

LINETRAXX® VMD461 with CD440 coupling device

Multifunctional voltage relay for AC, DC, 3(N)AC systems

Underfrequency $81 < U^*$, overfrequency $81 > O^*$, overvoltage 59^* ,
undervoltage 27^* , phase sequence 47^* , unbalance 47^* , vector shift 78^* ,
ROCOF df/dt $81R^*$

* ANSI codes



LINETRAXX® VMD461

with CD440 coupling device

Multifunctional voltage relay



LINETRAXX® VMD461 + CD440

Device features

- When combined with a CD440 coupling device, DC systems up to 1200 V, 1AC systems up to 690 V, 3AC systems up to 1200 V and 3NAC systems up to 690 V can be monitored
- All functions are represented in ANSI codes
- Monitoring of DC, 1AC, 3(N)AC systems DIN EN 60255-1:2010-9
- Three-stage voltage and frequency monitoring
- Unbalance, phase failure and phase sequence monitoring
- Monitoring of the connected switches and/or disconnectors (configurable: NC/NO/off)
- Islanding detection df/dt (ROCOF)
- Vector shift function
- RS-485 interface (data exchange/parameter setting/software update)
- Test function to determine the switch-off time
- Test button for the trigger circuit
- The last 300 network faults can be recalled with time stamp/real-time clock
- Continuous monitoring of the phase voltage and line-to-line voltage
- Special switch-on conditions after an infringement of a response value
- Language selection (German, English, French)
- Backlit graphic LC display
- Password protection for device setting
- Remote shutdown via ripple control signal receiver
- Sealable enclosure

Certifications



UL, CSA in preparation

Product description

The multifunctional voltage monitoring relay VMD461 monitors frequencies, undervoltages and overvoltages in DC, AC and 3(N)AC systems. The phase voltages and/or line-to-line voltages are measured as r.m.s. value and are continuously shown on the device display. The measured value required to trigger the alarm relay is stored. The VMD461 features additional measuring functions for:

- ROCOF df/dt
- Vector shift monitoring
- Unbalance monitoring
- Phase sequence monitoring

The corresponding ANSI codes for all available measuring functions are provided. Configurable delay times allow considering special installation-specific properties (e.g. device-specific start-up procedures). The VMD461 requires an external supply voltage.

The optional use of a CD440 coupling device extends the voltage range that can be monitored to DC/3AC 1200 V or 1AC/3NAC 690 V.

Application examples

- Monitoring of voltage-sensitive machines and installations
- Switching installations on and off at a certain voltage level
- Protection of three-phase motors against phase failure and phase open-circuit
- Vector shift detection for protection of electrical machines
- Islanding detection ROCOF (rate of change of frequency)
- Transformer protection by recognising asymmetrical load

Functional description

Once the supply voltage is applied, the start-up delay $t_{\text{start-up}}$ begins. Measured voltage and frequency values changing during this time do not influence the switching state of the alarm relays K1 and K2.

The devices feature three separately adjustable limit values for overvoltage/undervoltage as well as overfrequency/underfrequency which are respectively linked to their own response delay t_{off} .

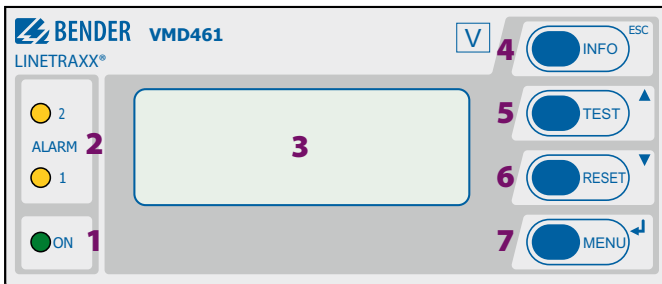
If the measured quantity exceeds or falls below the set response value and the related response delay t_{off} has elapsed, the relay assigned to the response value switches and the corresponding LED lights.

Standards

The device fulfils the requirements of the following standards:

