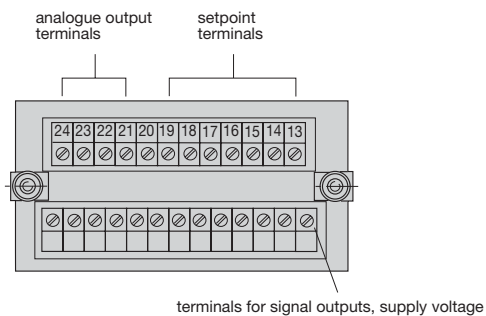
12-pole plug-in screw-terminal strip for max. 1.5 mm² cables.

Connector pin assignment



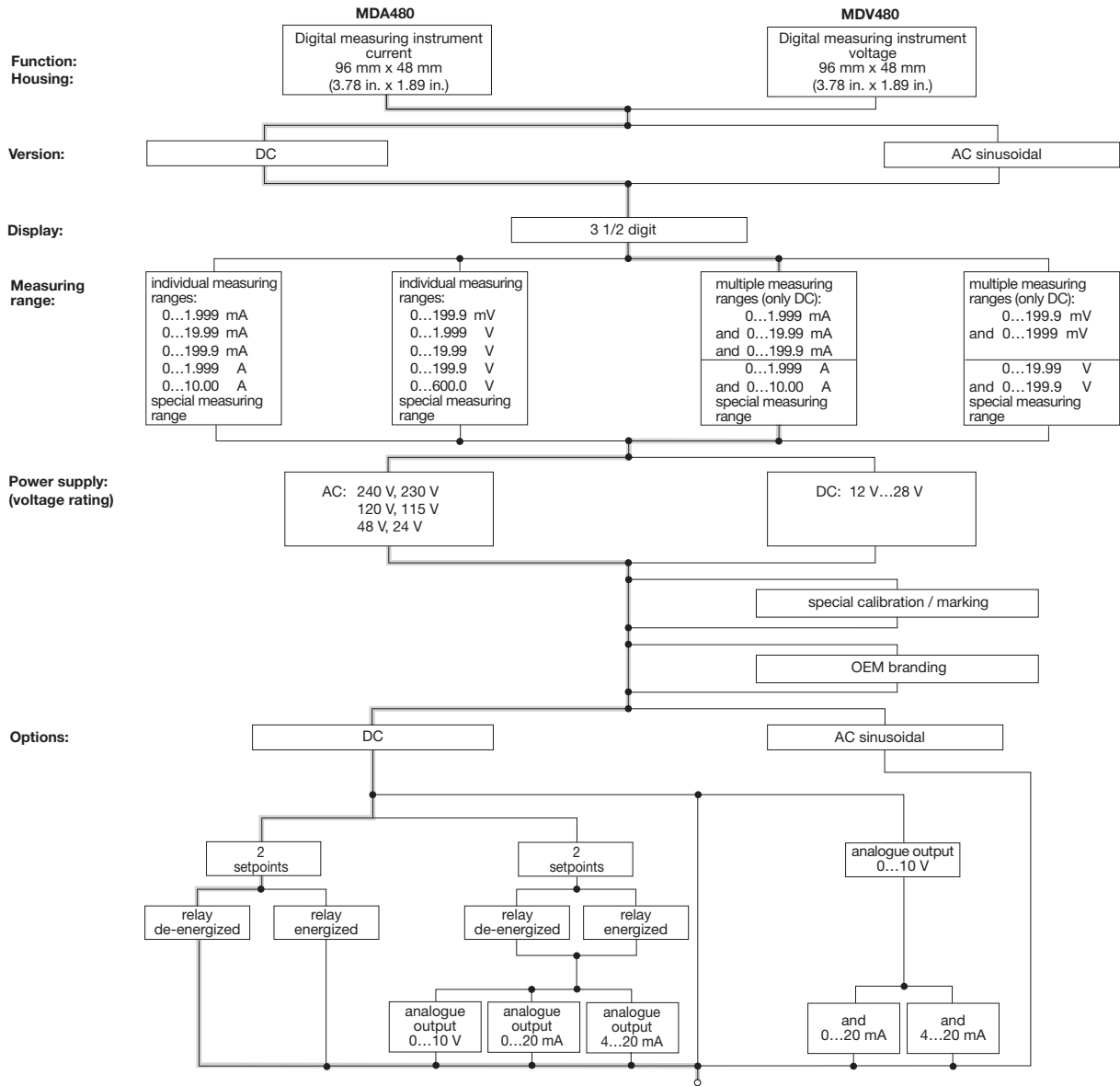
Contact position shown in the "acceptable range" condition with version "relay de-energized".

Rear view: 2 setpoints and analogue output



Selector chart

Please select the required type by following the chart below.



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

Ordering information

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

Type No.

Physical dimensions

A current

V voltage

Case

480 96 mm x 48 mm

Version

D DC

A AC

Display

3 3 1/2 digit

Measuring range

11 2 mA/200 mV

12 20 mA/2 V

13 200 mA/20 V

14 2 A/200 V

15 10 A/600 V

21 2 mA + 20 mA + 200 mA/200 mV + 2000 mV

22 2 A + 10 A / 20 V + 200 V

} multiple measuring range, with DC input signals only

00 special measuring range*)

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

K special marking (see below for standard markings*)

special marking as required by customer*)

special calibration*)

F OEM branding*)

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, 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 A 480 - D 3 22 A9 . . G1 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, 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, 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 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

Measuring range	Input resistance	Overload protection		Pin	
		cont.	5 sec.	-	+

Standard signals 0...5/10 V or 0/4...20 mA

5/10 V	20 MΩ	500 V	-	1	-	2
10 V	20 MΩ	500 V	-	1	-	2
20 mA	10 Ω	160 mA	300 mA	3	-	4

Full scale range: 200...3000 Digits (= Endwert-Anfangswert)

Initial value: -1000...+1000

User selectable decimal point.

