NGRM500 (HRG)
NGRM550 (LRG)

Neutral Grounding Resistor Monitor (NGR)

NGRM5xx_D00373_08_Q_XXEN/11.2022

Quick-start guide EN

Intended use

The NGRM500 is only intended for use in high-resistance grounded systems. The NGRM550 is only intended for use in low-resistance grounded systems. In these systems, the NGRM5… monitors

- the current through the neutral grounding resistor (NGR),
- the voltage between the star point of the transformer and ground (voltage drop across the NGR),
- the condition of the NGR.

This quick-start guide does not replace the operating manual of the device.
Download: www.bender.de/manuals

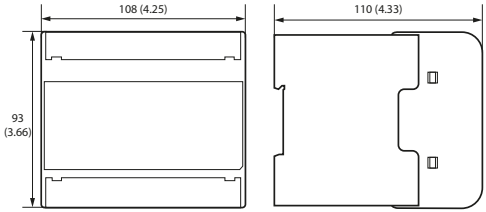
Safety instructions

Risk of electrocution due to electric shock!
Touching live parts of the system carries the risk of:
- An electric shock
- Damage to the electrical installation
- Destruction of the device
Before installing the device and before working on its connections, make sure that the installation has been de-energized. Observe the rules for working on electrical installations.

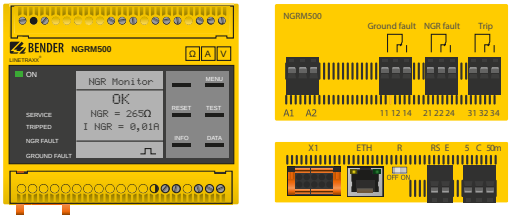
Quick-start guide for

Type	Supply voltage/Frequency range U_s	Art. No.	Manual
NGRM500	AC 48…240 V, 40…70 Hz	B94013500	D00373
NGRM550	DC 48…240 V	B94013550	

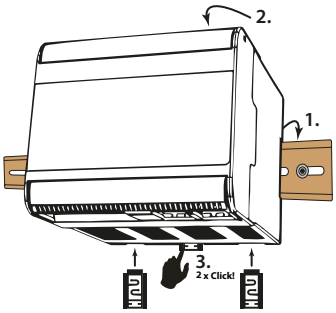
Dimension diagram (all dimensions in mm (in))



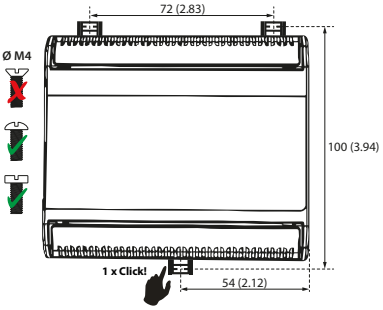
Enclosure view (front, top, bottom)



Mounting (DIN rail, screw mounting)

