Quick Installation Guide

Solar-inverter M88H_121 (ST)

Europe United Kingdom

This quick installation guide applies for the following inverter models:

- **M88H_121 (ST), Delta part number RPI883M121200**

with firmware versions:
DSP: 1.18 / RED: 1.03 / COM: 1.18 or higher

The Delta part number and the serial number can be found on the type plate of the inverter. The firmware versions are listed on the display in the **`Inverter Info.`** menu.

This manual is intended for installers.
The information in this manual is to be treated as confidential and no part of this manual may be reproduced without prior written permission from Delta Electronics. The information in this manual may not be used for any purpose not directly connected to use of the inverter.
All information and specifications can be modified without prior notice.

The Delta manuals undergo continuous revision in order to provide you with complete information regarding the installation and operation of our inverters. Therefore, before starting installation work, **always** consult www.solar-inverter.com to check whether a newer version of the Quick Installation Guide or of the comprehensive Installation and Operation Manual is available.

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Basic safety instructions

DANGER

Electric shock

Potentially fatal voltages are present at the inverter during operation. When the inverter is disconnected from all power sources, this voltage remains in the inverter for up to 100 seconds.

Therefore, always carry out the following steps before working on the inverter:

1. Disconnect the inverter from all AC and DC voltage sources and make sure that none of the connections can be accidentally restored.
2. Wait at least 100 seconds until the internal capacitors have discharged.

DANGER

Electric shock

Potentially fatal voltages are present at the inverter DC connections. When light falls on the solar modules, they immediately start to generate electricity. This also happens when light does not fall directly on the solar modules.

- ► Never disconnect the inverter from the solar modules when it is under load.
- ► Disconnect the connection to the grid so that the inverter cannot supply energy to the grid.
- ► Disconnect the inverter from all AC and DC voltage sources. Ensure that none of the connections can be restored accidentally.
- ► Ensure that the DC cables cannot be touched accidentally.

WARNING

Electric shock

When the cover is removed from the wiring box, this exposes voltage-carrying parts and protection conforming to IP65 is no longer guaranteed.

- ► Remove the cover only when absolutely necessary.
- ► Do not remove the cover if water or dirt might enter the inverter.
- ► After work is completed, ensure that the cover is properly replaced and screwed in. Check that the cover is properly sealed.

NOTICE

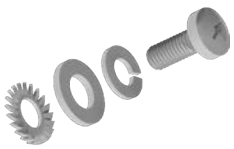
Incorrectly dimensioned solar system.

An solar system of the wrong size may cause damage to the inverter.

- ► When calculating the module string, always pay attention to technical data of the inverter (input voltage range, maximum current and maximum input power), see chapter “Technical data”, page 40.

- To comply with the IEC 62109-5.3.3 safety requirements and avoid injury or material damage, the inverter must be installed and operated in accordance with the safety and operating instructions set out in this manual. Delta Electronics is not responsible for damage resulting from failure to follow the safety and operating instructions set out in this manual.
- The inverter may only be installed and commissioned by installers who have been trained and certified for the installation and operation of grid-based solar inverters.
- All repair work on the inverter must be carried out by Delta Electronics. Otherwise, the warranty will be void.
- Warning instructions and warning symbols attached to the inverter by Delta Electronics must not be removed.
- The inverter has a high leakage current value. The grounding cable **must** be connected before commencing operation.
- Do not disconnect any cables while the inverter is under load due to risk of a fault arc.
- To prevent damage due to lightning strikes, follow the provisions that apply in your country.
- The surface of the inverter can get very hot during operation. Wear safety gloves when you touch the inverter (apart from at the display).
- The inverter is very heavy. The inverter must be lifted and carried by at least three people.
- Only equipment in accordance with SELV (EN 60950) may be connected to the RS485 interfaces.
- All connections must be sufficiently insulated in order to ensure the IP65 degree of protection. Seal any unused connection openings with the closure caps supplied.

Scope of supply

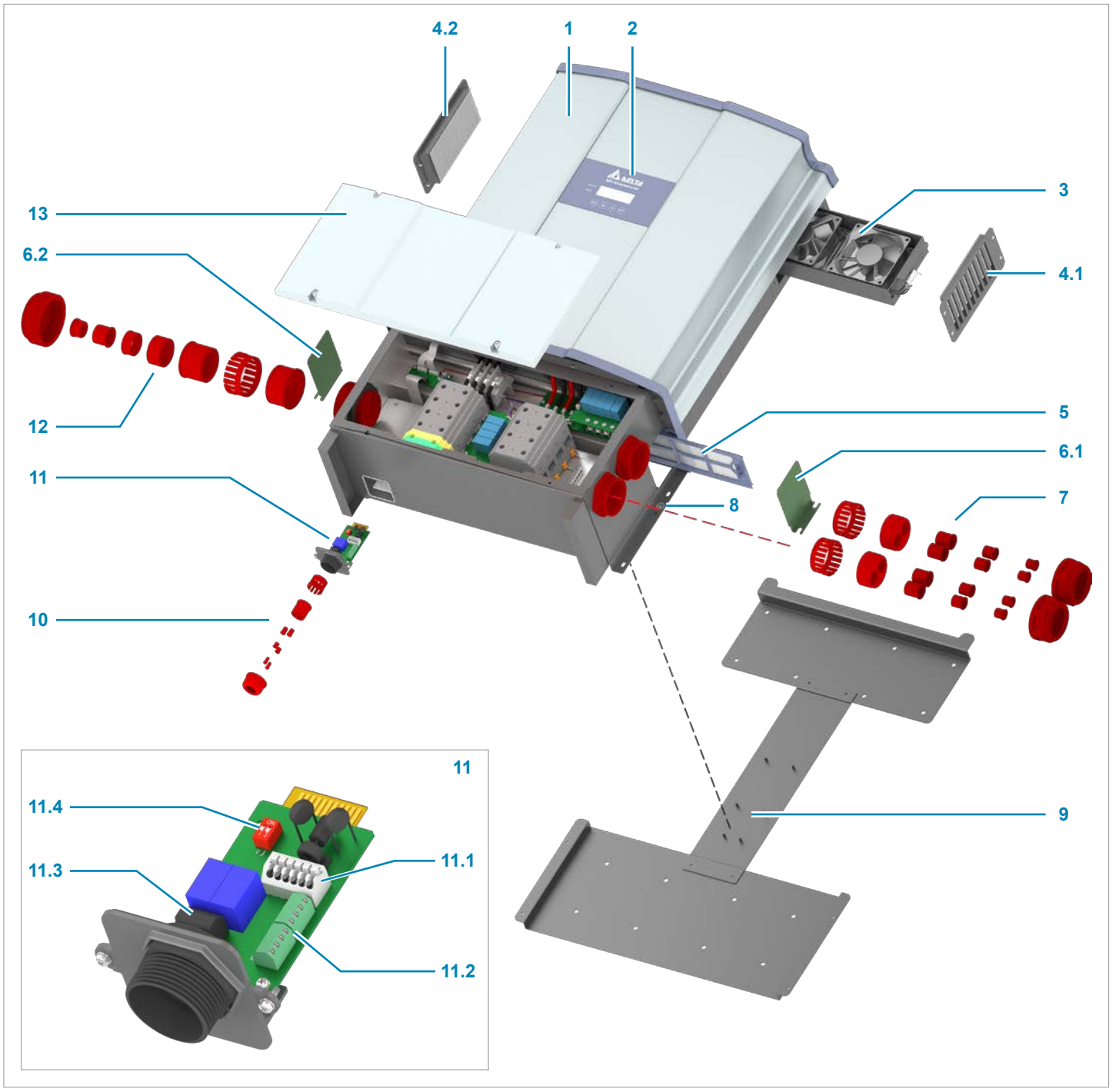
Part		Description	Part		Description
M88H_121 inverter with wiring box	1		Mounting plate	1	
Cover caps	2	For closing the upper cable feed-throughs on the junction box when the power module is removed from the junction box. The cover caps are fitted to the mounting plate. 		1	
Cable gland for AC feed-through	1	For feeding the AC cable into the junction box. 	M6 grounding screw	1	For grounding the inverter housing; with spring washer, washer and toothed lock washer; mounted on the inverter. 
Cable gland for DC feed-through	2	For feeding the DC cable into the junction box. 	Screening plate for the air inlet	2	For covering the air inlets and preventing the entry of small animals. 
Cable gland for the communication connection	1	For fastening the communication cables to the junction box. 	Quick installation guide and basic safety instructions	1	
M6 mounting screw	4	For fastening the wiring box to the mounting plate; with spring washer and washer. 			

Check the delivery for completeness and all components for damage before starting installation work.

Do not use any damaged components.

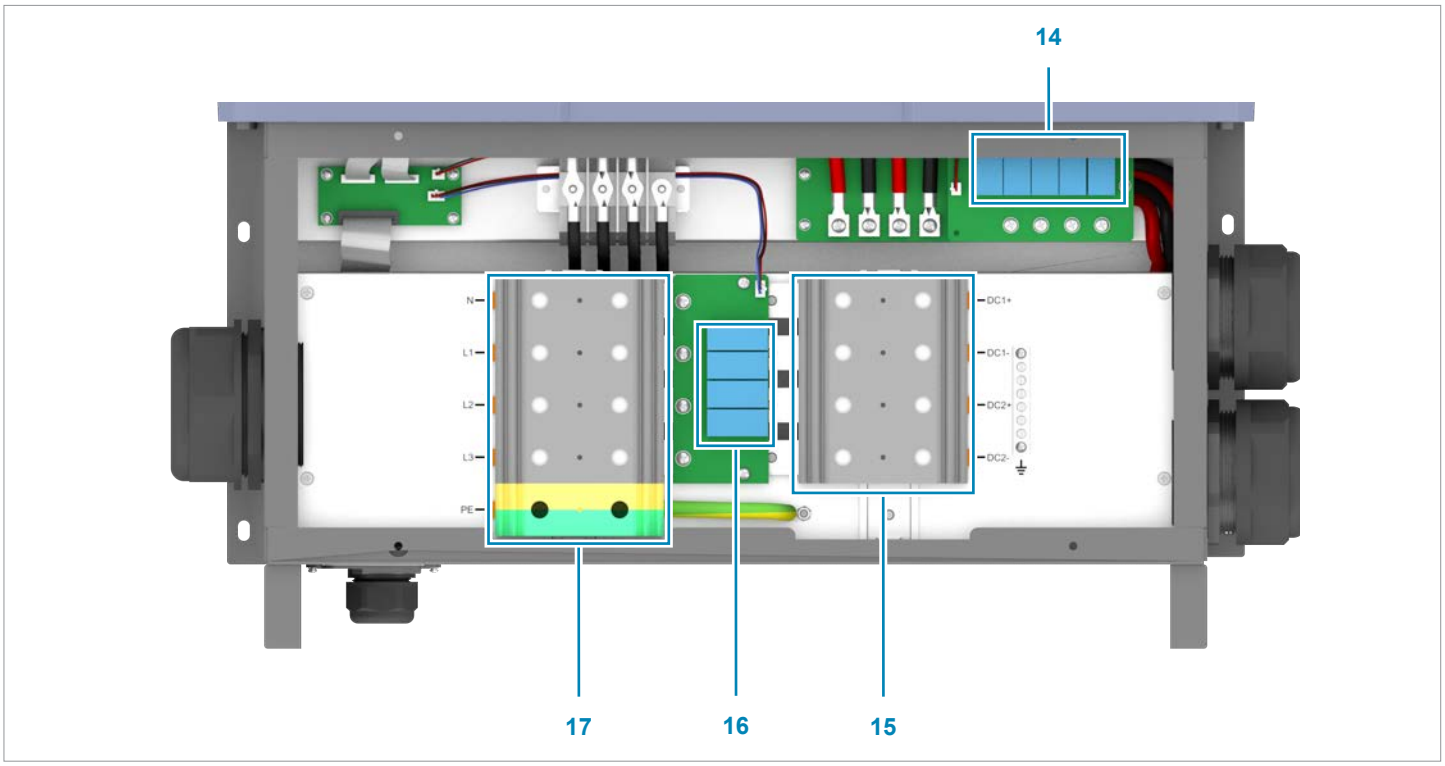
Keep the packaging.

Components of the inverter



1	Power module
2	Display, buttons, and LED
3	Fan module
4	Filter for air outlet (2x)
5	Filter for air inlet
6	Cover panel for the air inlet (2x)
7	DC cable gland (2x)
8	Grounding connection
9	Mounting plate
10	Cable gland for the communication connection
11	Communication card
12	AC cable gland
13	Cover panel for the wiring box

11.1	RS485 connection
11.2	Digital inputs
11.3	Dry contacts
11.4	DIP switch for VCC and RS485 termination resistor



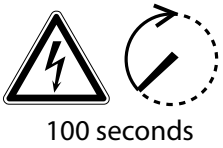
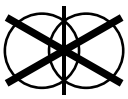
14 DC surge protection devices
15 DC terminal block
16 AC surge protection devices
17 AC terminal block

Display, buttons, and LEDs

GRID	Grid	Green LED. Lights up when the inverter is supplying electricity to the mains grid.
ALARM	Alarm	Red LED. Indicates an error, a failure or a warning.

EXIT	EXIT	Exit the current menu. Cancel the setting for a parameter. Changes are not adopted.
▼	Down	Move downwards in the menu. Reduce the value of a configurable parameter.
▲	Up	Move upwards in the menu. Increase the value of a configurable parameter.
ENT	ENTER	Select menu item. Open a configurable parameter for editing. Cancel the setting for a parameter. Changes are adopted.

Information on the type plate

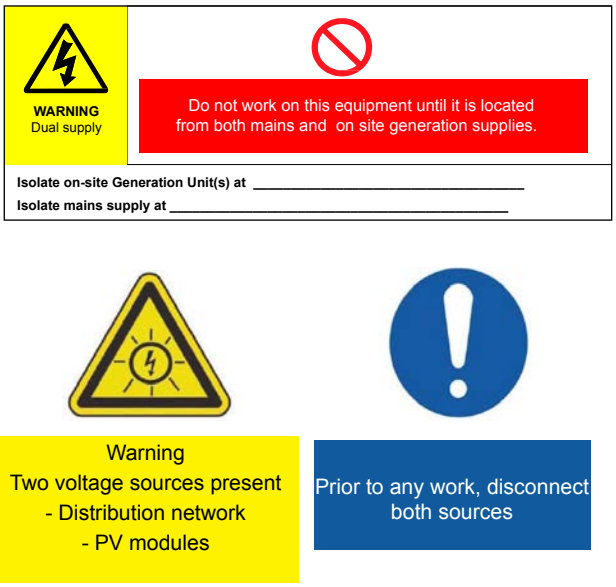
	**Danger to life through electric shock** Potentially fatal voltage is present inside the inverter during operation and this voltage remains present for up to 100 seconds after disconnection from the power supply. Only the wiring box may be opened. All other device parts may not be opened.
	Before working on the inverter, read the supplied manual and follow the instructions contained therein.
	This inverter is not separated from the grid by a transformer.
	The housing of the inverter must be grounded if this is required by local regulations.
	WEEE mark The inverter must not be disposed of as standard household waste, but in accordance with the applicable electronic waste disposal regulations of your country or region.
	This regulatory symbol does not apply to the EU because the noise level lies below the EU guidelines.

Attaching warning labels to the inverter

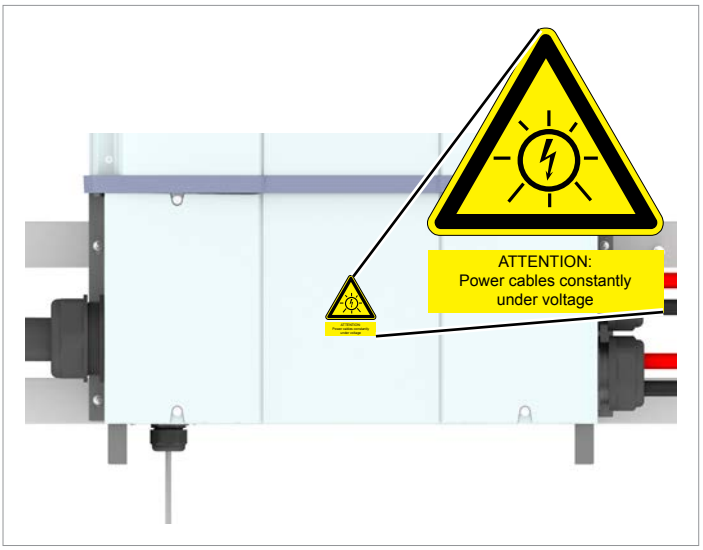
All countries

► Attach all necessary warning labels to the inverter. Always follow the local regulations.

Some examples of warning labels are listed below.



