

# LINETRAXX® VMD460-NA

Network and system protection (NS protection) for monitoring the network feed-in from generating plants





LINETRAXX® VMD460

### Device features

- Monitoring of different system types: 1AC, 3AC, 3NAC
- Continuous monitoring of the phase voltage and line-to-line voltage
- (Re)connection and monitoring of the conditions
- Reconnection after
  - short interruptions
  - df/dt detection (ROCOF)
  - vector shift detection
- Voltage protection functions  $U<$ ,  $U<<$ ,  $U>>$  and  $U>$
- Frequency protection functions  $f<$ ,  $f<<$ ,  $f>>$  and  $f>$
- Islanding detection df/dt (ROCOF), vector shift detection
- Unbalance detection
- Monitoring of the tripping circuits and interface switches by means of contact feedback
- Remote trip: remote disconnection via ripple-control receiver
- Test function for checking the tripping circuit, the interface switch and for determining the connection times
- Automatic self test
- Password protection
- Reset device to factory settings
- History memory of the last 300 faults with time stamp (real-time clock)
- Language selection (German, English, Italian)
- Remote configuration and remote maintenance using COM460IP and/or CP700 (RS-485)
- Backlit graphic LC display
- Sealable enclosure
- Single-fault tolerance

### Product description

The VMD460-NA is intended for protecting the network and the (generating) plant from inadmissible operating states and disconnecting them. For this purpose, the VMD460-NA is designed according to the single-fault tolerance principles.

If the switch-on conditions or (re-)connection conditions are fulfilled, the VMD460-NA enables the coupling of the generating plant to the network.

Details are regulated by the applicable (application) standards and guidelines.

The country-specific (application) standards and guidelines are stored in the device as selectable basic programs.

### Application examples

- Central NS protection (VDE-AR-N 4105)
- Protective disconnection (VDE-AR-N 4110, BDEW)
- Interface Protection (IP) (Engineering Recommendations; EREC G99, G59, G83, G59)
- Protezione di interfaccia (CEI 0-21)
- Automatic disconnection device between a generating plant parallel to the network and the public network
- Universal for generating plants for safe network decoupling

### Functional description

Network disconnection (switch-off) occurs when at least one of the activated protective or monitoring functions is triggered.

If the switch-on conditions or (re-)connection conditions are fulfilled, the VMD460-NA enables the coupling of the generating plant to the network.

Details are regulated by the applicable (application) standard and guideline.

The following monitoring and protective functions are implemented in the VMD460-NA:

- Voltage protection functions
  - Rise-in-voltage protection:  $U>$ ,  $U>>$
  - Under-voltage protection:  $U<<$ ,  $U<$
- Frequency protection functions
  - Rise-in-frequency protection:  $f>$ ,  $f>>$
  - Under-frequency protection:  $f<<$ ,  $f<$
- Islanding detection:
  - df/dt (Rate of Change of Frequency; ROCOF)
  - Vector shift detection
- Unbalance detection
- Monitoring of the trigger circuits and coupling switches by means of contact feedback
- Remote trip/remote switch-off (e.g. via ripple control signal receiver)
- Test function (test button) for testing the trigger circuit, the coupling switch and for determining the switch-off times
- Automatic self test

**Approvals/certificates of conformity/manufacture declarations**

- VDE-AR-N 4105:2018-11
- VDE-AR-N 4105:2011-08
- VDE-AR-N 4110:2018-11
- BDEW technical guideline 2008 incl. amendments until 01.2013
- G99/1:2019
- G59/2
- G59/3
- G98/1:2019
- G83/2
- CEI 0-21 (:2012-06, :V1:2012-12, :V2:2013-12, :2014-09, :V1:2014-12, :2016-07, V1:2017-07)
- C10/11:2012-06
- DIN V VDE V 0126-1-1(:2016-06, /A1:2012-02)

