Service Manual

Fronius Symo
10.0-3-M / 12.5-3-M / 15.0-3-M
17.5-3-M / 20.0-3-M
10.0-3-M-light / 12.5-3-M-light
15.0-3-M-light / 17.5-3-M-light
20.0-3-M-light
Fronius Symo 10.0-3-M-OS
Fronius Eco



DE | Serviceanleitung

EN | Service Manual

42,0410,2080 016-04062024

Contents

General information **99**

Foreword and safety instructions ... 101
Safety ... 101
Protective measures against ESD ... 101
Fronius Technical Support ... 101
Ordering spare parts ... 101
General ... 102
Tools and measuring devices ... 102
Functional description ... 102
Troubleshooting guide ... 102
Replacing components ... 102
Components with their own instructions ... 102
Safety inspection ... 102
Appendix ... 102
Tools and measuring devices ... 103
General ... 103
Tools required ... 103
Measuring and testing equipment ... 103
Auxiliary materials ... 103
Function overview ... 104
Device concept ... 104
Proper use/intended purpose ... 105
Warning notices on the device ... 105
Software update ... 106

Error location aid **107**

Service codes ... 109
Safety ... 109
General ... 109
Status code display ... 109
Software update after a PC board replacement ... 109
Total failure of the display ... 110
Status codes ... 110
Customer service ... 126
Operation in dusty environments ... 126
Error flowchart ... 127
General ... 127
Permanent faults ... 127
Temporary faults ... 128
Abnormal behaviour ... 128

Changing components **129**

General ... 131
Safety ... 131
Measuring the intermediate circuit voltage ... 132
ESD guidelines ... 133
General ... 133
Overview ... 133
Changing components ... 134
Safety ... 134
Opening and closing the device ... 134
Replacing threaded bushings in the base shell ... 137
Replacing the DC disconnector ... 139
Replacing the Eco DC disconnector ... 140
Replacing the Eco fuse ... 142
Replacing the Overvoltage PC board Eco ... 143

Replacing the overvoltage PC board - Symo ... 146
Replacing the external fan ... 150
Replacing the Symo internal fan ... 153
Replacing the Eco internal fan ... 154
Replacing the Datamanager cardWLAN option ... 157
Replacing the display PC board - Recerbo ... 159
Replacing the filter PC board - SymoFIL ... 161
Replacing the filter PC board - EcoFIL ... 162
Replacing the power board - SymoPS AC ... 165
Replacing the power board - SymoPS DC ... 167
Replacing the power board - EcoPS ... 170
Replacing other components ... 173

Safety Inspections **175**

Safety Inspections ... 177
Applicable standards ... 177
Additional information for inspections ... 177
Scope ... 177
Safety instructions ... 177
Qualifications of testing personnel ... 177
Responsibility ... 177
Measuring equipment ... 177
Visual inspections ... 179
General ... 179
Mains supply and connecting lines ... 179
Housing and covers ... 179
Adjustment and display devices ... 179
Safety labels, signs and notices ... 180
Electrical tests ... 181
Insulation resistance ... 181
Ground conductor resistance ... 183
Ground conductor current ... 183
Contact current ... 185
Finally... ... 186
General ... 186
General ... 186
Function tests ... 187
Function ... 187
Grid on/off devices ... 187
Indicators and control elements ... 187
Documentation ... 188
Documentation ... 188

Appendix **189**

Fronius Symo ... 190
Fronius Eco ... 191

General information

Foreword and safety instructions

Safety

⚠ WARNING!

Work that is carried out incorrectly can cause serious injury and damage.
All activities described in the service manual must only be carried out by Fronius-trained service technicians. Take note of the "Safety rules" section in the inverter operating instructions.

⚠ WARNING!

An electric shock can be fatal.
Before opening the device:

- ▶ Move the mains switch to the O position
- ▶ Unplug the device from the mains
- ▶ Put up an easy-to-understand warning sign to stop anybody inadvertently switching it back on again
- ▶ Using a suitable measuring instrument, check to make sure that electrically charged components (e.g. capacitors) have been discharged.

⚠ WARNING!

An electric shock can be fatal.
If the device needs to be switched on briefly for testing while the housing is open:

- ▶ Do not touch any parts inside the housing
- ▶ Only touch using suitable measuring or test probes

⚠ WARNING!

An inadequate ground conductor connection can cause serious injury or damage.
The housing screws provide a suitable ground conductor connection for earthing (grounding) the housing and must NOT be replaced by any other screws which do not provide a reliable ground conductor connection.

Protective measures against ESD

Danger of damage to electrical components from electrical discharge. Suitable measures should be taken to protect against ESD when replacing and installing components.

Fronius Technical Support

Please contact your national Fronius Technical Support team with any fault analysis queries.

Ordering spare parts

Please contact your national Fronius Technical Support team to order spare parts or to consult on fault analysis queries.

General	The service manual can be obtained from the DownloadCenter at "downloadcenter.fronius.com". Each chapter in the service manual deals with one complete topic. Use each chapter as a self-contained source of information. A short description of each chapter follows.
Tools and measuring devices	This provides an overview and description of all equipment required for servicing the power source and components professionally. This equipment includes: - Tools required - Measuring and testing equipment - Ancillary materials
Functional description	Contains a brief descriptive overview of the entire system.
Troubleshooting guide	Used to systematically locate and rectify errors.
Replacing components	The "Replacing components" chapter describes how to replace components that - have no instructions of their own for replacement and - require detailed replacement instructions
Components with their own instructions	The following components have their own Installation Instructions - State 112 KIT (42,0410,2321)
Safety inspection	This section outlines the safety inspection for the device described in these Service Instructions. Please be aware of the requirements and standards relevant to your country, as the measured values or steps taken during the tests may vary. Even if there are no relevant requirements and standards in your country, Fronius recommends that this inspection should still be carried out. The safety inspection must only be carried out on a fully assembled device.
Appendix	The Appendix contains the complete spare parts list and circuit diagram for the device. The circuit diagram is also supplied with the device.

Tools and measuring devices

General

"Tools and measuring devices" offers an overview and description of all equipment needed to service the device professionally. This equipment includes:

- Tools required
- Measuring and testing equipment
- Ancillary materials

Tools required

- Torx screwdriver, TX20
- Torx screwdriver, TX25
- Slotted screwdriver, 3 mm
- Socket wrench
- Socket wrench insert, 7 mm
- Socket wrench insert, 36 mm
- Flat spanner, 7 mm
- Flat spanner, 36 mm
- Diagonal cutting pliers
- Needle-nosed pliers
- Torque screwdriver with bit insert, 1 - 6 Nm
- Torque ratchet, 1 - 10 Nm
- Allen key, 4 mm
- Allen key, 5 mm

Measuring and testing equipment

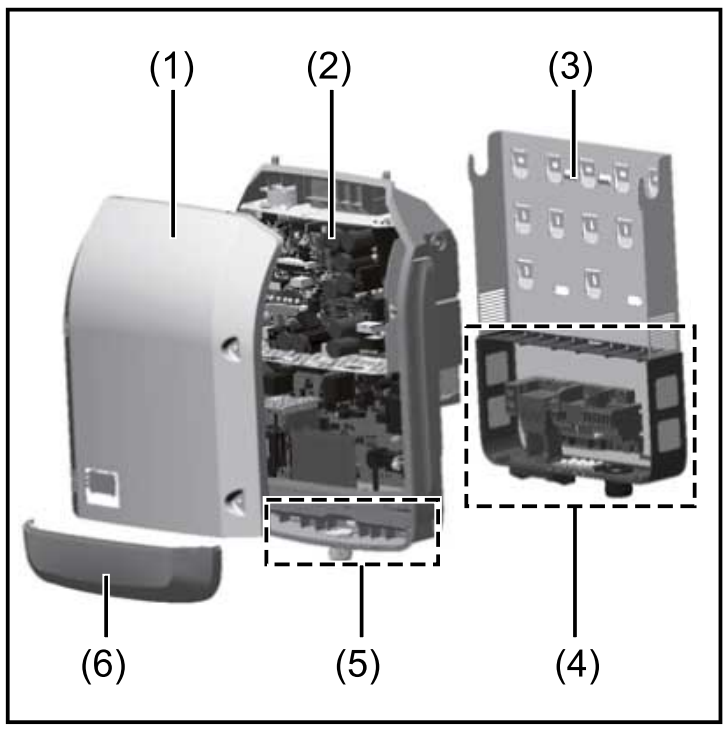
- Digital multimeter
- Safety inspection equipment

Auxiliary materials

- Cleaning materials (spray, paper)
- Cable tie types 102 and 200
- Heat conductive foil, TPC (42,0300,3054)

Function overview

Device concept



Device design:

(1) Housing cover
(2) Inverter
(3) Wall bracket
(4) Connection area incl. DC main switch
(5) Data communication area
(6) Data communication cover

The inverter transforms the direct current generated by the solar modules into alternating current. This alternating current is fed into the public grid synchronously with the grid voltage.