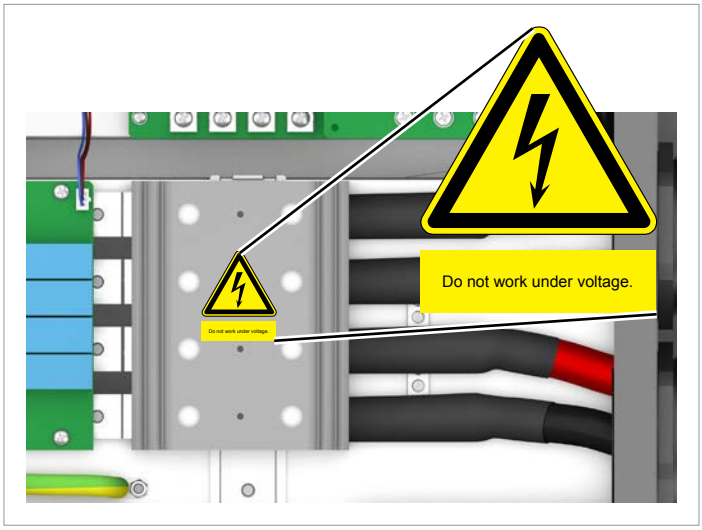
Examples of warning labels



Warning label on the terminal box cover

France

As required by UTE 15-712-1 the following warning labels must be attached:

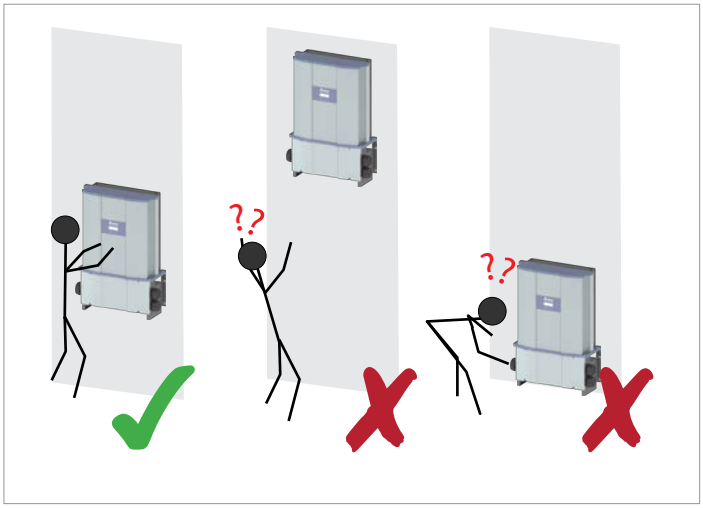


Warning label on the DC terminal block

Planning the installation

Installation location of the inverter

► Attach the inverter so that the information on the display can be read and the buttons can be operated without any problems.



► The inverter is very heavy. The wall or mounting system must be able to bear the heavy weight of the inverter.

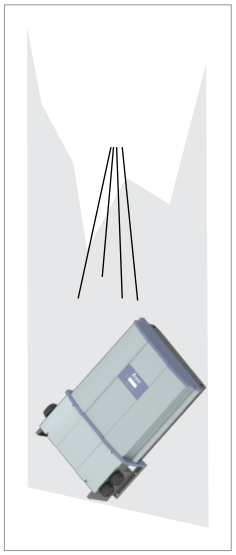
► Always use the mounting plate supplied with the inverter.

► Use mounting materials (dowels, screws etc.) that are suitable for the wall or the mounting system, as well as the heavy weight of the inverter.

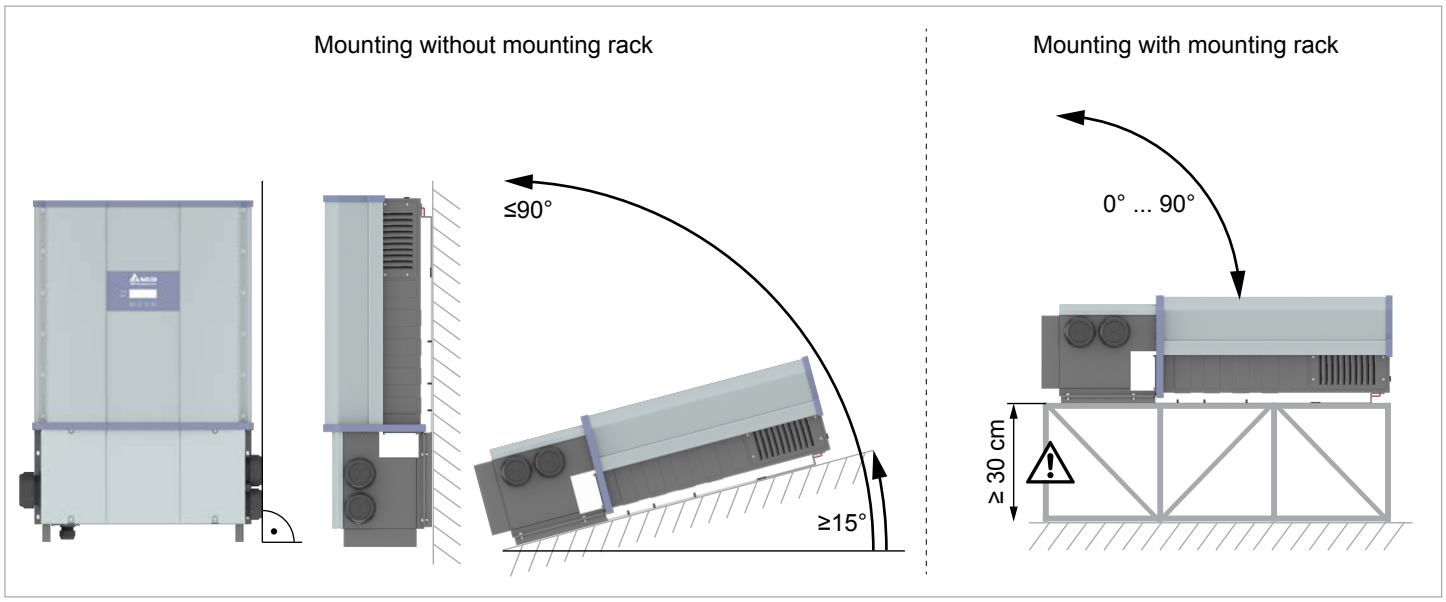
► Mount the inverter on a vibration-free wall to avoid disruptions.

► When using the inverter in residential areas or in buildings with animals, possible noise emissions can be disturbing. Therefore, carefully choose the place of installation.

► Mount the inverter on a fireproof wall.

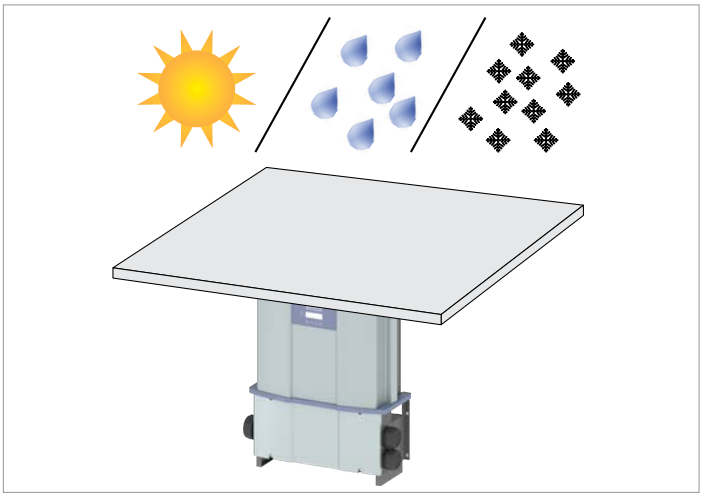


Mounting alignment

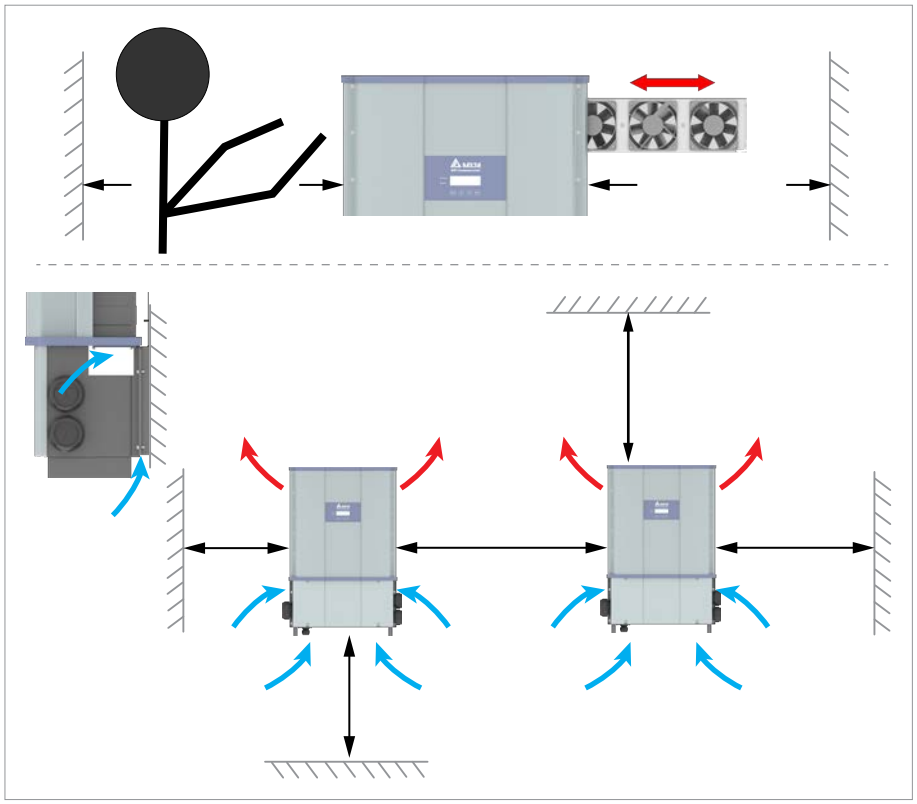


Outdoor installations

► The inverter has a protection degree of IP65 and can be installed indoors and outdoors. Despite this, the inverter should be protected by a roof against direct solar irradiation, rain and snow. For example, the power of the inverter will be reduced if it is too heavily heated by solar radiation. This is normal operating behavior for the inverter and is necessary to protect the internal electronics.



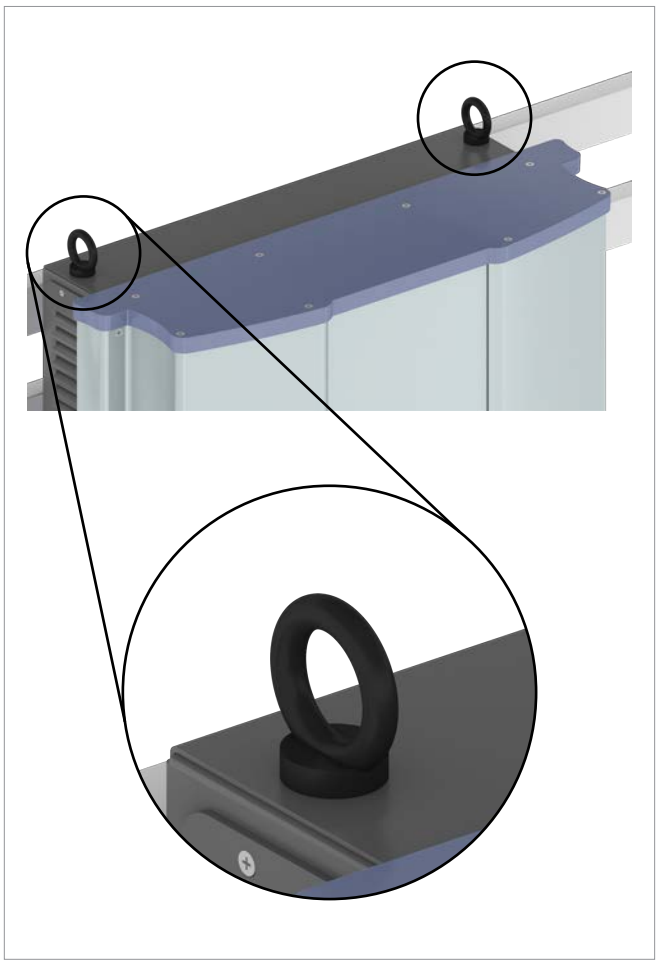
Installation clearances and air circulation



- ► Ensure sufficient air circulation. Hot air must be able to dissipate upwards. Leave enough space around each inverter.
- ► Do not install inverters above one another so that they do not heat each other.
- ► Note the *Operating temperature range without derating* and the *Operating temperature range*. When the *Operating temperature range without derating* is exceeded the inverter reduces the AC power fed into the mains. When the *Operating temperature range* is exceeded the inverter stops feeding AC power into the mains. This is normal operating behavior for the inverter and is necessary to protect the internal electronics.
- ► In areas with many trees or fields, pollen can clog the air inlets and outlets, hindering the air flow.

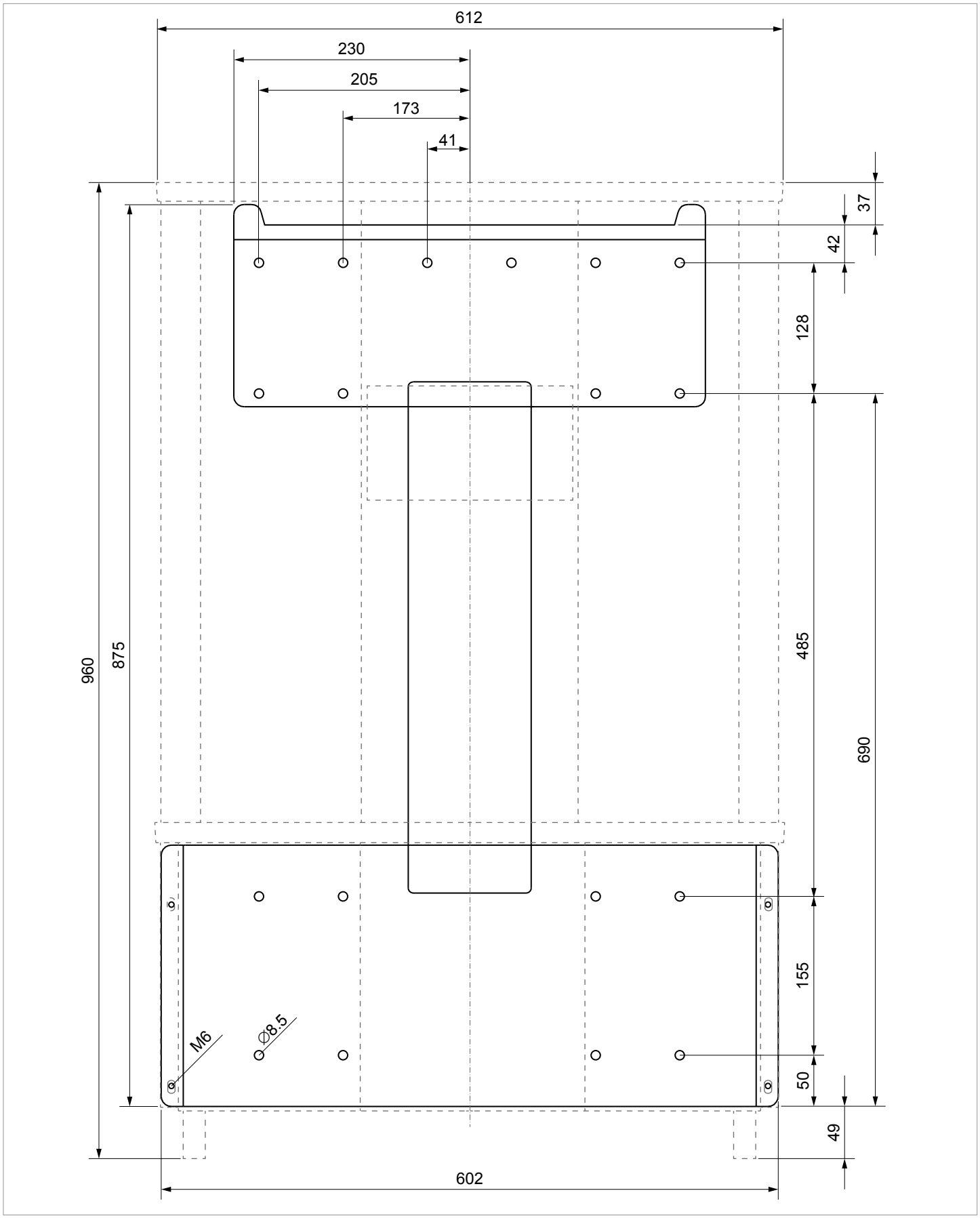
Lifting and transporting the inverter

- ► Screw eyebolts onto the upper side of the inverter. The screw eyebolts are not included in the scope of delivery.

