

Installation manual phase inverter (16/32A)



Table of contents

1	About this manual	3
1.1	Structure of the warnings	3
1.2	Symbols used	4
1.3	Signal words used	4
2	Intended use	5
3	General safety instructions	6
4	Packaging, transport and storage	7
4.1	Packaging	7
4.2	Transport	7
4.3	Storage	7
5	Design	8
5.1	Connector with multi-grip cable gland	8
5.2	Device connector	9
6	Assembly and disassembly	10
6.1	Connecting a conductor to a socket with multi-grip cable gland	10
6.1.1	QUICK-CONNECT connection	10
6.1.2	Screw terminal connection	12
6.2	Disconnecting a conductor from a socket with multi-grip cable gland	14
6.2.1	QUICK-CONNECT connection	14
6.2.2	Screw terminal connection	15
6.3	Connecting a conductor to a device connector	17
6.4	Disconnecting a conductor from a device connector	20
7	Operation	22
8	Cleaning and care	23
9	Decommissioning and disposal	24

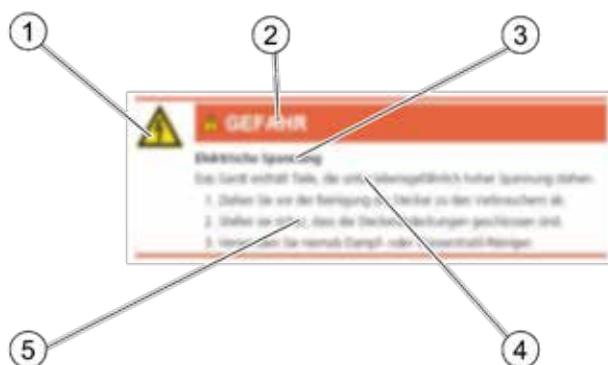
1 About this manual

This manual

- describes the assembly and disassembly of phase inverters from Bals Elektrotechnik GmbH & Co. KG
- is an integral part of the product and must be kept in safe custody during the product service life
- must be read carefully and understood before use and any work.




1.1 Structure of the warnings

The following picture illustrates the structure of a sample warning.



1	Hazard-specific symbol
2	Signal word
3	Type and source of the hazard
4	Possible consequences of failing to comply
5	Procedure for avoiding hazards

1.2 Symbols used

	General warning of a hazardous area
	Warning - dangerously high voltage
	Notice

1.3 Signal words used

All warnings in this manual are clearly highlighted. The following signal words are used for warnings:

DANGER	Warns of dangers which will lead to serious injuries or to death if the instructions are not followed.
WARNING	Warns of dangers that may lead to serious injuries or to death and/or cause considerable damage to property if the instructions are not followed.
CAUTION	Warns of dangers that may lead to reversible injuries and/or considerable damage to property if the instructions are not followed.
NOTICE	Warns of dangers that may lead to operational disruptions and/or considerable damage to property. Damage to the environment, too, may occur if the instructions are not followed.

2 Intended use

Phase inverters are built for professional use. The installation and the fixed connection to the mains supply should be carried out only by trained and qualified experts.

Any use going beyond the intended use is considered to be improper. The manufacturer is not liable for damages resulting from improper use. Any such risk shall be borne solely by the user.

In case of unauthorised modifications or conversions, the CE conformity becomes null and void, and thus, also all claims for warranty. Modifications may lead to risks for life and limb as well as damage to the plugs and sockets or loads connected.

Factory-fitted labels and markings on the distributors should not be removed, modified or blurred.

Protect against foreign bodies and impact of weather

The product meets either the protection degree IP44, IP54 or IP67 in accordance with **DIN EN 60529** (VDE 0470-1), depending on the respective design. Each of these mean:

- Protection degree IP44:
 - Protected against solid bodies with a diameter beyond 1.0 mm, e.g. a wire
 - Protection against water sprayed from all sides
- Protection degree IP67:
 - Dust-proof
 - Complete protection against contact
 - Protection against temporary immersion.

Environment

The following operating conditions apply for the safe operation of the product:

Size	Value
Temperature	-25 °C ... +40 °C
Humidity	10 %rH ... 90 %rH

3 General safety instructions



- Safe use is ensured only if this manual is followed completely.
- Before installation, commissioning or operation, read this manual thoroughly.
- The product must be installed, maintained and put into operation properly by qualified experts in accordance with the laws, ordinances and standards.
- Keep easily combustible and explosive materials away from the product.
- Handle the cables with care,
 - by always pulling at the plug and not the cable when unplugging,
 - by preventing the cable from getting damaged mechanically,
 - by keeping intense heat away.
- Never use faulty products or products with dirty, scratched or damage contacts.
- Keep the contacts on the product clean.
- Avoid tripping hazards.