The inverter has been developed exclusively for use in grid-connected photovoltaic systems; it is impossible to generate energy independently of the public grid.

Thanks to its design and the way it works, the inverter is extremely safe both to install and to operate.

The inverter automatically monitors the public grid. In the event of abnormal grid conditions, the inverter ceases operating immediately and stops feeding power into the grid (e.g. if the grid is switched off, if there is an interruption, etc.).
The grid is monitored by monitoring the voltage, frequency and islanding conditions.

The inverter operates fully automatically. As soon after sunrise as there is sufficient energy available from the solar modules, the inverter starts monitoring the grid. When insolation has reached a sufficient level, the inverter starts feeding energy into the grid.
The inverter operates in such a way that the maximum possible amount of power is obtained from the solar modules.
As soon as the power available has fallen below the level at which energy can be fed into the grid, the inverter disconnects the power electronics completely from the grid and stops running. It retains all its settings and stored data.

If the inverter becomes too hot, it automatically reduces the current output power in order to protect itself.
Reasons for the inverter becoming too hot include the ambient temperature being too high or inadequate heat dissipation (e.g. if it is installed in a switch cabinet without suitable heat dissipation).

The Fronius Eco does not have an internal boost converter. This results in certain restrictions in the choice of solar module and string. The minimum DC input voltage ($U_{DC\ min}$) depends on the grid voltage. On the other hand, a highly optimised device is then available for the appropriate application.

Proper use/ intended purpose

The inverter is intended exclusively to convert direct current from solar modules into alternating current and to feed this into the public grid.
Utilisation not in accordance with the intended purpose comprises:

- Any use above and beyond this purpose
- Making any modifications to the inverter that have not been expressly approved by Fronius
- the installation of components that are not distributed or expressly approved by Fronius.

Fronius shall not be liable for any damage resulting from such action.
No warranty claims will be entertained.

Proper use also includes:

- Carefully reading and obeying all the instructions and all the safety and danger notices in the Operating Instructions and Installation Instructions
- Performing all stipulated maintenance work
- Installation as specified in the Installation Instructions

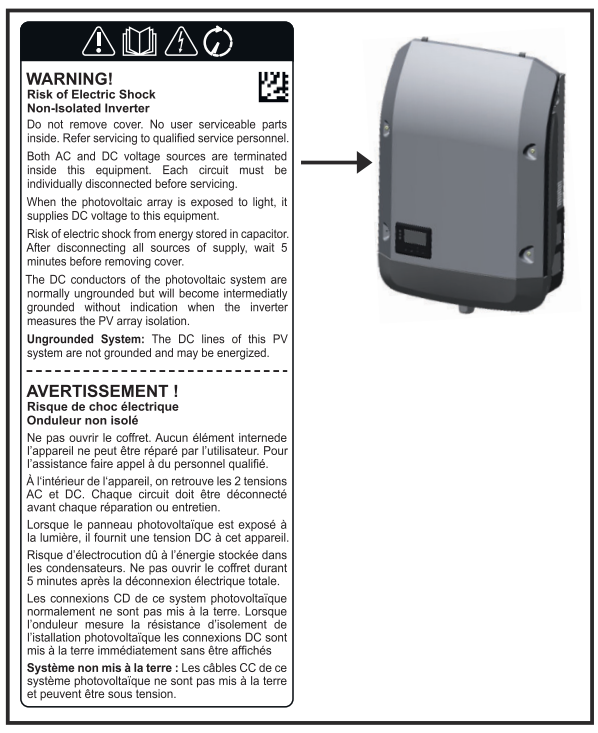
When designing the photovoltaic system, ensure that all components are operated within their permitted operating ranges at all times.

Observe all the measures recommended by the solar module manufacturer to ensure that the solar module retains its properties in the long term.

Obey the regulations of the power supply company regarding connection methods and energy fed into the grid.

Warning notices on the device

There are warning notices and safety symbols on the inside and outside of the inverter. These warning notices and safety symbols must not be removed or painted over. They warn against incorrect operation, as this may result in serious injury and property damage.



Safety symbols:

Danger of serious injury and property damage due to incorrect operation

Do not use the functions described here until you have fully read and understood the following documents:

- These Operating Instructions
- All Operating Instructions for the system components of the photovoltaic system, especially the safety rules

Dangerous electrical voltage

Wait for the capacitors to discharge.

Text of the warning notices:

WARNING!

Risk of electric shock!

Non-insulated inverter

Do not remove the cover. The device does not contain any user-serviceable parts. Maintenance work must be carried out by a trained service technician.
Both AC and DC voltage sources terminate inside this device. Each circuit must be turned off before carrying out maintenance work.
If the solar module is exposed to light, it will supply a DC voltage to the device.
Risk of electric shock due to energy stored in capacitors. Do not remove the cover until all power supply sources have been switched off for at least 5 minutes.
Ungrounded system: The DC cables in this PV system are not grounded and can be live.

Software update

With the help of the USB stick, end customers can also update the inverter software via the USB item on the SETUP menu: the update file is first saved to the USB stick, from where it is then transferred to the inverter. The update file must be saved in the root directory on the USB stick.

Error location aid

Service codes

Safety

⚠ WARNING!

An electric shock can be fatal.
Before opening the device:

- ▶ If applicable, turn the mains switch to the -O- position
- ▶ Unplug the device from the mains
- ▶ Disconnect the inverter from the DC side
- ▶ Using a suitable measuring instrument, ensure that electrically charged parts (e.g. capacitors) are fully discharged
- ▶ Restrict access to the working area
- ▶ Take steps to ensure the metallic surfaces of the device cannot be touched
- ▶ Suitable protective clothing and equipment must be worn when carrying out the test or the repair

General

These service codes help to localise and - where possible - rectify faults with the device on-site. The individual service codes are subdivided into service classes.

The following information is given for every service code:
- The reason the service code is being displayed
- The relevant troubleshooting measure

IMPORTANT!
Software may only be updated after consulting the Solar Electronics hotline.
The need for the update will be clarified in advance depending on the serial number and firmware version.

Status code display

The inverter performs a system self-diagnosis that automatically detects many faults that may occur and shows them on the display. This means you are promptly made aware of malfunctions in the inverter or the photovoltaic system, or of any installation or operating faults.

If the system self-diagnosis has detected a specific fault, the associated status code will be shown on the display.

IMPORTANT! Status codes may sometimes appear briefly as a result of the inverter's control response. If the inverter then continues working with no sign of any problem, this means that there was no fault.

Software update after a PC board replacement

In rare cases, an incompatibility message „State 480“ may occur on the inverter after the PC board has been successfully replaced.
Please carry out a software update or contact Fronius Technical Support National.

Total failure of the display

If the display fails to come on some time after sunrise:

- Check the AC voltage ON the inverter connections: the AC voltage must be 230 V (+ 10 % / - 5 %)*
- Carrying out an AC reset: Disconnect the inverter when not under load from the AC supply and switch it back on

* The mains voltage tolerance depends on the country setup

Status codes

Service class 1

Status codes of these class only arise momentarily and are caused by the public grid.

The initial response of the inverter in this case is to disconnect itself from the grid. The grid is subsequently checked for the stipulated monitoring period. If no further problem has been detected by the end of this period, then the inverter will resume feeding energy into the grid.

