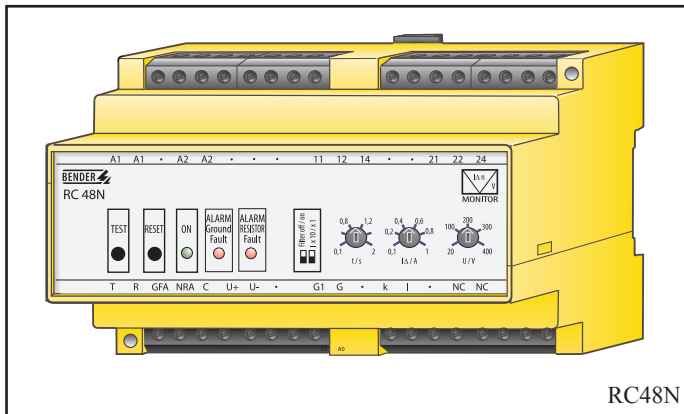


## Ground-Fault & Neutral Grounding Resistor Monitor



### Function

The RC48N ground-fault and neutral-grounding-resistor monitor

- measures the residual current in the respective circuit or branch of the system with BENDER residual current transformers. For that purpose, the neutral grounding conductor and the connection of the coupling device to the neutral have to be passed through the residual current transformer. Alternatively, all active conductors (phases + N) can be passed through the residual current transformer. If the residual current exceeds the response value, the "Alarm Ground Fault" LED lights and the alarm relay switches. The trip time is adjustable.
- monitors the resistance of the neutral grounding resistor (NGR), connections through the transformer, and the connections to ground. Also monitors the voltage drop on the neutral grounding resistor via the coupling device CD1000 and CD5000. Coupling device CD1000 is suitable for system voltages from AC 0 .. 1000 V. Coupling device CD5000 is suitable for system from voltages AC 0 ... 5000 V. An alarm is indicated when the ground-fault current or the transformer neutral and ground voltage exceeds the RC48N set point. This alarm has no time delay feature.

### Intended use

The RC48N ground-fault neutral-grounding-resistor monitor is used to monitor high-resistance grounded systems up to and including 5kVac. It is designed to monitor the presence of the neutral-grounding resistor and does this through monitoring of the current and voltage in the transformer neutral.

The RC48N ground-fault and neutral-grounding-resistor monitor combines three functions in one device:

- Monitoring the residual current.
- Monitoring the voltage between the transformer neutral and ground.
- Monitoring the grounding resistor for continuity (NGR).

If a value is not within the thresholds, a relay with two voltage-free changeover contacts will be activated. These contacts can be jumper selected for shunt or UV operation.

Alarm messages of the RC48N ground-fault and neutral-grounding monitor can also be displayed on a remote RC2000NC alarm indicator and operator panel.

### Safety Information

The connection to the power system's neutral point is made via BENDER's coupling devices CD1000 or CD5000. The enclosure of the CD1000 and CD5000 must be connected to the system ground.

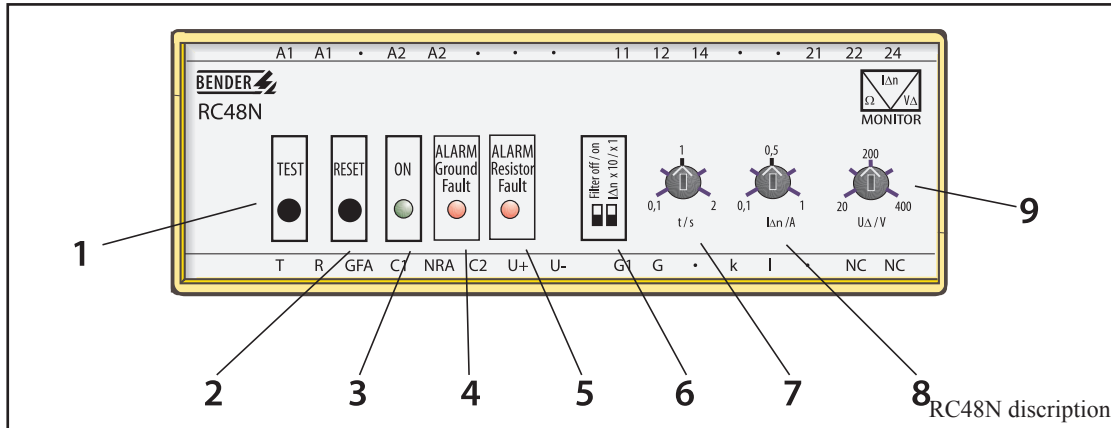
Failure to comply with this information may cause electric shock to personnel.