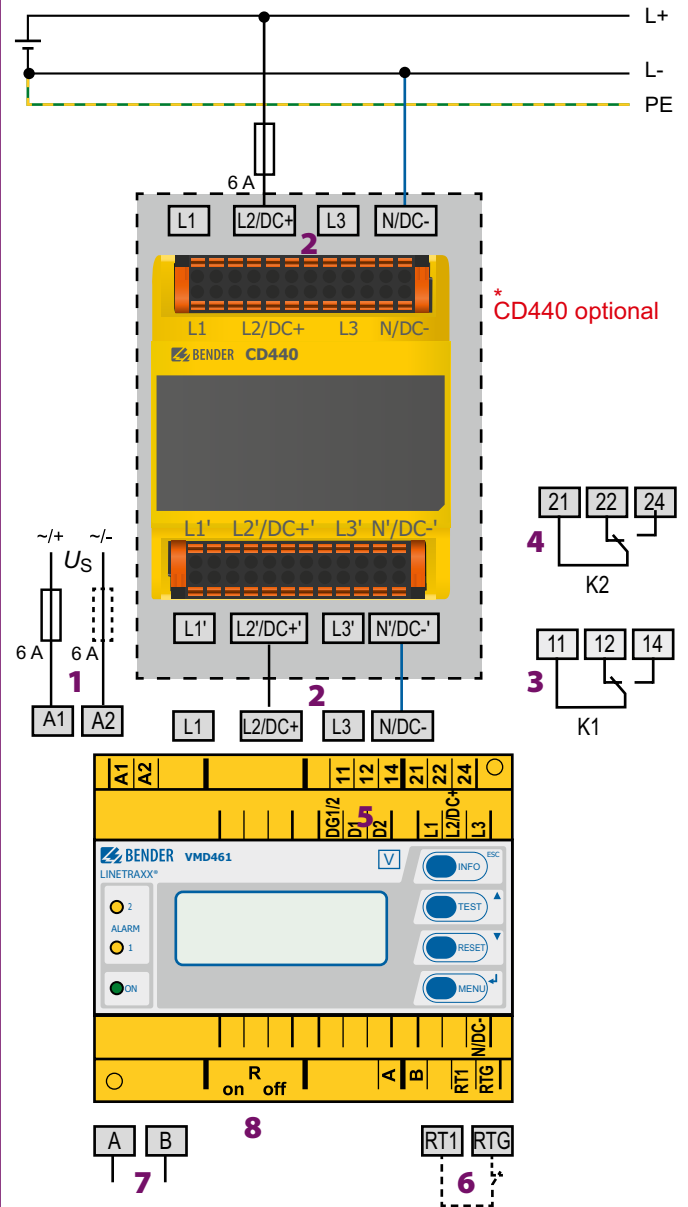
- DIN EN 60255-127 (IEC 60255-127:2010)
- VDE 0435-3127: 2014-09