Code	Description	Behaviour	Remedy
102	Grid voltage above permitted limit	1. Mains voltage error	1. Check mains voltage
		2. Incorrect values in the Service Menu / Wrong Set-up	2. Check values in the Service Menu / Check Setup
		3. Measuring error on the filter board	3. Change filter board
103	Grid voltage below permitted limit	1. Mains voltage error	1. Check mains voltage
		2. Wrong AC cabling	2. Check AC cabling
		3. Incorrect values in the Service Menu / Wrong Set-up	3. Check values in the Service Menu / Check Setup
		4. Bad contact: wall bracket <-> filter board	4. Check AC wall bracket screws
		5. Measuring error on the filter board	5. Change filter board
105	Mains frequency above permitted limit	1. Mains voltage error	1. Check mains voltage
		2. Incorrect values in the Service Menu / Wrong Set-up	2. Check values in the Service Menu / Check Setup
		3. Reconnection limit	3. Normal legal requirement, no error (50,05Hz)
		4. Ripple control signals	4. Report to TSI specialist
		5. Measuring error on the filter board	5. Change filter board

Code	Description	Behaviour	Remedy
106	Mains frequency below permitted limit	1. Mains voltage error	1. Check mains voltage
		2. Incorrect values in the Service Menu / Wrong Set-up	2. Check values in the Service Menu / Check Setup
		3. Ripple control signals	3. Report to TSI specialist
		4. Measuring error on the filter board	4. Change filter board
107	Synchronisation with the public mains supply not possible	1. Incorrect values in the Service Menu / Wrong Set-up	1. Check values in the Service Menu / Check Setup
		2. Bad contact of the power stage set with AC	2. Check AC connector screws
		3. Bad AC connection	3. Check mains connection
		4. Measuring error on the filter board	4. Change filter board
108	Islanding detected	1. Islanding detected	1. Automatic correction
		2. Severe disturbances in public mains	2. Automatic correction
		3. Bad contact: wall bracket <-> filter board	3. Check AC wall bracket screws
		4. Grid Impedance out of permitted values	4. Contact utility
		5. Bad AC connection	5. Check AC connection
		6. Ripple control signals	6. Report to TSI specialist
		7. Measuring error on the filter board	7. Change filter board
112	RCMU Error	1. Old filter board software (<4.6)	1. Software update
		2. Permanent grounding error	2. Check AC / DC connections

Service class 2

Code	Description	Behaviour	Remedy
240	AFCI tripping	No error, AFCI tripped. Error visible for 4 Seconds then 241	Automatic correction
241 - 242	AFCI tripping	Arc occurred, to resume operation press enter twice (first 242 then operation is resumed)	Check PV generator
245	AFCI selftest fail	1. Selftest routine failed due to detection failure	1. Restart inverter or do a software update 2. Change filter board

Code	Description	Behaviour	Remedy
247	AFCI currentsensor fail	1. Data from primary and secondary current sensor don‘t correspond	1. Restart inverter or do a software update 2. Change filter board

Service class 3

Class 3 includes status codes that may occur while feeding energy into the grid, but generally do not cause the process to be interrupted for any length of time

The inverter disconnects automatically from the grid, the grid is then monitored as specified and the inverter attempts to resume feeding energy into the grid.

Code	Description	Behaviour	Remedy
301	Current peak on the mains supply detected	1. Voltage drop on the public mains	1. Automatic correction
		2. Grid Impedance out of permitted values	2. Contact utility
		3. Bad contact: wall bracket <-> inverter	3. Check AC wall bracket screws
		4. Measuring error on the filter board	4. Change filter board
		5. Wrong power limit on device	5. Change AC board
302	Current peak on the PV generator	1. Bad contact: wall bracket <-> inverter	1. Check AC wall bracket screws
		2. Voltage drop in the public mains	2. Automatic correction
		3. Measuring error on the power stage set	3. Change DC board. Afterwards if necessary AC board
303	Too high heat sink temperature	1. Ventilation opening blocked	1. Clean openings
		2. Too high ambient temperature	2. Change mounting place
		3. In- or outside fan cable not connected	3. Connect fan cable
		4. In- or outside fan defective	4. Change fan
		5. Bad contact: wall bracket <-> heat sink	5. Check phase change paste
		6. Measuring error on the power stage set	6. Change AC board
		7. Fan output on Recerbo defective	7. Change Recerbo

Code	Description	Behaviour	Remedy
306	POWER LOW	1. DC power is too low for feeding in	1. Wait for more irradiance or check PV modules
		2. Measuring error on the power stage set	2. Change DC board. Afterwards if necessary AC board
307	DC LOW	1. DC main switch open	1. Close DC main switch
		2. PV generator not connected	2. Connect PV generator
		3. DC voltage too low for feeding in	3. Wait for more irradiance or check PV modules
		4. Reversal voltage of PV generator	4. Reverse polarity of PV generator
		5. DC operation mode: fix voltage + wrong voltage	5. Check MPP settings / voltage
		6. Measuring error on the power stage set	6. Change DC board. Afterwards if necessary AC board
308	The intermediate circuit voltage	1. Voltage drop on AC grid	1. Automatic correction
		2. Bad contact: wall bracket <-> inverter	2. Check AC wall bracket screws
		3. Measuring error on the power stage set	3. Change AC board
309	Too high DC1 voltage	1. PV generator voltage too high in MPP1	1. Check PV configuration
		2. Wrong DC cabling in MPP 1	2. Check DC cabling
		3. Measuring error on the power stage set	3. Change DC board. Afterwards if necessary AC board
313	Too high DC2 voltage	1. PV generator voltage too high in MPP 2	1. Check PV configuration
		2. Wrong DC cabling in MPP 2	2. Check DC cabling
		3. Measuring error on the power stage set	3. Change DC board. Afterwards if necessary AC board

Service class 4

Some of the class 4 status codes necessitate intervention by a Fronius-trained service engineer.

Code	Description	Behaviour	Remedy
401	Communication error between Recerbo and power stage set	1. Ribbon cable between power stage set and filter board faulty or not connected properly	1. Check ribbon cable between Recerbo and power stage set
		2. Ribbon cable defective	2. Change ribbon cable
		3. Recerbo not plugged in correctly	3. Check Recerbo plug
		4. Recerbo defective	4. Change Recerbo
		5. Power stage set defective	5. Change AC board
		6. Filter board defective	6. Change filter board
406	Temperature sensor in DC semiconductor module defective	1. Defective temperature sensor in semiconductor module	1. Change DC board
		2. Defective circuit on the power stage set	2. Change DC board
407	Temperature sensor on the power stage set	1. Defective temperature sensor on the power stage set	1. Change AC board
		2. Defective circuit on the power stage set	2. Change AC board
408	On the inverter an unacceptably high DC injection was detected	1. Asynchronous AC grid	1. Check AC grid
		2. Power stage set defective	2. Change AC board
412	Adjusted fix voltage beyond the accessible MPP range	1. Fix voltage was adjustable too high or too low	1. Check adjustments in the service menu
415	Wire shutdown tripped	1. Option card tripped a wired shutdown	1. Automatically corrected, option card stopped the inverter
416 - 425	Communication error between power stage set and Recerbo	1. Occurs once - PSP communication error	1. Automatically corrected
		2. Unknown option card blocks the inverter	2. Software update
		3. Ribbon cable between filter and power stage set defective	3. Change ribbon cable
		4. Recerbo defective	4. Change Recerbo
		5. Filter board defective	5. Change filter board
		6. Power stage set defective	6. Change AC board
426	Charging intermediate circuit takes too long	1. Too less DC Power	1. Restart inverter or do a software update
		2. DC inductors not properly connected	2. Check DC inductors screws
		3. DC booster defect	3. Change DC board. Afterwards if necessary AC board

Code	Description	Behaviour	Remedy
427		1. Software error	1. Update software
		2. Measuring error on the power set	2. Change AC board
431	Power stage set is in boot mode	1. Power stage set will be programmed by the Recerbo automatically	1. Automatically corrected
		2. Power stage set can not be programmed automatically	2. Software update
		3. Filter board defective	3. Change Recerbo
		4. Recerbo defective	4. Change filter board
		5. Power stage set defective	5. Change AC board
432	Consistent error in power stage set management	1. Power stage set could not communicate with the Recerbo	1. Restart inverter or do a software update
		2. Power stage set defective	2. Change AC board
		3. Recerbo defective	3. Change Recerbo
433	Allocation error of dynamic addresses	1. Power stage set could not communicate with the Recerbo	1. Restart inverter or do a software update
		2. Power stage set defective	2. Change AC board
		3. Recerbo defective	3. Change Recerbo
436	Problem while error transmitting of the power stage set	1. Power stage set could not communicate with the Recerbo	1. Restart inverter or do a software update
		2. Power stage set defective	2. Change AC board
		3. Recerbo defective	3. Change Recerbo
437	Problem with the internal error handling	1. Power stage set could not communicate with the Recerbo	1. Restart inverter or do a software update
		2. Power stage set defective	2. Change AC board
		3. Recerbo defective	3. Change Recerbo
438	Problem while error transmitting from power stage set to Recerbo	1. Power stage set could not communicate with the Recerbo	1. Restart inverter or do a software update
		2. Power stage set defective	2. Change AC board
		3. Recerbo defective	3. Change Recerbo