Furthermore, substantial damage to the electrical installation and destruction of the RC48N might occur.

Alarm messages are indicated by the "Alarm Ground Fault" and "Alarm Resistor Fault" LEDs on the RC48N or on the remote RI2000NC alarm indicator and operator panel. The alarm message remains stored until the built-in or the external RESET button is pressed.

The alarm relay can be used for the tripping of a contactor or load switch. Depending on the type of load switch the operating mode of the alarm relay can be set to N/O (shunt) operation or N/C (UV) operation.

## Operating and display elements



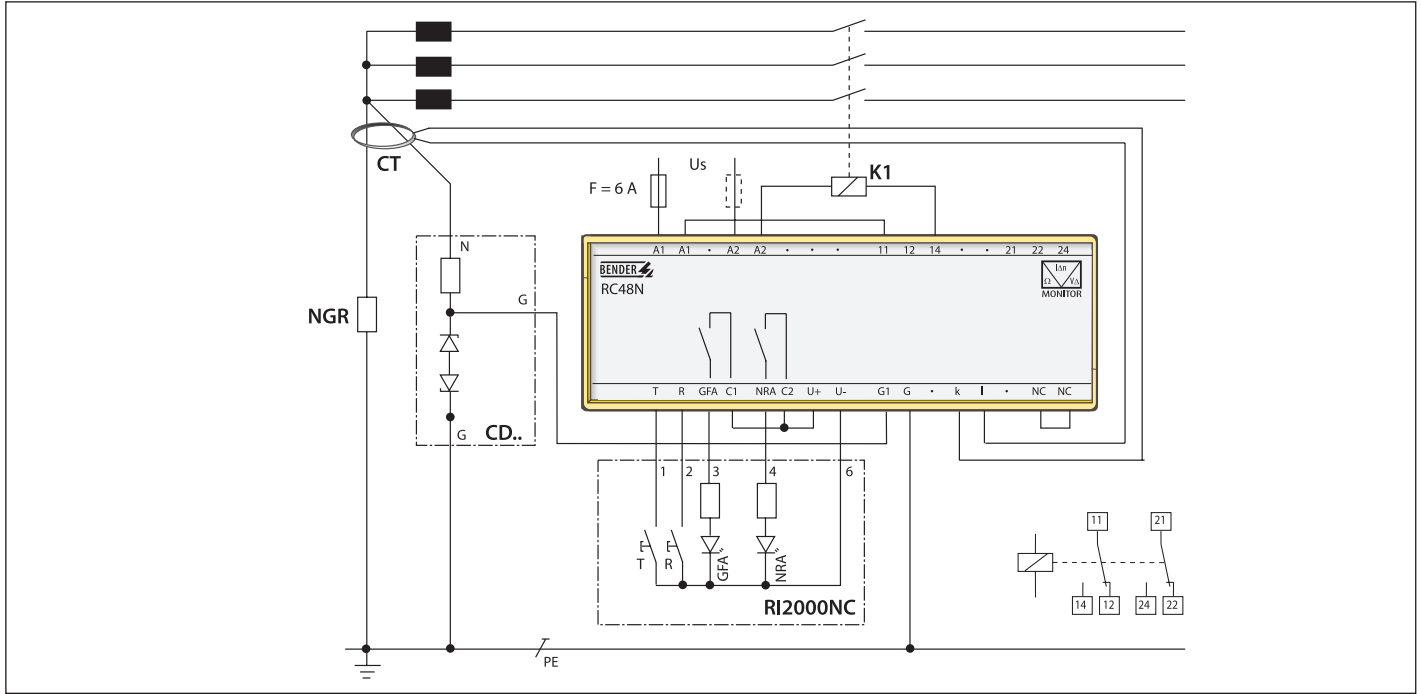
### Legend to operating and display elements