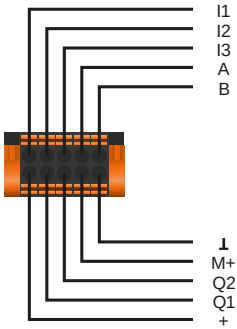


DIN rail



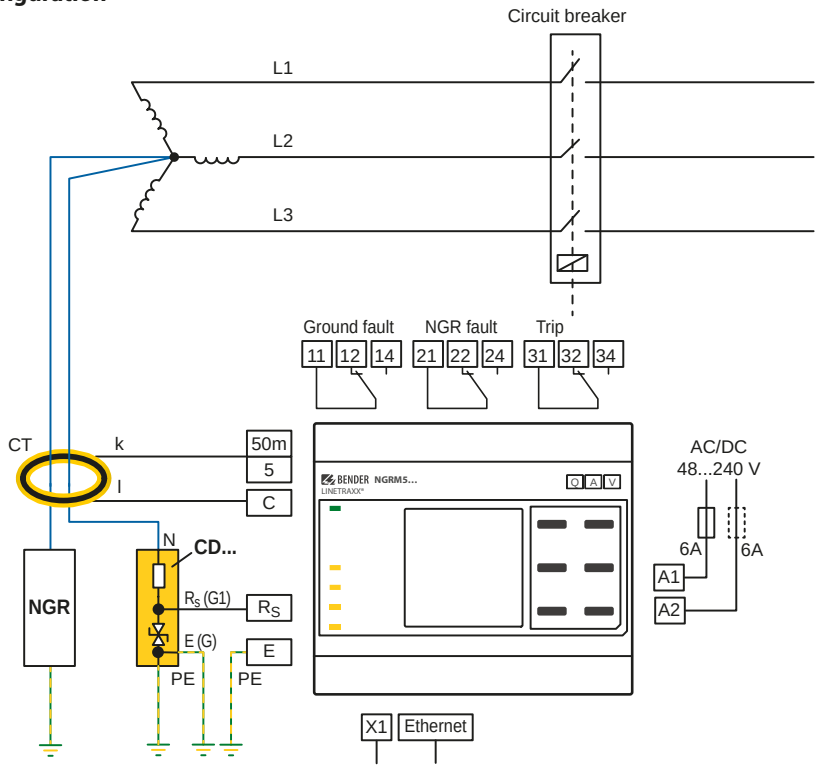
Screw mounting

Connection X1



I1	Digital 1 (configurable: pulser, NGR method)
I2	Reset IN
I3	Test IN
A	Modbus RTU (A)
B	Modbus RTU (B)
⊥	Common
M+	Analog output
Q2	Open collector: Pulser OUT
Q1	Open collector: Device health
+	Output for supply of external relays (+24 V, max. 100 mA)

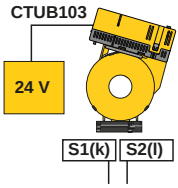
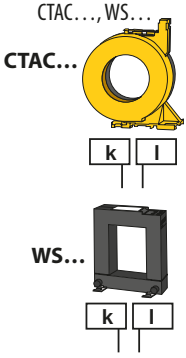
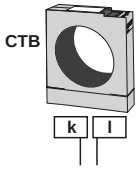
Star configuration



The "N" connection of the CD-series coupling device should be as close to the transformer star point as possible.

Measuring current transformer selection

Depending on the system to be monitored, a suitable measuring current transformer has to be chosen. All common measuring current transformers (50 mA or 5 A on the secondary side) can be used. The following table helps you with the choice:

System type	AC + DC	AC	AC	AC
I_{NGR}	1…25 A	5…25 A	5…1000 A	10…2000 A
f	0…3800 Hz	42…3800 Hz	50/60 Hz	50/60 Hz
Transformation ratio Bender measuring current transformer	Measuring range (see CTUB103 manual) 5 A 100:1 10 A 200:1 25 A 500:1	600:1		
Connecting cable	max. 30 m	max. 40 m	max. 25 m (4 mm²/AWG 12) max. 40 m (6 mm²/AWG 10)	
	provided cable or 0.75…1.5 mm²/AWG 18…16			
$I_{\Delta n}$	~ ⎓	~	~	~
Type	CTUB103 	CTAC…, WS… 	CTB31…51 	Any standard current transformer can be used.
CT: terminal k	NGRM5…: **50 mA**	NGRM5…: **50 mA**	NGRM5…: **5 A**	NGRM5…: **5 A**
CT: terminal l	NGRM5…: **C**	NGRM5…: **C**	NGRM5…: **C**	NGRM5…: **C**

Menu overview

1. Data meas. values

R_{NGR}, $R_{NGR\ rel}$, Method, R_{sense}, I_{rms}, $I_{rms\ rel}$, U_{rms}, $U_{rms\ rel}$, I_{fund}, $I_{fund\ rel}$, U_{fund}, $U_{fund\ rel}$, I_{harm}, $I_{harm\ rel}$, U_{harm}, $U_{harm\ rel}$,

2. Harmonics

3. History

History, Delete

4. Pulser

Pulser, t_{Impuls}

5. Display

R_{NGR}, I_{NGR}

6. HRG settings

- HRG/LRG system: U_{sys} (L-L), f, $I_{NGR\ nom}$, $R_{NGR\ nom}$
- CT: CT primary, CT secondary, CT connection
- NGR: Method, Filter, Filter type, Filter size, Ignore values
- Response values: $U_{NGR\ Trip}$, $I_{NGR\ Trip}$, $>R_{NGR}$, $<R_{NGR}$ *(HRG only)*, $t_{NGR\ trip}$, GF trip, $t_{GF\ trip}$, Alarm stored, $t_{restart}$, Max. no. of restarts, Trip signal, Upper limit harmonics, Lower limit harmonics
- System settings:
  - Ground fault relay ····· Mode, Relay test
  - NGR relay ····· Mode, Relay test
  - Trip relay ····· Mode, Relay test
  - Analogue ····· Mode, Function
  - Digital in/out ····· Device OUT, Pulser OUT, Digital 1, Reset IN, Test IN
  - Buzzer ····· Buzzer alarm, Buzzer test
- Field calibration

7. Device settings

Language, Clock, Interface, Display, Password, Factory setting, Software, Service

8. Commissioning

Setting Language, Clock, $U_{sys\ L\text{-}L}$, f, $I_{NGR\ nom}$, $R_{NGR\ nom}$, $CT_{primary}$, $CT_{secondary}$, $CT_{Connection}$, Field calibration

9. Info

Device information, Software information, Clock and date information, Ethernet information

10. Alarm

Acknowledge, Reset, Test

HRG system: Recommended minimum value R_{NGR} (tripping level 50 %)

Temperature range –40…+60 °C,
Field calibration at 20 °C

() = Limited temperature range at any field calibration temperature ±20 K
The temperatures must be within the limits of the operating temperature range of –40…+70 °C
[for UL applications –40…+60 °C].)

