EN Manual

BENDER
The Power in Electrical Safety©

VG12

Safety distributor for mobile power generators ready for connection

VG12_D00032_03_M_XXEN/01.2019

Bender GmbH & Co. KG
P.O. Box 1161 • 35301 Grünberg • Germany
Londorfer Straße 65 • 35305 Grünberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-mail: info@bender.de • www.bender.de

Photos: Bender archive and bendersystembau archive.

Table of Contents

1. Making effective use of this document

1.1 How to use this manual

This manual describes the operation of the safety distributor VG12. It informs about the essential safety instructions to be considered and the underlying regulations of the concept.

This manual is intended for qualified personnel working in electrical engineering and electronics.

Please read this manual and the instructions of the power generator prior to using the devices. Keep the two manuals within easy reach near the power generator.

If you have any questions, please do not hesitate to contact us. In this case, please refer to our service:
www.bender.de/en/service-support/downloads

1.2 Explanation of symbols and notes

The following symbols to indicate hazards and to indicate optimum use of the product are used in this manual

*This signal word indicates that there is a **high risk** of danger that will result in **death** or **serious injury** if not avoided.*

*This signal word indicates a **medium risk of danger** that can lead to **death** or **serious injury** if not avoided.*

*This signal word indicates a **low level risk** that can result in **minor** or **moderate injury or damage to property** if not avoided.*

*This symbol denotes information intended to assist the user in making **optimum use** of the product.*

2. Safety instructions

2.1 Intended use

The VG12 safety distributor is intended for guaranteeing the protective measure "Protective separation with insulation monitoring and disconnection" according to DIN VDE 0100-410, DIN VDE 0100-551 and GW 308 of the DVGW (German Association of Gas and Water Line e.V.) and thus for the safe operation of mobile power generators.

The VG12 safety distributor is suitable for the direct connection to single-phase power generators. The total load current must not exceed 16 A with respect to the plug of the input cable.

The chapter "System description" lists the requirements to be fulfilled in order to be able to apply the protective measure.

2.2 Work activities on electrical installations

WARNING

Danger as a result of unprofessional work!
Any work on electrical installations which is not carried out properly can lead to death and injury! Therefore, observe the following safety instructions!

- Only electrically skilled persons are permitted to carry out the work necessary to install, commission and run a device or system.
- Compliance with applicable regulations governing work on electrical installations and with the regulations derived from and associated with them, is mandatory. EN 50110 is of particular importance in this regard.
- If the device is being used in a location outside the Federal Republic of Germany, the applicable local standards and regulations must be complied with. The European standard EN 50110 can be used as a guide.

2.3 Device-specific safety instructions

CAUTION

Danger due to inappropriate power generators!

The VG12 safety distributor is only suitable for single-phase power generators with AC 230 V. VG12 can conduct a maximum of 16 A.

CAUTION

Danger during insulation and voltage tests!

The VG12 safety distributor must be disconnected from the mains for the duration of the test. Check the correct connection of the VG12 safety distributor when recommissioning it. Perform a functional test according to the instructions in the chapter
"Chapter 5. Commissioning and continous operation".

2.4 General safety instructions

Bender devices are designed and built in accordance with the state of the art and accepted rules in respect of technical safety. However, the use of such devices may introduce risks to the life and limb of the user or third parties and/or result in damage to Bender devices or other property.

- Use Bender devices only:
  - as intended
  - in perfect working order
  - in compliance with the accident prevention regulations and guidelines applicable at the location of use
- Eliminate all faults immediately which may endanger safety.
- Do not make any unauthorised changes and only use replacement parts and optional accessories purchased from or recommended by the manufacturer of the devices. Failure to observe this requirement can result in fire, electric shock and injury.
- Reference signs must always be clearly legible.

3. System description

3.1 Protective measures for mobile generators

The VG12 safety distributor is intended for the practical implementation of the protective measure "Protective separation with insulation monitoring and disconnection" specified in section 551.4.4.2 of the standard DIN VDE 0100-551.