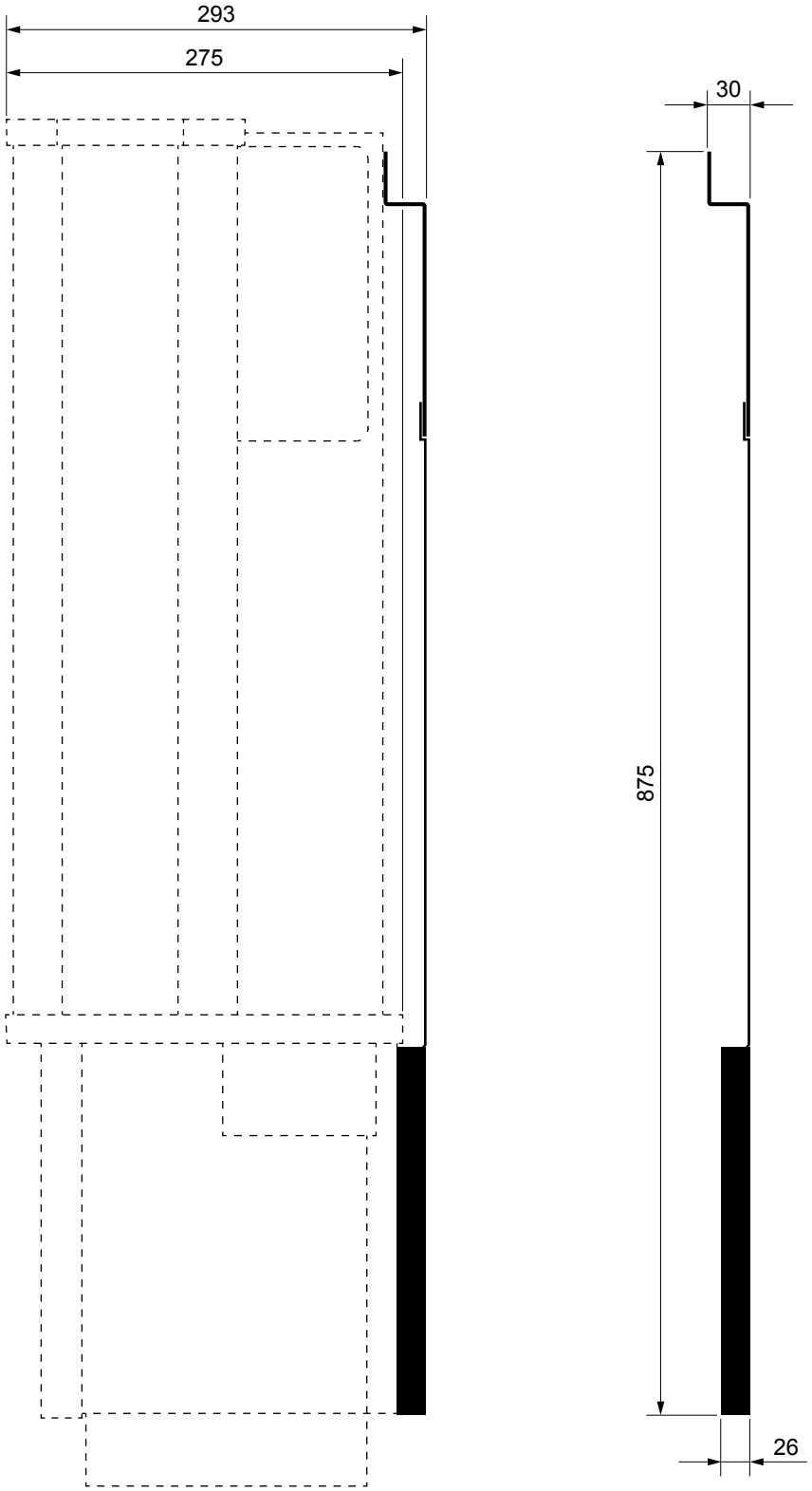


- ► Lift the inverter with a block and tackle or crane.

Dimensions



Dimensions



Cable requirements

AC and DC terminal blocks - general information

The section describes the general technical characteristics of the AC and DC terminal blocks. The special features which apply to the installation of the inverter are explained in the following sections.
AC and DC terminal blocks are of the same type.

The specifications in this section have been defined by Phoenix Contact. Check if the technical specifications have change before starting installation work, see www.phoenixcontact.com.

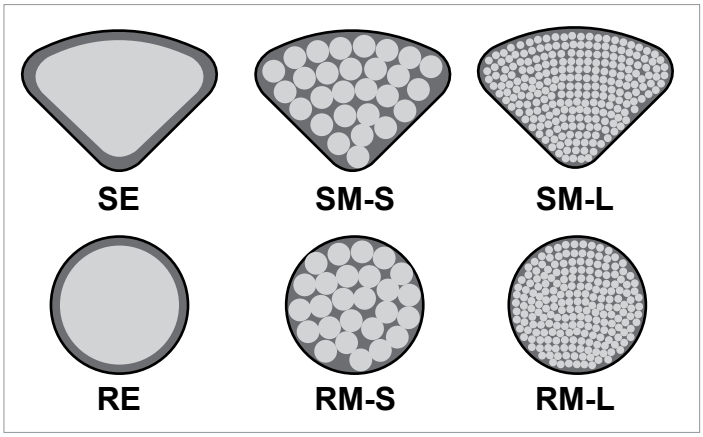
Specification of the terminal block (AC and DC)

Designation	Phoenix Contact UKH 150
Connection type	Screws with hexagon socket head
Screw thread	M10
Rated current I_N	309 A
Rated voltage U_N	1000 V
Attaching the conductor	
Type of attachment	M10 screws with hexagon socket head
Tightening torque	25 ... 30 Nm

Specification for copper cable

Min./max. Wire cross-section	
Without wire end sleeve	
• rigid cable (solid)	35 ... 150 mm²
• flexible cable	50 ... 150 mm²
with wire end sleeve	
• Flexible cable (wire end sleeve without plastic sleeve)	50 ... 150 mm²
• flexible cable (wire end sleeve with plastic sleeve)	50 ... 150 mm²
Stripping length	40 mm

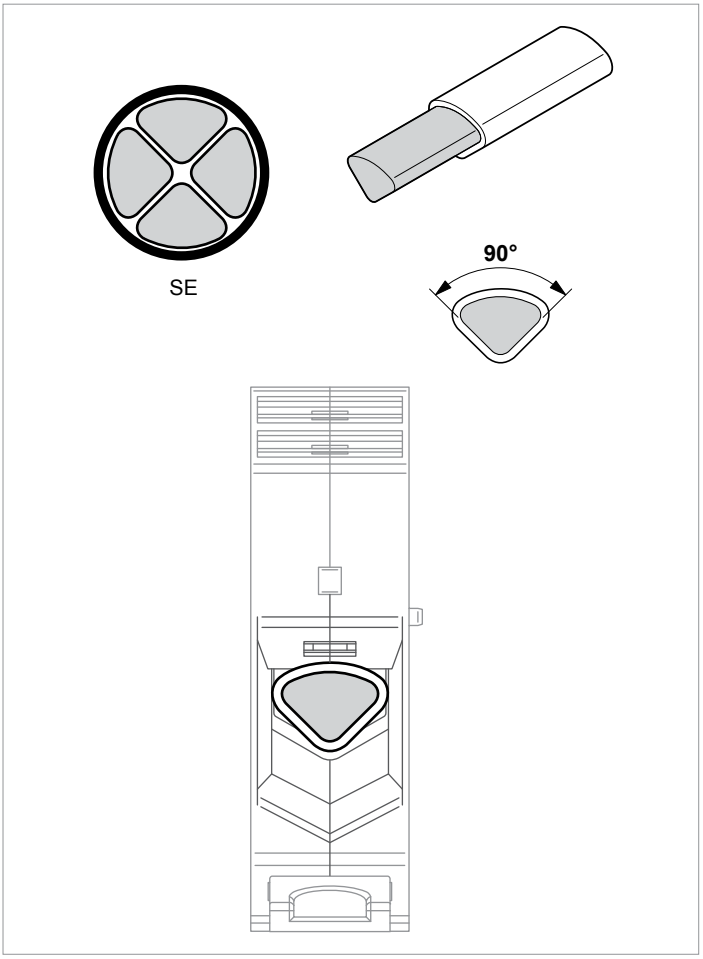
Specification for aluminum cable



SE **s**ector-shaped, **s**olid conductor
SM-S **s**ector-shaped, **m**ulti-conductor, rigid wires
SM-L **s**ector-shaped, **m**ulti-conductor, (stranded wires)
RE **r**ound, **s**olid conductor
RM-S **r**ound, **m**ulti-conductor, rigid wires
RM-L **r**ound, **m**ulti-conductor, (stranded wires)

The terminals have been specially developed for direct connection of sector-shaped, solid (SE) aluminum cables:

Min./max. Conductor cross-section	120 / 150 mm²
Stripping length	40 mm



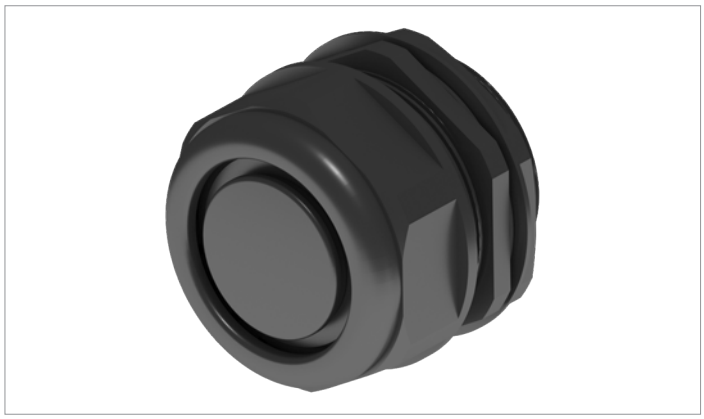
If other types of aluminum cables are used, Al-Cu crimped connectors (such as those from Klauke, Elpress or Mecatraction) must be used, see “Special instructions for the use of aluminum cables”, page 16.

AC cable

AC cable gland

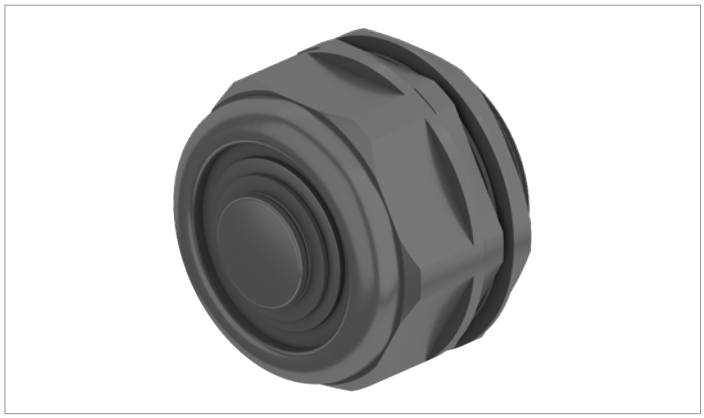
The inverter has 1 AC cable gland with 1 cable feed-through. Two different AC cable glands are supplied with the M88H_121. These are designed for different cable diameters. If the AC cable gland that was supplied with your inverter is not suitable for the cable diameter you are using, you can order a new AC cable gland from Delta.

Variant A:



Min./max. Cable diameter	39.8 ... 65.8 mm

Variant B:



Min./max. Cable diameter	23.9 ... 65.9 mm

Notes on calculating the cable cross-section

Consider the following factors when calculating the cable diameter:

- Cable material
- Temperature conditions
- Cable length
- Installation type
- Voltage drop
- Loss of power in the cable

Always follow the installation regulations for AC cables applicable in your country.
France: Follow the installation instructions of UTE 15-712-1. This standard contains the requirements for minimum cable diameters and for avoiding overheating due to high currents.

Germany: Follow the installation instructions of UTE VDE 0100-712. This standard contains the requirements for minimum cable diameters and for avoiding overheating due to high currents.

DC cables

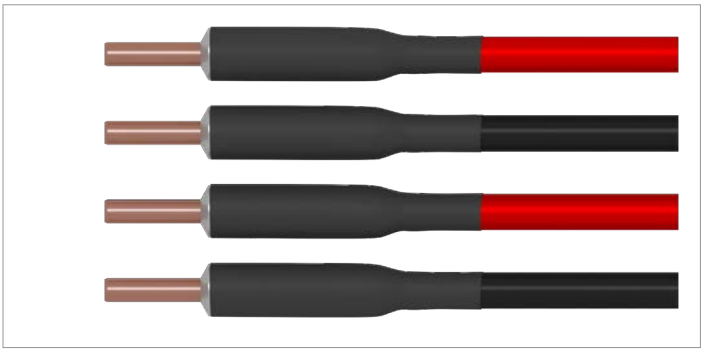
DC cable gland

The inverter has 2 DC cable glands each with 2 cable feed-throughs.

Min./max. Cable diameter	12.4 ... 25.7 mm

Instructions for the use of aluminum cables

See “Special instructions for the use of aluminum cables”, page 16.



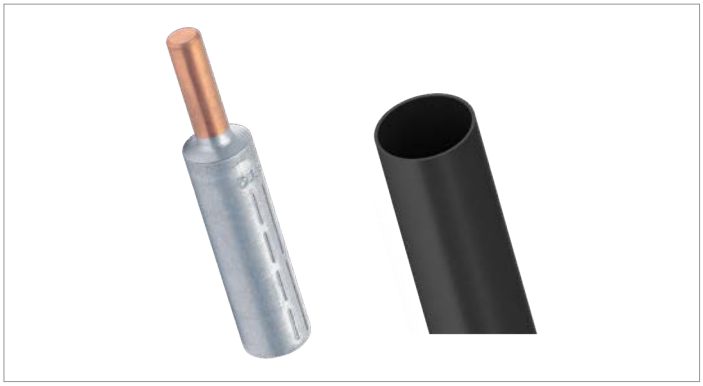
Cable requirements

Special instructions for the use of aluminum cables

The instructions contained in this section refer specifically to the use of aluminum cables with this inverter. These instructions supplement the specifications of the manufacturer of the terminal blocks.

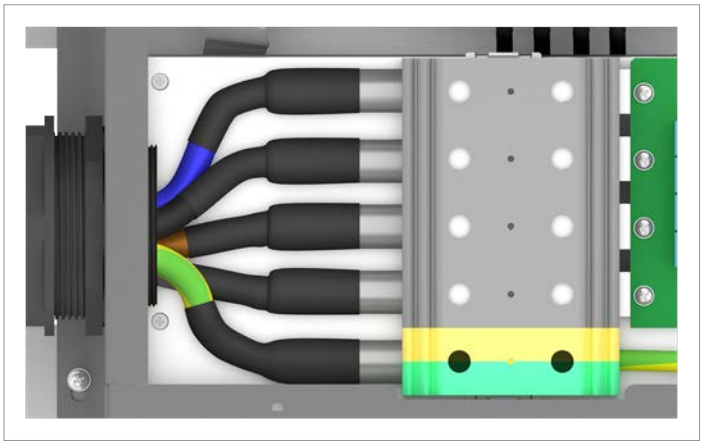
Because of the special design features of the junction box and due to various national regulations, the sector-shaped, solid aluminum conductors (SE) specified by Phoenix cannot be used. There is insufficient space in the junction box to bend and turn the aluminum conductors into the required position without incurring the risk of breaking the aluminum conductors or the insulation.
Other types of aluminum conductors must be used for that reason. Additional Al-Cu crimped connectors (such as those from Klauke, Elpress or Mecatraction) and heat-shrink sleeving are required when these other types are used.

► Select crimp connectors suitable for the type of cable that is used.
► Comply with the installation instructions issued by the manufacturer of the crimp connectors.
► Secure the cables with an external strain relief element.



Additional Al-Cu crimped connectors and heat-shrink sleeving are required with non-sector-shaped aluminum cables

► Use original tools from the manufacturer of the crimp connectors for assembling the aluminum cables.



AC cabling using aluminum cables, crimp connectors and heat-shrink sleeving

Handling aluminum conductors during installation work

The special properties of aluminum must be taken in to consideration when using aluminum:

- Aluminum "flows", i.e. it gives way under pressure.
- A thin non-conductive oxide layer forms within a few minutes on de-insulation, which increases the contact resistance between the conductor and clamping point.
- The specific conductivity and hence the current carrying capacity is approximately one third less than that of copper.

NOTICE

Extreme temperature rise at the clamping point

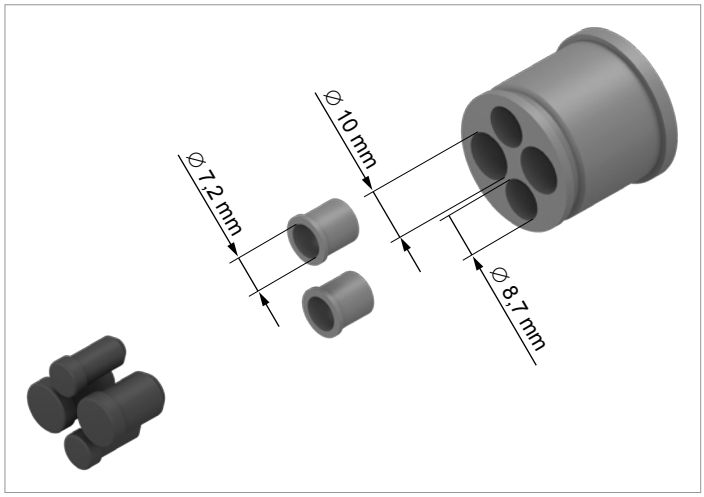
If the contact resistance between the aluminum conductor and clamping point is too high, the clamping point can become very hot and even catch fire in extreme cases.

To ensure a safe and reliable contact, **always** perform the following work steps:

► Use a conductor cross-section at least one number larger due to the lower current-carrying capacity.
► Keep the installation location as free as possible from moisture or corrosive atmospheres.
► Connect the aluminum cables quickly.
► Mechanically clean the stripped end of the aluminum conductor (using for instance a knife blade to scrape off the oxide layer), then immediately dip the aluminum conductor into acid-fee and alkaline-free (= neutral) Vaseline and straight away insert it into the terminal block.
► Tighten the clamping screw in the clamping body with the maximum permissible tightening torque.

Communications cables

Cable gland



The inverter has 1 cable gland for the communications cable with 2x2 cable feed-throughs.