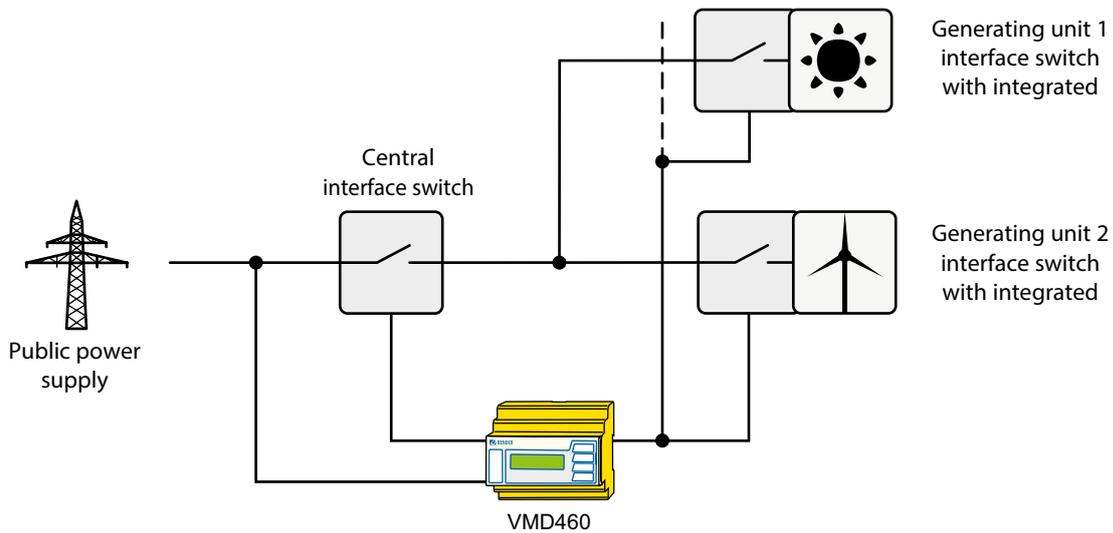
**Standards**

- UL 508
- CSA (22.2 No. 14-13)

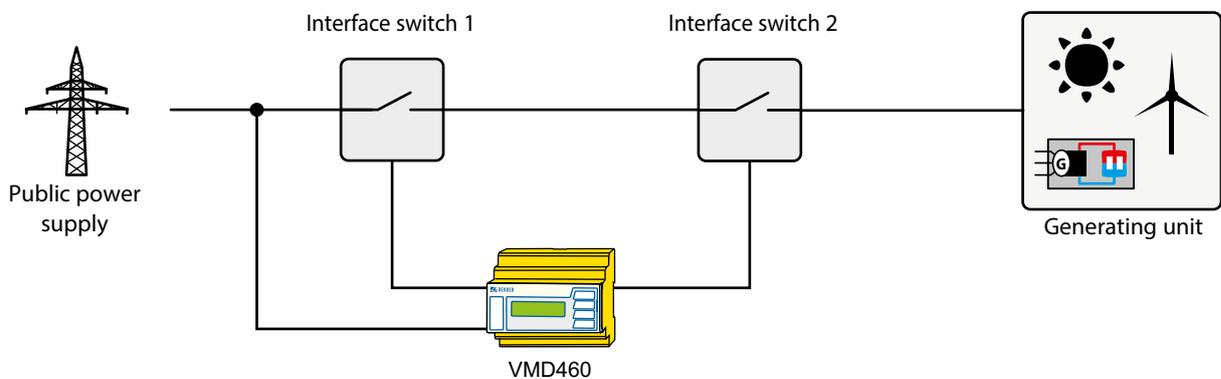
**Certifications**



**Schematic diagram**

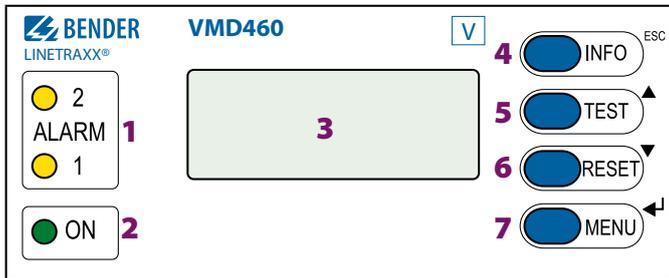


*Schematic diagram of a central NS protection according to VDE-AR-N 4105:2018-11*