- |   |  |
|---|--|
| <p>1 Pressing the TEST button initiates the following sequence: a test residual current is simulated, after the expiry of the response time an alarm is recognized which causes the alarm relay to switch and the red “Alarm Ground Fault” LED to light. The alarm message is stored .</p> <p>2 Pressing the RESET button deletes alarm messages.</p> <p>3 ON LED (green) indicates that the RC48N is in operation.</p> <p>4 “Alarm Ground Fault” (red) LED lights when the ground fault current exceeds the alarm response value and the time delay. It flashes if a CT is not connected.</p> <p>5 “Alarm Resistor Fault” LED (red) lights when the voltage across the neutral grounding resistor exceeds the preset value or when the NGR’s resistance exceeds 2 KΩ.</p> <p>6 DIP switch:<br/>Filter off / on: bandpass filter 60 Hz<br/>When the bandpass filter is switched on, only the narrow-band 60 Hz components of the residual current are detected. This function can be used to avoid false trippings caused by the occurrence of harmonics and transient components in the residual current.<br/>IΔn x 10 / x 1: for setting the residual current response value IΔn/A:</p> | <p>7 Setting the time delay t/s for the residual current measurement from 0.1 to 2 seconds.</p> <p>8 Setting the residual current response value to 0.1 A ... 1 A respectively 1 A ... 10 A.</p> <p>9 Setting of the response value for voltages across the neutral grounding resistor from 20 to 400 V.</p> <p>Setting the response value: Formula <math>E=R \times I</math></p> <p><math>E</math>=Response Voltage Set Point<br/> <math>I</math> = RC48N Ground-fault-trip set point<br/> <math>R</math> = NGR Resistance</p> <p>IE: A 5-A NGR on a 480V system with the RC48N set to trip at 2 A would use a CD1000 with a response voltage setting of <math>2 \text{ A} \times 55 \text{ ohms} = 110 \text{ Volts}</math>.<br/>         Therefore the response voltage set point would have to be 110 volts minimum.</p> |
|---|--|

Prior to installation and before work activities are carried out on the connecting cables, make sure that the mains power is disconnected.  
 Failure to comply with this safety information may cause electric shock to personnel.  
 Furthermore, substantial damage to the electrical installation and destruction of the device might occur.

## Connection

Connect the RC48C as described in the diagram below



## Components

**CD...** Coupling devices CD1000 or CD5000 allow for voltage measurement across the neutral grounding resistor. Install the coupling device CD.. as close as possible to the neutral grounding resistor.

**CT** Residual current transformers to detect the current flowing through the neutral grounding resistor. Place the residual current transformer as shown in the wiring diagram. The residual current transformer can also be placed between the neutral grounding resistor and ground provided that no insulation fault exists in the neutral grounding resistor. Connect the residual current transformer to the terminals k and l on the RC48N.  
Do not ground any of the CT connections.  
The residual current transformer is equipped with overcurrent protection.

**RI2000NC** Remote alarm indicator and operator panel with TEST button (T), RESET button (R), "Alarm Ground Fault" LED (GFA) and "Alarm Resistor Fault" LED (NRA). The functions of the buttons and LEDs and the designations correspond to the respective operating elements on the RC48N.

**F** Short-circuit protection supply voltage: a 6 A fuse is recommended.

**K1** External load switch, disconnects the system being monitored in case of an alarm.

**A1, A2** Connection supply voltage  $U_s$ .

**11, 12, 14, and 21, 22, 24** Two voltage free changeover contacts, trip in case of alarm.

**NC, NC** Select N/O operation or N/C operation for the free changeover contacts:

Bridge open: N/O (shunt) operation

Bridge closed: N/C operation (UV) (factory setting)

**G, G1** Connection, coupling devices CD1000 or CD5000

**k, l** Connection residual current transformer, alarm LED flashes if the CT connection is interrupted.

## Connection of the remote alarm indicator and operator panel RI2000NC:

**T** Connection external TEST button

**R** Connection external RESET button

**GFA** Connection external "Alarm Ground Fault" LED

**NRA** Connection external "Alarm Resistor Fault" LED

**U+, U-** Output DC 12 V, supplying the remote alarm indicator and operator panel RI2000NC.

**C1, C2, U+** Bridge supplies the remote alarm indicator and operator panel RI2000NC with supply voltage from the RC48N.