Specify measuring unit when ordering



MDK480

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

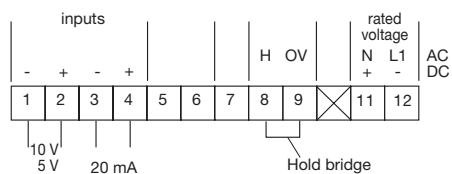
Vibration test: on duty: 2 g (0.15 mm), 10...55 Hz
 on transport: 5 g (0.35 mm), 10...150 Hz
 to IEC 68-2-6/DIN 40 046, page 8

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.

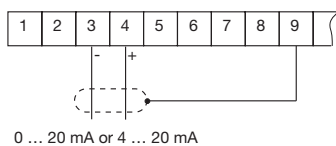
Power consumption: ≤ 9 VA/6,5 W

Connector pin assignment

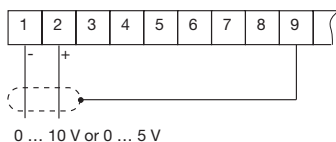


Connections for standard signals

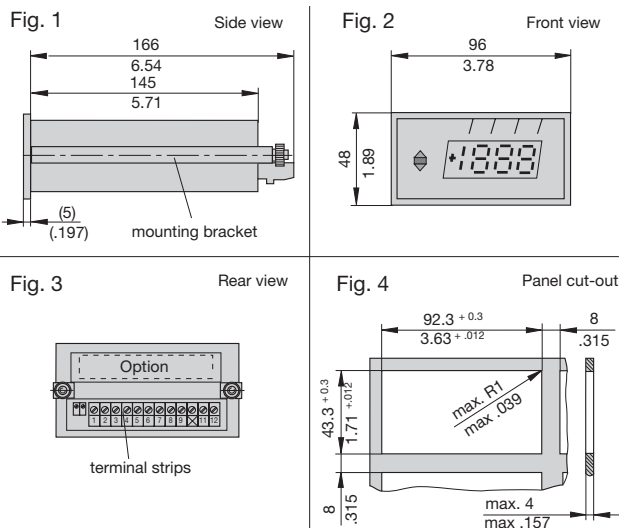
Current



Voltage



Case



This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

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
 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 0...100 % measuring range
 Load resistance: $R_L \geq 10 \text{ k}\Omega$

Overload protection: continuous short-circuit or no load

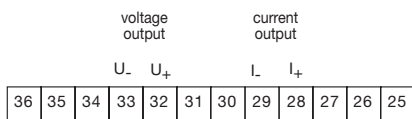
Caution!

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.

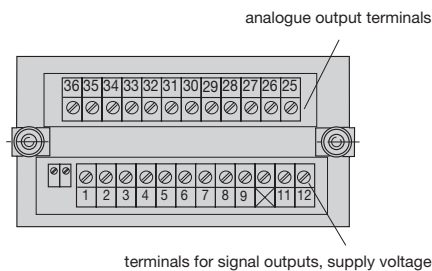
Terminations:

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

Connector pin assignment



Rear view with analogue output option:



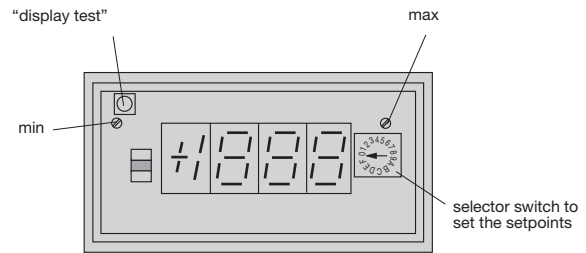
Setpoints

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.

2 Setpoints (option G1)

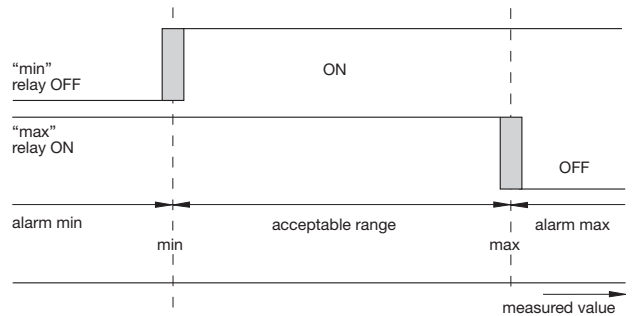
Setting the setpoints (after removal of front glass)



Switch position	Readout
or 8	measuring value
1 or 9	min
3 or B	max
All other switch positions	overflow

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)

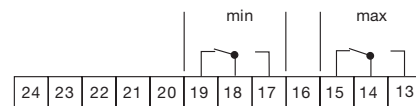


All relay switching conditions are inverted with "relay de-energized".

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



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: $R_L \geq 10 \text{ k}\Omega$

Overload protection: continuous short-circuit or no-load

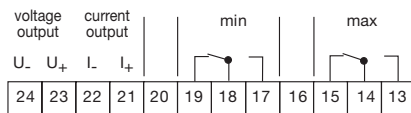
Caution!

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:

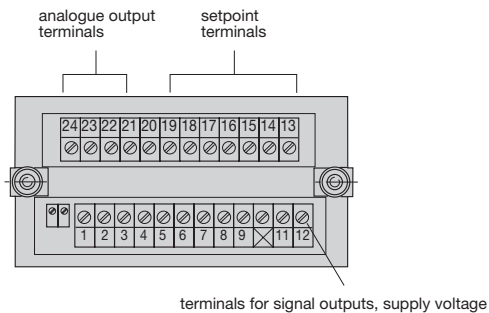
12 pole plug-in screw-terminal strip for max. 1.5 mm² cables.