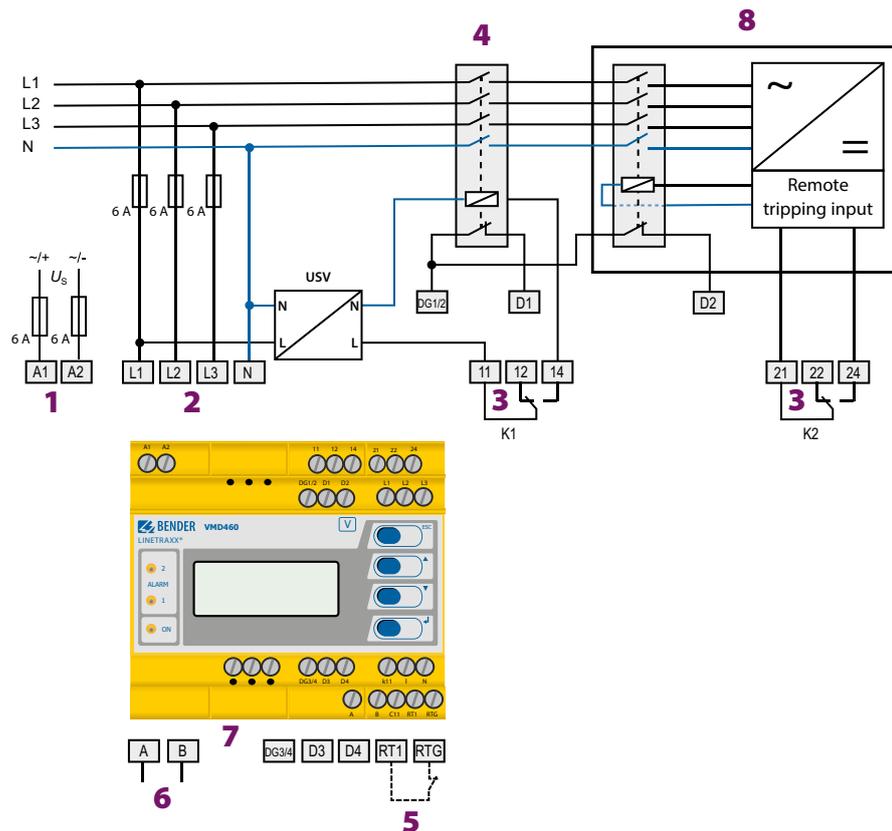
*Schematic diagram of a central NS protection with interface switches*

**Operating elements**



- 1 - Both alarm LEDs “AL1” and “AL2”: light up in case of a limit value violation of voltage and frequency.
- 2 - “ON” LED (green): lights when the voltage supply is available and the device is in operation or flashes in case of a system error message (external watchdog).
- 3 - Backlit LC display
- 4 - “INFO” button
- 5 - Use the “TEST” button to run a manual self test which triggers both alarm relays (trigger test to check the coupling switches). In addition, fault simulation will be carried out with documentation of the switch-off time.  
Arrow-up button: parameter change, scrolling.
- 6 - “RESET” button: acknowledge alarm and fault messages.  
Arrow-down button: parameter change, scrolling.
- 7 - “MENU” button: toggle between the standard display, menu and alarm display.

**Wiring diagram VMD460 (VDE-AR-N-4105)**



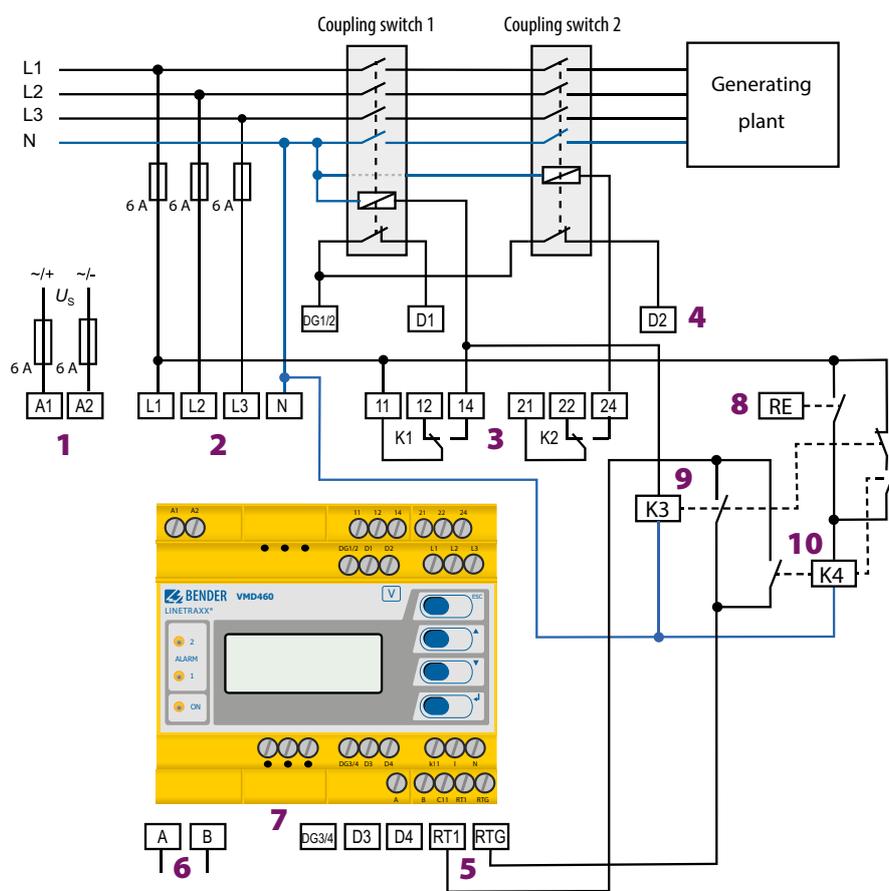
- 1 - A1, A2 Supply voltage  $U_s$  (see ordering details)
  - 2 - L1, L2, L3, N Power supply connection
  - 3 - K1, K2 Relay connections
  - 4 - DG1/2, D1 Central interface switch with contact monitoring  
D1: Feedback signal contact K1  
(feedback signal contacts optionally NC/NO/off)\*
  - 5 - RTG, RT1  
RTG: GND  
RT1: remote trip input (optionally NC/NO/off)\*
  - 6 - A, B Service interface
  - 7 -  $R_{on/off}$  Activate or deactivate the terminating resistor of the service interface (120  $\Omega$ )
  - 8 - DG1/2, D2 Generating unit (in this case PV inverter with an integrated interface switch and contact monitoring)  
D2: Feedback signal contact K2  
(feedback signal contacts optionally NC/NO/off)\*
- \* NO (in non-operating state open)  
  