4 Packaging, transport and storage

4.1 Packaging



Packaging materials are valuable raw materials and can be reused. The packaging materials should therefore be brought to an appropriate recycling facility. If this is not possible, dispose of the packaging materials according to the locally applicable regulations.

4.2 Transport

Check the delivery for completeness and integrity. If you identify transit damage or if the delivery is incomplete, notify your dealer or supplier immediately.

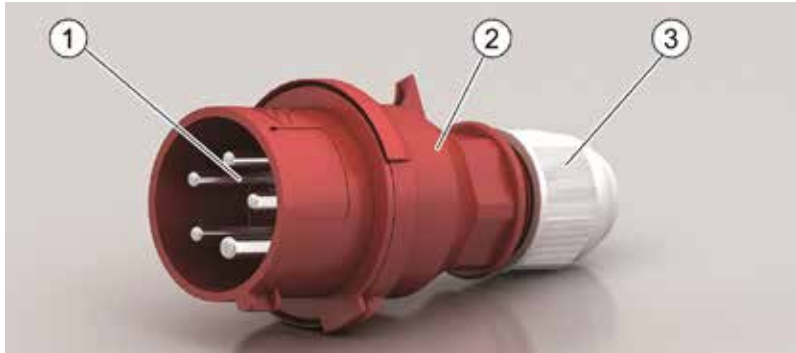
4.3 Storage

The product must be stored in clean condition and protected from dust and humidity. The original packaging is best suited for this purpose.

5 Design

5.1 Connector with multi-grip cable gland

Based on an example, the following figure illustrates the main components of a phase inverter in the design of a connector with multi-grip.



1	Socket insert with connections for all types of copper conductors
2	Housing
3	Cable gland with multi-grip as integrated strain relief

Conductor cross-sections

The following table displays the possible conductor cross-sections that can be connected:

Design	Possible conductor cross-section	
	QUICK-CONNECT	Screw terminals
16A	1 mm ² ... 2.5 mm ²	1 mm ² ... 2.5 mm ²
32A	2.5 mm ² ... 10 mm ²	2.5 mm ² ... 6 mm ²

Cable diameter

The following table displays the cable diameters that can be used:

Design	Possible cable diameter	
	QUICK-CONNECT	Screw terminals
16A, 3-pin and 4-pin	8 mm ... 18 mm	8 mm ... 18 mm
16A, 5-pin	10 mm ... 21 mm	
32 A, 3-pin and 4-pin	11 mm ... 23 mm	11 mm ... 23 mm
32 A, 5-pin	13 mm ... 27 mm	

5.2 Device connector

Based on an example, the following figure illustrates the main components of a phase inverter in the design of a device connector.



1	Housing
2	Socket insert with connections for all types of copper

Conductor cross-sections

The following table displays the possible conductor cross-sections that can be connected:

Design	Possible conductor cross-section
16A	1.5 mm ² ... 4 mm ²
32A	2.5 mm ² ... 10 mm ²

Technical specifications

The technical specifications of the product depend on the design. You will find them in our catalogue or on our website <http://www.bals.com>.

6 Assembly and disassembly



DANGER

Danger to life by electrical voltage

The supply cable may carry high electrical voltage that is fatal. Pay attention to the five safety rules of electricity:

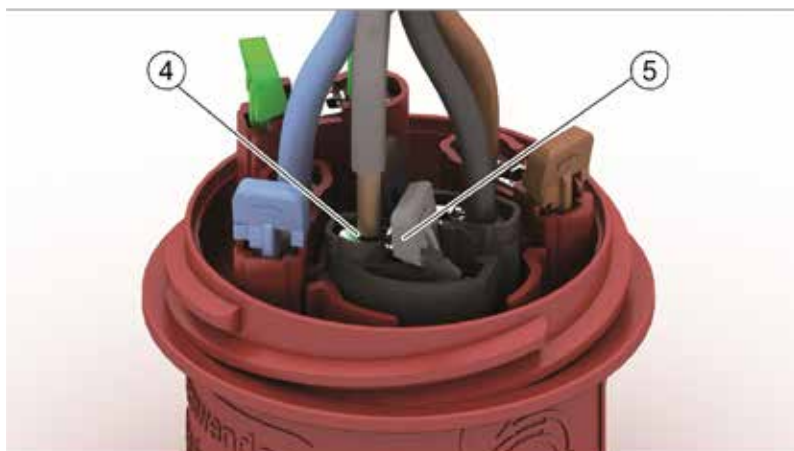
1. De-energise
2. Secure the supply from being switched on again
3. Ensure the de-energised condition
4. Connect to earth and short circuit
5. Cover or cordon off adjacent live parts