The voltage supply is designed in a way that protective separation is realised with more than one load. The continuously measuring ISOMETER® switches off the mains voltage if the value falls below the response value. This results in the following characteristics:

- No earth spike
- High-resistance insulation faults are detected immediately. When reaching the response value, the socket-outlets of the VG12 are switched off.
  (DIN VDE 0100-410, Annex C3)
- Suitable only for operation and monitoring by electrically skilled or instructed persons.
- The exposed conductive parts of the whole generator circuit must be connected by insulated, unearthed protective equipotential-bonding conductors PA (see schematic wiring diagram on Page 15).
  Such conductors must not be connected to the protective conductors or exposed conductive parts of other circuits or to any other conductive parts.

An ISOMETER® measures the sum of all insulation faults in the system, i.e. the absolute insulation value.
Page 21 provides a list of all relevant standards.

3.2 Prerequisites for use

The protective measure "Protective separation with insulation monitoring and disconnection" avoids hazards from indirect contact with parts carrying voltage due to faults in the basic insulation of the circuit.

- The power generator must supply a single-phase AC voltage of 230 V. Tolerances according to IEC 38 are permissible. Higher voltages may destroy components of the safety distributor. Hence, the protective function may be disabled.
- The maximum load current must not exceed 16 A. Higher load currents may destroy the contacts of the connection plug of the VG12 safety distributor and thus disable the protective function.

3.3 Functional description

The VG12 safety distributor provides a protective measure which

- meets the legal provisions
- is practice-oriented
- does not hinder the work with the power generator
- can be mounted quickly, simply and cost-effectively (plug connection)
- can be connected to the interior of the power generator without any intervention
- does not require maintenance.

The VG12 safety distributor has a compact plastic enclosure made of impact-resistant material. The Schuko socket-outlets are integrated in this enclosure. The loads are supplied exclusively via this socket-outlet after mounting and commissioning. A cable connects the VG12 safety distributor to the power generator.

The VG12 safety distributor contains an insulation monitoring device in accordance with EN 61557-8. It is an actively measuring ISOMETER® type IR423 which superimposes a measuring voltage onto the system.

When the power generator is running, this device constantly monitors the insulation condition of the power generator system against the equipotential bonding. If the insulation resistance falls below 23 kΩ, the ISOMETER® triggers and disconnects the socket-outlets from the main voltage via a relay within one second. At the same time, the LEDs "AL1", "AL2" on the insulation monitoring device indicate the change in the insulation resistance.

The disconnection and the indication via the LEDs "AL1", "AL2" can be reset via the combined test/reset button "T/R" if the insulation fault is at least 25 % above the response value of 23 kΩ.