Code	Description	Behaviour	Remedy
445	Country setup information faulty	1. Country setup information faulty	1. Do a software update and reload country setup fromsetup menu
		2. Old software (e.g after print exchange)	2. Do a software update and reload country setup fromsetup menu
		3. Impossible manual settings in service menu	3. Check settings
		4. Recerbo defective	4. Change Recerbo
447	Isolation failure detected	1. PV generator grounded	1. Use only ungrounded modules
		2. PV generator grounding error	2. Check PV generator
		3. Measuring circuit on power stack defect	3. Change DC board. Afterwards if necessary AC board
448	Neutral wire fault	1. No neutral wire detected	1. Check wiring
		2. Wrong setup	2. Check country setup
		3. Bad contact: wall bracket <-> inverter	3. Check AC wall bracket screws
		4. Filter board defective	4. Change filter board
451	Flash of the guard defective	1. Grid problem	1. Automatically corrected
		2. Defective AC guard on filter board	2. Change filter board
		3. Defective AC guard on power stage set	3. Change AC board
452	Communication between filter & power stage set faulty	1. Communication problem caused by temporary environmental disturbances (grid, EMC, ...)	1. Automatically corrected
		2. Ribbon cable between filter board and power stage set defective	2. Change ribbon cable
		3. Defective AC guard on filter board	3. Change filter board
		4. Defective AC guard on power stage set	4. Change AC board
453	Processor guard detected a faulty grid voltage	1. Measuring error	1. Software update
		2. Grid problem	2. Automatically corrected
		3. Defective AC guard on filter board	3. Change filter board
		4. Defective AC guard on power stage set	4. Change AC board

Code	Description	Behaviour	Remedy
454	Processor guard detected a faulty grid frequency	1. Measuring error 2. Grid problem 3. Defective AC guard on filter board 4. Defective AC guard on power stage set	1. Software update 2. Automatically corrected 3. Change filter board 4. Change AC board
456	Error in the Anti Islanding monitoring detected	1. Occurs once 2. Software problem 3. Measuring on filter board 4. Measuring circuit for Anti Islanding defective	1. Restart inverter 2. Software update 3. Change filter board 4. Change AC board
457	Grid relais do not release	1. Occurs once 2. Grid test time is too low 3. Relay got stuck	1. Restart inverter 2. Change settings 3. Change AC board
458	RCMU selftest failed	1. RCMU measurement defect	1. Change filter board
459	Faulty isolation measurement	1. Occurs once 2. Isolation measuring defective	1. Restart inverter 2. Change DC board. Afterwards if necessary AC board
460	Reference voltage outside permitted limits	1. Occurs once 2. Measuring circuit on power stage set defective	1. Restart inverter 2. Change AC board
461	Defective data memory	1. Defective power stage set	1. Change DC board. Afterwards if necessary AC board
462	Failure on the DC injection monitoring detected	1. Occurs once 2. DC injection monitoring defective	1. Restart inverter 2. Change inverter
463	AC pole reserved	1. AC connector between power stage and filter board mounted in wrong direction (L1 and L2 exchanged)	1.Check wiring
472	defective grounding fuse	1. Defective grounding fuse 2. Wrong settings in service menu basic	1. Change grounding fuse 2. Set DC mode to ‚floating‘
474	RCMU sensor error	1. Quick radiation changes 2. Sensor defect	1. Automatically corrected 2. Change filter board

Code	Description	Behaviour	Remedy
475	Isolation failure detected	1. Wrong setting	1. Check ISO / GFDI setting
		2. PV generator grounding error	2. Check PV generator
		3. Measuring circuit in power stage set defective	3. Change DC board. Afterwards if necessary AC board
476	Internal power supply missing	1. Grid voltage too low	1. Check wiring
		2. Grid test time is too low	2. Grid failure
		3. Defective internal power supply	3. Change AC board
		4. Defective internal power supply	4. Change filter board
480	Power stage set software incompatible to display software	1. Old power stage set software	1. Software update
		2. Old software	2. Reload setup
		3. Incompatible hardware combinations	3. Check hardware components
481	Recerbo has old software version	1. Old Recerbo software	1. Software update
		2. Old software	2. Reload setup
		3. Incompatible hardware combinations	3. Check hardware components
482	Inverter switched off during commissioning	1. Startup procedere not successful	1. Restart inverter
483	Adjusted fix voltage DC2 beyond the accessible MPP range	1. Fix voltage was adjusted too high or too low	1. Check settings
484 - 485	Data transfer error	1. Communication problem caused by temporary environmental disturbances (grid / EMC, ...)	1. Automatically corrected
		2. Ribbon cable between filter board and power stage set	2. Change ribbon cable
		3. Defective AC guard on filter board	3. Change filter board
		4. Defective AC guard on power stage set	4. Change AC board

Service class 5 - 6

Class 5 status codes do not generally prevent the feeding of energy into the grid, but can restrict it. A status code is displayed until it is acknowledged by pressing a key (the inverter, however, continues to operate normally in the background).

Code	Description	Behaviour	Remedy
502	An isolation fault between DC+ / DC- to earth has been detected	1. Isolation fault at the PV generator	1. Check cables and PV generator
509	No feed-in operation for 24 hours	1. Snow covered or very dirty modules	1. Clean modules or remove snow
		2. Insufficient power from the modules for feed in operation	2. Check other service codes
515	EEPROM communication failure	1. Occurs once	1. Restart inverter
		2. Filter calibration value not correct	2. Change AC board. Afterwards if necessary DC board
516	Communication error inside the power stage set	1. Occurs once	1. Restart inverter
		2. Power stage set defective	2. Change board
517	Power stage set derating caused by too high temperature	1. Ventilation opening blocked	1. Clean openings
		2. Too high ambient temperature	2. Change mounting place
		3. Fan cables not connected	3. Connect fan cables
		4. Fan defective	4. Change fan
		5. Bad contact: power modul <-> heat sink	5. Check phase change paste
		6. Filter board defective	6. Change filter board
		7. Recerbo defective	7. Change Recerbo
		8. Measuring error on the power stage set	8. Change board
519	Communication error inside the power stage set	1. Occurs once	1. Restart inverter
		2. Filter board defective	2. Change filter board
520	No feed-in fpr 24 hours from DC1 Input	1. Snow covered or very dirty modules	1. Clean modules or remove snow
		2. Insufficient power from the modules for feed in operation	2. Check other service codes
		3. Input not used	3. Configure inverter as monostring
521	No feed-in fpr 24 hours from DC2 Input	1. Snow covered or very dirty modules	1. Clean modules or remove snow
		2. Insufficient power from the modules for feed in operation	2. Check other service codes
		3. Input not used	3. Configure inverter as monostring

Code	Description	Behaviour	Remedy
522	DC LOW Ch1	1. DC main switch open	1. Close DC main switch
		2. PV generator not connected	2. Connect PV generator
		3. DC voltage too low for feeding in	3. Wait for more irradiance or check modules
		4. Reversal voltage of PV generator	4. Change polarity of PV generator
		5. DC operating mode: fix voltage and wrong voltage	5. Check MPP settings / voltage
		6. Measuring error on the power stage set	6. Change DC board. Afterwards if necessary AC board
523	DC LOW Ch2	1. DC main switch open	1. Close DC main switch
		2. PV generator not connected	2. Connect PV generator
		3. DC voltage too low for feeding in	3. Wait for more irradiance or check modules
		4. Reversal voltage of PV generator	4. Change polarity of PV generator
		5. DC operating mode: fix voltage and wrong voltage	5. Check MPP settings / voltage
		6. Measuring error on the power stage set	6. Change DC board. Afterwards if necessary AC board
558	Country setup not supported by power stage set	1. Old software	1. Software update
		2. Old software	2. Reload setup
		3. Incompatible hardware combinations	3. Check hardware components
559	Feature nor supported by Recerbo	1. Old software	1. Software update
		2. Old software	2. Reload setup
		3. Incompatible hardware combinations	3. Check hardware components
560	Power reduction because of over frequency	1. Too high grid frequency	1. Automatically corrected
		2. Grid disturbances	2. Software update
		3. Wrong settings	3. Check settings
565	AFCI SD card failure	1. Writing data to SD card failed	1. Format SD card
566	AFCI deactivated	1. No error, AFCI is deactivated	1. If AFCI has to be switched on, use tool
567	GVDPR active	1. Too high grid voltage	1. Automatically corrected
		2. Grid disturbances	2. Software update
		3. Wrong settings	3. Check settings
568	Multifunction current interface Warning	An external custom device performs a signal state change	Check the external signal or the input signal configuration

Code	Description	Behaviour	Remedy
601	Internal communication fault	1. Occurs once 2. Occurs permanently	1. Restart inverter 2. Change AC board
602	Auto test Italy failed	1. Auto test Italy was started and not finished or failed	1. Reload setup
603	Temperature sensor in µC defect (Ch3 AC Temp)	1. Defective temperature sensor µC 2. Defective circuit on the power stage	1. Change power stack 2. Change AC board
604	Temperature sensor in DC module 2 defect (Ch4 DC2)	1. Defective temperature sensor in DC module 2 2. Defective circuit on the power stage	1. Change DC board 2. Change DC board
607	RCMU continous fault occured more than 4 times in 24 hours	1. Grounding problem 2. Check PV array 3. Check wiring	1. Automatically corrected after 24 hours

Service class 7 - 10

Class 7 status codes related to control system, the configuration and inverter data recording, and may directly or indirectly affect the process of feeding energy into the grid.