6.1 Connecting a conductor to a socket with multi-grip cable gland

6.1.1 QUICK-CONNECT connection

Proceed as follows:

1. Make sure that the cable is de-energised.
2. Depending on the design:
Open the rotary lock or loosen the screws in order to separate the front part from the housing.
3. Push the cable about 50 cm wide through the cable gland and housing.
4. Strip the cable to the required length (16A designs: 60 mm; 32 A designs: 70 mm).
5. Remove the insulation from the individual conductors (16 A designs: 9 mm; 32 A designs: 12 mm). Twist the multi-strand copper conductors slightly by hand. Conductor end sleeves are not necessary but may be used.
6. The terminals are open at the time of delivery. Guide the bare individual conductors into the opening near the contact slide (4) and press the contact slide (5) to the right (in the direction of the arrow). The contact slide get latched and fixes the individual conductor. Take care to ensure that only the bare individual conductor (without insulation) is clamped. Pay attention to the marking of the terminals and ensure that the assignment of the individual conductors to the terminals is correct.



7. Check whether the individual conductors are seated tightly by pulling them lightly. If this is not the case, open the terminal and repeat the previous step.
8. Depending on the design:
Connect the housing and the front part with the screws until the snap-on lock (6) latches or fix the housing and front part together with the screws foreseen for this purpose.



9. Next, tighten the cable gland (3). The tightening torque must be between 4 Nm and 7 Nm for the 16A designs and between 5 Nm and 9 Nm for the 32A designs. Please refer to the embossing on the cable gland for the exact value of the respective design. Secure the cable gland using the screw placed on the side for this purpose (8, depending on the design).



10. Check that the cable is seated tightly in the socket outlet.

6.1.2 Screw terminal connection

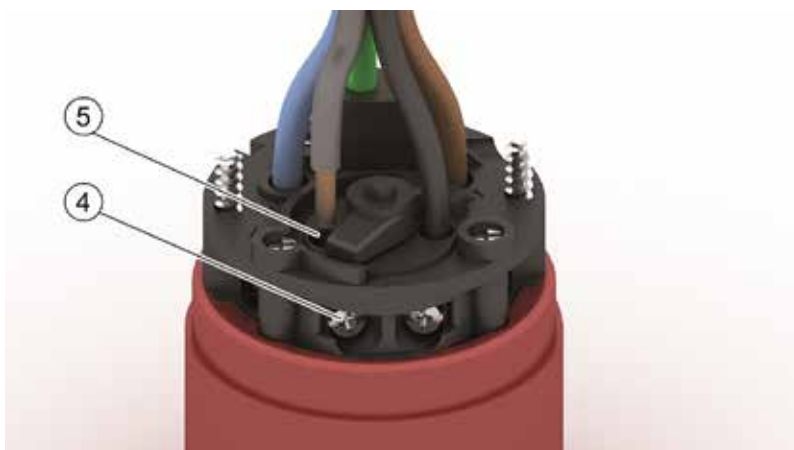
Proceed as follows:

1. Make sure that the cable is de-energised.
2. Depending on the design:
Open the rotary lock or loosen the screws in order to separate the insert with the screw terminals from the from the housing.



3. Remove the insert with the screw terminal in front out of the housing.
4. Push the cable about 50 cm wide through the cable gland and housing.

5. Strip the cable to the required length (16A designs: 60 mm; 32 A designs: 70 mm).
6. Remove the insulation from the individual conductors (16 A designs: 7 mm; 32 A designs: 12 mm).
7. For better, permanent contact, provide the individual conductors with suitable conductor end sleeves.
8. The terminals are open at the time of delivery. Guide the individual conductors into the opening (5) and tighten the screws (4) with a torque of at least 0.8 Nm. Take care to see that only the individual conductor (without insulation) is clamped. Pay attention to the marking of the terminals and ensure that the assignment of the individual conductors to the terminals is correct.



9. Connect the housing and the insert with the screws foreseen for this purpose.
10. Next, tighten the cable gland (3). The tightening torque must be between 4 Nm and 7 Nm for the 16A designs and between 5 Nm and 9 Nm for the 32A designs. Please refer to the embossing on the cable gland for the exact value of the respective design. Secure the cable gland using the screw placed on the side for this purpose (6, depending on the design).