Connector pin assignment:



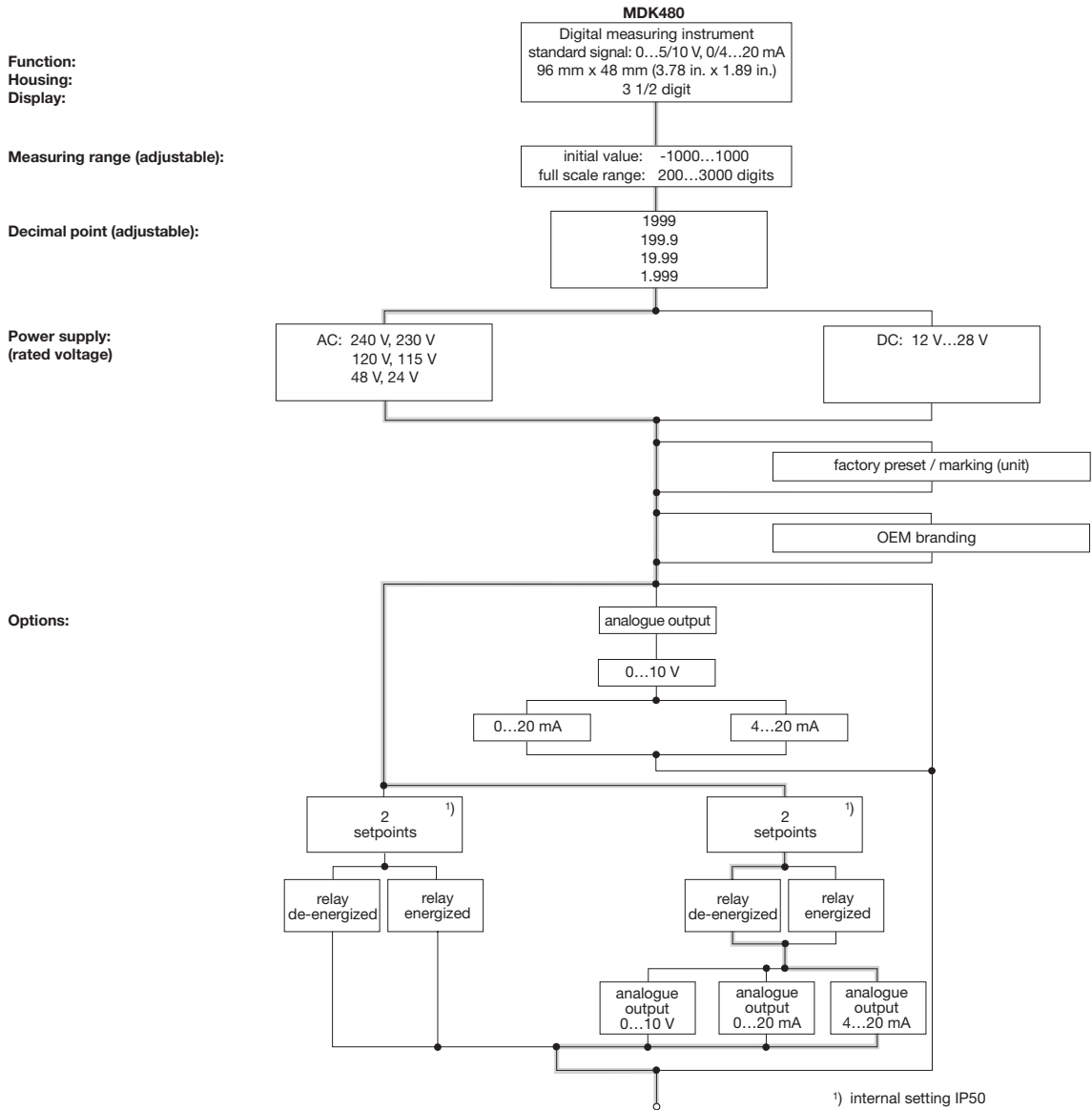
Contact position shown in the "acceptable range" condition with version "relay de-energized".

Rear view: 2 setpoints and analogue output



Selector chart

Please select the required type by following the chart below.



Example: MDK480-X 3 0 X 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).

Type No.

Physical dimension	
K	standard signal
Case	
480	96 mm x 48 mm
Input	
X	standard signal 0...5 V, 0...10 V, 0...20 mA, 4...20 mA (to be set by user)
0	special measuring range *)
Display	
3	3 1/2 digit
Initial value of display	
0	user selectable between -1000 and 1000 digits
Full scale range	
X	user selectable between 200 and 3000 digits
Decimal point	
X	user selectable decimal point
Voltage supply (voltage rating)	
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
K	factory pre-set*)
	standard marking (see below)*)
	special marking as requested by customer*)
F	OEM branding *)
Options	
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, 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 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, 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, 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

Measuring range	Input resistance	Overload protection		Pin designation	
		cont.	5 sec	-	+
Standard signal from pressure transmitters 0...5/10 V or 0/4...20 mA					
5/10 V	20 M Ω	500 V	-	1	- 2
20 mA	10 Ω	160 mA	300 mA	3	- 4
Pressure sensors (strain gauge sensors/solid-state sensors)					
20 mV...200 mV*	880 k Ω	150 V	-	1	- 2

*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.