 NC (in non-operating state closed)  
  
 aus (switched off)

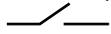
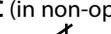
**Wiring diagram VMD460 (4110)**

Within the scope of VDE-AR-N 4110:2018-11, the VMD460-NA can be used as protective disconnection device for the generating unit or as higher-level protective disconnection, the latter, however, only if the Q-U protection function may be dispensed with. According to VDE-AR-N 4110:2018-11 chapter 10.3.3.4 par. 5, this is possible after consultation with the network operator and under the following conditions:

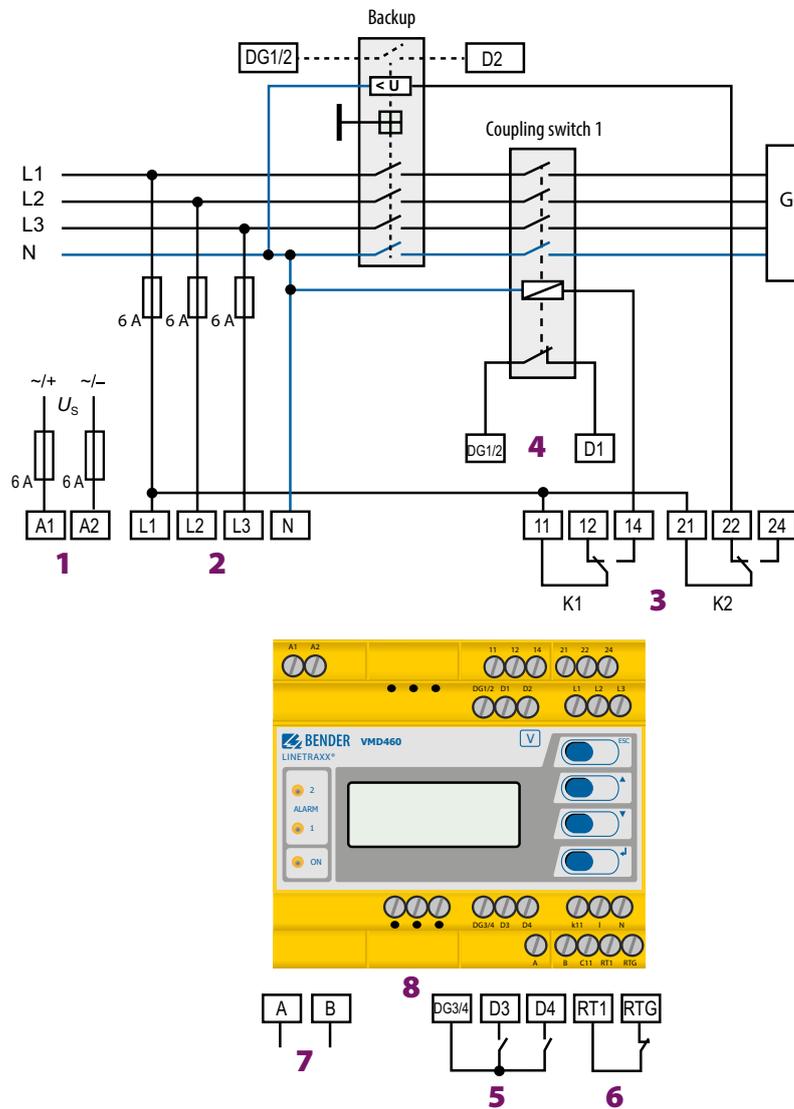
- Generating plants with limited dynamic network support or
- Generating plants < 1 MVA

Both types of application are possible when the generating plant is connected to the busbar of a substation (MV-busbar) or when the generating plant is connected to the medium-voltage network (MV-network).