	CD1000/CD1000-2			CD1000-2	CD5000		CD14400					CD25000
U_{sys}	400 V	600 V	690 V	1000 V	2400 V	4200 V	6000 V	6600 V	7200 V	11000 V	14400 V	25000 V
I_{NGR}												
1 A	231 Ω	346 Ω	398 Ω	577 Ω	1386 Ω	—	—	—	—	—	—	—
5 A	46 Ω	69 Ω	80 Ω	115 Ω	277 Ω	485 Ω	693 Ω	762 Ω	831 Ω	1270 Ω	1663 Ω	—
10 A	*(23 Ω)*	35 Ω	40 Ω	58 Ω	139 Ω	242 Ω	346 Ω	381 Ω	416 Ω	635 Ω	831 Ω	1443 Ω
15 A	*(15 Ω)*	*(23 Ω)*	*(27 Ω)*	38 Ω	92 Ω	162 Ω	231 Ω	254 Ω	277 Ω	423 Ω	554 Ω	962 Ω
20 A	—	*(17 Ω)*	*(20 Ω)*	29 Ω	69 Ω	121 Ω	*(173 Ω)*	191 Ω	208 Ω	318 Ω	416 Ω	722 Ω
25 A	—	—	*(16 Ω)*	*(23 Ω)*	55 Ω	97 Ω	*(139 Ω)*	*(152 Ω)*	*(166 Ω)*	254 Ω	333 Ω	577 Ω
30 A	—	—	—	*(19 Ω)*	*(46 Ω)*	81 Ω	*(115 Ω)*	*(127 Ω)*	*(139 Ω)*	212 Ω	277 Ω	481 Ω
40 A	—	—	—	—	*(35 Ω)*	61 Ω	*(87 Ω)*	*(95 Ω)*	*(104 Ω)*	*(159 Ω)*	208 Ω	361 Ω
50 A	—	—	—	—	*(28 Ω)*	*(48 Ω)*	—	*(76 Ω)*	*(83 Ω)*	*(127 Ω)*	*(166 Ω)*	289 Ω
100 A	—	—	—	—	—	*(24 Ω)*	—	—	—	—	*(83 Ω)*	*(144 Ω)*

Maximum trip times t(GFtrip) for the CD-NGRM used

The setting for $t_{GF\ trip}$ must under no circumstances be longer than the maximum possible operating time of the CD-NGRM coupling device.

The table shows an overview of the $t_{GF\ trip}$ settings for the coupling device used (menu 6.4):

U_{sys}	Coupling device	Ground-fault trip setting	max. $t_{GF\ trip}$
400…690 V	CD1000	on or off	48 h
	CD1000-2		
691…1000 V	CD1000	on	300 s
	CD1000-2	on or off	48 h
	CD5000		
1001…4300 V	CD5000	on or off	48 h
4301…14550 V	CD14400	on	60 s
	CD25000	on	90 s
14551…25000 V	CD25000	on	10 s

Initial commissioning

The commissioning wizard **(menu 8)** queries the following parameters; additional settings: menu 6.

Language (8.2)	Select
Date (8.3)	Set
Time (8.4)	Set
U_{sys} L-L (8.5)	System voltage
Frequency (8.6)	50 or 60 Hz
$I_{NGR\ nom}$ (8.7)	
$R_{NGR\ nom}$ (8.8)	
CT primary (8.9)	
CT secondary (8.10)	
CT connection (8.11)	50 mA or 5 A
Field calibration (8.12)	Start or do not start

1. Setting the response values (menu 6.4)

- Trip threshold for voltage (U_{NGR})
- Trip threshold for current (I_{NGR})
- Trip threshold for resistance (R_{NGR})

***Low** trip threshold values: may lead to false tripping.*
***High** trip threshold values: the device may not trip at all*

2. System settings of the relays (menu 6.5)

The factory setting for the relays is fail-safe. In the case of a test, the relays change state.

Fail-safe: The relay is energized during normal operation and is de-energized in the event of a fault ("fail-safe")
Non-fail-safe: The relay is de-energized in normal operation and is energized in the event of a fault ("non-fail-safe")

3. Field calibration (menu 6.6)

During field calibration, all tolerances of the connected CD-series coupling device and the NGR are considered. The current measured value is calibrated to the set nominal value of the NGR ($R_{NGR\ nom}$). In order to achieve high accuracy, start the device and let it run for at least one hour in the operating environment before carrying out the field calibration.