Code	Description	Behaviour	Remedy
701*	LN node type out of range	1. Wrong LN number 2. EEPROM defective	1. Insert LN number again 2. Change Recerbo
702*	Recerbo buffer full	1. Problems with LN ring 2. Recerbo defective	1. Check LN ring 2. Change Recerbo
703*	LN send buffer full	1. Problems with LN ring 2. Recerbo defective	1. Check LN ring 2. Change Recerbo
705*	LN number exists 2 times	1. LN number exists 2 times	1. Change LN number, LN number must be unique
706* - 707*	Key controller communication failed	1. Occurs once 2. Recerbo defective	1. Automatically corrected 2. Change Recerbo
711*	EEPROM error	1. Recerbo defective	1. Change Recerbo
712*	Failure while writing on EEPROM	1. Occurs once	1. Automatically corrected
713	EEPROM data could not be read completely	1. Occurs once 2. Recerbo defective	1. Automatically corrected 2. Change Recerbo
714* - 715*	Failure while reading from EEPROM	1. Occurs once 2. Recerbo defective	1. Automatically corrected 2. Change Recerbo
721	Failure while writing on EEPROM	1. Occurs once 2. Recerbo defective	1. Automatically corrected 2. Change Recerbo

Code	Description	Behaviour	Remedy
722* - 726*	Failure while reading / writing from EEPROM	1. Occurs once 2. Recerbo defective	1. Automatically corrected 2. Change Recerbo
727* - 730*	EEPROM backup defective	1. Occurs once 3. Recerbo defective	1. Automatically corrected 3. Change Recerbo
731	Failure while initialising, USB flash drive was not detected	1. USB flash drive read / write protected 2. USB flash drive not detected 3. USB flash drive not supported 4. Access time of the inverter too fast	1. Remove read / write protection 2. Format USB flash drive 3. Use another USB flash drive 4. Update software
732	Failure while initialising, USB flash drive has a too high current	1. USB flash drive ineligible due to too high current	1. Use another USB flash drive
733	No USB flash drive inserted, although there should be	1. No USB flash drive inserted 2. Unplugged USB flash drive while updating	1. Insert USB flash drive 2. Reconnect USB flash drive and start update again
734	Update file not identified	1. Update file has wrong format 2. Update in the wrong file	1. Name update file correctly (e.c. Froxxxxx.upd) 2. Store update on root directory
735	For this inverter no fitting update is on the USB flash drive	1. Old or defective update on the USB flash drive 2. Update file from another inverter 3. Compatibility error	1. Load new update on the USB flash drive 2. Use the correct update file 3. Check hardware components
736	Read or write error appeared	1. Incorrectly formatted USB flash drive 2. USB flash drive secured with a password 3. Read or write protection on the USB flash drive	1. Format USB flash drive with FAT32 2. Delete password protection 3. Delete read or write protection
737	Update file couldn‘t be opened	1. Defective update file 2. Failure while formatting	1. Load new update on the USB flash drive 2. Format USB flash drive
738	Creating a Logfile is not possible	1. Incorrectly formatted USB flash drive 2. USB flash drive secured with a password 3. Read or write protection on the USB flash drive	1. Format USB flash drive with FAT32 2. Delete password protection 3. Delete read or write protection

Code	Description	Behaviour	Remedy
740	Failure while writing initialising	1. Failure in the USB flash drive format	1. Format USB flash drive
		2. Defective USB flash drive	2. Use another USB flash drive
741	Failure while writing on USB flash drive	1. Memory on USB flash drive full	1. Delete data from USB flash drive
		2. Memory on USB flash drive too small	2. Use a bigger USB flash drive
		3. USB flash drive unplugged while writing	3. Reconnect USB flash drive and start update again
		4. Mains voltage drop out while writing	4. Check grid
		5. Invalid data	5. Format USB flash drive
743	Update failed	1. Unplugged USB flash drive while updating	1. Reconnect USB flash drive and start update again
		2. Update failed	2. Restart update
		3. Read or write protection on the USB flash drive	3. Delete read or write protection
		4. Compatibility error	4. Check hardware components
745	Checksum test failed	1. File on USB flash drive is defective	1. Format USB flash drive
746	One or more boards could not be identified	1. Boards have not started completely yet	1. Wait 1 minute with the update
		2. Boards have not started completely yet	2. See device -> info menu: all versions available?
		3. Print data of some boards are incompatible	3. Change inverter
751	Lost real time clock	1. Inverter had no AC connection for longer than 5 days	1. Set time
		2. Memory of the Recerbo defective	2. Change Recerbo
754* - 755*	Time set	1. Time / data has been set	
757	Time can not be stored, due to safety reasons the inverter does not feed in	1. Defective real time clock	1. Change Recerbo
758	RTC quarz in emergency operation	1. Occurs once	1. Automatically corrected
		2. Recerbo defective	2. Change Recerbo
760	Systemquarz defective	1. Occurs once	1. Automatically corrected
		2. Recerbo defective	2. Change Recerbo

Code	Description	Behaviour	Remedy
761*	Reading error of on-board storage print	1. On-board storage print is missing	1. Change interface board with the one containing the on-board storage print
		2. Defective ribbon cable	2. Change ribbon cable
		3. Recerbo defective	3. Change Recerbo
		4. On-board storage print is defective	4. Change inverter
762*	Reading error of attached storage print	1. Attached storage print is missing	1. Usage / attach the original storage print
		2. Defective ribbon cable	2. Change ribbon cable
		3. Recerbo defective	3. Change Recerbo
		4. Attached storage print is defective	4. Change inverter
763*	Power limitation of the on-board storage print not readable	1. On-board storage print is missing	1. Usage / attach the original storage print
		2. Recerbo defective	2. Change Recerbo
		3. On-board storage print is defective	3. Change inverter
765*	Recerbo can not read power limitation	1. Recerbo defective	1. Change Recerbo
766	No power limitation found	1. Recerbo defective	1. Change Recerbo
		2. On-board or attached storage print is defective	2. Change inverter
767*	Power limitation not readable	1. Occurs once	1. Automatically corrected
		2. Recerbo defective	2. Change Recerbo
768	Power limitation while feeding-in operation changed	1. Attached storage print is being connected or disconnected during feeding in operation	1. Automatically corrected
772	Memory on the storage print not available, due to safety reasons the inverter does not feed in	1. SSP not connected	1. Check SSP
773	Memory on the storage print not initialised, due to safety reasons the inverter does not feed in	1. Memory not programmed or memory lost	1. Reload setup
		2. Defective Recerbo	2. Change Recerbo
775	Faulty programming of the power stage set	1. Power stage set or filter board not programmed	1. See device -> info menu: look for missing versions infos and change defective print
782* - 783*	Error during update	1. Occurs once	1. Automatically corrected
		2. Recerbo defective	2. Change Recerbo
784*	Waiting on flash / busy	1. Occurs once	1. Automatically corrected
		2. Recerbo defective	2. Change Recerbo