Operating elements

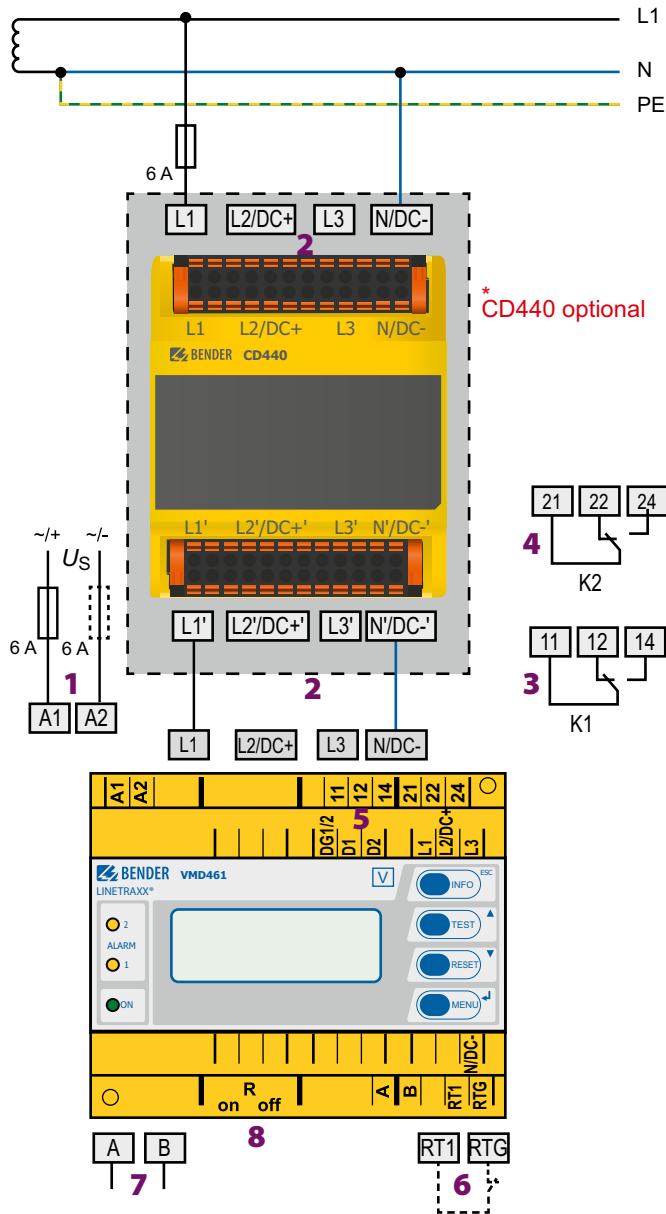


- 1 - ON Power On LED, green;
lights when the voltage supply is available and the device is in operation;
flashes when the device is being started or when an internal device error has occurred
- 2 - ALARM1 and ALARM2 Alarm LEDs, yellow: installation switched off
Only ALARM 1 lights: alarm relay K1 has tripped
Only ALARM 2 lights: alarm relay K2 has tripped
ALARM 1 and ALARM 2 light: response value violation of voltage or frequency, df/dt, vector shift detection, unbalance, phase sequence, remote trip
ALARM 1 and ALARM2 flash: internal device error or error in contact monitoring
- 3 - Backlit LC display
- 4 - INFO ESC **Standard display:** Toggle between standard display and device information
Menu display: Exit the parameter setting menu without saving; switch to the next higher menu level
- 5 - TEST **Standard display:** Use the TEST button (< 1.5 s) to start a manual self test which triggers both alarm relays (trigger test to check the switches/disconnectors). In addition, the switch-off times are documented.
Menu display: arrow-up button for parameter change and scrolling
- 6 - RESET **Standard display:** (> 1.5 s) Acknowledge fault messages from contact monitoring
Menu display: arrow-down button for parameter change/scrolling
- 7 - MENU **Standard display:** Toggle between standard, menu and alarm display
Menu display: ↵ button
Jump to setting parameter; save the changed parameters