3.3.1 Display and operating elements

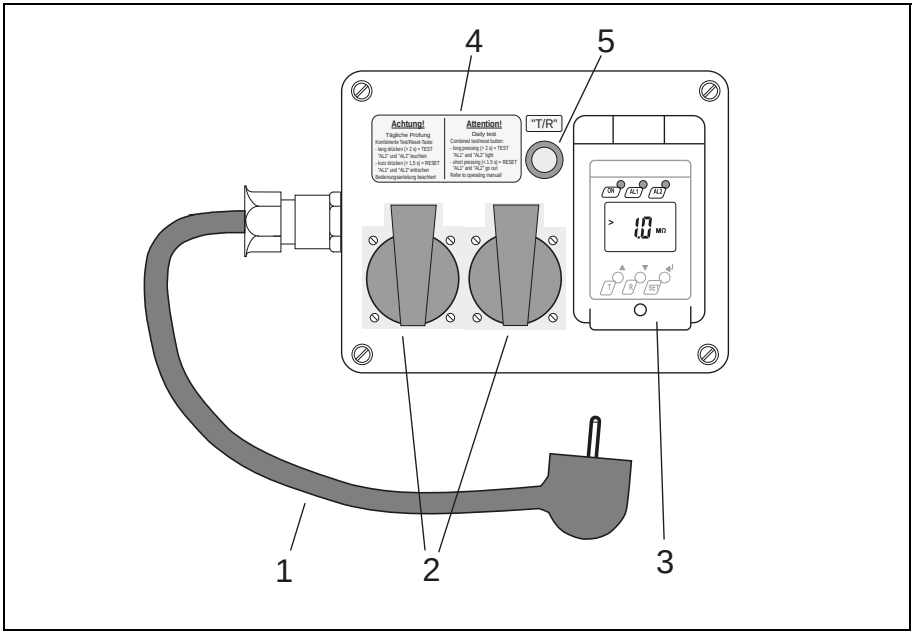

Fig. 3.1: Connecting cable and front view of the VG12

1 Input: 0.7 m connecting cable H07RN-F3G 2.5 with Schuko plug for max. 16 A

2 Output: 2 Schuko socket-outlets for max. 16 A output current

CAUTION

Danger due to excessive nominal current at the socket-outlets!
If both sockets are used, the total nominal current of both sockets must not exceed 16 A.

3 Insulation monitoring device IR423

4 Instruction for daily test

5 Combined test/reset button "T/R"

In general, an operation of the IR423 is not required. Thus, the description of the operating elements is only informative.

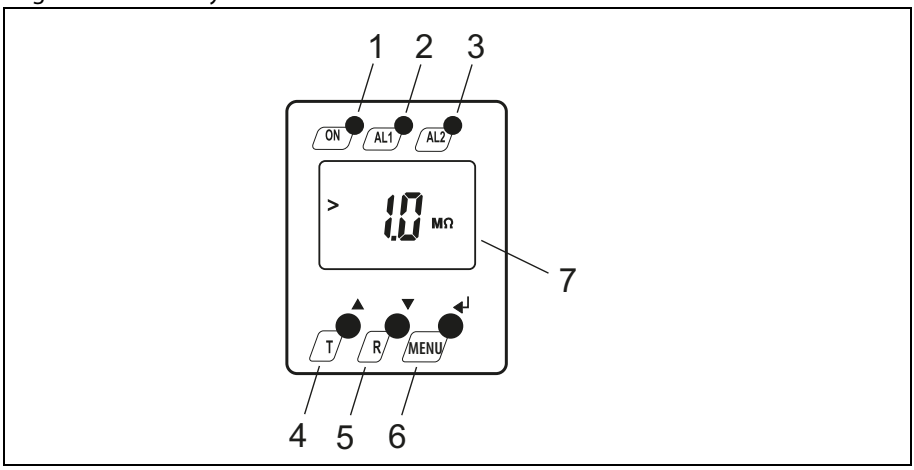

Fig. 3.2: Front view of the IR423

1 POWER ON LED

2 The alarm LED "AL1" lights up if the value falls below the response value R_{an1} (Alarm 1) (prewarning).

3 The alarm LED "AL2" lights up if the value falls below the response value R_{an2} (Alarm 2) (prewarning).

4 The test button "T" is intended for the daily test of the safety distributor. After pressing it, "AL1" and "AL2" light up.

5 The insulation monitoring device is reset by pressing the reset button "R". The alarm LEDs "AL1" and "AL2" go out.

6 The menu/enter button is intended for accessing the menu operation, choosing functions and changing values. The button is not required for normal operation!

7 Display for indicating the insulation value and for navigating in the menu

4. Installation and connection

DANGER

Risk of an electric shock!

Do not carry out installation work while the power generator is running. Make sure that the power generator is not activated during installation work. Work activities on the running power generator may cause severe injuries!

4.1 Installation

The cover of the VG12 must be unscrewed prior to installation. Mount the VG12 safety distributor with four M4 screws to the power generator. Make sure that the mounting parts have the required stability so that they are not destroyed by the typical vibrations of the power generator. Avoid sharp edges and corners. Secure the mounting screws via lock washers, spring washers or the like.