Code	Description	Behaviour	Remedy
789*	Setup CRC failed	1. Wrong / defective data in flash 2. Recerbo defective	1. Update software 2. Change Recerbo
794*	Flash data structure defect	1. Wrong / defective data in flash 2. Recerbo defective	1. Update software 2. Change Recerbo
901	Deviation of measurement channel 1	Current of channel 1 deviates from the other channels	Check settings, DC fuse and modules
902	Deviation of measurement channel 2	Current of channel 2 deviates from the other channels	Check settings, DC fuse and modules
903	Deviation of measurement channel 3	Current of channel 3 deviates from the other channels	Check settings, DC fuse and modules
904	Deviation of measurement channel 4	Current of channel 4 deviates from the other channels	Check settings, DC fuse and modules
905	Deviation of measurement channel 5	Current of channel 5 deviates from the other channels	Check settings, DC fuse and modules
990	Deviation of output from radiation sensor value too big	Difference between the performance of the irradiation sensor and that of the inverter too big	Check archives values, shadow of the modules, blown string fuse or defect
991	Deviation of radiation sensor too big	The radiation sensor deviates too far	Check if your radiation sensor is soiled, shaded or defect
992	No radiation sensor values or value(s) not permitted	The radiation sensor does not return any values or returns values that are not permitted	Check the cable lines of the radiation sensor
993	Faulty energy report	Faulty energy report due to missing archive values	Check archive values at Fronius Solar.web server or Datalogger
996	No connection to Fronius Solar.web	No connection to Fronius Solar.web	1. Check LED status on Datalogger 2. Restart Datalogger 3. Check internet connection 4. Check if customer has got timer to switch off internet connection and time interval settings is too short

Code	Description	Behaviour	Remedy
997	Deviation between inverters	Deviation of the kWh value between inverters depending on the settings in Fronius Solar.web	Check settings in system administration in Fronius Solar.web (real Wpeak per inverter and deviation), inquire if there are shadows etc.
998	Fronius Solar.net loop is open more than 24h	Fronius Solar.net is not closed and the X-LED is red on the Datamanager or Datalogger	1. Check Fronius Solar.net loop 2. Check networ cabling 3. Check Fronius Com Card
999	24h no feed in	1. No communication between inverter and Datamanager or Datalogger more than 24h	1. Check LED status from Datamanager or Datalogger
		2. No communication between Fronius Sensor Card and Datamanager or Datalogger more than 2h	2. Check archive values and Fronius Solar.net loop
1000* - 1001*	Service-Message	Are harmless for a faultless feeding in process and gives information about the internal processor status	
1201* - 1210*	Service-Message	Are harmless for a faultless feeding in process and gives information about the internal processor status	

* ... Code appears only with Eventlogging and in the Error Counter

Customer service

IMPORTANT! Contact your Fronius dealer or a Fronius-trained service technician if

- an error appears frequently or all the time
- an error appears that is not listed in the tables

Operation in dusty environments

When operating the inverter in extremely dusty environments:
when necessary, clean the cooling elements and fan on the back of the inverter as well as the air intakes at the mounting bracket using clean compressed air.

Error flowchart

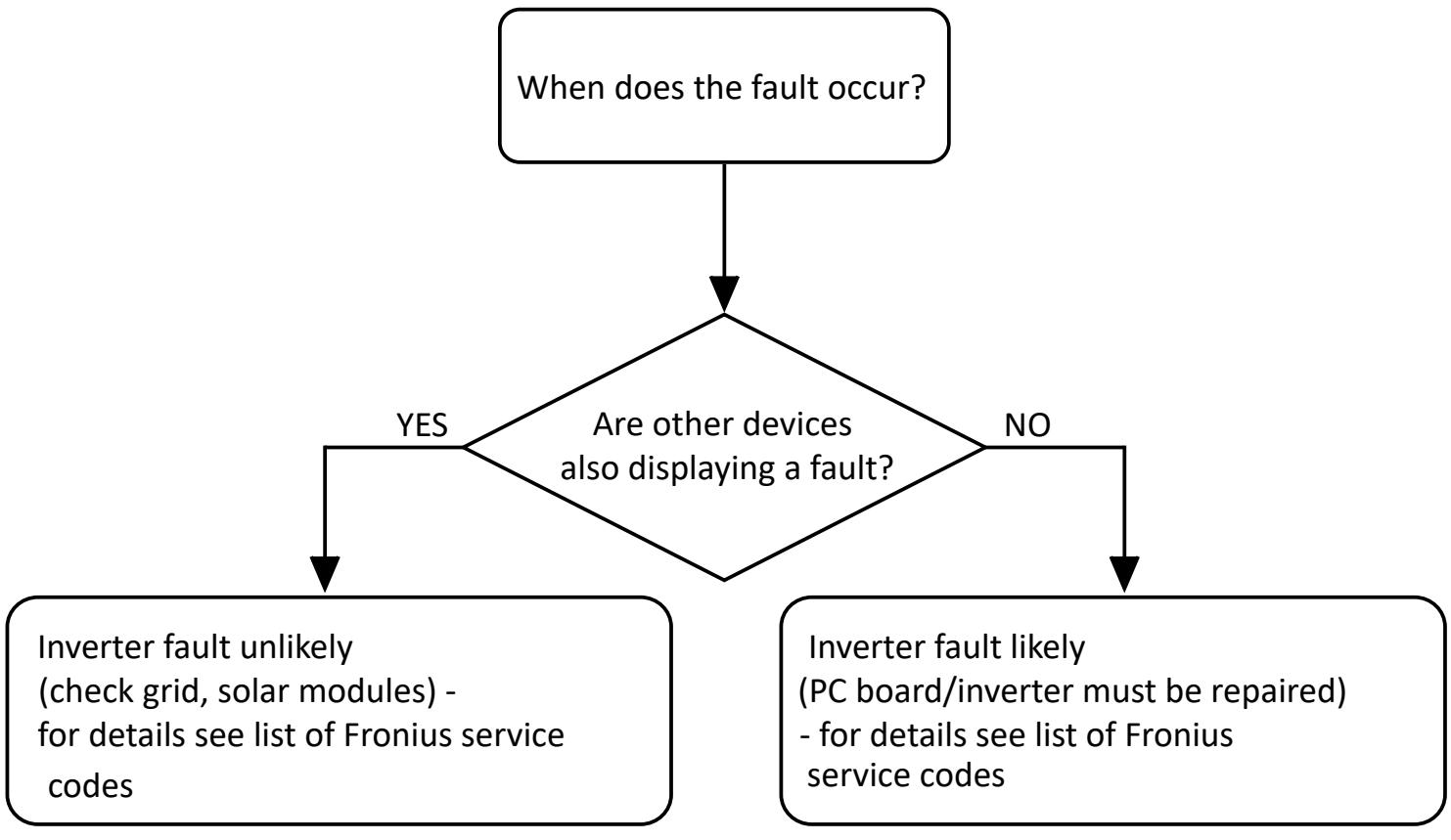
General

The error search tree is used to systematically locate and rectify errors.

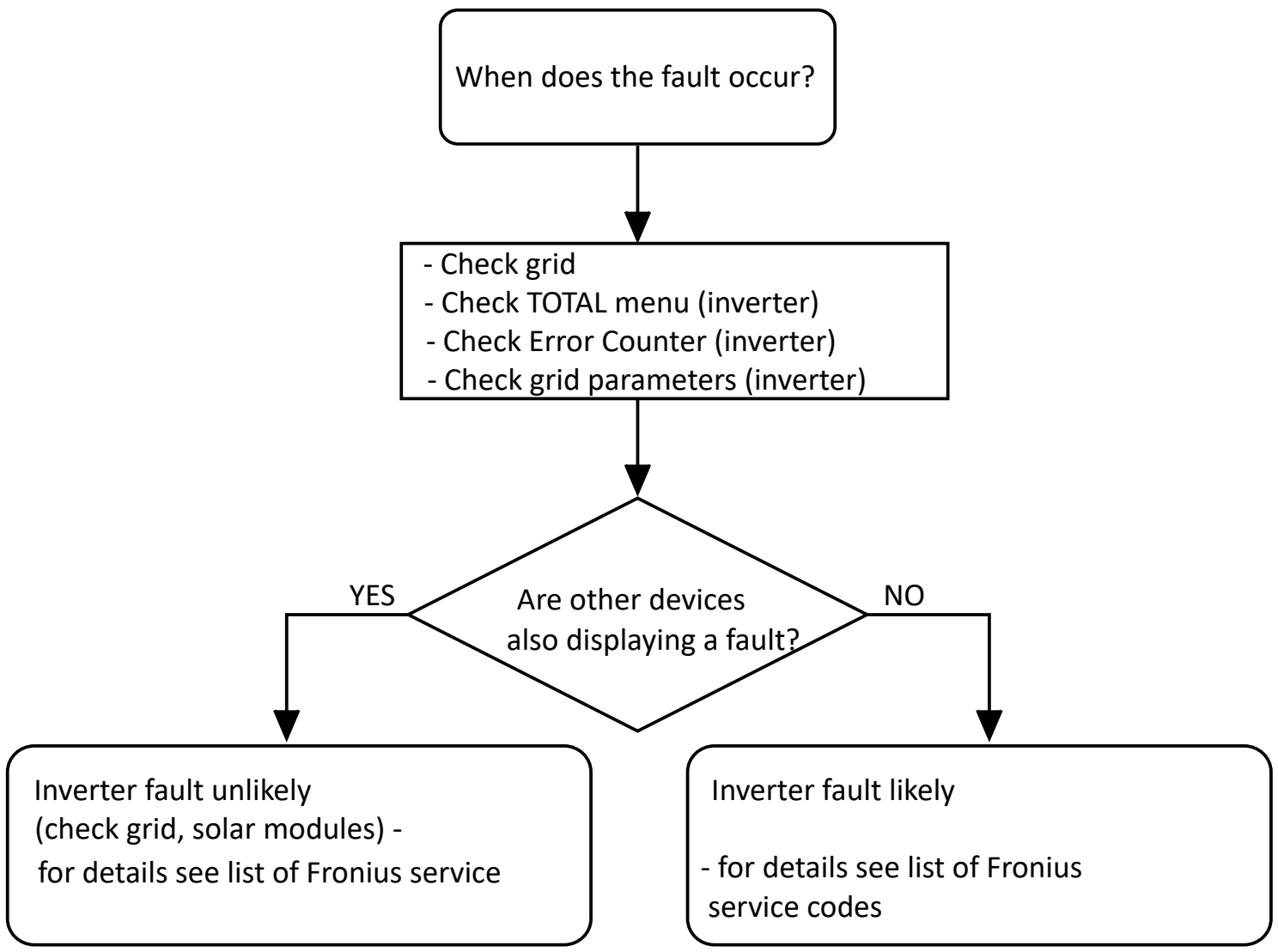
Before starting any troubleshooting activities, read the "Function overview" section in order to understand the layout of the device and how it works.