MDR480

Technical data

Accuracy of display (at 23 °C)

0.1 % of reading \pm 1 digit

Input: potential-free differential input
common-mode range \pm 1 V
common-mode rejection >60 dB

Display: Red 7-segment LED display
3 1/2 digit
13 mm high
Full scale range: \pm 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 \pm 10 %

Current: 25 mA

Residual ripple: \leq 0.5 %

Terminals: 5(-) and 6(+)

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

Constant voltage: $U_{ref} = 10$ V

Bridge resistance: \geq 330 Ω

or

Constant current: $I_{const} = 1$ mA

Environmental requirements

Temperature drift: \leq 0.01 % span/K
(span = full measuring range)

Warm-up to full accuracy: \leq 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 \pm 10 % 48...62 Hz

other voltages: AC 240 V, 120 V, 115 V \pm 10 % 48...62 Hz

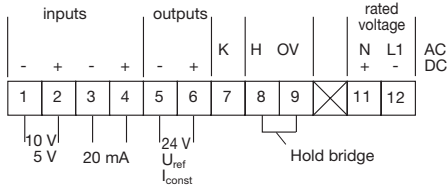
(optional) AC 48 V, 24 V \pm 10 % 48...62 Hz

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.

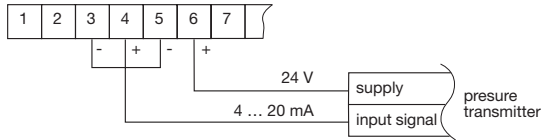
Power consumption: \leq 8 VA/6.5 W

Connector pin assignment

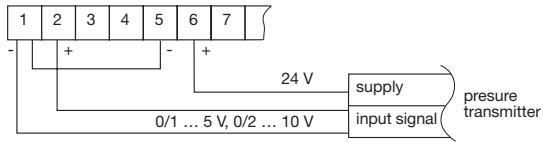


Connection of pressure transmitters

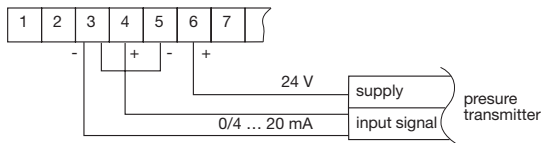
2 conductor circuit, current: 4 ... 20 mA



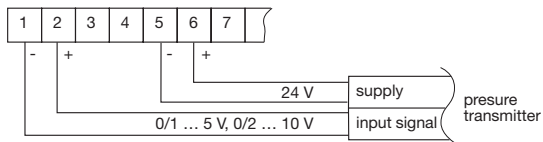
3 conductor circuit, voltage: 0/1 ... 5 V or 0/2 ... 10 V



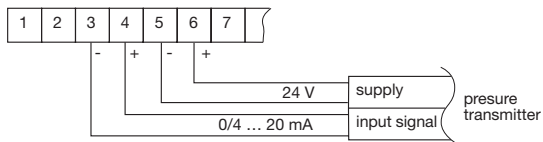
3 conductor circuit, current: 0 ... 20 mA or 4 ... 20 mA



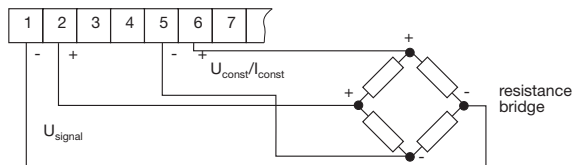
4 conductor circuit, voltage: 0/1 ... 5 V or 0/2 ... 10 V



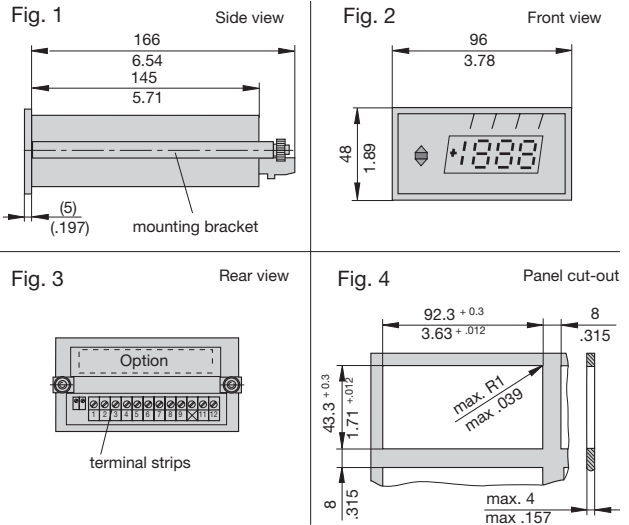
4 conductor circuit, current: 0 ... 20 mA or 4 ... 20 mA



Connection of resistance bridges



Case



This is a metric design and millimeter dimensions take precedence ($\frac{\text{mm}}{\text{inch}}$)

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: 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 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
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: $R_L \geq 10 \text{ k}\Omega$

Overload protection: continuous short-circuit or no load

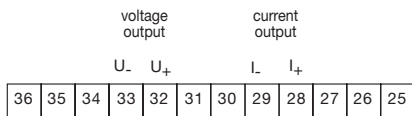
Caution!

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.

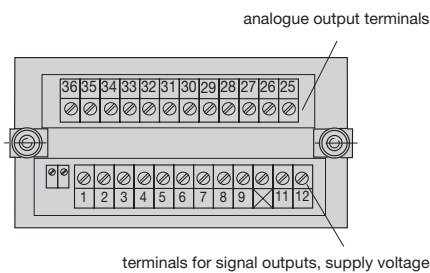
Terminations:

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

Connector pin assignment



Rear view with analogue output option:



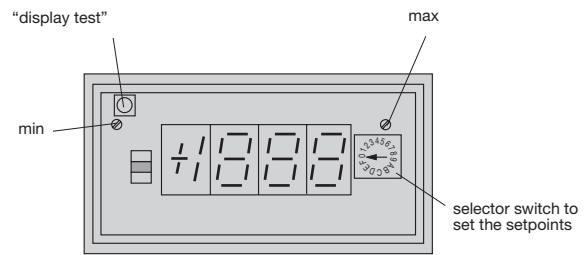
Setpoints

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.