Cable requirements

- Shielded twisted-pair cable (CAT5 or CAT6)
- Cable diameter: 7.2 / 8.7 / 10.0 mm
- Wire cross-section: 0.25 ... 1.5 mm^2

The communications cable is required for connection to the following units:

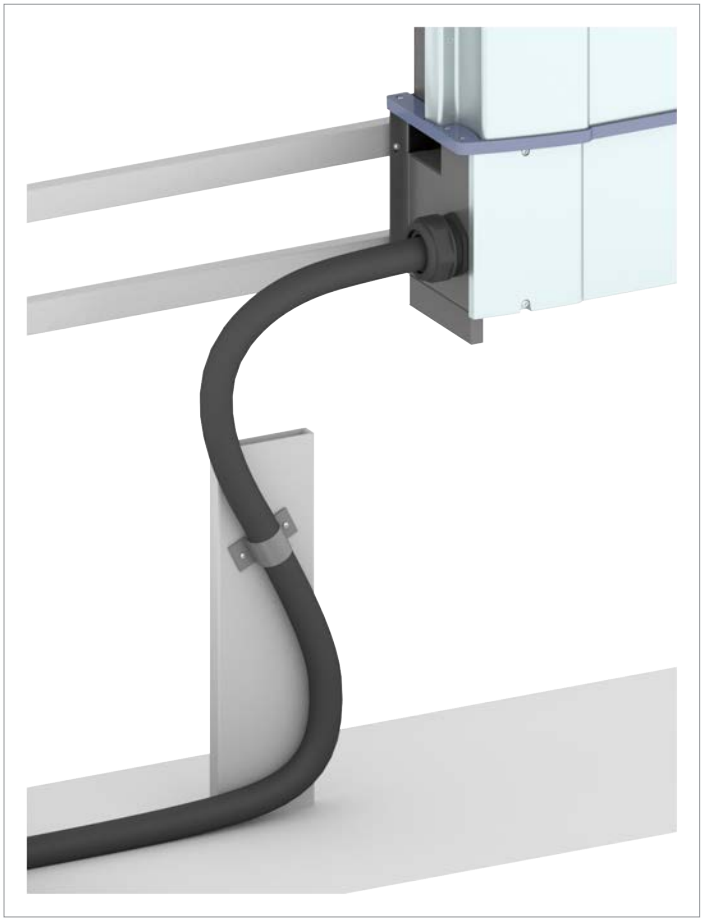
- Data logger
- External alarm unit
- Ripple control receiver
- External power-off
- PC

Routing the cables

This section describes the optimum routing for the cables in the region of the inverter.

When bending and twisting cables or conductors, always comply with the manufacturer's instructions, so as to avoid breakage of the conductors or the insulation.

AC cable



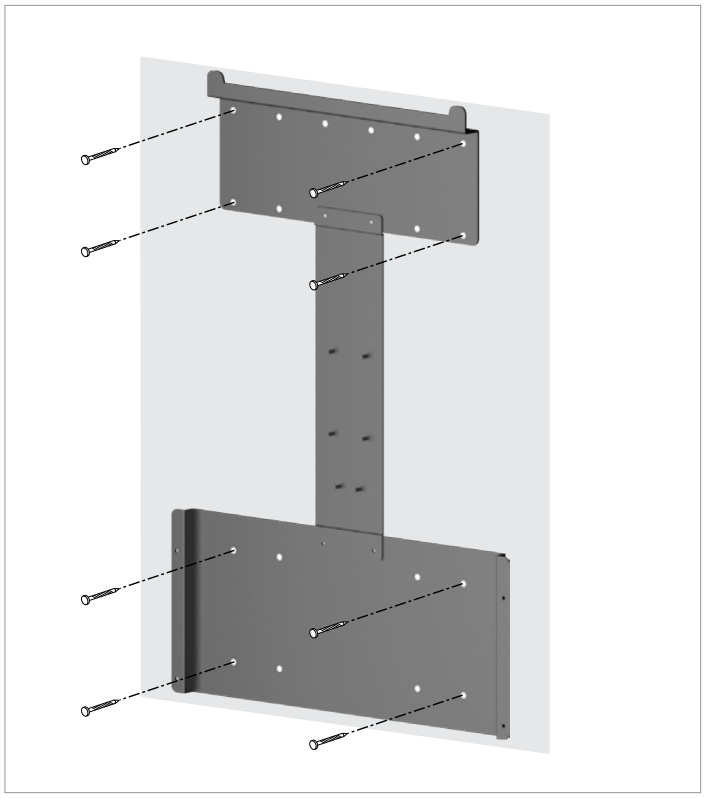
Recommended feeding of the AC cable

Fasten the cable with a strain relief element.

Communications cables

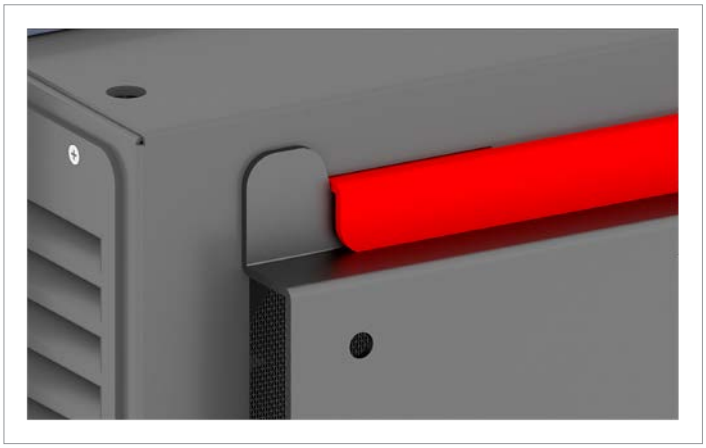
Lay the cable with a suitable clearance to the AC and DC cables to prevent interference in the data connection.

Mounting the inverter



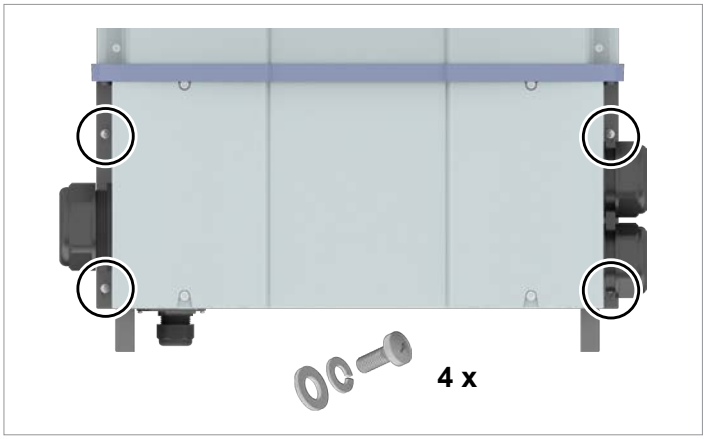
1. Attach the mounting plate to the wall / the mounting system with 8 M8 screws.

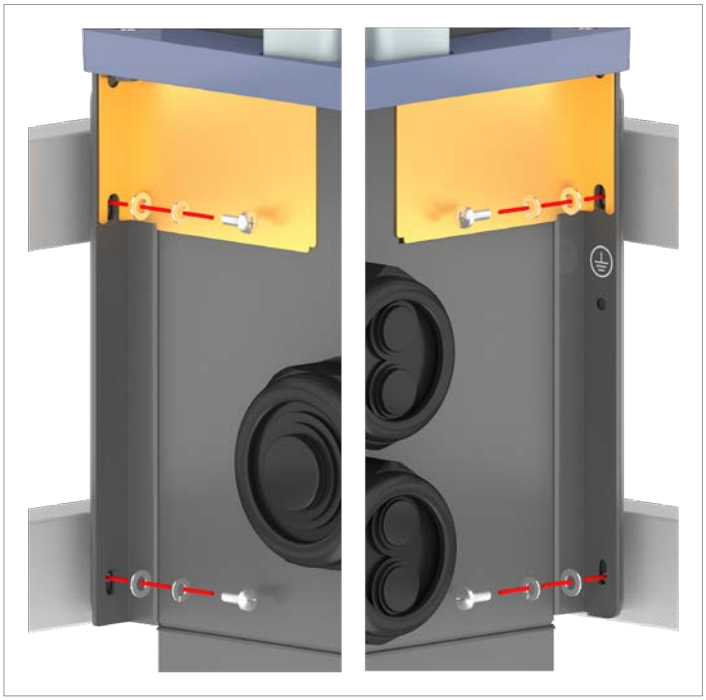
2. Mount the inverter on the mounting plate.



3. Check that the inverter is correctly mounted on the mounting plate.

Mounting the inverter





4. Screw the inverter to the mounting plate with 4 M5 screws, spring washer and washer. The screws are supplied in the scope of delivery.

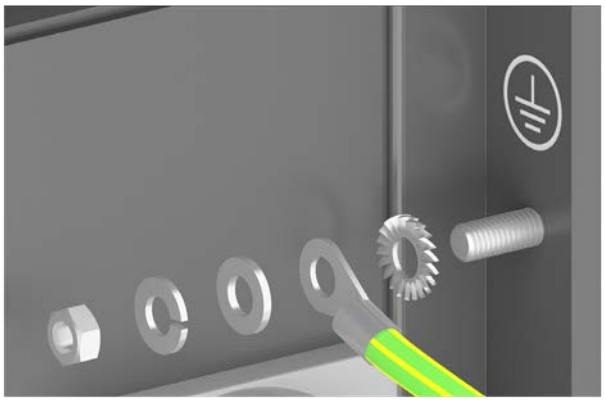
   If desired, also mount the cover panels for the side air inlets.

Grounding the inverter housing

WARNING

High current

- ► Always observe the local regulations relating to grounding cable requirements.
- ► To increase the safety of the system, always ground the inverter housing even when this is not required by the local regulations.
- ► Always ground the inverter housing **before** connecting the inverter to the mains and solar modules.
- ► The grounding cable cross-section must be at least 6 mm^2.



DANGER

Electric shock

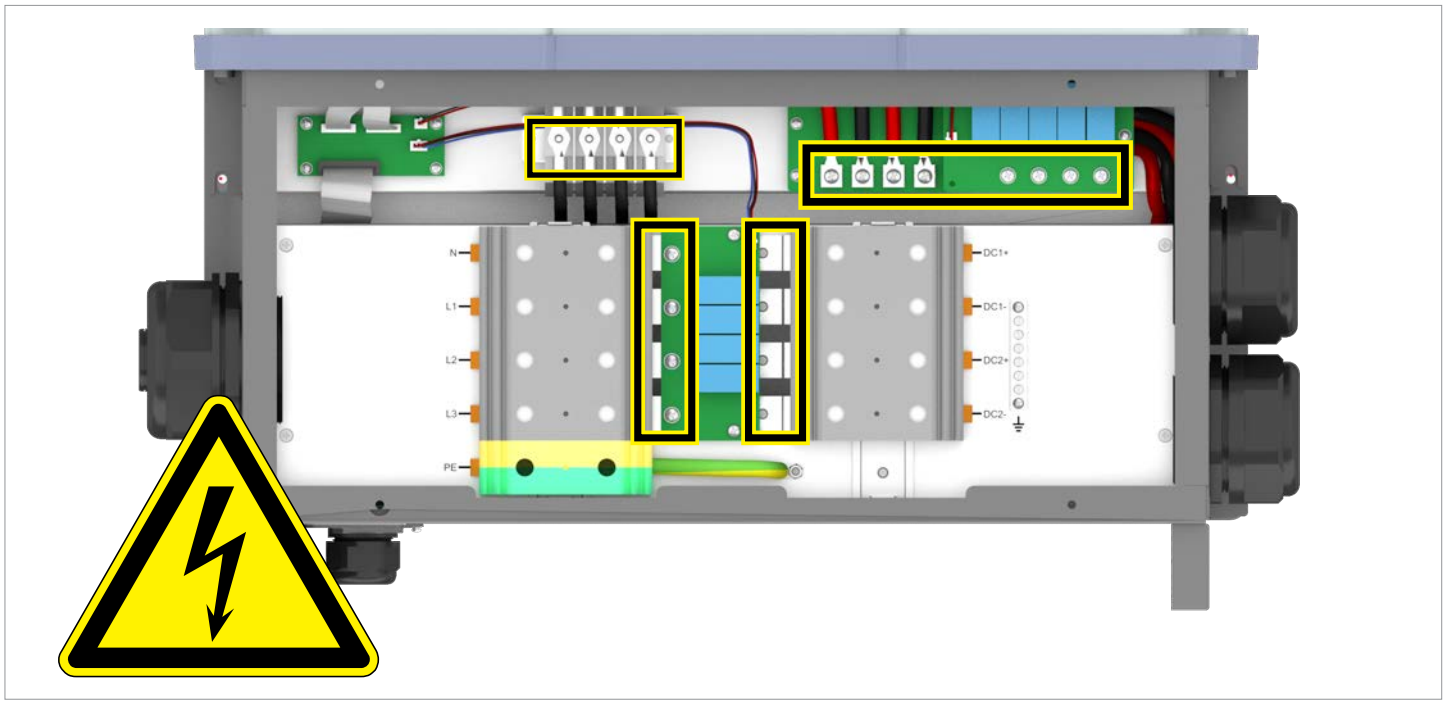
In IT grids, a twofold insulation fault can lead to high residual currents on the inverter housing.

- ► Ground the housing of the inverter via the grounding connection.
- ► Set up a permanent insulation monitoring system.
- ► The first time an insulation fault occurs, this insulation fault must be rectified **immediately**!

5. Bolt the grounding cable onto the inverter. M6 screw, spring washer, washer, and toothed lock washer are already mounted on the inverter.

6. Perform a continuity check of the grounding connection. If there is no sufficient conductive connection, scratch away the paint from the inverter housing under the toothed lock washer to achieve a better electrical contact.

Connecting the mains (AC)



Hazard zones with potentially life-threatening currents and voltages

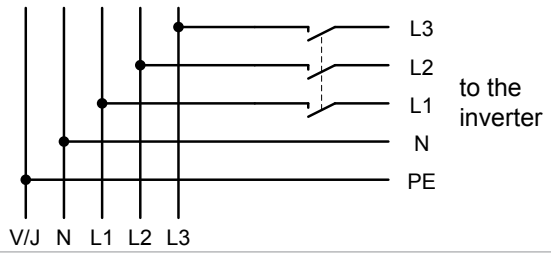
NOTICE

Ingress of moisture
If the wiring box cover is removed, the degree of protection is no longer IP65.
► Only remove the cover when the inverter is in a dry environment.

Important safety instructions

► Always follow the specific regulations of your country or region.
► Always follow the specific regulations of your energy provider.
► Install all stipulated safety and protective devices (such as automatic circuit breakers and/or surge arresters).
► Protect the inverter with a suitable upstream circuit breaker:

Upstream line protection	125 A



Residual current circuit breaker

Due to its design, the inverter cannot supply the grid with DC residual current. This means that the inverter meets the requirements of DIN VDE 0100-712.
Possible error events were assessed by Delta in accordance with the current installation standards. The assessments showed that no hazards arise from operating the inverter in combination with an upstream, type A residual current circuit breaker (FI circuit breaker, RCD). There is no need to use a type B residual current circuit breaker.

Minimum tripping current of the type A residual current circuit breaker	≥300 mA

The required tripping current of the residual current circuit breaker depends first and foremost on the quality of the solar modules, the size of the PV system, and the ambient conditions (e.g. humidity). The tripping current must not, however, be less than the specified minimum tripping current.

Integrated residual current monitoring unit

The integrated, universal current-sensitive residual current monitoring unit (RCMU) is certified in accordance with VDE 0126 1-1:2013-08 §6.6.2.

Integrated string fuses and surge protection devices

► Replace damaged string fuses with devices of the same type and from the same manufacturer.
► Surge protection devices are available from Delta.

Grounding the inverter

The inverter must be grounded via the PE conductor. To do this, connect the PE conductor of the AC cable to the AC plug pin provided for that purpose.

Permissible grounding systems

DANGER

Electric shock

In IT grids, a twofold insulation fault can lead to high residual currents on the inverter housing.

- ► Ground the housing of the inverter via the grounding connection.
- ► Set up a permanent insulation monitoring system.
- ► The first time an insulation fault occurs, this insulation fault must be rectified **immediately**!