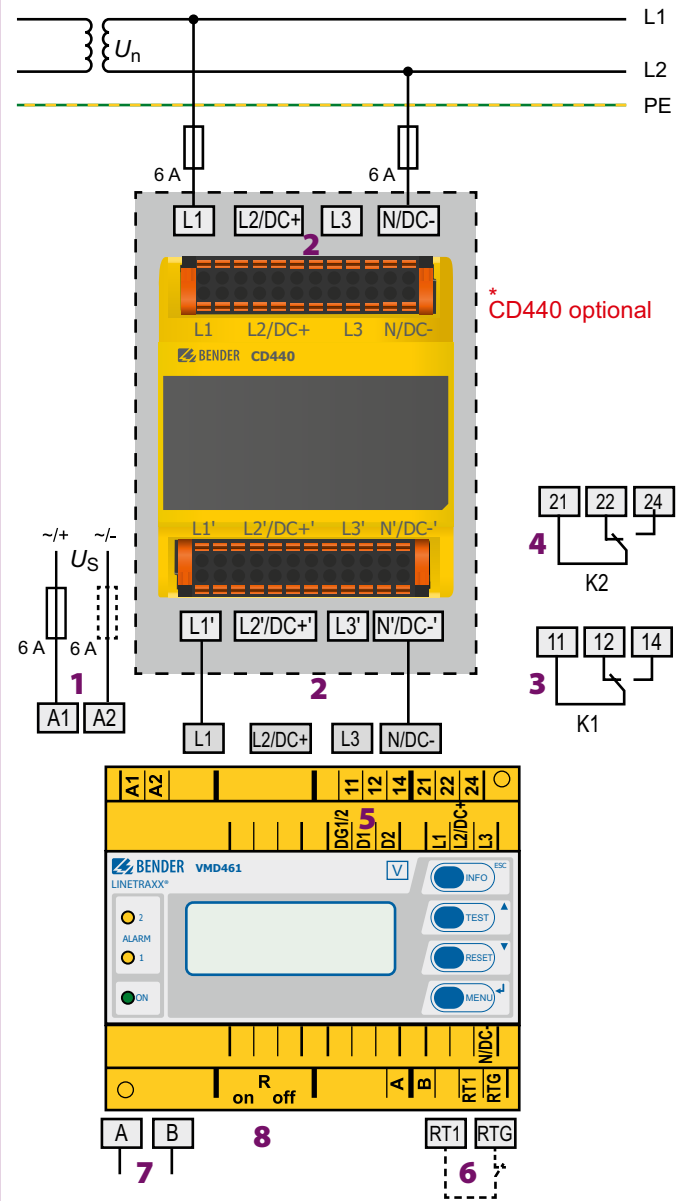
Connection DC: VMD461 with CD440



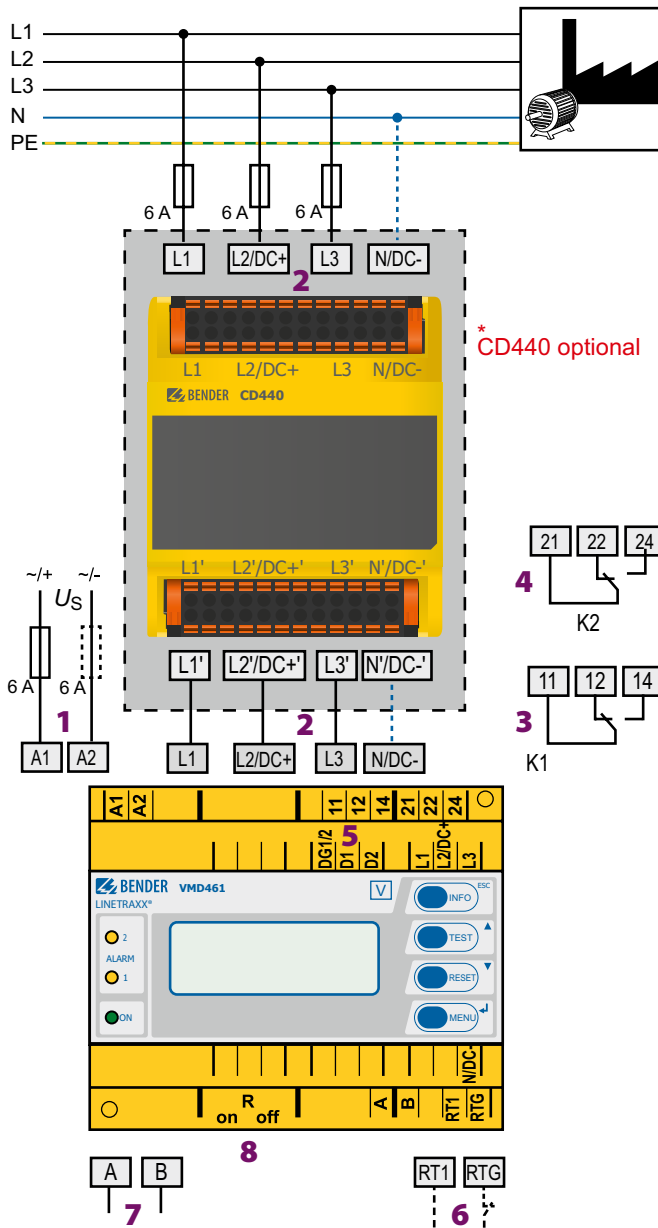
Connection AC: VMD461 with CD440 (earthed system)



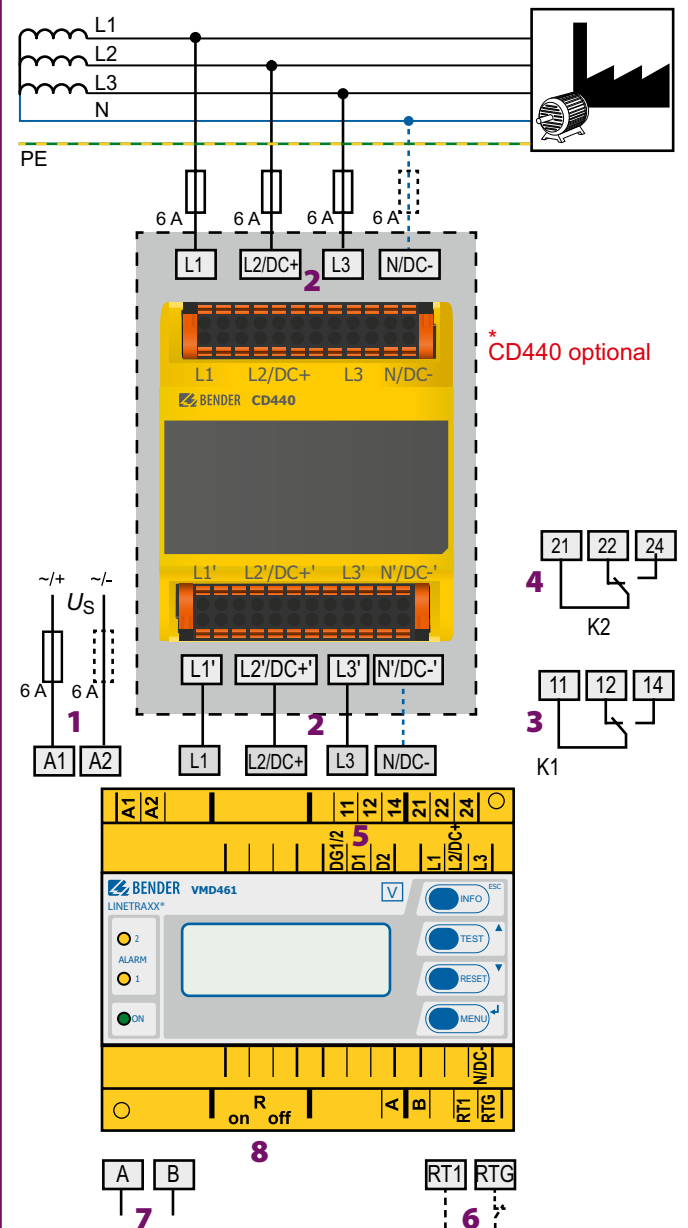
Connection AC: VMD461 with CD440 (unearthed system)