11. Check that the cable is seated tightly in the socket outlet.

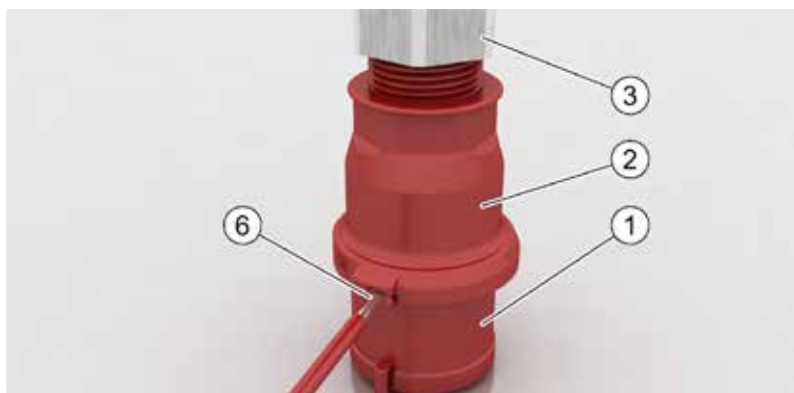
6.2 Disconnecting a conductor from a socket with multi-grip cable gland

6.2.1 QUICK-CONNECT connection

1. Make sure that the cable is de-energised.
2. If the cable gland (3) is secured with the help of a screw (8), loosen this screw.



3. Loosen the cable gland.
4. Disconnect the joint between the housing (2) and the front part (1). Depending on the design, loosen the connecting screws for this purpose or open the snap-on lock (6) with the help of a screwdriver and remove the housing from the front part by unscrewing it.



5. Push the housing and the cable gland back on the cable until the connections in the front part are easily accessible.
6. Open the contact slide (4) by sliding it to the right (in the direction of the arrow) and pull the individual conductors from the terminals.



7. Pull the cable out of the housing and out of the cable gland.

6.2.2 Screw terminal connection

1. Make sure that the cable is de-energised.
2. If the cable gland (3) is secured with the help of a screw (6), loosen this screw.



3. Loosen the cable gland.
4. Disconnect the connection between the housing and the front part. Depending on the design, loosen the connecting screws for this purpose or open the snap-on lock with the help of a screwdriver and remove the housing from the front part by unscrewing it.



5. Push the housing and the cable gland back on the cable until the connections in the front part are easily accessible.
6. Loosen the screws (4) of the terminals and pull out the individual conductor.



7. Pull the cable out of the housing and out of the cable gland.

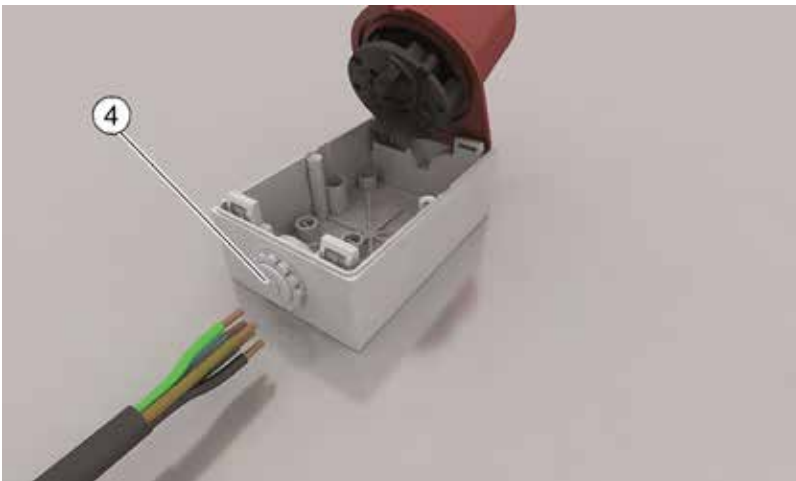
6.3 Connecting a conductor to a device connector

Proceed as follows:

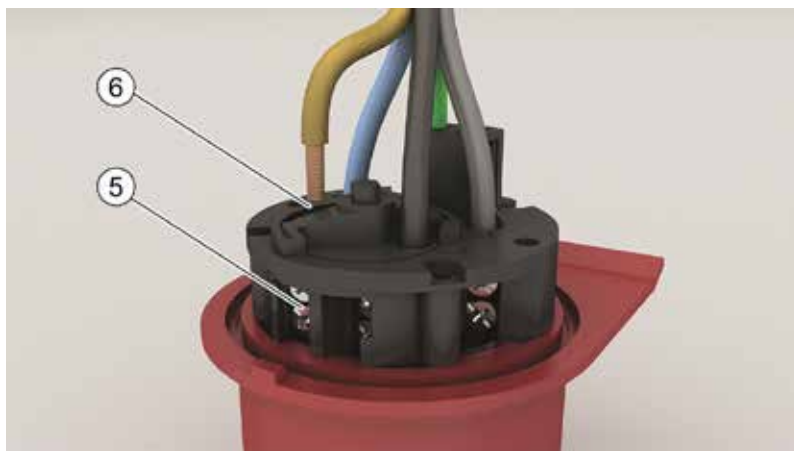
1. Make sure that the cable is de-energised.
2. Strip the cable to the required length.
3. Remove the insulation from the individual conductors (16 A designs: 9 mm; 32 A designs: 12 mm). Twist the multi-strand copper conductors slightly by hand for flexible conductors. Conductor end sleeves are not necessary but may be used.
 - ⇒ For wall-mounted device connectors, follow the explanation starting from point 4.
 - ⇒ For device connectors with bolt-on or flange mounting, follow the explanation starting from point 7.
4. Loosen the two housing screws in order to open the housing.