Grounding system	TN-S	TN-C	TN-C-S	TT	IT
Allowed	Yes	Yes	Yes	Yes	Yes

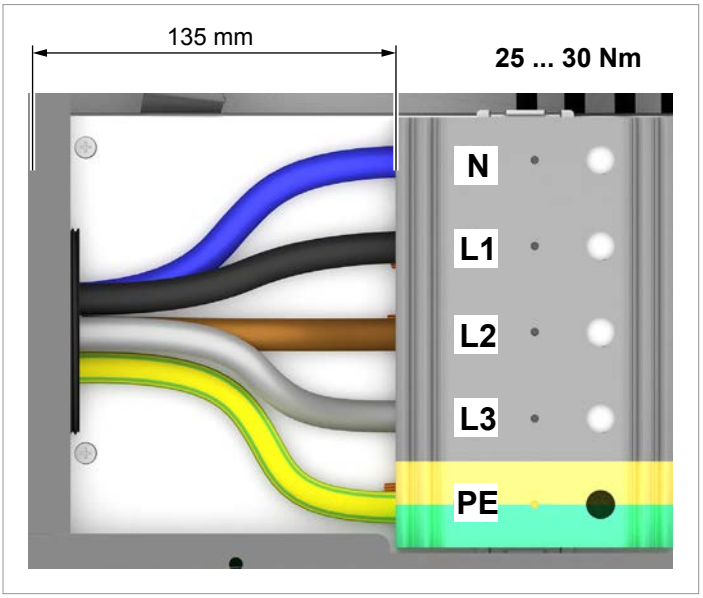
Requirements for the grid voltage

3P3W	Voltage range	3P4W	Voltage range
L1-L2	400 V_{AC} ± 30%	L1-N	230 V_{AC} ± 30%
L1-L3	400 V_{AC} ± 30%	L2-N	230 V_{AC} ± 30%
L2-L3	400 V_{AC} ± 30%	L3-N	230 V_{AC} ± 30%
L1-L2	480 V_{AC} ± 20%	L1-N	277 V_{AC} ± 20%
L1-L3	480 V_{AC} ± 20%	L2-N	277 V_{AC} ± 20%
L2-L3	480 V_{AC} ± 20%	L3-N	277 V_{AC} ± 20%

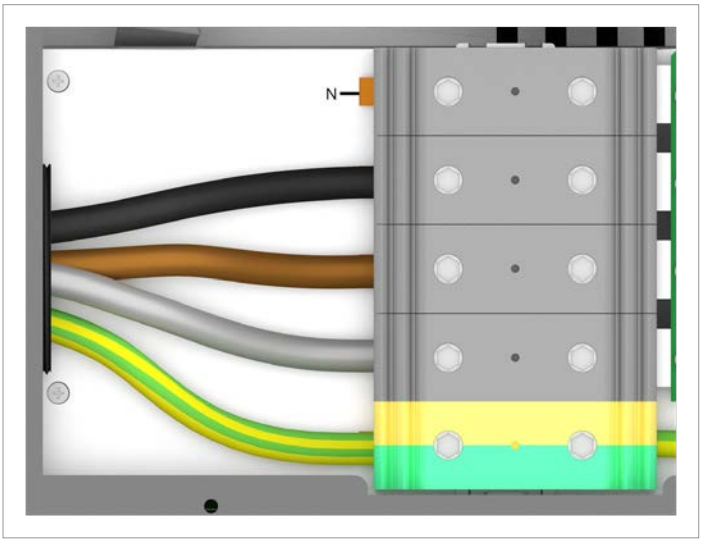
Tools

Use an insulated torque wrench with an M8 Allen key bit for the contact screws.

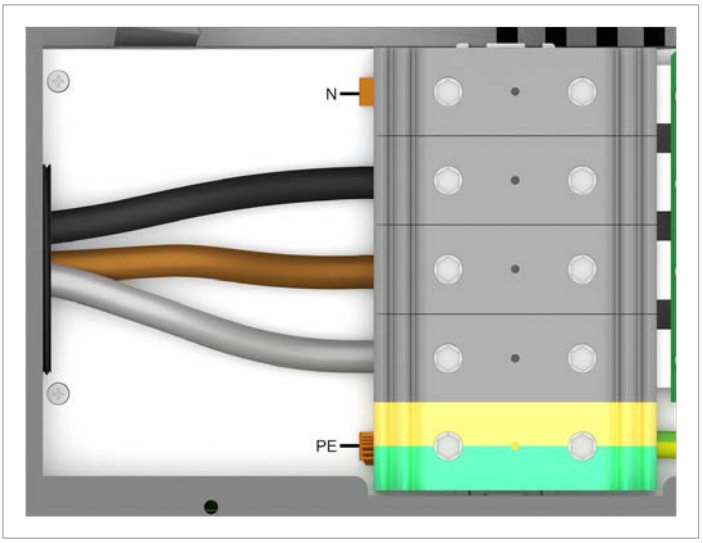
Wiring examples



Wiring example 1: With PE conductor, with neutral conductor

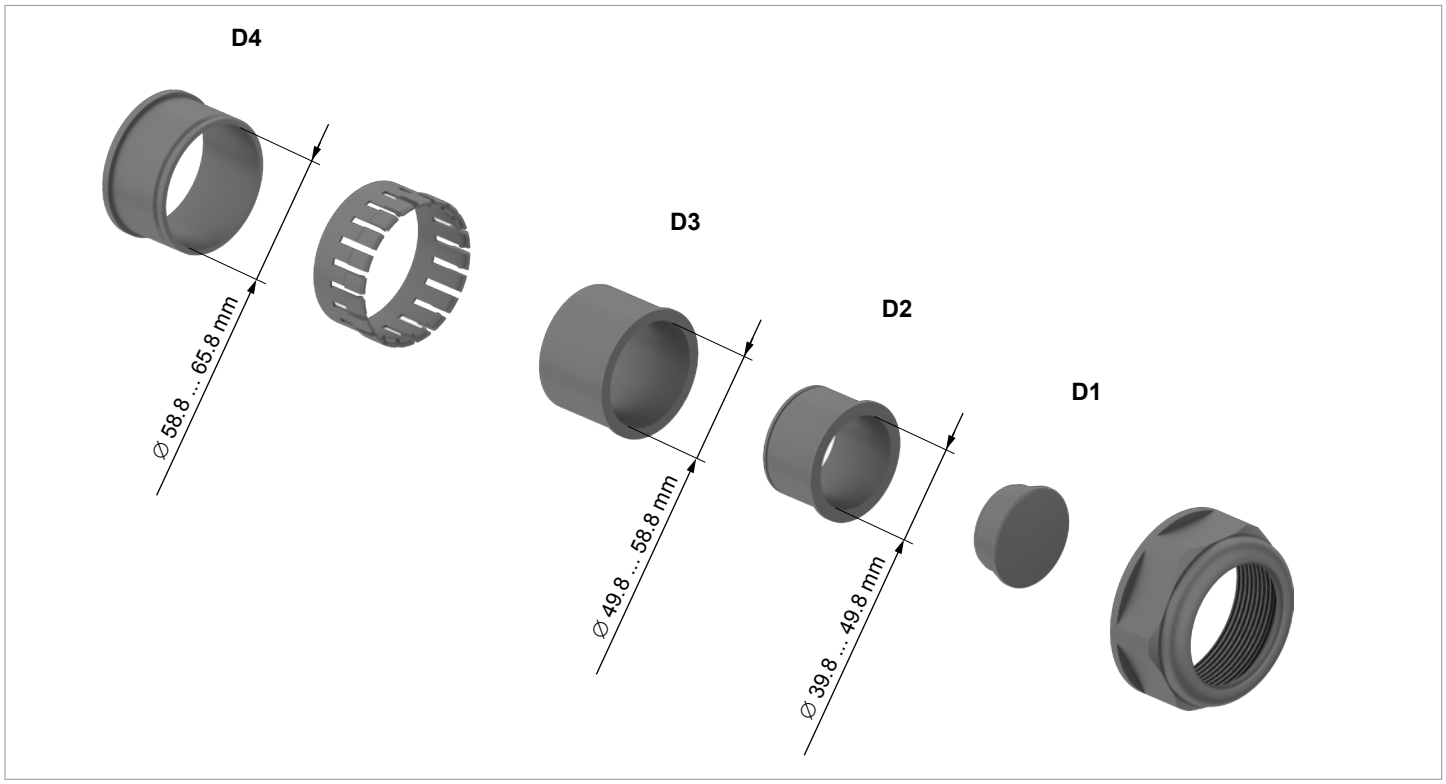


Wiring example 2: With PE conductor, without neutral conductor

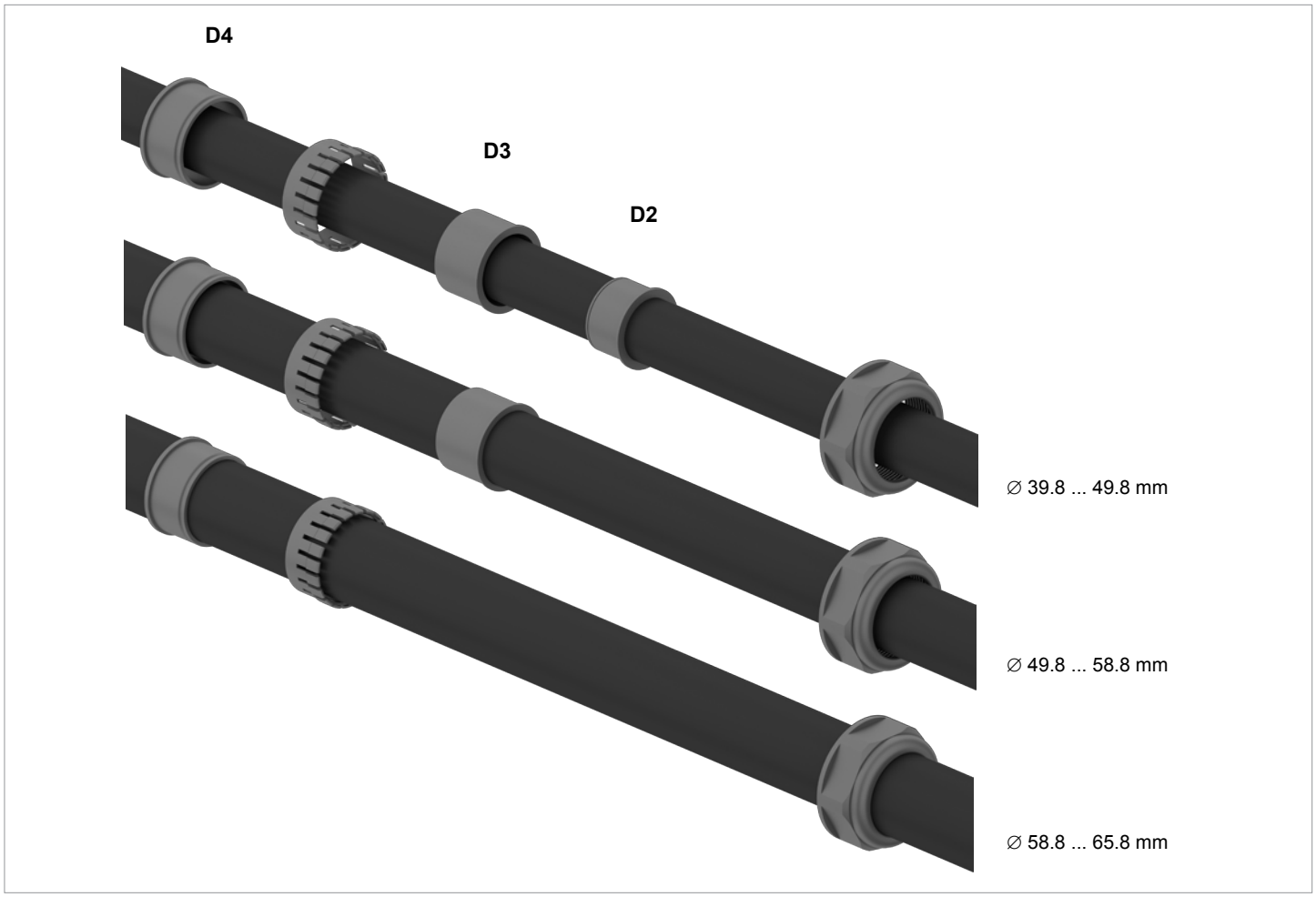


Wiring example 3: Without PE conductor, without neutral conductor

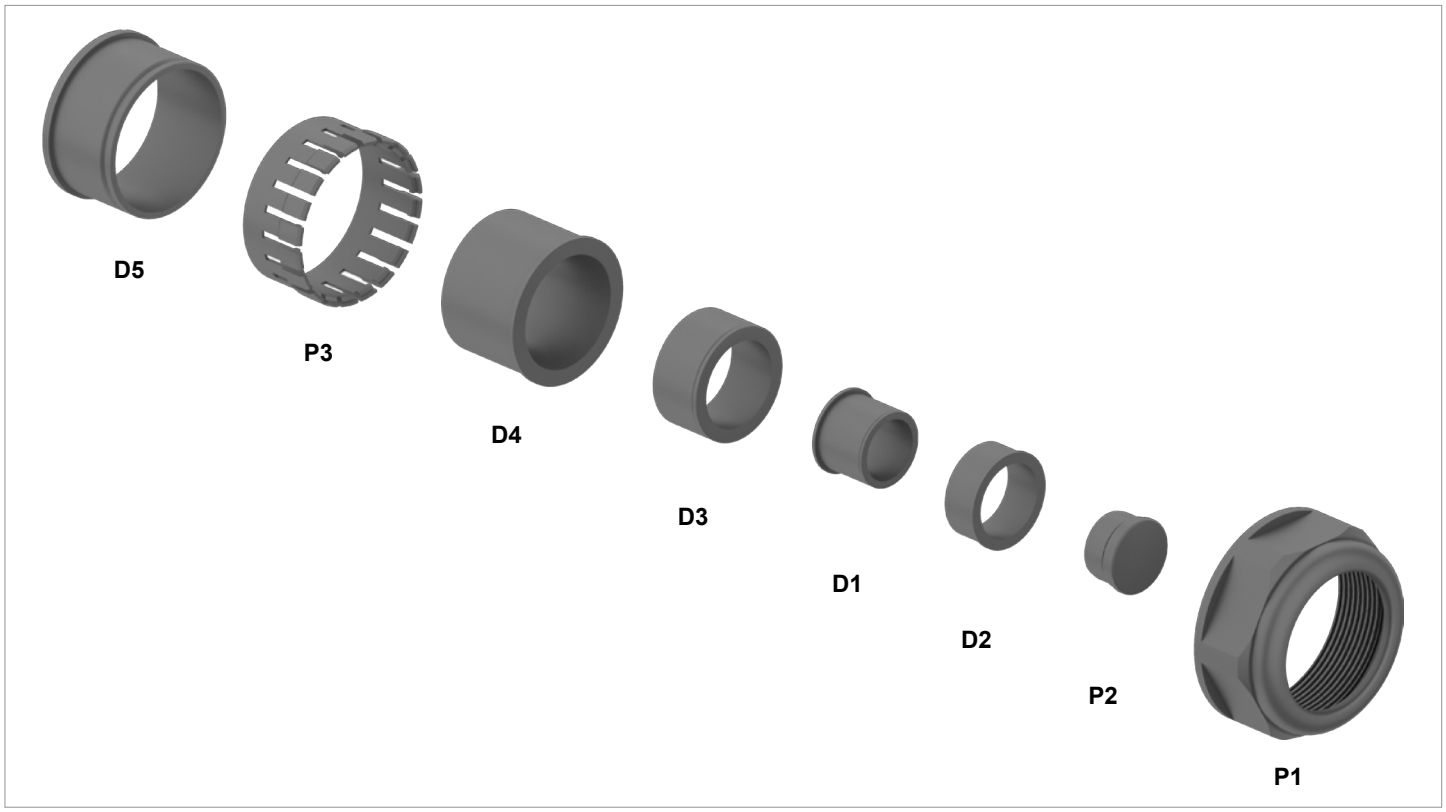
Connecting the mains (AC)



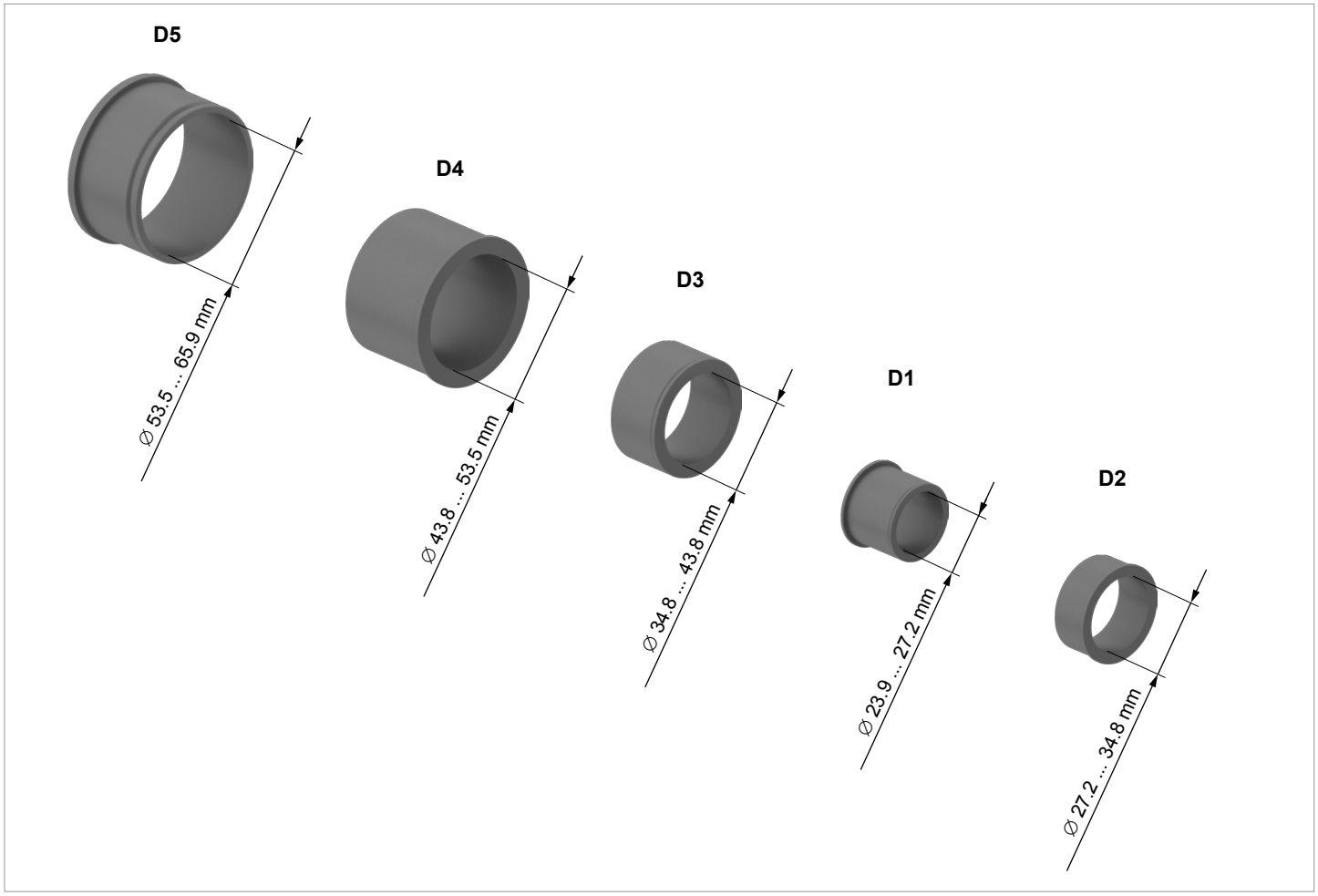
AC cable gland , Variant A: Overview of parts and diameters of the sealing rings