Connection 3(N)AC: VMD461 with CD440 (earthed system)



Connection 3(N)AC: VMD461 with CD440 (unearthed system)



Legend wiring diagrams

1 - A1, A2 Supply voltage U_S (see ordering details)

2 - L1, L2/DC+, L3, N/DC- Power supply connection

3 - 11, 12, 14 Connection to alarm relay K1

4 - 21, 22, 24 Connection to alarm relay K2

5 - DG1/2, D1, D2 Contact monitoring
 DG1/2: GND
 D1: Feedback signal contact to alarm relay K1
 D2: Feedback signal contact to alarm relay K2
 (feedback signal contacts optionally NC/NO/off)*

6 - RTG, RT1 RTG: GND
 RT1: Remote-trip input (optionally NC/NO/off)*

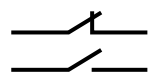
7 - A, B Connection to communication interface BMS bus

8 - $R_{on/off}$ Activate or deactivate the terminating resistor of the BMS bus (120 Ω)

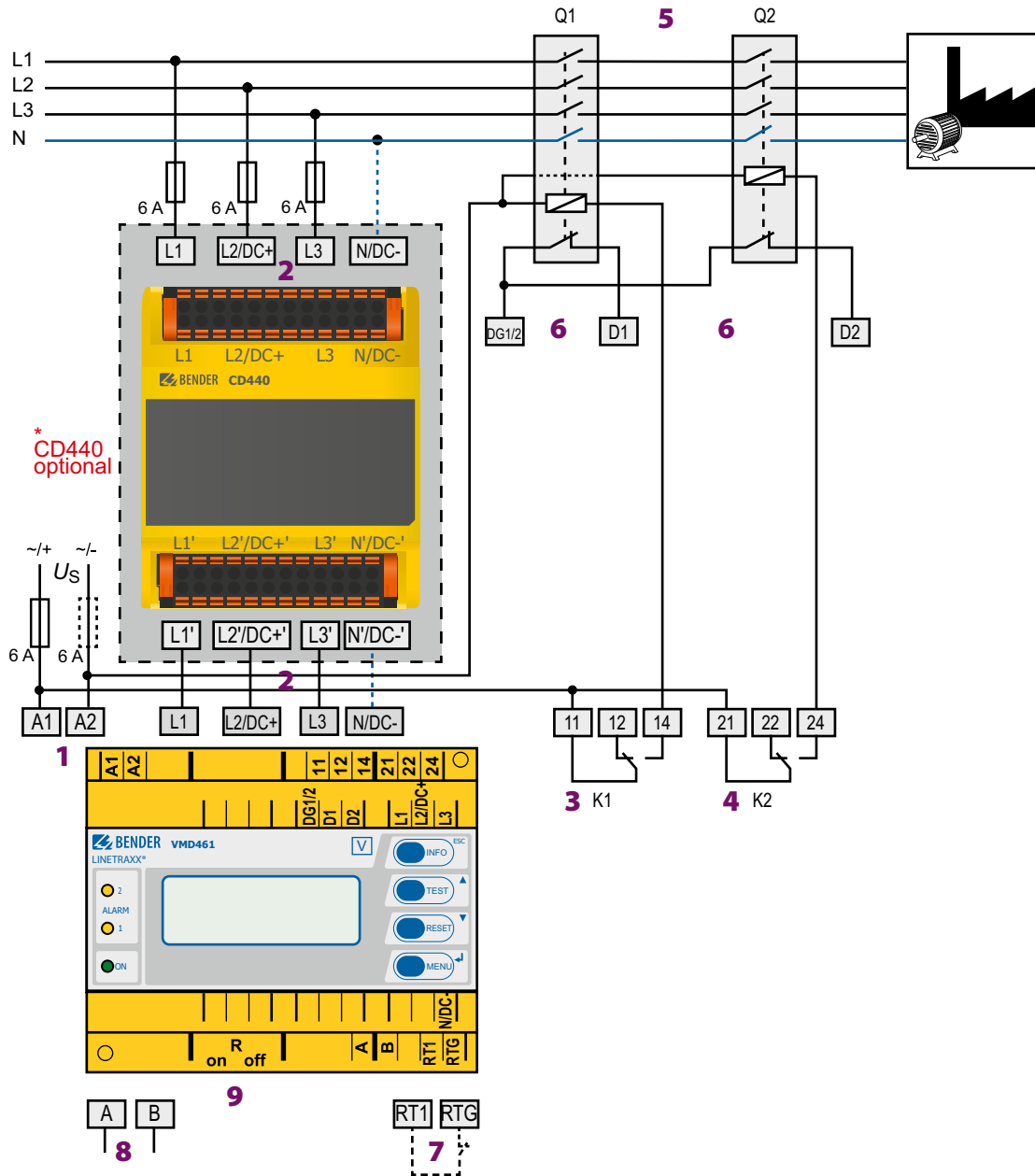
* Explanation: **NC** (closed in non-operating state)