2 Setpoints (option G1)

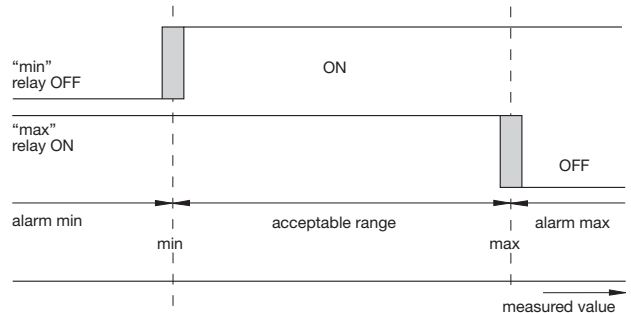
Setting the setpoints (after removal of front glass)



Switch position	Readout
or 8	measuring value
1 or 9	min
3 or 8	max
All other switch positions	overflow

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)

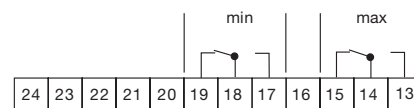


All relay switching conditions are inverted with "relay de-energized".

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



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: $R_L \geq 10 \text{ k}\Omega$

Overload protection: continuous short-circuit or no-load

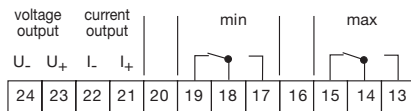
Caution!

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:

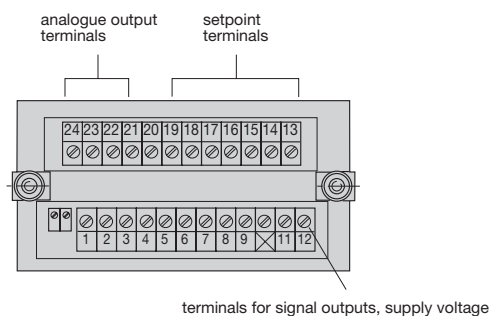
12-pole plug-in screw-terminal strip for max. 1.5 mm² cables.

Connector pin assignment:



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

Rear view: 2 setpoints and analogue output



Selector chart

Please select the required type by following the chart below.

Function:
Housing:
Display:

MDR480
Digital measuring instrument
pressure
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,
0...20 mA, 4...20 mA

strain-gauge sensor
solid state sensor

Measuring range:

0...250	0...1999
0...400	200...1000
0...600	300...1500
0...1000	special range
0...1600	

Decimal point:

1999
199.9
19.99
1.999

Marking (unit):

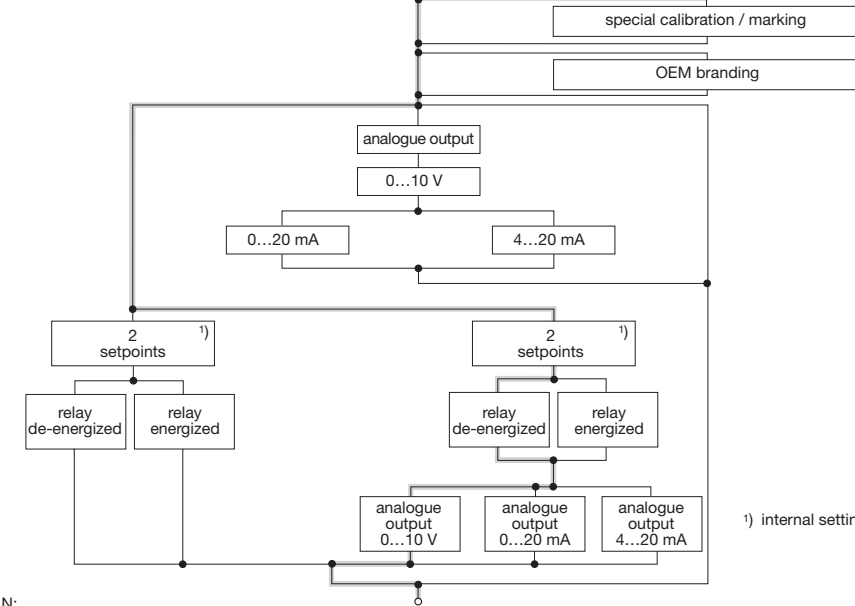
bar	N/m ²
mbar	N/mm ²
kPa	without unit
psi	special marking

**Power supply:
(rated voltage)**

AC: 240 V, 230 V,
120 V, 115 V,
48 V, 24 V

DC: 12 V...28 V

Options:



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

Ordering Information

Type No.

Physical dimension

R Pressure

Case

480 96 mm x 48 mm

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**) ($U_{ref} = 10\text{ V}$)
- 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**) ($I_{const} = 1\text{ mA}$)
- 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
- 0** special measuring range*)
- 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
- 9** without unit
- 0** special marking (see below for standard markings*)
special marking as requested by customer*)

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*)

F OEM branding*)

Options

- 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, 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

*) Clearly add desired specifications.