5. Fix the bottom part of the housing to the wall with the help of the fixing material suitable for the application.
6. Push the cable through the sealing plugs (4) into the housing. Open the sealing plugs only as far as necessary so that they can still get sealed. Generally, we recommend using a separate cable gland for the cable entry.



7. The terminals are open at the time of delivery. Guide the bare individual conductors into the opening (6) and tighten the screws (5) with a torque of at least 0.8 Nm. Take care to ensure that only the bare individual conductor (without insulation) is clamped. Pay attention to the marking of the terminals and ensure that the assignment of the individual conductors to the terminals is correct.



8. Check whether the individual conductors are seated tightly by pulling them lightly. If this is not the case, open the terminal and repeat the previous step.
9. For wall-mounted device connectors: Tighten the cable gland.
10. Fix the housing with the panel mounting appliance (panel mounting variant) or fix the cover with screws to the housing (surface-mounting variants). NOTICE! With the panel mounting variants, make sure that you insert the gasket, and with the surface-mounting variants, that the insert with the connections is placed correctly into the bottom part of the housing!



6.4 Disconnecting a conductor from a device connector

Proceed as follows:

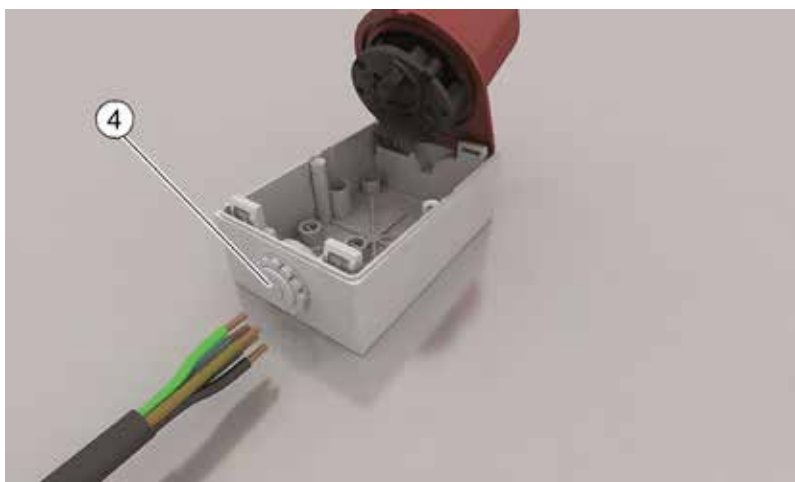
1. Make sure that the cable is de-energised.
2. For wall-mounted device connectors: Loosen the two housing screws in order to open the housing.



3. Loosen the screws (5) and pull out the individual conductors from the terminals.



4. Pull out the cable from the housing, and for wall-mounted device connectors, also out of the cable gland (4).



5. Fix the cover with screws to the housing (wall variants).

7 Operation

A phase inverter is always used if the application requires the direction of rotation of the attached consumer to be changed.

Proceed as follows:

1. Take a suitable screwdriver and push the phase inversion element inwards.
2. Rotate the phase inversion element by 180 ° until it engages.



8 Cleaning and care

It is recommended to clean it as required. Use a dry cloth to do this, and use a wet cloth if it is very dirty.



DANGER

Electrical voltage

The device contains parts that carry hazardous voltage that may be fatal.

1. Pull out the connectors to the loads before cleaning them.
2. Make sure that the connector covers are closed.
3. Never use steam or water jet cleaners.



NOTICE

Damage to the plastic parts

Corrosive cleaning agents may attack or destroy the plastic parts.

Use only a cloth moistened with water for cleaning.

9 Decommissioning and disposal



Send the worn-out product for recycling or for proper disposal. Always make sure to observe and follow the local regulations.

The product should not be disposed of in household waste. Environmental damage and risk to personal health are avoided with proper disposal.

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