4.1.1 Dimension diagrams

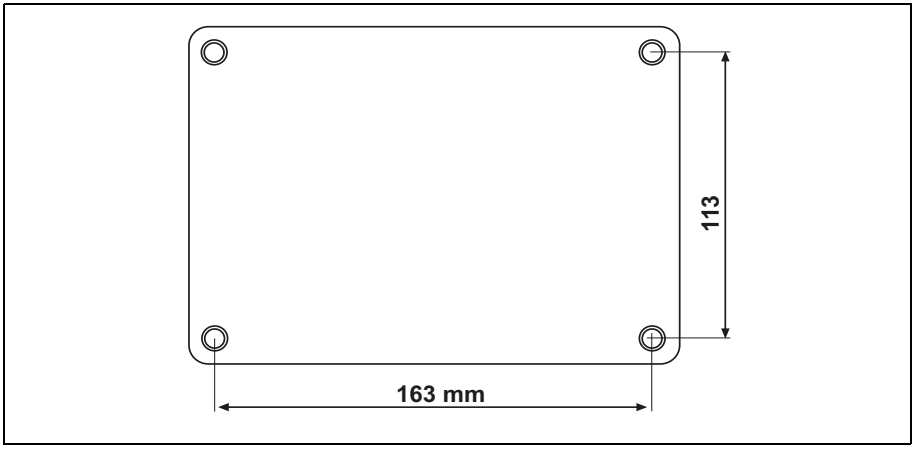

Fig. 4.1: Drilling template

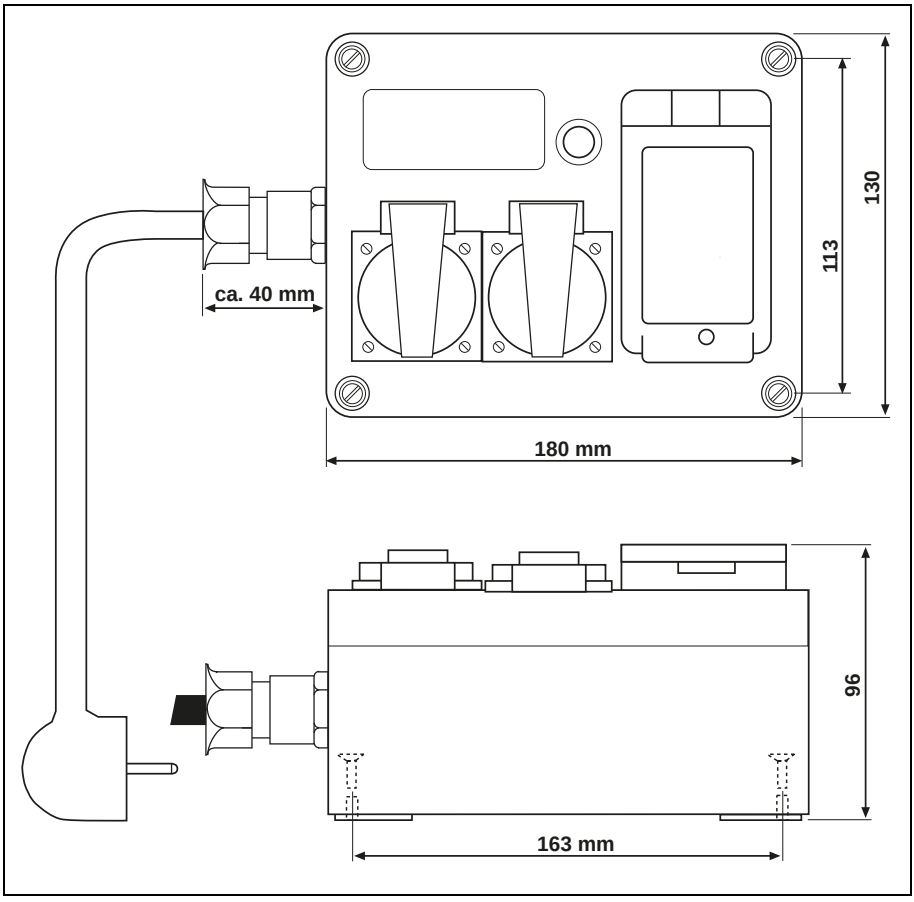

Fig. 4.2: Dimensions of the VG12

4.2 Connection

DANGER

Risk of an electric shock!
Work activities on electrical parts of the power generator and on the electrical equipment must only be carried out by electrically skilled persons.