NO (open in non-operating state)

aus (switched off)






Possible wiring diagram with 2 coupler switches

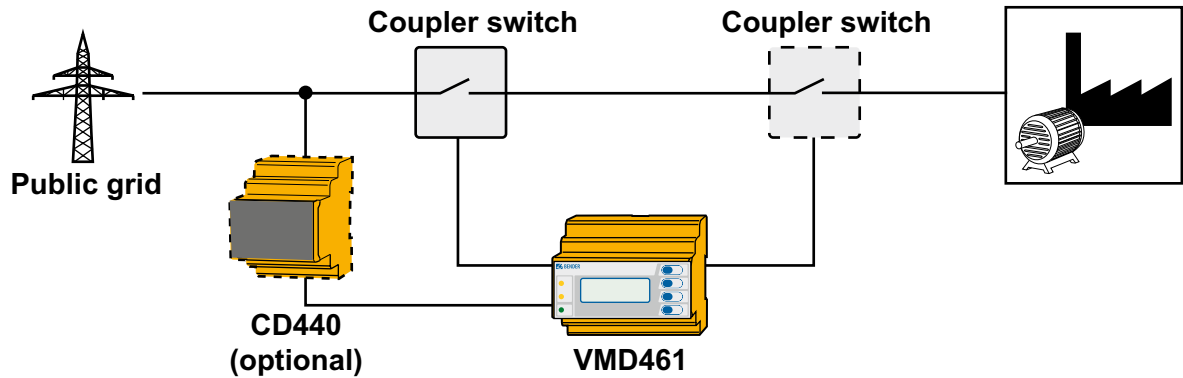


- 1 - A1, A2 Supply voltage U_s (see ordering details)
- 2 - L1, L2/DC+, L3, N/DC- Power supply connection
- 3 - 11, 12, 14 Connection to alarm relay K1
- 4 - 21, 22, 24 Connection to alarm relay K2
- 5 - Q1, Q2 Coupler switches
- 6 - DG1/2, D1, D2 Contact monitoring coupler switches Q1/Q2
DG1/2: GND
D1: Feedback signal contact to alarm relay K1
D2: Feedback signal contact to alarm relay K2
(feedback signal contacts optionally NC/NO/off)*

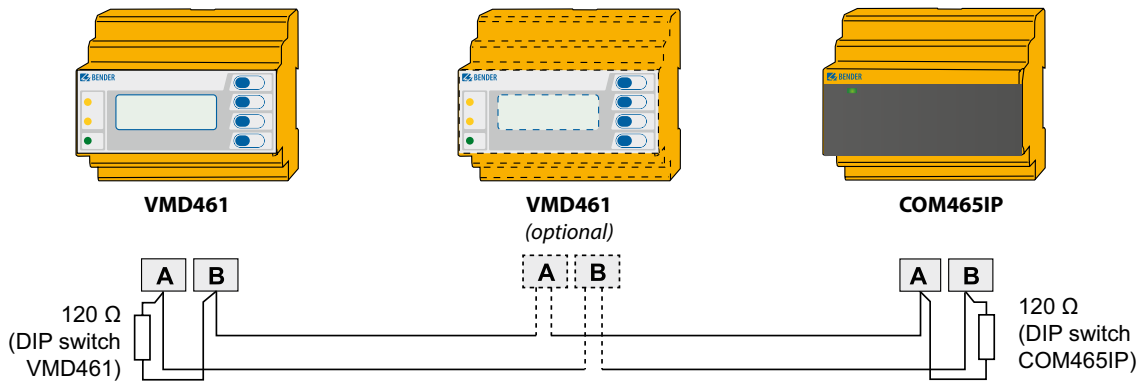
- 7 - RTG, RT1 RTG: GND
RT1: Remote-trip input (optionally NC/NO/off)*
- 8 - A, B Connection to communication interface BMS bus
- 9 - $R_{on/off}$ Activate or deactivate the terminating resistor of the BMS bus (120 Ω)