**) Please indicate the signal voltage range and the bridge resistance when ordering.

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, 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, 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 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

Operating mode	Digital signals	AC-Eingangssignale
Frequency measurement	0.1 Hz...100 kHz	0.1 Hz...10 kHz
Velocity measurement	6...99999 min ⁻¹	6...9999 min ⁻¹
Time measurement	1 ms...9999 ms	1 ms...9999 ms
Impulse counting	max. 1 kHz	max. 1 kHz
Special function	0.1 Hz...100 kHz	0.1 Hz...10 kHz

Signal inputs

Digital signals	Impulse duration min.	Input voltage (V)	Trigger level typically (V)	R _{on} (kΩ)/C _{on} (pF)	Overload/Reverse polarity protection
TTL	4 μs	5	2.4	100/10	DC 50 V dauernd
SPS	4 μs	24	6	8.2/10	
OC-PNP	4 μs	max. 40	6	8.2/10	
OC-NPN	4 μs	max. 40	6	8.2/10	
Universal	4 μs	max. 40	6	100/10	
Namur	4 μs		1.2...2.1 mA		

AC input signals U _{rms}	Input resistance	Overload protection continuous
15 V...50 V	13 kΩ	120 V
50 V...150 V	43 kΩ	350 V
150 V...430 V	120 kΩ	600 V

Signal sensor supply: DC 24 V ± 10 %, I_{max} = 40 mA, short-circuit proof, physically isolated (terminals 4/5/6)

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 %

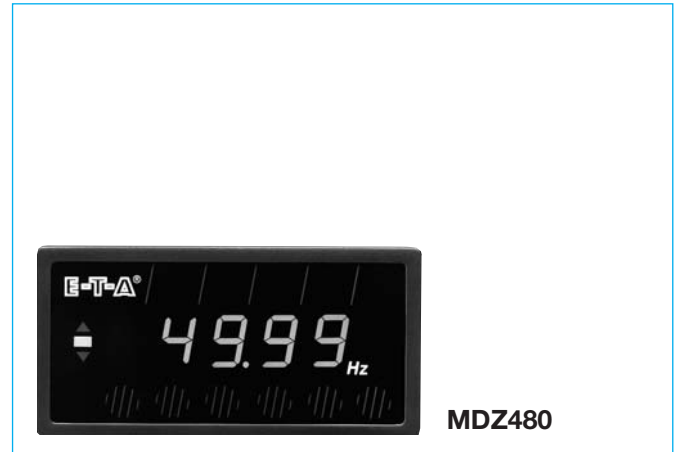
Operating temperature range: 0...50 °C

Storage temperature: -20...70 °C

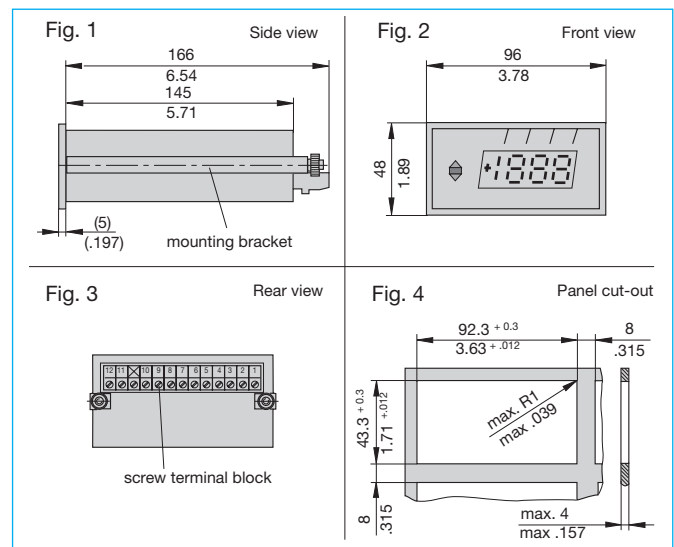
Admissible humidity: ≤ 75 % annual average, 95 % max. non-condensing

Power supply: AC 230 V ± 10 % 48...62 Hz
 AC 115 V ± 10 % 48...62 Hz

Power consumption: ≤ 9.5 VA



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

Version (Display)

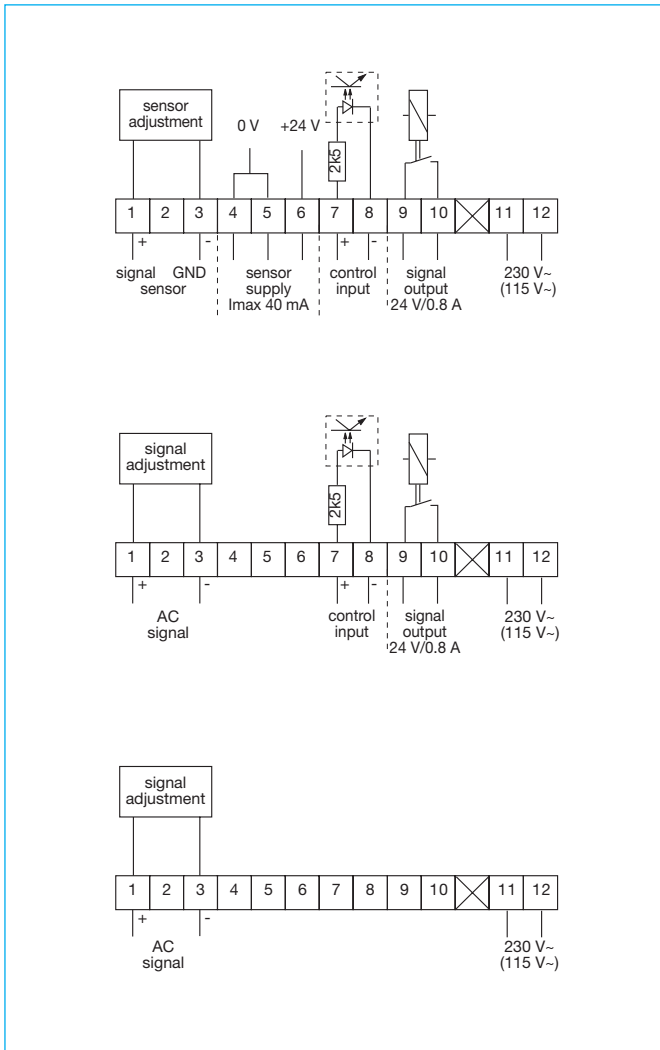
Version **V**: selectable operating modes, programmable, full-scale range of max. 5 digits.