## Technical data

### Insulation coordination acc. to IEC 60664-1:

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/contamination level	2.5 kV/3

### Voltage ranges:

Supply voltage $U_s$	AC/DC 60 ... 264 V, 50 / 60 Hz
Fuse recommended:	6 A slow fuse
Power consumption	approx. 5.8 VA at AC 60 V approx. 8.5 VA at AC 264 V

### Residual current monitoring:

Response value, residual current	adjustable 0.1 ... 1 A respectively 1 ... 10 A
Accuracy	+ 0 ... - 25 %
Response delay	adjustable 0.1 ... 2 s
Accuracy of response delay	± 20 %
Continuous short circuit current	200 A 2500 A for 2 s
Operating mode	latching

### Ground conductor monitoring:

Response value, voltage measurement	adjustable 20 ... 400 V
Accuracy	± 10 %
Response value, neutral grounding resistor at $U_N = 0$ V	2 k $\Omega$
Accuracy	+ 5 ... - 2 % of the coupling resistance
Response time	5 s ± 20 %
Operating mode	latching

### Inputs

Connection to the residual current transformer:	
Single wire, 0.75 mm <sup>2</sup> (AWG 18)	up to 1 m (3')
Single wire, twisted 0.75 mm <sup>2</sup> (AWG 18)	1 ... 10 m (3 ... 30')
Shielded cable 0.75 mm <sup>2</sup> (AWG 18) (shield to Ground)	10 ... 25m (30 ... 75')

### Outputs

Switching elements (alarm relay)	2 Form C contacts
Rated contact voltage	AC 250 V / DC 300 V
Limited making capacity	AC/DC 5 A
Limited breaking capacity	AC/DC 2/0.2 A
Permissible number of operations	12000 cycles
Operating mode, alarm relay, selectable	N/O (Shunt) or N/C (UV) operation

### Switching elements (GFA, NRA)

Rated contact voltage	AC 250 V / DC 300 V
Limited making capacity	AC/DC 5 A
Limited breaking capacity	AC/DC 2/0.2 A
Permissible number of operations	12000 cycles

### Type tests

Test of the electromagnetic compatibility (EMC)	
Immunity	according to IEC 62020
Emissions	according to EN 50081
Emissions according to EN 55011/CISPR11	Class A

### General data:

Operating temperature	- 40 °C ... + 60 °C (233 K ... 333 K)
Storage temperature	- 55 °C ... + 80 °C (218 ... 353 K)
Climatic class	according to IEC 60721K35
Operating mode	continuous operation
Mounting	any position
Connection	screw terminals
Wire cross section, single wire	0.2 ... 4 mm <sup>2</sup> (AWG 24 to 12)
Wire cross section, flexible	0.2 ... 2.5 mm <sup>2</sup> (AWG 24 to 14)
Protection class according to DIN EN 60529	
Built-in components	IP 30
Terminals	IP 20
Flammability class	UL94V-0
Weight	approx. 350 g

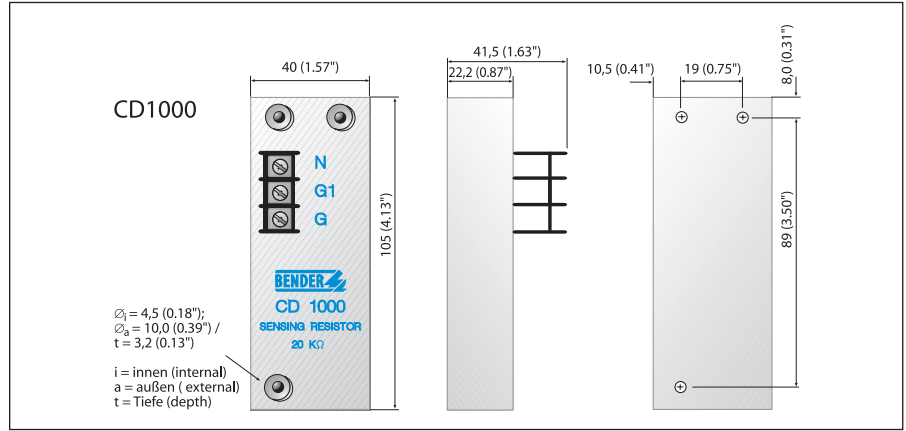
### Applied standards

CSA M421-00: July 2000: Use of electricity in mines  
 AS 2081.1 - AS2081.5: Electrical equipment for Coal Mines  
 IEC 62020:1998-08 Residual Current Monitors