WARNING

Danger due to freely accessible generator socket-outlets!
Use the socket-outlets of the VG12 safety distributor only.
Any other socket-outlets of the power generator must be shut down.
When the socket-outlets have been shut down and closed by means of a protective cap, secure the socket-outlets with a locking wire against unauthorised use.

CAUTION

Danger due to excessive nominal system voltage!
VG12 is only suitable for power generators with AC 230 V. Higher voltages may destroy components of the safety distributor. Hence, the protective function may be disabled.

The VG12 is connected via a plug connection:

- Connect the Schuko plug connecting cable of the VG12 safety distributor to a Schuko socket-outlet of the power generator.

Schematic wiring diagram

The following wiring diagram informs you about the interaction of the components generator, VG12 safety distributor and loads. The details are purely informative and not required for the connection of the VG12 to the power generator.

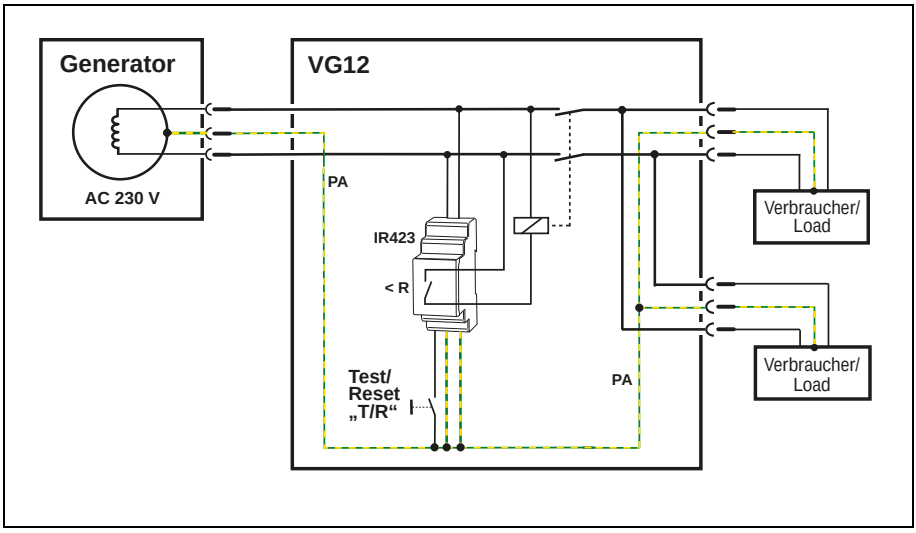

Fig. 4.3: Schematic wiring diagram

5. Commissioning and continous operation

5.1 Specific factory settings

The specific factory settings of the ISOMETER® IR123 in the VG12 differ from the standard factory settings of an IR123!

Response value 1/2 (Alarm 1/2):	*46 kΩ/23 kΩ*
Operating mode K1/K2:	*N/C operation (n.c.)*
Fault memory:	*activated (on)*
Start-up delay:	*t = 0 s*
Response delay:	*t_{on} = 0 s*
Password:	*0, deactivated*

5.2 Functional test before first use

1. Check the correct mechanical mounting of the VG12 to the power generator.
2. Make sure that the connecting cable of the VG12 is connected to the generator securely.
3. Ensure that other socket-outlets of the generator are sealed.
4. Start the power generator.
5. Plug a load (e.g. an AC 230 V hand lamp) into a socket-outlet of the VG12 safety distributor. The lamp should light up.
6. Press the **combined** test/reset button "T/R" of the VG12. A short time later, "tES" appears on the display for a few seconds.
   In the following, the alarm LEDs "AL1" and "AL2" light up and the VG12 disconnects all poles of the safety socket-outlets (The hand lamp goes out).