Essential system data:
- Inverter type
- Serial number of the installed inverter
- Service code shown on the display (State PS menu)
- Name of PV system (name of system operator)
- System operating period
- Location of system
- Number of inverters installed in system (type, serial number)
- DC and AC voltage

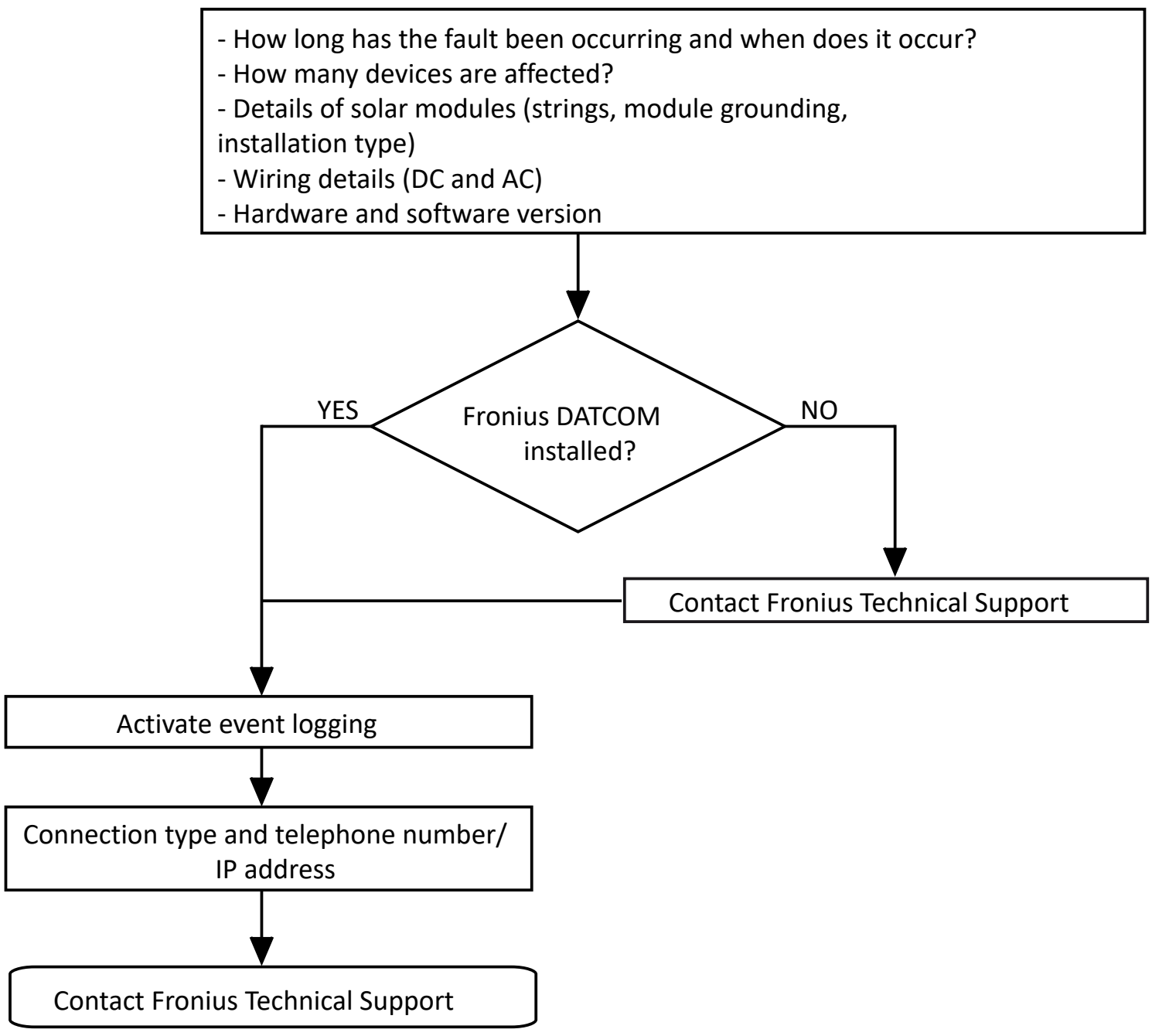
Permanent faults



Temporary faults



Abnormal behaviour



Changing components

General

Safety

⚠ WARNING!

An electric shock can be fatal.
Before opening the device:

- ▶ If applicable, turn the mains switch to the O position
- ▶ Unplug the device from the mains
- ▶ Disconnect the inverter from the DC side
- ▶ Using a suitable measuring instrument, ensure that electrically charged parts (e.g. capacitors) are fully discharged
- ▶ Restrict access to the working area
- ▶ Take steps to ensure the metallic surfaces of the device cannot be touched
- ▶ Suitable protective clothing and/or equipment must be worn when carrying out the test or the repair

⚠ WARNING!

An electric shock can be fatal.
Danger due to residual voltage in capacitors. Wait for the capacitors to discharge. See the operating instructions and the safety notices on the inverter for more details on the discharge time.

⚠ WARNING!

Incorrect operation or poorly executed work can cause serious injury or damage.
Commissioning of the inverter may only be carried out by trained personnel in accordance with the technical regulations. The "Safety Rules" section must be read prior to commissioning the equipment or carrying out servicing or repair work.

⚠ WARNING!

An electric shock can be fatal.
Danger due to mains voltage and DC voltage from solar modules.

- ▶ The connection area must only be opened by an authorised electrician.
- ▶ The separate area containing the power stage sets must only be disconnected from the connection area when in a de-energised state.
- ▶ The separate area containing the power stage sets must only be opened by a Fronius-trained service technician.
- ▶ Make sure that both the AC side and the DC side of the inverter are de-energised before making any connections.

⚠ WARNING!

An inadequate ground conductor connection can cause serious injury or damage.
The housing screws provide a suitable ground conductor connection for earthing the housing and must NOT be replaced by any other screws that do not provide a reliable ground conductor connection.

NOTE!