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:

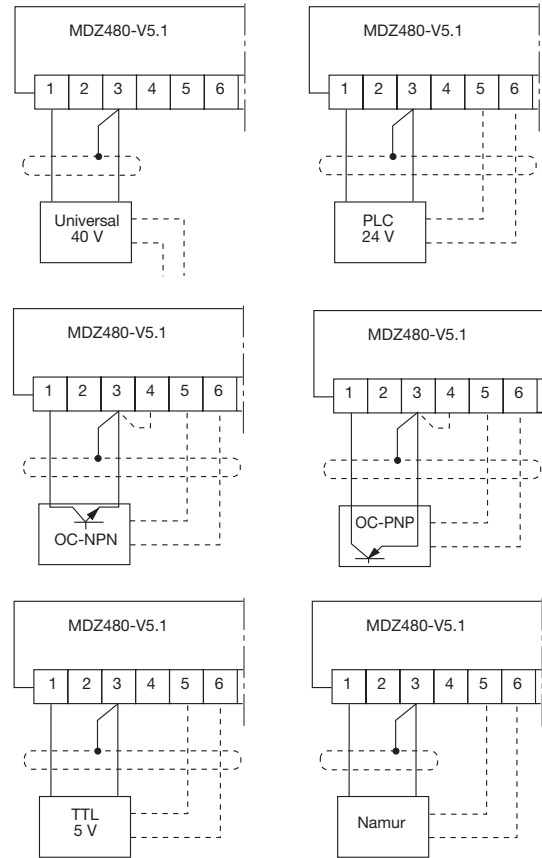
Version MDZ480-V5...	Version MDZ480-F4...	Version MDZ480-F3...
0.100...9.999	0.100...9.999	0.100...9.99
10.00...99.99	10.00...99.99	10.0...99.9
100.0...999.9	100.0...999.9	100...999
1000...9999	1000...9999	1000...9999
10000...99999		

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 9.9.9.9.9, 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.

Measuring procedures for frequency and velocity

Two procedures are available to increase the accuracy of measurement: impulse counting when the input frequency f_{in} 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.

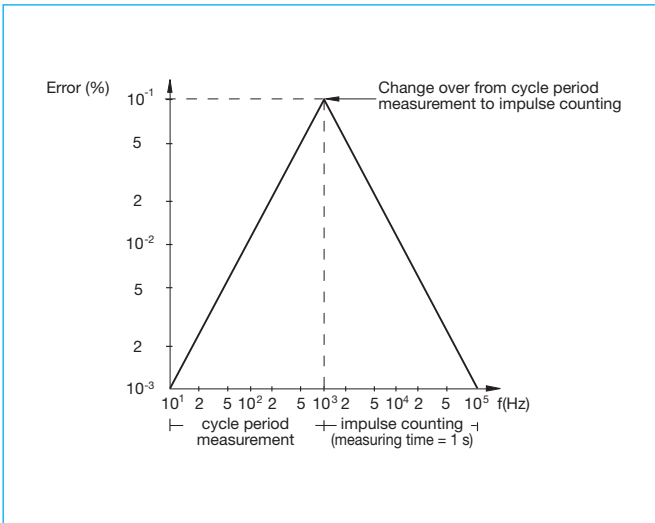
Measuring time 0: readout update after each 0.5 s.

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.

Error diagram



Option: Limit Values

An upper and a lower limit value may be set between 0.001 and 99998. 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. The relay operating mode may be selected.

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: "-----"

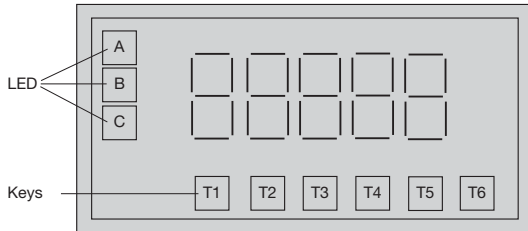
Readout when the measuring range has been exceeded: "E E E E E"

LED Display

Function	Status	Signalization
Measuring mode	Measuring or display range exceeded Counting Below measuring or display range	
Limit value monitoring	Upper limit value exceeded Acceptable range Below lower limit	
Display indicates: lower peak value (flashing)	Upper limit value exceeded Acceptable range Below lower limit	
Display indicates: upper peak value (flashing)	Upper limit value exceeded Acceptable range Below lower limit	