CAUTION

Risk of malfunction!
*If the power generator is **not** switched off after pressing the combined test/reset button "T/R", a fault exists. Protect the power generator against accidental switch-on. Please contact Bender.*

If the shutdown was carried out as intended:

1. Press the **combined** test/reset button "T/R" for 1 s
   – VG12 reconnects the socket-outlets (The hand lamp lights up).
   – The alarm LEDs "AL1" and "AL2" go out.
2. Ensure that this manual as well as the instructions of the power generator are kept within easy reach near the device.

5.3 Test before daily use

Check the safe function of the VG12 daily before each use of the power generator:

1. Start the power generator.
2. Plug a load (e.g. a hand lamp) into a socket-outlet of the VG12 safety distributor.
3. Press the **combined** test/reset button "T/R" of the VG12 for 3 s. A short time later, "tES" appears on the display for a few seconds.
   In the following, the alarm LEDs "AL1" and "AL2" light up and the VG12 disconnects all poles of the safety socket-outlets. (The hand lamp goes out).

CAUTION

Risk of malfunction!
*If the power generator is **not** switched off after pressing the combined test/reset button "T/R", a fault exists. Protect the power generator against accidental switch-on. Please contact Bender.*

If the shutdown was carried out as intended:

1. Press the **combined** test/reset button "T/R" for 1 s
   – VG12 reconnects the socket-outlets (The hand lamp lights up).
   – The alarm LEDs "AL1" and "AL2" go out.
2. After successful testing, the power generator can be used as normal.

5.4 Regular tests

Observe the deadlines for regular testing of the power generator and the connected electrical equipment according to the accident prevention regulation BGV A3.

5.5 Troubleshooting

Of course, an insulation fault can also occur during the daily use of the power generator. Thus, all loads plugged into the VG12 are suddenly shut down and the LEDs AL1 and AL2 light up. What is to be done in this case?

Fault description	Presumed cause	Actions
LEDs "AL1"/"AL2" light up.	Combined test/reset button "T/R"was pressed deliberately or accidentally.	Press the combined test/reset button "T/R" for 1 s.
LEDs "AL1"/"AL2" light up (**no** loads connected).	Insulation fault power generator	Turn off power generator immediately. Arrange checking by skilled person.
LEDs "AL1"/"AL2" light up (loads **are** connected).	Insulation fault load or power generator	Unplug plugs of all loads. Then press combined test/reset button "T/R". a) LEDs "AL1"/"AL2" **do not** go out: Arrange checking of the power generator by electrically skilled person. b) LEDs "AL1"/"AL2" go out: A load has an insulation fault. Plug in plugs of the loads one after the other until alarm and shutdown occur again. Remove damaged load again and press reset button "R". Arrange checking of damaged load by electrically skilled person.

6. Technical data

Monitored IT system

Nominal system voltage U_n ..... AC 192...276 V
Nominal frequency f_n ..... 42...60 Hz

Response values

Response value R_{an1} (ALARM 1) ..... 1...200 kΩ (46 kΩ)*
Response value R_{an2} (ALARM 2) ..... 1...200 kΩ (23 kΩ)*
Relative uncertainty 1 kΩ...5 kΩ/5 kΩ...200 kΩ ..... ±0.5 kΩ/±15 %
Hysteresis ..... 25 %

Time response

Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1$ µF ..... < 1 s
Start-up delay (start time) t ..... 0...10 s (2 s)*
Response delay t_{on} ..... 0...99 s (0 s)*

Measuring circuit

Measuring voltage U_m ..... 12 V
Measuring current I_m (at $R_F = 0$ Ω) ..... < 200 µA
Internal resistance DC R_i ..... > 62 kΩ
Impedance Z_i at 50 Hz ..... > 60 kΩ
Permissible extraneous DC voltage U_{fg} ..... < DC 300 V
Permissible system leakage capacitance C_e ..... < 5 µF