* Explanation: **NC** (closed in non-operating state) 
NO (open in non-operating state) 
aus (switched off) 

Schematic diagram with coupler switches

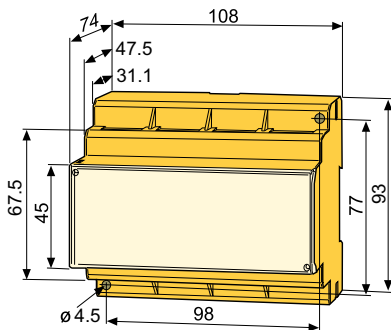


Example for a system design



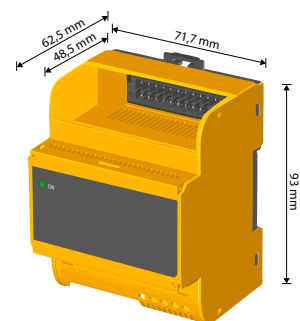
Dimension diagram VMD461

Dimensions in mm



Dimension diagram CD440

Dimensions in mm



Technical data

Insulation coordination of the device combination VMD461/CD440:

Rated voltage ≤ 1000 V	acc. to IEC 60664-1/IEC 60664-3
Rated voltage > 1000 V	acc. to EN 50178:1998

Definitions

Measuring circuit (IC1)	CD440 (L1, L2/DC+, L3, N/DC-)
Measuring circuit (IC2)	VMD461 (L1, L2/DC+, L3, N/DC-)
Supply circuit (IC3)	VMD461 (A1, A2)
Control circuit (IC4)	VMD461 (D1, D2, DG1/2, RTG, RT1)
Output circuit 1 (IC5)	VMD461 (11, 12, 14)
Output circuit 2 (IC6)	VMD461 (21, 22, 24)
Output circuit 3 (IC7)	VMD461 (A, B)

Rated voltage

IC1	DC, 3AC: 1200 V 1AC, 3NAC: 690 V
IC2	400 V
IC3	250 V
IC5, IC6	250 V

Rated impulse voltage

Overvoltage category	III
Max. altitude	2000 m
IC1/(IC2...6)	10.5 kV
IC2/(IC3...6)	4 kV
IC3/(IC4...6)	4 kV
IC4/(IC5...6)	4 kV
IC5/IC6	4 kV

Rated insulation voltage

Pollution degree	3
IC1/(IC2...6)	DC, 3AC: 1250 V 1AC, 3NAC: 800 V
IC2/(IC3...6)	400 V
IC3/(IC4...6)	400 V
IC4/(IC5...6)	400 V
IC5/IC6	4 kV

Protective separation (reinforced insulation):

IC1/(IC3...6)	DC, 3AC: Overvoltage category III, 1250 V 1AC, 3NAC: Overvoltage category III, 1000 V
IC2/(IC3...6)	300 V
IC3/(IC4...6)	300 V
IC4/(IC5...6)	300 V
IC5/IC6	300 V

Voltage test (routine test) acc. to IEC 60255-27/DIN EN 50178:1998

IC2/(IC3...6)	2.21 kV
IC3/(IC4...6)	2.21 kV
IC4/(IC5...6)	2.21 kV
IC5/IC6	2.21 kV

Supply voltage

Nominal supply voltage U_s	100...240 V
Tolerance U_s	± 25 %
Nominal frequency range U_s	DC, 50/60 Hz
Power consumption at AC 230 V maximum	< 3.5 W/ < 7.5 VA 3.5 W/9 VA

Measuring circuit

VMD461

System type	DC, 1AC, 3AC, 3NAC
Measuring range U	
r.m.s. value (L-N)	DC, AC 0...300 V
r.m.s. value (L-L)	0...520 V
Response values	1...150 %
Operating uncertainty U_n	$\leq \pm 1$ %
Resolution of setting U_n	1 %
Rated frequency	DC, 50/60 Hz
Frequency range U_n	DC, 45...65 Hz
Resolution of setting f	0.05 Hz
Relative uncertainty f	$\leq \pm 0.1$ %

VMD461 with CD440

System type	DC, 1AC, 3AC, 3NAC
Nominal voltage U_n	
r.m.s. value (L-N)	0...690 V
r.m.s. value (DC+ - DC-)	0...1200 V
r.m.s. value (L-L)	0...1200 V
Response values	1...150 %
Operating uncertainty U_n	$\leq \pm 2$ %
Resolution of setting U_n	1 %
Rated frequency	DC, 50/60 Hz
Frequency range U_n	DC, 45...65 Hz
Resolution of setting f	0.05 Hz
Relative uncertainty f	$\leq \pm 0.1$ %