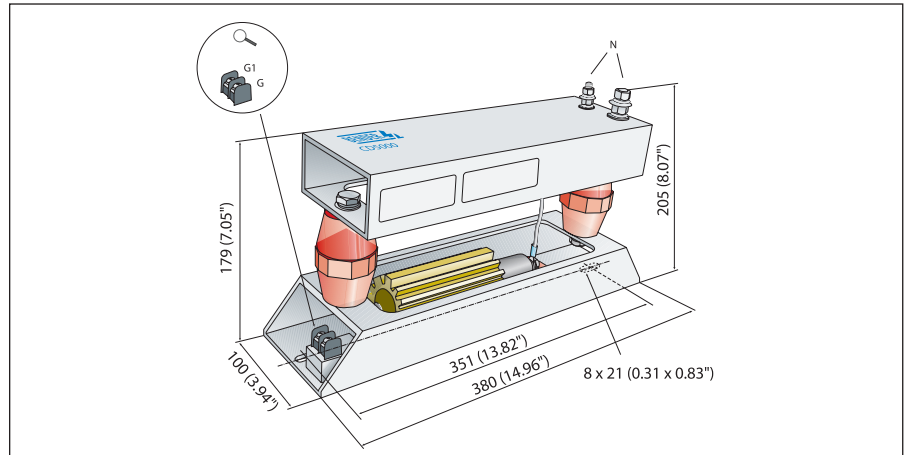


## Accessories

Dimensions in mm (inches)  
Coupling device CD1000

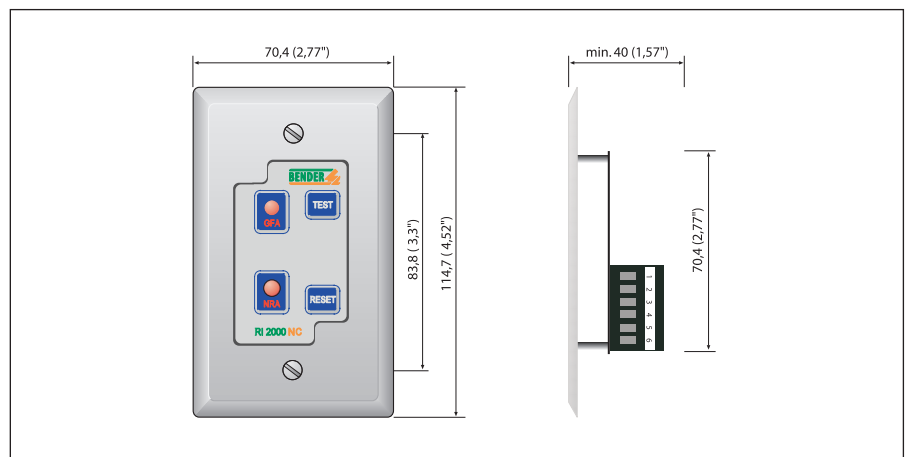


Coupling device CD5000



Remote alarm indicator and  
operator panel RI2000NC

(Installation into standard "one-gang (G1) box".)



## Ordering details

Type	Designation	Part.No
RC-48N-935	Ground-Fault and NGR Monitor	B9401 3005
CD1000	Coupling device for RC48N UN= AC 0 ... 1000V	B98039010
CD5000	Coupling device for RC48N UN= AC 0 ... 5000V	B98039011
RI2000NC	Remote alarm indicator and operator panel for RC48N	B9407 1001
CT-M70	Residual current transformer ID= 2.8"	B911 777
CT-M105	Residual current transformer ID= 4.2"	B911 778