For the field calibration the device must be in auto mode (menu 6.3.1 = auto). If the digital input I1 is used with "Digital 1 > NGR method" (menu 6.6.5.3), "Method > external" (menu 6.3.1) must be selected and I1 must be active. The trip relay is switched during field calibration!

4. RMS trip signal, fundamental frequency, harmonics

The measured value which causes tripping can be selected via the "Trip signal" parameter (menu 6.4.11). Trip signal can be:

- **RMS**: The RMS value of *I* or *U* over the entire frequency range (up to approx. 3.8 kHz).
- **Fundamental frequency**: Only the RMS value of the fundamental frequency (50 or 60 Hz).
- **Harmonics**: The filtered RMS value on the selected range of harmonics with

H0 = DC; H1 = fundamental frequency; H2 = 2 x fundamental frequency; … H32 = 32 x fundamental frequency

In the "Harmonics" measured value display (menu 2) all spectral lines are always displayed. This is independent of the trip signal setting.

*On the standard display, the **trip signal** is indicated as **resistance** (in Ω or %) **or** as **current** (in A or %). The setting is entered in "Display" (menu 5).*

5. Initial measurement

During device start, all measured values are recorded.

Factory settings

Menu		Factory settings
Menu 6.1: HRG/LRG system		
1. $U_{sys\ (L\text{-}L)}$		400 V
2. CD-NGRM		CD1000
3. Frequency		50 Hz
4. $I_{NGR\ nom}$		5 A
5. $R_{NGR\ nom}$		150 Ω
Menu 6.2: CT		
1. CT primary		600
2. CT secondary		1
3. CT connection		50 mA
Menu 6.3: NGR		
1. Method		auto
2. Filter		off
Menu 6.4: Response values		
HRG	**LRG**	
1. $U_{NGR\ Trip}$		60 %
2. $I_{NGR\ trip}$		60 %
3. > R_{NGR}		150 % (HRG), 250 Ω (LRG)
4. < R_{NGR} (HRG only)	–	50 % (HRG)
5. $t_{NGR\ trip}$	4. $t_{NGR\ trip}$	0 s
6. Ground-fault trip	5. Ground-fault trip	on
7. $t_{GF\ trip}$	6. $t_{GF\ trip}$	5 s
8. Alarm stored	7. Alarm stored	on
9. $t_{restart}$	8. $t_{restart}$	5 s
10. Max. no. of restarts	9. Max. no. restarts	2
11. Trip signal	10. Trip signal	RMS
12. Upper limit harmonic	11. Upper limit harmonic	32
13. Lower limit harmonic	12. Lower limit harmonic	0

Menu	Factory settings
Menu 6.5: System settings	
1. Ground-fault relay	Mode: Fail-safe
	Rel. Test: on
2. NGR-fault relay	Mode: Fail-safe
	Rel. Test: on
3. Trip relay	Mode: Fail-safe
	Rel. Test: on
4. Analog	Mode: 4-20 mA
	Function: R_{NGR} (HRG) I_{NGR} (LRG)
5. Dig. in/out	Device OUT: Fail-safe
	Pulser OUT: Non-fail-safe
	Digital 1: Pulser, Active high
	RESET IN: Active high
	TEST IN: Active high
6. Buzzer	Buzzer alarm: off
	Buzzer test: on

Technical data

Rated voltage ..... 250 V
Overvoltage category III
Nominal supply voltage U_s ..... AC/DC, 48…240 V
for UL applications ..... AC/DC, 48…240 V
for AS/NZS 2081 applications ..... AC/DC, 48…230 V
Tolerance U_s ..... ±15 %
Tolerance U_s (for UL applications) ..... –50…+15 %
Tolerance U_s (for AS/NZS 2081 applications) ..... –25…+20 %
Frequency range U_s ..... DC, 40…70 Hz
Power consumption (max.) ..... ≤ 7 W / 16 VA
Switching elements (ground-fault, NGR-fault, trip relays)
..... Changeover contacts, configurable fail-safe/non-fail-safe)
Contact data acc. to IEC 60947-5-1
Rated operational voltage ..... AC 250 V/250 V
Utilization category AC-13/AC-14
Rated operational current AC ..... 5 A/3 A
Rated operational current AC (for UL applications) ..... 3 A/3 A
Rated operational voltage DC ..... 220/110/24 V
Utilization category DC12
Rated operational current DC ..... 0.1/0.2/1 A
Minimum current ..... 1 mA at AC/DC > 10 V

BENDER
The Power in Electrical Safety©

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