Recording of measurement values, switch-on condition

$U<, U<<, U<<<$	1...100 %
$U>, U>>, U>>>$	100...150 %
$f<, f<<, f<<<$	45...60 Hz
$f>, f>>, f>>>$	50...65 Hz
Phase sequence/Polarity	right, left

Recording of measurement value, switch-off condition

$U<, U<<, U<<<$	1...100 %
$U>, U>>, U>>>$	100...150 %
$f<, f<<, f<<<$	45...60 Hz
$f>, f>>, f>>>$	50...65 Hz
df/dt	0.05...9.95 Hz/s
Vector shift	1...25 %
Unbalance	1...50 %

Time response

Start-up delay $t_{\text{start-up}}$	200 ms...60 min (200 ms)*
Switch-on delay t_{on}	off, 50 ms...60 min (100 ms)*
Response delay t_{off}	off, 50 ms...60 min (100 ms)*
Operating time voltage t_{ae}	half a supply period
Operating time, frequency t_{ae}	≤ 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 ... ≤ 30 V

D1	Feedback signal contact of alarm relay K1
D2	Feedback signal contact of alarm relay K2
RT1	remote trip
DG1/2, RTG	GND
max. length of the connecting cables of the digital inputs (shielded cable recommended)	10 m
Cable length for external test/reset button	0...10 m

Technical data (continuation)
Displays, memory

Display	LC display, multi-functional, illuminated
Display range, measured value	0...9.99 kV
History memory for the last 300 messages	per 1 data record measured values
Password	on/off/0...999 (off*)

Interface

Interface/protocol	RS-485/BMS
Baud rate	9.6 kBit/s
Cable length	0...1200 m
Recommended cable (shielded, shield connected to PE on one side)	J-Y(St)Y min. 2 x 0.8
Terminating resistor	120 Ω (0.25 W) connectable via DIP switch
Device address, BMS bus	1...90 (2)*

Switching elements

Number of changeover contacts	2 x 1 (K1, K2)
Operating principle K1, K2	N/C operation or N/O operation (N/C)*
Electrical endurance under rated operating conditions, number of cycles	10,000

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 ≥ 10 V				

Environment/EMC

EMC	DIN EN 60255-26
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
Long-term storage (IEC 60721-3-1)	1K4

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 VMD461

Connection	screw-type terminals
Connection properties:	
Rigid	0.2...4 mm ² (AWG 24...12)
Flexible with ferrule	0.2...2.5 mm ² (AWG 24...14)
Stripping length	8...9 mm
Tightening torque	0.5...0.6 Nm (5...7 lb-in)

Connection CD440

Rigid	0.2...2.5 mm ² (AWG 24...14)
Flexible without ferrule	0.75...2.5 mm ² (AWG 19...14)
Flexible with ferrule	0.2...1.5 mm ² (AWG 24...16)
Stripping length	10 mm
Opening force	50 N
Test opening, diameter	2.1 mm

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
Software version, measurement technology	D570 V1.2x
Software version, display	D256 V2.3x
Weight VMD461	≤ 360 g
Weight CD440	≤ 125 g

() * Factory setting

Ordering details

Description	Supply voltage U_s	Type	Art. No.
	AC/DC		
Multifunctional voltage relay	100...240 V	VMD461-D-2	B93010047
Coupling device for nominal voltage DC 1200 V / 1AC 690 V / 3AC 1200 V / 3NAC 690V	–	CD440	B73010046

Device version with push-wire terminals on request.

Accessories

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

Suitable system components

Description	Device variants / Supply voltage U_s	Type	Art. No.
Condition Monitor	with an integrated gateway: Bender system/Ethernet AC/DC 24...240 V, DC, 50...60 Hz	COM465IP	B95061065
	with an integrated gateway: Bender system/Ethernet DC 24 V	COM465IP-24 V	B95061066
	Individual texts for devices/channels, device failure monitoring, e-mail in the event of an alarm	COM465IP function module A	B75061011
	Modbus TCP server for max. 98 * 139 BMS nodes as well as BCOM devices and universal measuring devices, SNMP server	COM465IP function module B	B75061012
	Parameter setting for BMS devices as well as BCOM and universal measuring devices	COM465IP function module C	B75061013
	Visualisation of Bender systems, system visualisation	COM465IP function module D	B75061014
	Virtual devices	COM465IP function module E	B75061015
	Integrating third-party devices	COM465IP function module F	B75061016
	for the connection of Bender BMS devices and universal measuring devices to TCP/IP systems	CP700	B95061030
RS-485 repeater	DC 10...30 V	DI-1	B95012015
	AC/DC 24 V \pm 20 %	DI-1PSM	B95012044
Power supply unit for DI-1	AC 230 V, 50...60 Hz / AC/DC 20 V	AN471	B924189



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