- 1 - A1, A2 Supply voltage  $U_s$  (see ordering details)
  - 2 - L1, L2, L3, N Power supply connection
  - 3 - K1, K2 Relay connections
  - 4 - DG1/2, D1, D2 Contact monitoring coupling switch  
DG1/2: GND  
D1: Feedback signal contact K1  
D2: Feedback signal contact K2  
(feedback signal contacts optionally NC/NO/off)\*
  - 5 - RTG, RT1 RTG: GND  
RT1: remote trip input (optionally NC/NO/off)\*
  - 6 - A, B Service interface
  - 7 -  $R_{on/off}$  Activate or deactivate the terminating resistor of the service interface (120  $\Omega$ )
  - 8 - RE Ripple-control receiver
  - 9 - K3 External relay with an N/C contact and an N/O contact
  - 10 - K4 External relay with two N/O contacts
- DG3/4, D3, D4 Not used for the standard mentioned before
- \* **NO** (in non-operating state open)  
  
**NC** (in non-operating state closed)  
  
**off** (contact monitoring switched off)

**Wiring diagram VMD460 (CEI 0-21)**



- 1 - A1, A2** Supply voltage  $U_s$  (see ordering details)
  - 2 - L1, L2, L3, N** Power supply connection
  - 3 - K1, K2** Relay connections
  - 4 - DG1/2, D1, D2** Contact monitoring, coupling switch  
 DG1/2: GND  
 D1: Feedback signal contact K1  
 D2: Feedback signal contact K2  
*(feedback signal contacts optionally NC/NO/off)\**
  - 5 - DG3/4, D3, D4** Digital inputs (external monitoring)  
 DG3/4: GND  
 D3: local control (CEI 0-21 8.6.2.1.1)\*\*  
 D4: external signal (CEI 0-21 8.6.2.1.2)\*\*  
*(optionally NC/NO/off)\**
  - 6 - RTG, RT1** RTG: GND  
 RT1: Remote trip input  
*(optionally NC/NO/off)\**
  - 7 - A, B** Service interface
  - 8 - R<sub>on/off</sub>** Activate or deactivate the terminating resistor of the BMS bus (120 Ω)
- \* **NO** (in non-operating state open)  
  
**NC** (in non-operating state closed)  
  
**off** (contact monitoring switched off)
- \*\* In order to evaluate the inputs D3 and D4, the mode can be adjusted correspondingly in the menu (menu: 3. Settings -> 1. General -> 4. Mode)

**Ordering details**

Supply voltage $U_s$	Type	Art. No.
AC/DC	VMD460-NA-D-2	B93010045
100...240 V		

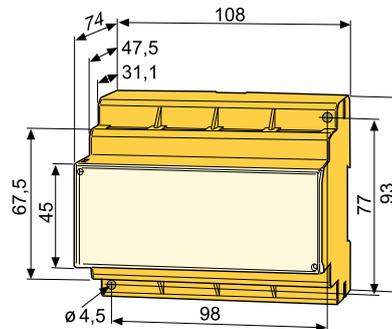
Device version with push-wire terminals on request.

**Accessories**

Name	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

**Dimension diagrams**

Dimensions in mm



**Technical data**
**Insulation coordination acc. to IEC 60664-1/IEC 60664-3**

Rated voltage	400 V
Rated impulse voltage/pollution degree	6 kV/2
Overtoltage category	III
Protective separation (reinforced insulation) between (A1, A2) - (L1, L2, L3, N) - (11, 12, 14, 21, 22, 24) (D1, D2, D3, D4, DG1/2, DG3/4, RTG, RT1)-(A1, A2, L1, L2, L3, N)	
Voltage test according to IEC 61010-1: (N, L1, L2, L3) - (A1, A2), (11, 12, 14, 21, 22, 24)	3.32 kV