AC cable gland , Variant A: Assignment of the sealing rings to the cable diameters

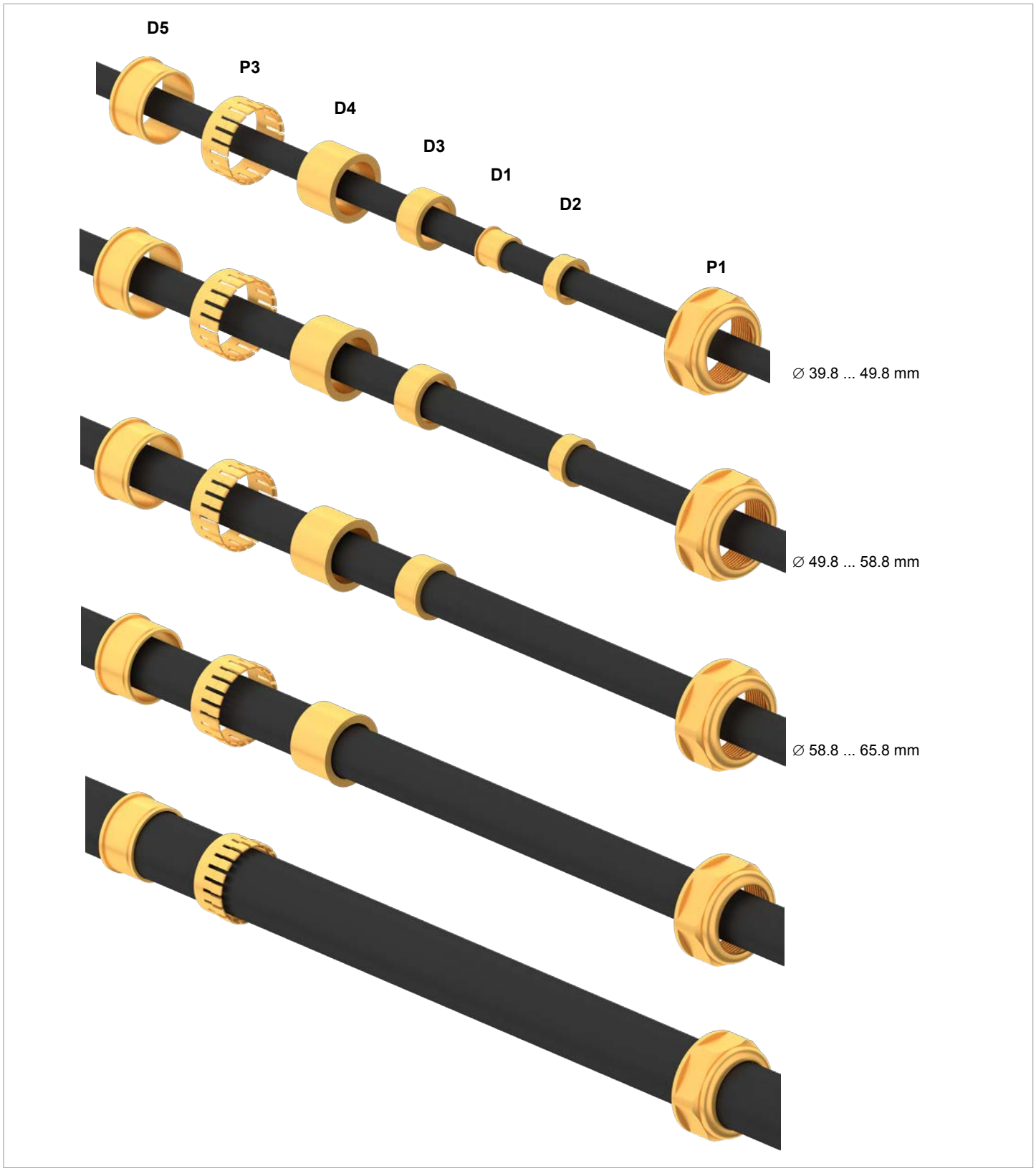


AC cable gland , Variant B: Overview of parts



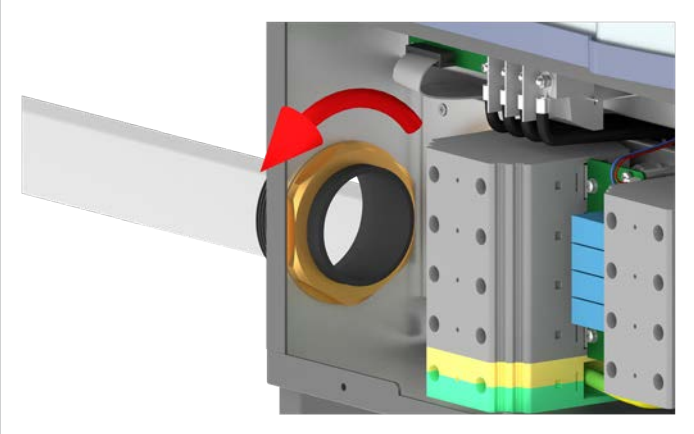
AC cable gland , Variant B: Dimensions of the sealing rings

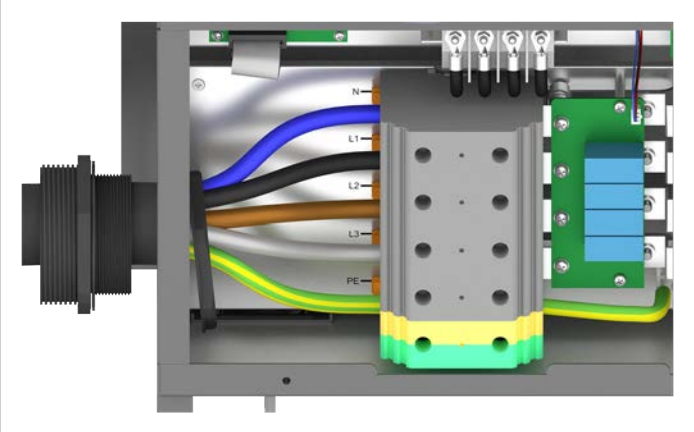
Connecting the mains (AC)



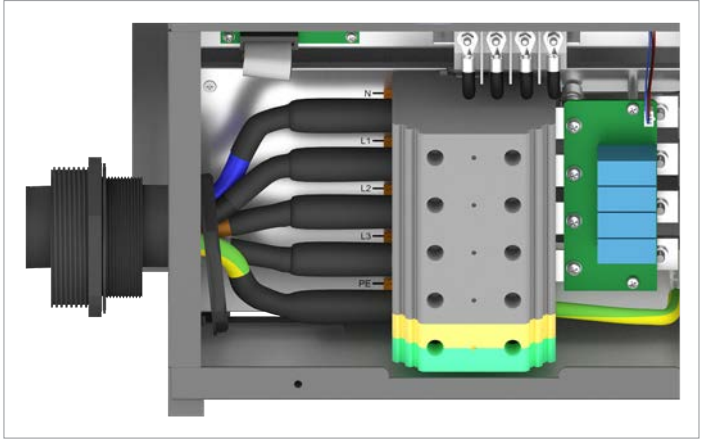
AC cable gland , Variant B: Assignment of the sealing rings to the cable diameters

► Screw off the outer and inner ring of the cable gland as well to make it easier to pull the AC cable into the junction box.



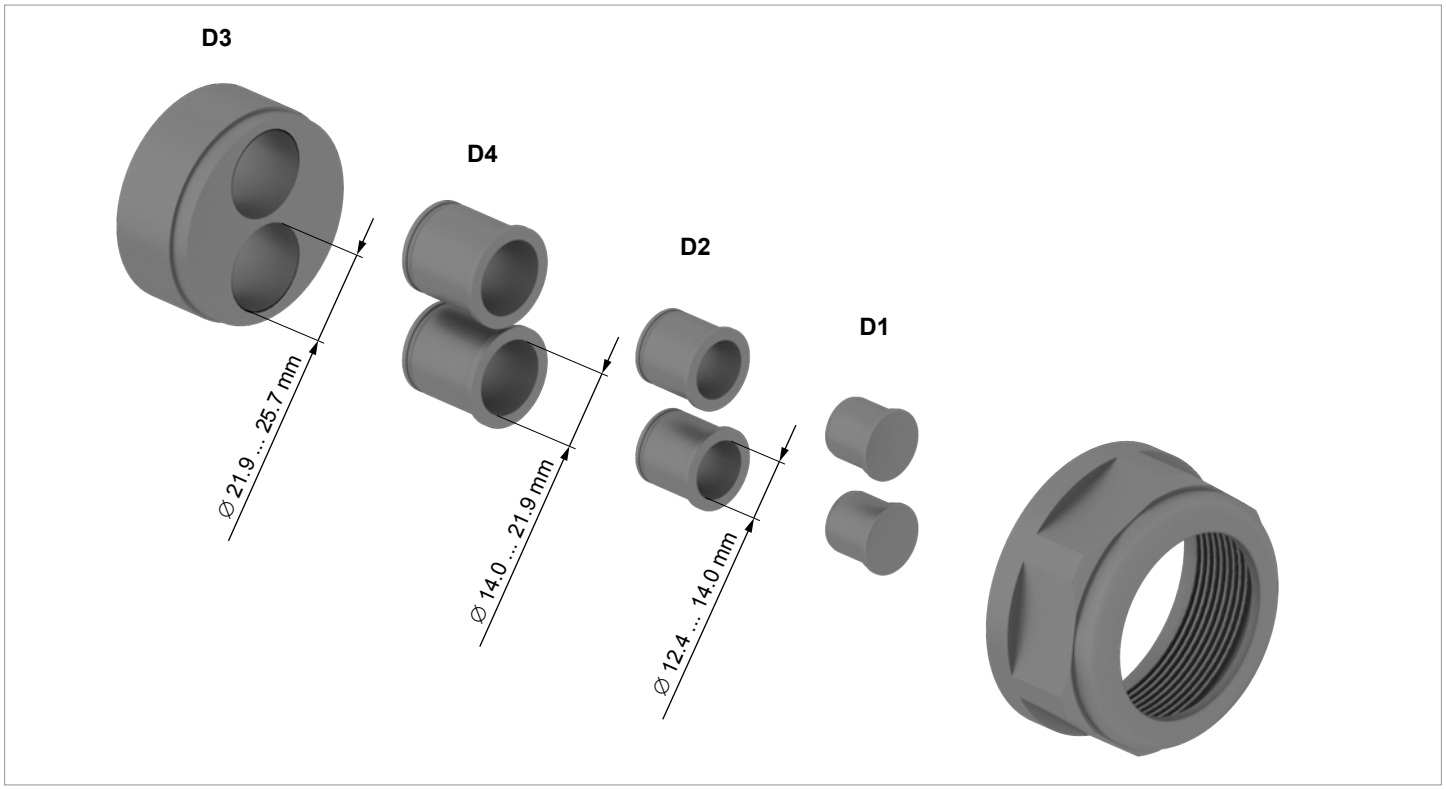


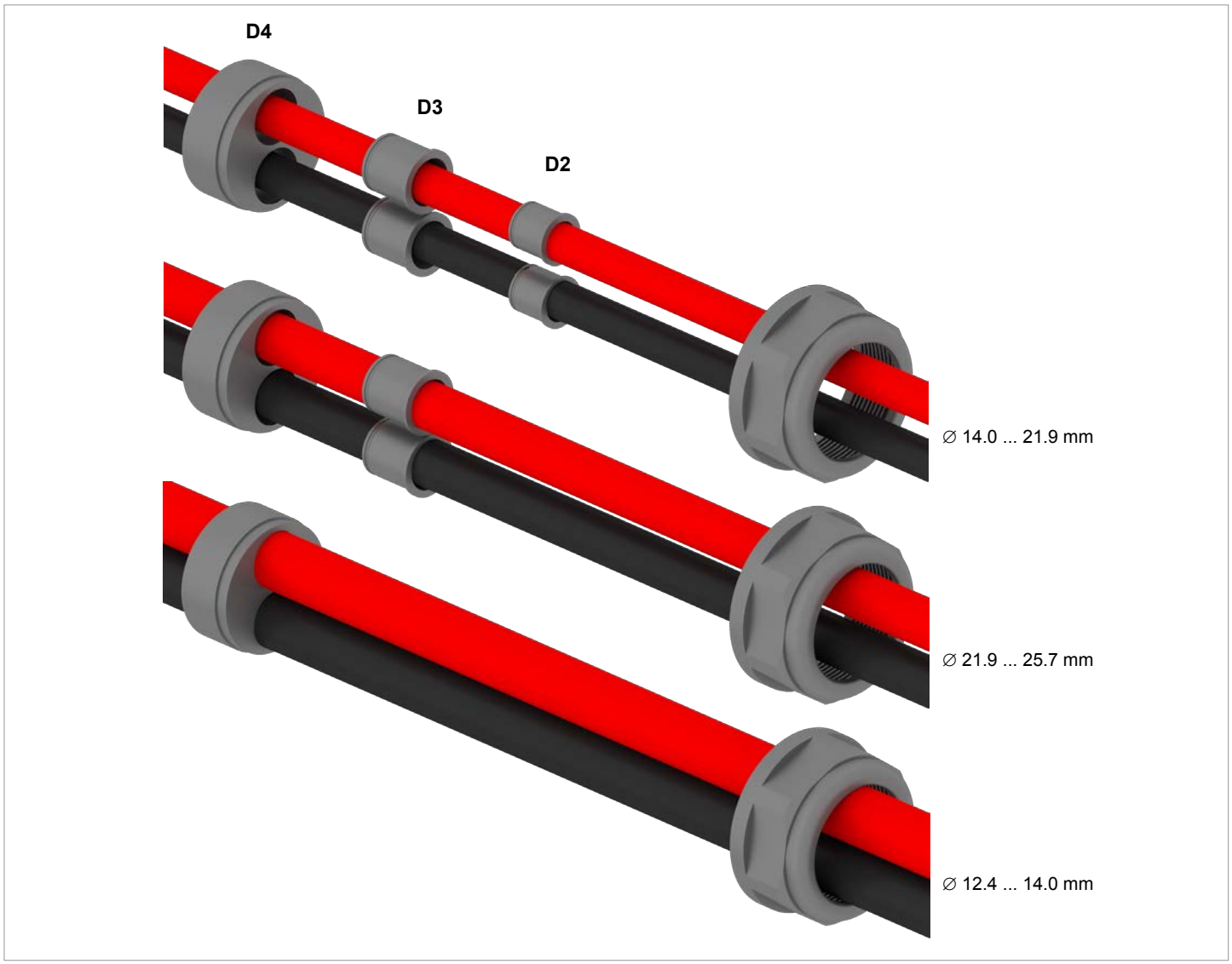
► Insert the conductors of the AC cable into the terminals of the AC terminal block in accordance with the phase assignment, and tighten the terminals (torque 25 ... 30 Nm). The illustration on the left shows the wiring for a 5-conductor system with PE and N.



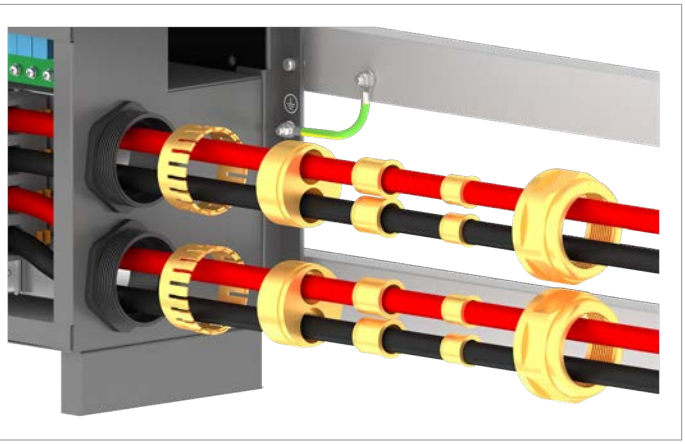
The illustration on the left shows the wiring for a 5-conductor system with PE and N when aluminum cables with crimp connectors are used.