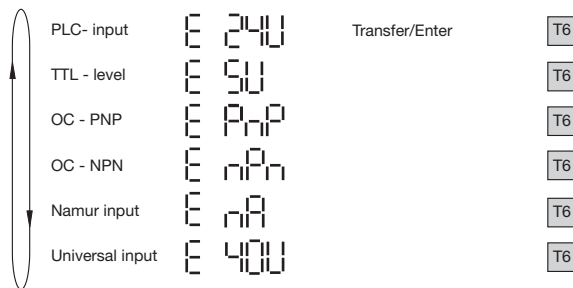
Programming

Position of the operator and display elements



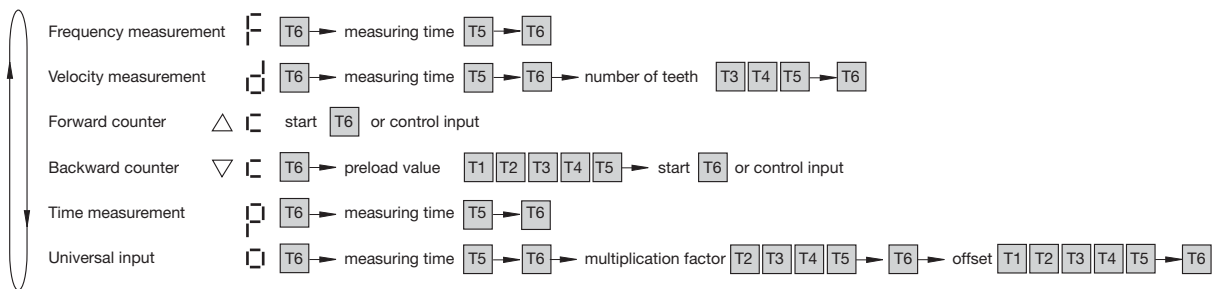
1. Select measuring input

Key 2



2. Select operating mode

Key 1



Limit values

Key 4

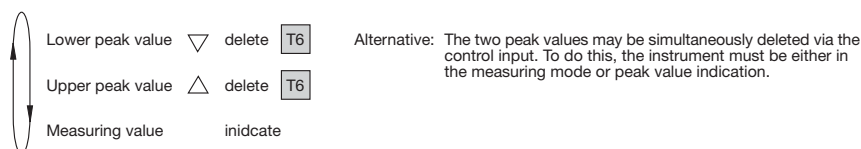
Relay operation

Key 4



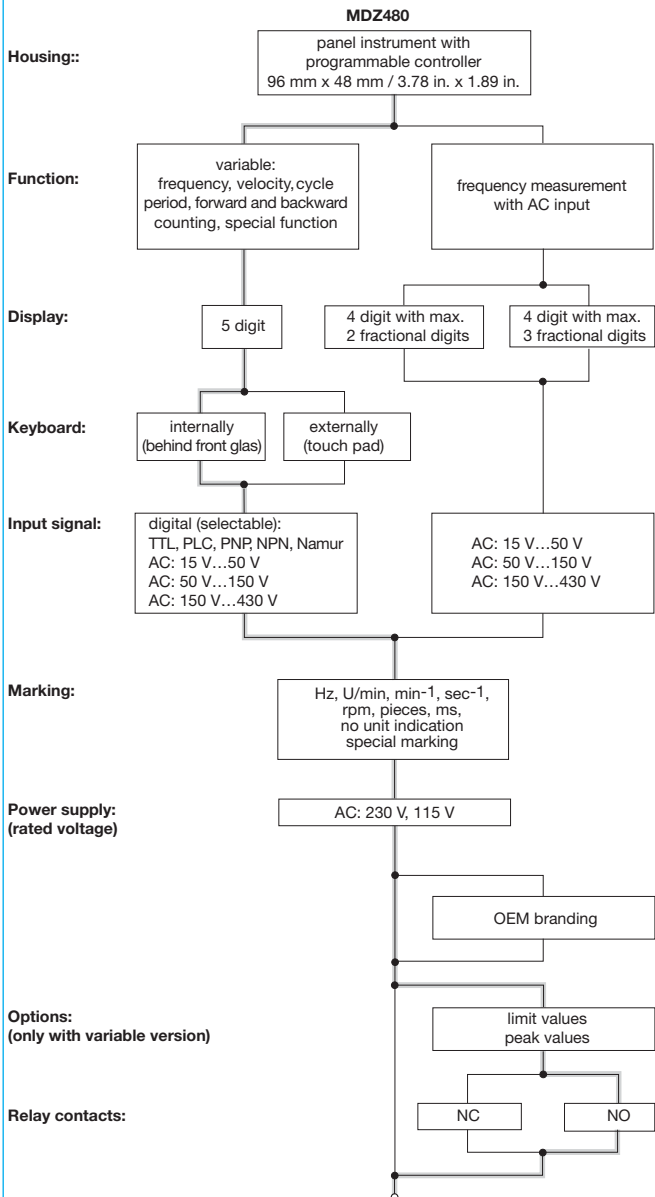
Peak values

Key 5



Selector chart

Please select the required type by following the chart below.



Example: MDZ480-V 5 H 1 1 A9 G0
Panel instrument with programmable operating modes (keyboard behind front glas)
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 Type No.

Housing

480 96 mm x 48 mm

Function

V variable

F frequency measurement

Display

3 4 digit with max. 2 fractional digits Readout: 0.00...9.99

10.0...99.9 / 100...9999 Hz

4 4 digit with max. 3 fractional digits Readout: 0.000...9.999

10.00...99.99 / 100.0...999.9

1000...9999 Hz

5 5 digit (only with ...-V version)

Keyboard

H internal

E external (only with ...-V version)

Input signal (measuring range)

1 digital (only with ...-V version)

2 AC 15 V...50 V

3 AC 50 V...150 V

4 AC 150 V...430 V

Marking

1 Hz

2 U/min

3 min⁻¹

4 sec⁻¹

5 rpm

6 pieces

7 ms

9 no unit indication

0 special marking (see below for standard markings *)

special marking as required by customer **)

Power supply (voltage rating)

A9 AC 230 V (standard)

A8 AC 115 V

F OEM branding

Options (only with ...-V version)

G0 limit values/peak values/

NO relay contact

G1 limit values/peak values/

NC relay contact

MDZ 480 - V 5 H 1 1 A9 . G0 ordering example

*) 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, 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, t/h

***) Clearly add desired marking.

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

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.