Displays, memory

Display range measured value ..... 1 kΩ...1 MΩ
Operating uncertainty 1 kΩ...5 kΩ/5 kΩ...1 MΩ ..... ±0.5 kΩ/±15 %
Password ..... off/0...999 (off)*
Fault memory signalling relay ..... on/off (on)*

Switching element socket-outlets:

Nominal current ..... 16 A
Nominal voltage ..... AC 250 V
Max. switching capacity AC ..... 7,500 VA
Recommended minimum load ..... 500 mA/AC 12 V
Electrical endurance, number of cycles 10,000

Environment/EMC

EMC ..... IEC 61326
Operating temperature ..... -25 °C . . . +55 °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3) ..... 3K5 (no condensation, no 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

Vibration resistance acc. to IEC 60068-2-6:

DIN rail ..... 3 g/30 . . . 150 Hz
Screw mounting ..... 6 g/30 . . . 150 Hz

Connection/Socket-outlets

Input:

Connecting cable with Schuko plug ..... H07RN-F3G2,5 black
Wire diameter ..... 3 x 2.5 mm^2
Cable length ..... 0.7 m
Output ..... Schuko socket, protected against splashing water

Other

Operating mode ..... continous operation
Mounting ..... any position, but display oriented
Degree of protection, enclosure (DIN EN 60529) IP54
Enclosure material ..... polycarbonate
Screw mounting ..... 4 x M4
Weight ..... 1,300 g

( )*: factory setting

6.1 Standards and certifications

The following application standards must be considered:

- DIN VDE 0100-410 (VDE 0100-410)
  Low-voltage electrical installations –
  Part 4-41: Protection for safety, Protection against electric shock
- DIN VDE 0100-551 (VDE 0100-551)
  Low-voltage electrical installations,
  Part 5: Selection and erection of electrical equipment;
  Chapter 55: Other equipment;
  Section 551: Low-voltage generating sets
- DIN VDE 0100-704 (VDE 0100-704)
  Low-voltage electrical installations
  Part 7-704: Requirements for special installations or locations - Construction and demolition site installations
- DIN VDE 0100-100 (VDE 0100-100)
  Low-voltage electrical installations
  Part 100: Application area, purpose and principles
- DVGW policy, technology notes, leaflet GW308
  Mobile power generators for pipe construction sites
- BGI 594, BG information:
  The use of electrical equipment in case of increased electrical hazard
- BGI 867, BG information:
  Selection and operation of alternative power generators on construction and mounting sites
- DIN 14687, firefighting and fire protection
  Permanently installed generators (generating sets) < 12 kVA for the use in firefighting vehicles

Subject to change! The specified standards take into account the edition valid until 01.2019 unless otherwise indicated.

6.2 Ordering details

Type	Nominal voltage* U_n	Order number
VG12 Safety distributor for mobile power generators ready for connection	AC 50…60 Hz, 192…276 V	B980853
* Absolute value		

6.3 Other safety distributors

Specific or very powerful power generators can be selected and modified individually. For this purpose, contact the Bender service directly.

The following tabular overview shows the possibilities in short to equip mobile power generators with the practice-oriented protective measures "Protective separation with insulation monitoring and shutdown".

Type	Short description	Installation
VG20	Versatile safety distributor for single and three-phase power generators. Fire brigade version available. Adaptable to special tasks.	Only by Bender
VG30	Safety distributor for single-phase mobile power generators for stationary attachment	By electrically skilled person

INDEX

Bender GmbH & Co. KG
P.O. Box 1161 • 35301 Grünberg • Germany
Londorfer Straße 65 • 35305 Grünberg • Germany
Tel.: +49 6401 807-0 • Fax: +49 6401 807-259
E-mail: info@bender.de • www.bender.de

Photos: Bender archives and bendersystembau archives.

BENDER Group