Connecting the solar modules (DC)



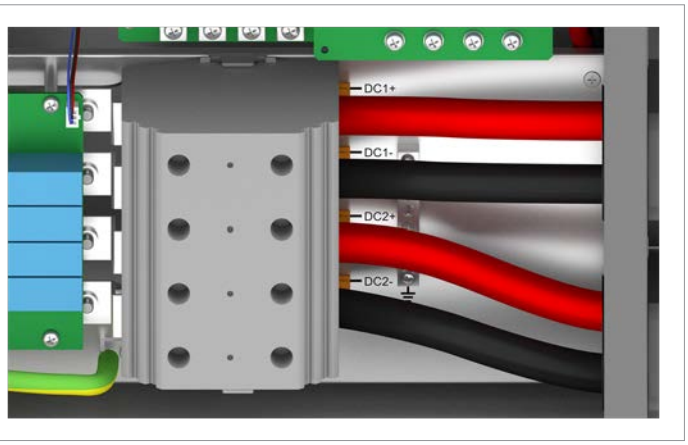


Connecting the solar modules (DC)



When bending and twisting cables or conductors, always comply with the manufacturer's instructions, so as to avoid damage to the conductors or the insulation.

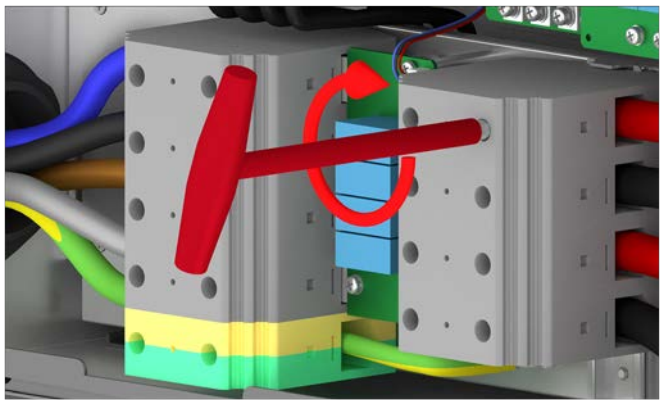
1. Pull the stripped DC cables through all the parts of the cable glands and the DC cables feed-throughs.



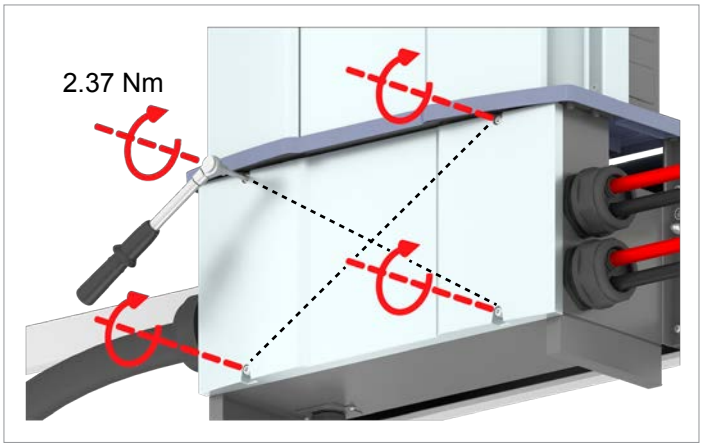
2. Insert the DC cables into the respective terminals of the DC terminal block and tighten the terminals (torque 25 ... 30 Nm).

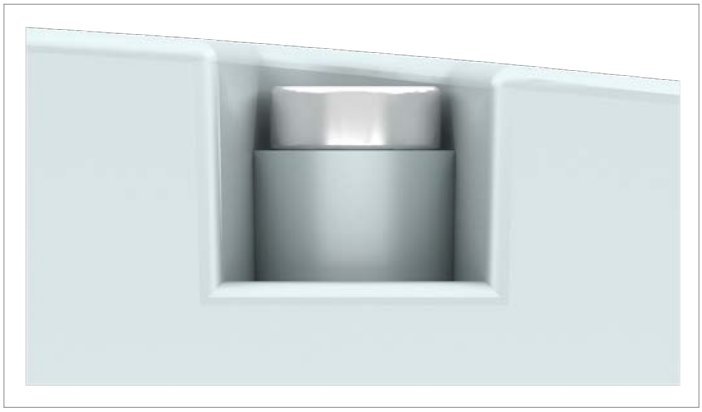
If aluminum cables with crimped connectors are being used, the installation should appear as shown in this illustration.

25 ... 30 Nm



Closing the wiring box





NOTICE

Impairment of operating response caused by moisture and dirt.
In order to restore degree of protection IP65 after the completion of installation work, attach the cover of the wiring box in accordance with the following instructions.

1. Before screwing on the cover, check all seals and surfaces for correct positioning and cleanliness.

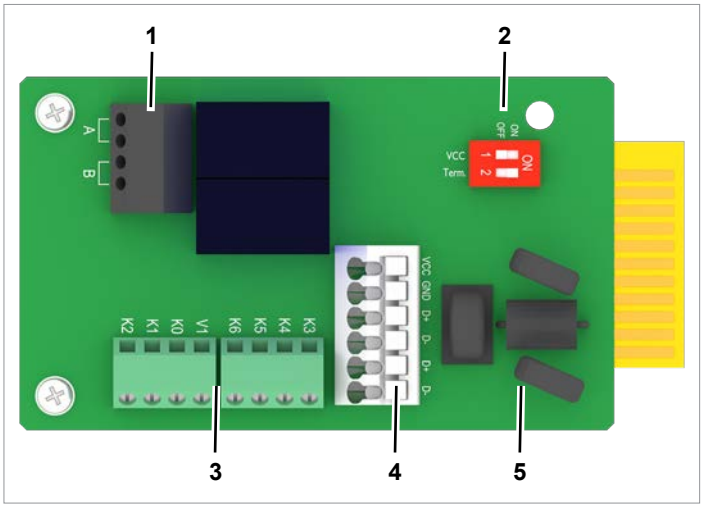
2. Attach the cover in such a way that it is evenly mounted and not skewed.

3. Tighten the screws by hand at first and then use a torque wrench to tighten them crosswise with a torque of 2.37 Nm.

4. Do not skew the screws. The screw heads must be flush with the surface.

Overview of communications card

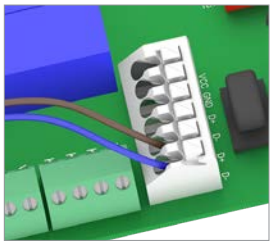
The connections for RS485, the digital inputs, the dry contacts and the external power-off (EPO) are all on the communication card. This means that the installation work can be combined.



1 2 x dry contacts (terminal box)
2 DIP switch for RS485 termination resistor and VCC
3 Digital inputs and external power-off (terminal block)
4 RS485 (terminal block)
5 Protection against electromagnetic interference (EMI)

Connecting a PC via RS485

If you wish to use a PC with the Delta Service Software for setting up the inverter you will need a USB/RS485 adapter in order to connect the PC to the inverter.

	Inverter	USB/RS485 adapter
		
DATA+	Terminal 3 or 5	D+
DATA–	Terminal 4 or 6	D–

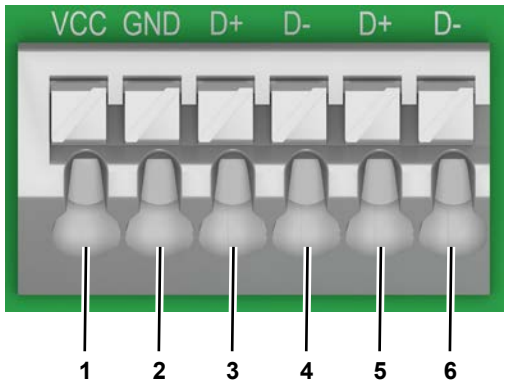
NOTICE

Unwanted currents.
Unwanted currents can flow when multiple inverters are connected via RS485.

- ► Do not use GND and VCC.
- ► If the cable shield is used for providing lightning protection then the housing of only one inverter in the RS485 chain should be grounded.

Connecting a data logger via RS485

RS485 terminal block



1 VCC (+12 V; 0.5 A)
2 GND
3 DATA+ (RS485)
4 DATA– (RS485)
5 DATA+ (RS485)
6 DATA– (RS485)

Terminal pairs 3/4 or 5/6 can be used. The second terminal pair is only required when connecting several inverters via RS485.

Data format

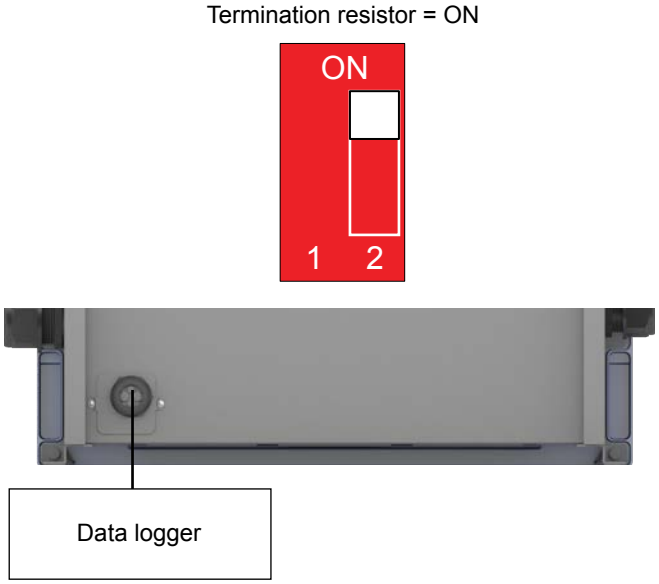
Baud rate	9600, 19200, 38400; standard: 19200
Data bits	8
Stop bit	1
Parity	Not applicable

The baud rate can be set on the inverter display after commissioning, see “Baud rate for RS485”, page 36.

DIP switch for RS485 termination resistor and VCC

1 VCC (+12 V; 0.5 A)
2 RS485 termination resistor

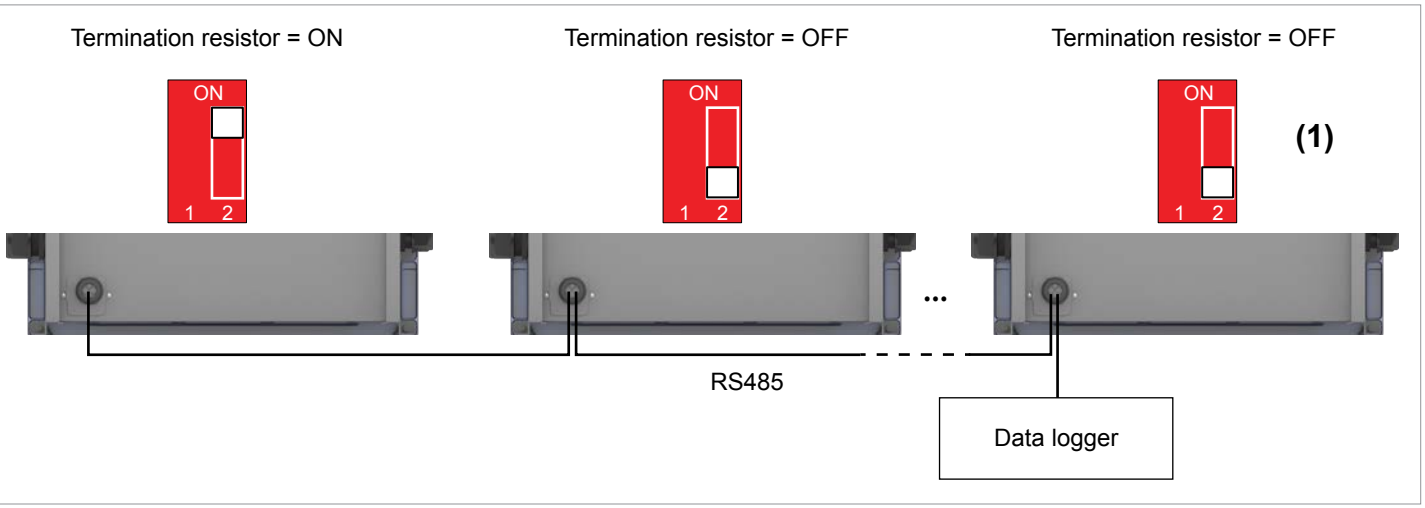
Connecting a single inverter to a data logger



Connecting multiple inverters to a data logger

► If the data logger does not have an integrated RS485 termination resistor, switch the RS485 termination resistor on the first inverter to ***ON*** **(1)**.

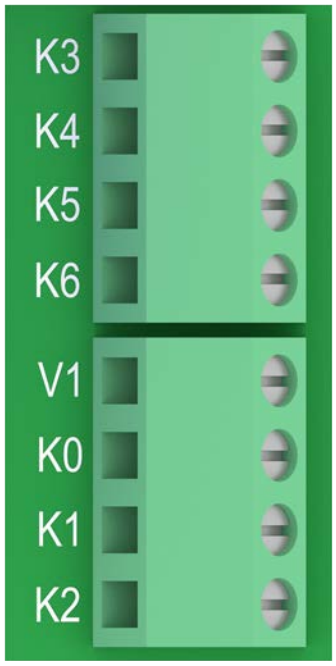
► Set a different inverter ID at each inverter during commissioning, see “Commissioning – basic settings”, page 34.



Connecting the digital inputs, dry contacts and external power-off (optional)

Digital inputs and external power-off (EPO)

To control the active power, an external ripple control receiver can be connected to the digital inputs.

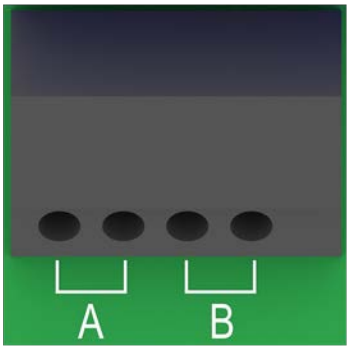


Pin	Short circuit	Assigned action
V1	-	-
K0	V1 + K0	External power-off (EPO)
K1	V1 + K1	Max. active power 0%
K2	V1 + K2	Max. active power 30 %
K3	V1 + K3	Max. active power 60 %
K4	V1 + K4	Max. active power 100 %
K5	V1 + K5	Reserved
K6	V1 + K6	Reserved

After commissioning, the relays for the external power-off can be defined on the display as normally closed or normally open relays.

Dry contacts

The inverter has two dry contacts. The contacts are closed when the relays energize.

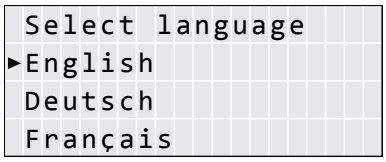


Event	Description
Disabled	The functions for the dry contacts are switched off.
On Grid	Inverter is connected to the mains grid.
Fan failure	The fans are defective.
Insulation	Insulation test failed.
Alarm	An error, failure or warning message is present.
Error	An error message is present.
Fault	A failure message is present.
Warning	A warning message is present.

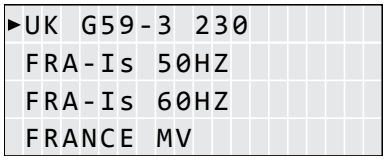
An event can be assigned to the dry contacts can be set on the inverter display after commissioning.
The default setting for both contacts is "Disabled".

Commissioning – basic settings

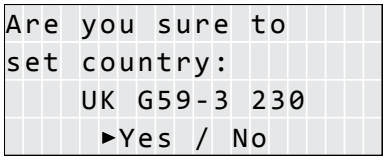
To make the settings as described in this chapter, the inverter must be powered with alternating current (mains grid). The inverter also needs a DC voltage in order to operate fully from the energy provider.



1. Use the ▼ and ▲ buttons to select the **English** language and then press the ENT button.



2. Use the ▼ and ▲ buttons to select your country or grid type and then press the ENT button.

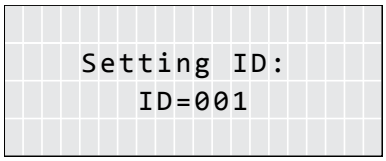


3. Check that the correct country or mains type is selected.

   If the correct country is selected, use the ▼ and ▲ buttons to select the **Yes** entry and the press the ENT button.

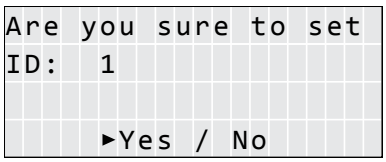
   To change the selection, press the EXIT button.

   → The inverter starts a self-test lasting approx. 2 minutes. The remaining time is shown on the display.



NOTICE
If multiple inverters are connected to the PV system, set a different inverter ID for each inverter. For example, the inverter ID is used by monitoring systems to uniquely identify each inverter.

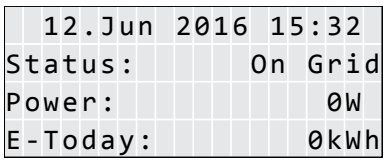
4. Use the ▼ and ▲ buttons to set the individual digits and then press the ENT button.



5. Check that the correct inverter ID is set.

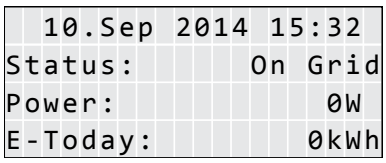
   If the correct inverter ID is selected, use the ▼ and ▲ buttons to select the **Yes** entry and the press the ENT button.

   Press the EXIT button to change the selection

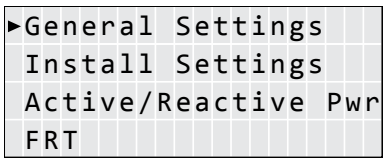


☑ The basic settings are now complete. The standard menu is displayed.