**Supply voltage**

Nominal supply voltage $U_s$	AC/DC 100...240 V DC/50/60 Hz
Operating range $U_s$	AC/DC 75...300 V DC/40...70 Hz
Power consumption at AC 230 V maximum	< 7.5 VA / < 3.5 W 9 VA / 3.5 W

**Measuring circuit**

Nominal system voltage $U_n$ (rms value) (L-N)	AC 0...300 V
Nominal system voltage $U_n$ (rms value) (L-L)	AC 0...520 V
Rated frequency $f_n$ ( $U_n > 20$ V)	45...65 Hz

**Response values**

System type	1AC: 230 V, 50 Hz 3(N)AC: 400/230 V, 50 Hz
Relative uncertainty, voltage	$U \leq 280$ V: $\leq \pm 1$ % $U > 280$ V: $\pm 3$ %
Resolution of setting, voltage	1 %
Nominal frequency	50/60 Hz
Relative uncertainty, frequency	$\leq \pm 0.1$ %
Resolution of setting $f$	0.05 Hz

**Recording of measurement values, condition for connection**

L-N, L-L	0...1.5 $U_n$
$f < , f <<$	45...60 Hz
$f > , f >>$	50...65 Hz

**Recording of measurement value, condition for disconnection**

L-N, L-L	0...1.5 $U_n$
$f < , f <<$	45...60 Hz
$f > , f >>$	50...65 Hz
df/dt	0.05...9.9 Hz/s
Vector shift	1...25 %
Unbalance (Neutral-Voltage-Displacement 59 (N))	1...50 %

**Time response**

Delay time for connection $t_{on}$	40 ms...60 min
Resolution of setting $t_{on}$	< 50 ms: 5 ms 50...200 ms: 10 ms 200 ms...5 s: 50 ms 5...10 s: 0.1 s 10 s...60 s: 1 s 60...300 s: 10 s 300 s...60 min: 1 min
Operating time voltage $t_{ae}$	half a supply period
Operating time, frequency $t_{ae}$	$\leq 40$ ms
Recovery time $t_b$	300 ms

**Digital inputs**

Monitoring of potential-free contacts or voltage inputs:	closed = low; 0...4 V; $I_m < -5$ mA open = high; $> 6$ ... $\leq 30$ V
D1	feedback signal contact K1
D2	feedback signal contact K2
D3	local control (mode)
D4	external signal (mode)
RT1	remote trip
DG1/2, DG3/4, RTG	GND
Max. length of the connecting cables of digital inputs	3 m

**Displays, memory**

Display	LC display, multi-functional, illuminated
Display range, measured value	AC/DC 0...520 V
Operating uncertainty, voltage	$U \leq 280$ V: $\leq \pm 1$ % $U > 280$ V: $\pm 3$ %
Operating uncertainty, frequency	$\leq \pm 0.1$ %
History memory for the last 300 messages	1 data record of measured values each
Password	off/on/0...999 (off)*

**Switching elements**

Number of changeover contacts	2 x 1 (K1, K2)
Operating mode	N/C operation / N/O operation
Electrical endurance in rated operating conditions	10 000 cycles

**Contact data acc. to IEC 60947-5-1**

Utilisation category	AC-13	AC-14	DC-12	DC-12	DC-12
Rated operational voltage	230 V	230 V	24 V	110 V	220 V
Rated operational current	5 A	3 A	1 A	0.2 A	0.1 A
Minimum contact rating	1 mA at AC/DC $\geq 10$ V				

**Environment/EMC**

EMC	DIN EN 60255-26/CEI 0-21
Operating temperature	-25...+55 °C

**Classification of climatic conditions acc. to IEC 60721**

Stationary use (IEC 60721-3-3)	3K5 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K3 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K4 (except condensation and formation of ice)

**Classification of mechanical conditions acc. to IEC 60721**

Stationary use (IEC 60721-3-3)	3M4
Transport (IEC 60721-3-2)	2M2
Long-term storage (IEC 60721-3-1)	1M3

**Connection**

Connection type	screw-type terminals or push-wire terminals
Connection properties:	
rigid	0.2...4 mm <sup>2</sup> (AWG 24...12)
flexible	0.2...2.5 mm <sup>2</sup> (AWG 24...14)
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm

**Other**

Operating mode	continuous operation
Mounting	any position
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
Flammability class	UL94 V-0
DIN rail mounting acc. to	IEC 60715
Screw mounting	2 x M4 with mounting clip
Documentation number	D00001
Weight	$\leq 360$ g

(\*) = Factory setting



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