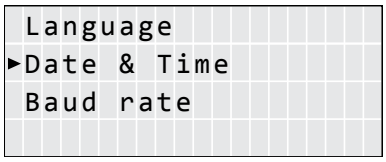
Date and time



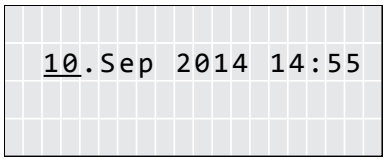
1. If the default information is displayed, press the EXIT button to open the main menu.
   Otherwise, press the EXIT button repeatedly until the main menu is displayed.



2. Use the ▼ and ▲ buttons to select the **General Settings** entry and then press the ENT button.



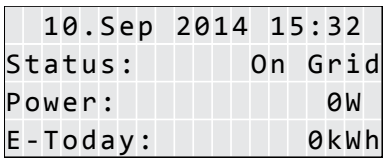
3. Press the ▼ and ▲ buttons to select the entry **Date and Time** and press the ENT button.



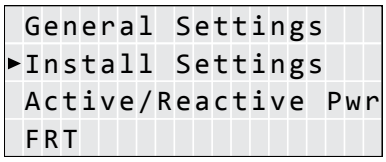
4. Use the ▼ and ▲ buttons to configure the value and then press the ENT button.
   Repeat the procedure for the other settings.

Inverter ID

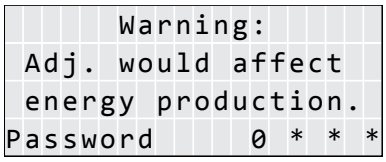
If multiple inverters are connected to the PV system then a different inverter ID must set for each inverter. For example, the inverter ID is used by monitoring systems to uniquely identify each inverter.



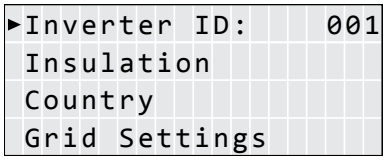
1. If the default information is displayed, press the EXIT button to open the main menu.
   Otherwise, press the EXIT button repeatedly until the main menu is displayed.



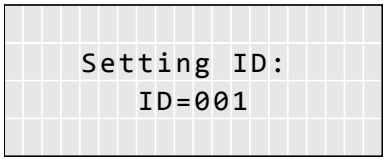
2. Use the ▼ and ▲ buttons to select the **Install Settings** entry and then press the ENT button.



3. This function is protected with password 5555.
   Use the ▼ and ▲ buttons to set the individual numerals.
   Press the ENT button to confirm a numeral.



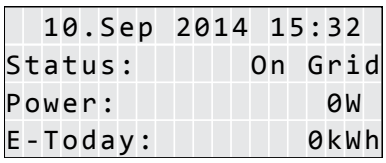
4. Use the ▼ and ▲ buttons to select the **inverter ID** entry and then press the ENT button.



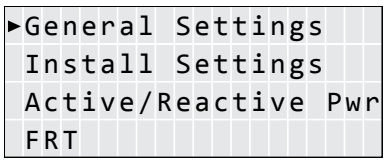
5. Use the ▼ and ▲ buttons to configure the value and then press the ENT button.

Commissioning – further settings (optional)

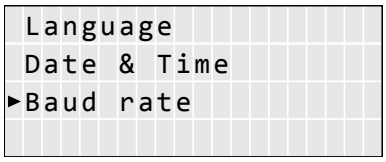
Baud rate for RS485



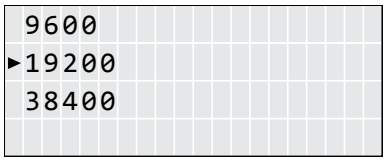
1. If the default information is displayed, press the EXIT button to open the main menu. Otherwise, press the EXIT button repeatedly until the main menu is displayed.



2. Use the ▼ and ▲ buttons to select the **General Settings** entry and then press the ENT button.



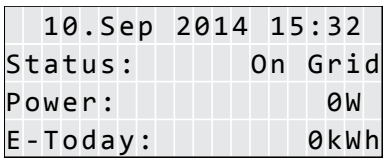
3. Use the buttons ▼ and ▲ to select the entry **Baud Rate** and press the ENT button.



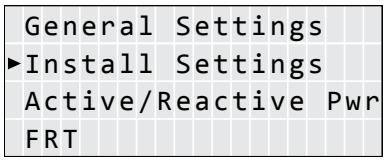
4. Use the ▼ and ▲ buttons to configure a value and then press the ENT button. Repeat the procedure for the other settings.

AC connection type

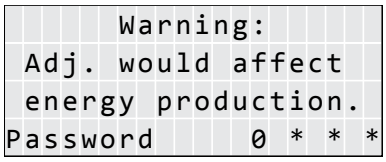
By default, the AC connection type is set to 3P4W (3 phases + N + PE). You only need to change this setting if you are using an AC system with 3 phases + PE (3P3W).



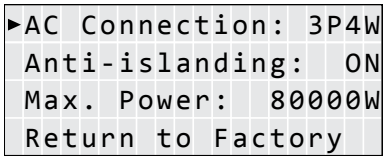
1. If the default information is displayed, press the EXIT button to open the main menu. Otherwise, press the EXIT button repeatedly until the main menu is displayed.



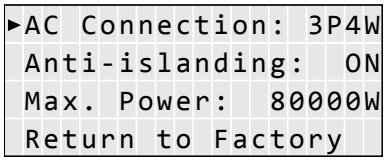
2. Use the ▼ and ▲ buttons to select the **Install Settings** entry and then press the ENT button.



3. This function is protected with password 5555.
Use the ▼ and ▲ buttons to set the individual numerals.
Press the ENT button to confirm a numeral.

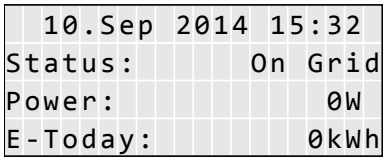


4. Use the buttons ▼ and ▲ to select the entry **AC connection** and press the ENT button.

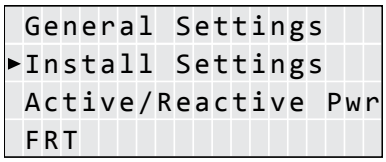


5. Use the ▼ and ▲ buttons to select the **3P3W** entry and then press the ENT button.

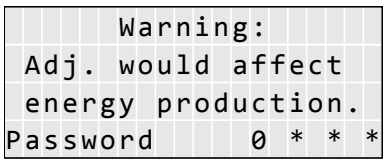
External power-off (EPO)



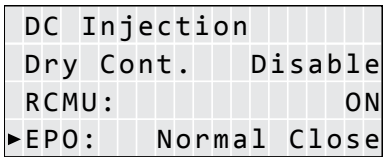
1. If the default information is displayed, press the EXIT button to open the main menu.
   Otherwise, press the EXIT button repeatedly until the main menu is displayed.



2. Use the ▼ and ▲ buttons to select the **`Install Settings`** entry and then press the ENT button.



3. This function is protected with password 5555.
   Use the ▼ and ▲ buttons to set the individual numerals.
   Press the ENT button to confirm a numeral.



4. Use the buttons ▼ and ▲ to select the entry **`EPO`** and press the ENT button.

5. Use the ▼ and ▲ buttons to select an option and then press the ENT button.

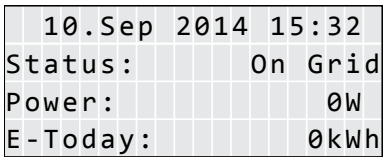
Available options

`Normally open`: The relay operates as a normally open device.
`Normally closed`: The relay operates as a normally closed device.

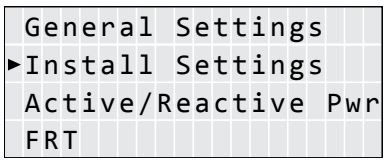
Active power limitation

Change this setting only after consultation with Delta customer service.

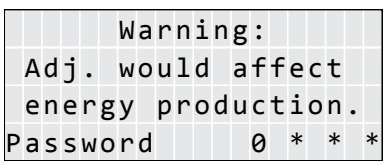
To change this setting, you need a special password that you receive from Delta customer service. You can find the contact information on the back of this document.



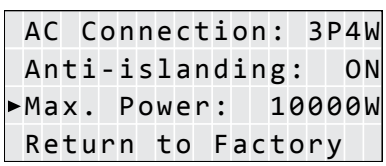
1. If the default information is displayed, press the EXIT button to open the main menu.
   Otherwise, press the EXIT button repeatedly until the main menu is displayed.



2. Use the ▼ and ▲ buttons to select the **`Install Settings`** entry and then press the ENT button.



3. Enter the password provided by Delta customer service.
   Use the ▼ and ▲ buttons to set the individual numerals.
   Press the ENT button to confirm a numeral.

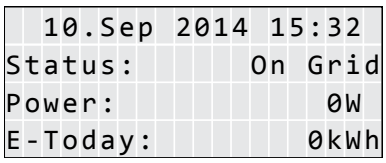


4. Use the ▼ and ▲ buttons to select the **`Max. Power`** entry and then press the ENT button.

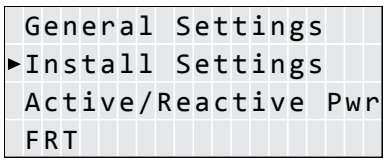
5. Use the ▼ and ▲ buttons to configure a value and then press the ENT button.

Commissioning – further settings (optional)

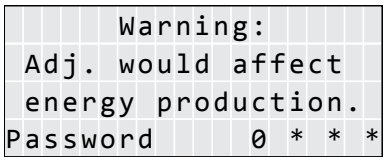
Dry contacts (Relay)



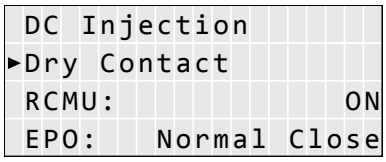
1. If the default information is displayed, press the EXIT button to open the main menu. Otherwise, press the EXIT button repeatedly until the main menu is displayed.



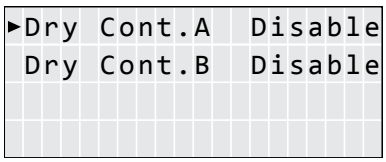
2. Use the ▼ and ▲ buttons to select the **`Install Settings`** entry and then press the ENT button.



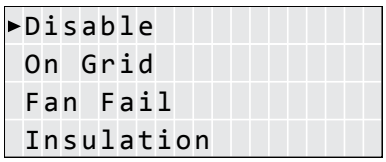
3. This function is protected with password 5555.
Use the ▼ and ▲ buttons to set the individual numerals.
Press the ENT button to confirm a numeral.



4. Use the buttons ▼ and ▲ to select the **`Dry Cont.`** entry and press the ENT button.



5. Use the buttons ▼ and ▲ to select a dry contact and press the ENT button. The current setting is shown after the name of the dry contact.



6. Use the ▼ and ▲ buttons to select an option and then press the ENT button.

See "Connecting the digital inputs, dry contacts and external power-off (optional)", page 33 for the available options.

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Technical data

Input (DC)	M88H_121 (ST)	
AC nominal voltage	**400 V_{AC}**	**480 V_{AC}**
Recommended maximum PV power	90 kW_P	110 kW_P
Maximum input power (total / per input)		
Symmetrical design	76 kW / 38 kW	91 kW / 45.5 kW
Asymmetrical design	45.6 kW / 30.4 kW	54.6 kW / 36.4 kW
Rated power	70 kW	84 kW
Maximum input voltage	1100 V_{DC}	
Operating input voltage range	200 ... 1000 V_{DC}	
Nominal voltage	600 V_{DC}	710 V_{DC}
Cut-in voltage	250 V_{DC}	
Cut-in power	150 W	
MPP input voltage range	200 ... 1000 V_{DC}	
MPP input voltage range with full power		
Symmetrical design	540 ... 800 V_{DC}	650 ... 800 V_{DC}
Asymmetrical design (60% / 40%)	650 / 440 V_{DC}	780 / 520 V_{DC}
MPP input voltage range at rated power		
Symmetrical design	500 ... 800 V_{DC}	600 ... 800 V_{DC}
Asymmetrical design (60% / 40%)	580 / 390 V_{DC}	710 / 475 V_{DC}
Asymmetrical design	60/40%; 40/60%	
Maximum total input current (DC1 / DC2)	140 A (70 A / 70 A)	
Maximum DC short-circuit current I_{SC}	180 A (90 A per DC input)	
Maximum breaking current	120 A	
Open-circuit voltage VOC	1000 V	
Number of MPP trackers	Parallel inputs: 1 MPP tracker; separate inputs: 2 MPP tracker	
Number of DC inputs, total (DC1/DC2)	2 (1 / 1)	
Electrical isolation	No	
Overvoltage category [1]	II	
String fuses	15 A [2]	
Surge protection devices [3]	Type 2, replaceable	

Output (AC)	M88H_121 (ST)	
AC nominal voltage	**400 V_{AC}**	**480 V_{AC}**
Maximum apparent power [4]	73 kVA [5]	88 kVA [6]
Rated apparent power [5]	66 kVA	80 kVA
Nominal voltage [7]	400 ± 30% Δ and Y / 480 V_{AC} ± 20% Δ and Y 3 phases + PE or 3 phases + N + PE	
Nominal current	96 A	
Maximum current	106 A	
Maximum current under fault conditions	115.4 A_{rms}	
Switch-on current	40 A / 100 µs	
Nominal frequency	50 / 60 Hz	
Frequency range [7]	45 ... 65 Hz	
Configurable power factor	0.8 cap ... 0.8 ind	
Total harmonic distortion	< 3% at rated apparent power	
DC injection	<0.5% at nominal current	
Power loss in night mode	<3 W	
Overvoltage category [1]	III	
Surge protection devices [8]	Type 2, replaceable	

Technical data

Mechanical details	M88H_121 (ST)
Dimensions (W x H x D)	960 × 615 × 275 mm
Weight	84 kg (power module: 68 kg)
Cooling	3 fans
AC connection type	Phoenix Contact UKH 150
DC connection type	Phoenix Contact UKH 150
Communication interfaces	2 x RS485, 2 x dry contacts, 1 x external power-off, 6 x digital inputs

General specifications	M88H_121 (ST)
Delta model name	RPI M88H_121
Delta part number	RPI883M121200
Maximum efficiency	98.8%
EU efficiency	98.5%
Operating temperature range	-25 ... +60 °C
Operating temperature range without derating	-25 ... +40 °C
Storage temperature range	-25 ... +60 °C
Relative humidity	0 ... 100%, non-condensing
Max. operating height	3000 m above sea level
Noise level (at a distance of 1 m)	75.8 dB(A)

Standards and guidelines	M88H_121 (ST)
Protection degree	IP65
Safety class	I
Pollution degree	II
Overload behavior	Current limiting, power limiting
Safety	IEC 62109-1 / -2, CE-compliance
EMC	EN 61000-6-2, EN 61000-6-3
Fault-free operation	IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8
Harmonic distortion	EN 61000-3-2
Fluctuations and fibrillations	EN 61000-3-3
Grid connection guidelines	You will find the current list at www.solar-inverter.com.

1) IEC 60664-1, IEC 62109-1
2) The specified value applies for a temperature of 25 °C in the interior of the inverter. At higher temperatures, the value can drop down to 10 A.
3) EN 50539-11
4) For cos phi = 1 (VA = W)
5) Can occur under the following conditions: DC input voltage > 540 V; symmetrical design; ambient temperature < 35 °C.
6) Can occur under the following conditions: DC input voltage > 650 V; symmetrical design; ambient temperature < 35 °C.
7) AC voltage and frequency range are programmed using the corresponding country specifications.
8) EN 61463-11

Customer Service - Europe

Austria	service.oesterreich@solar-inverter.com	0800 291 512 (toll free)
Belgium	support.belgium@solar-inverter.com	0800 711 35 (toll free)
Bulgaria	support.bulgaria@solar-inverter.com	+421 42 4661 333
Czech Republic	podpora.czechia@solar-inverter.com	800 143 047 (toll free)
Denmark	support.danmark@solar-inverter.com	8025 0986 (toll free)
France	support.france@solar-inverter.com	0800 919 816 (toll free)
Germany	service.deutschland@solar-inverter.com	0800 800 9323 (toll free)
Great Britain	support.uk@solar-inverter.com	0800 051 4281 (toll free)
Greece	support.greece@solar-inverter.com	+49 7641 455 549
Israel	supporto.israel@solar-inverter.com	800 787 920 (toll free)
Italy	supporto.italia@solar-inverter.com	800 787 920 (toll free)
Netherlands	ondersteuning.nederland@solar-inverter.com	0800 022 1104 (toll free)
Poland	serwis.polska@solar-inverter.com	+48 22 335 26 00
Portugal	suporte.portugal@solar-inverter.com	+49 7641 455 549
Slovakia	podpora.slovensko@solar-inverter.com	0800 005 193 (toll free)
Slovenia	podpora.slovenija@solar-inverter.com	+421 42 4661 333
Spain	soporto.espana@solar-inverter.com	900 958 300 (toll free)
Switzerland	support.switzerland@solar-inverter.com	0800 838 173 (toll free)
Turkey	support.turkey@solar-inverter.com	+421 42 4661 333
Other European countries	support.europe@solar-inverter.com	+49 7641 455 549