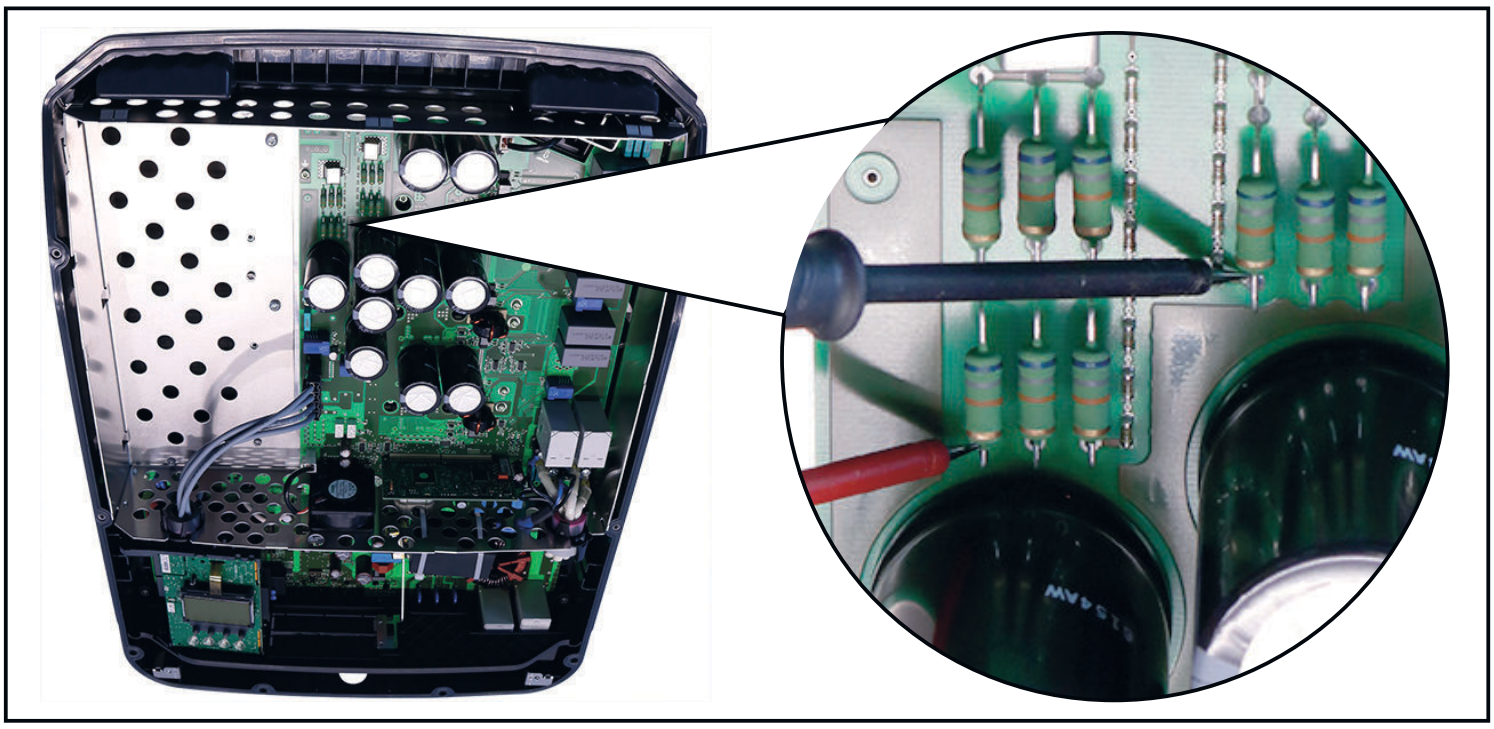
Requirements concerning electrical installations may be subject to national standards and directives, which must be observed.

A safety inspection must be carried out after replacement, maintenance or repair work on any component (see "Safety inspection").

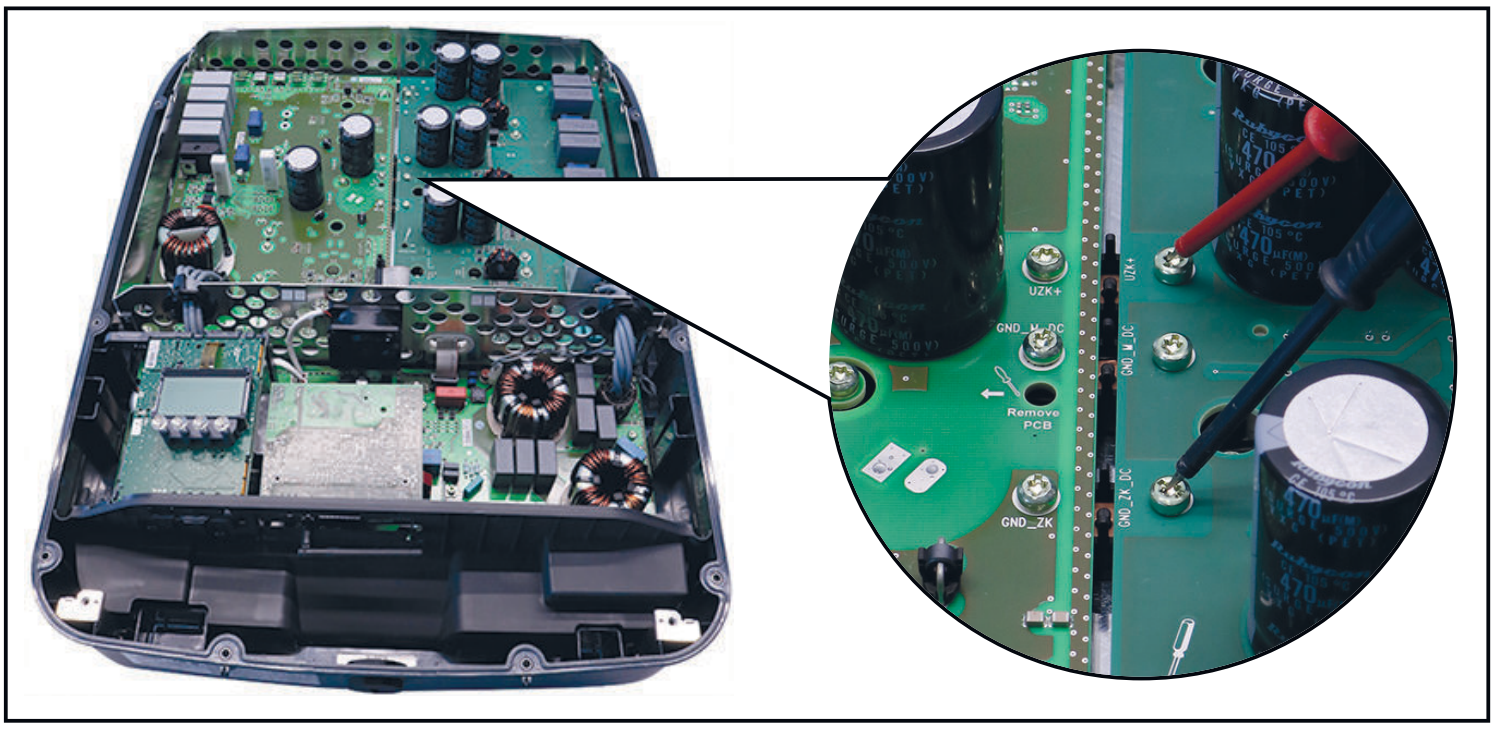
Measuring the intermediate circuit voltage

⚠ WARNING!

Risk of electric shock! Despite the intended discharge circuit, a dangerous voltage can be present in the intermediate circuit for a long time.
To ensure safe operation, wait for the capacitors to discharge and then measure the intermediate circuit voltage with a suitable measuring device. The voltage must not exceed 30 V DC. The measuring points are shown in the following pictures.



Measuring points Fronius Eco



Measuring points Fronius Symo 10 - 20 kW

ESD guidelines

NOTE!

Observe ESD guidelines when handling electronic components and PC boards.
This primarily applies to ESD-compatible
- Packaging
- Work surfaces
- Floors
- Seating
- Earthing facilities
- Ease of handling

No guarantee or warranty claims can be made in respect of any improperly handled electronic component or PC board.

General

The "Changing components" section describes how to replace components that:
- Have no instructions of their own for replacement and
- Require detailed replacement instructions

Overview

The "Replacing components" chapter is divided into the following sections:

- Opening and closing the device
- Replacing the DC disconnector
- Replacing the Eco DC disconnector
- Replacing the Eco fuse
- Replacing the Overvoltage PC board
- Replacing the external fan
- Replacing the internal fan
- Replacing the Eco internal fan
- Replacing the Datamanager card / WLAN option
- Replacing the display PC board - Recerbo
- Replacing the filter PC board - SymoFIL
- Replacing the filter PC board - EcoFIL
- Replacing the power board - SymoPS AC
- Replacing the power board - SymoPS DC
- Replacing the power board - EcoPS
- Replacing other components

Changing components

Safety

⚠ WARNING!

An electric shock can be fatal.
Before opening the device:

- ▶ Move the mains switch to the "O" position
- ▶ Unplug the device from the mains
- ▶ Put up an easy-to-understand warning sign to stop anybody inadvertently switching it back on again
- ▶ Using a suitable measuring instrument, check to make sure that electrically charged components (e.g. capacitors) have been discharged

⚠ WARNING!

An electric shock can be fatal.
Danger due to residual voltage in capacitors. Wait for the capacitors to discharge. The discharge time is six minutes. See the Operating Instructions and the safety notices on the inverter for more details on discharge time.

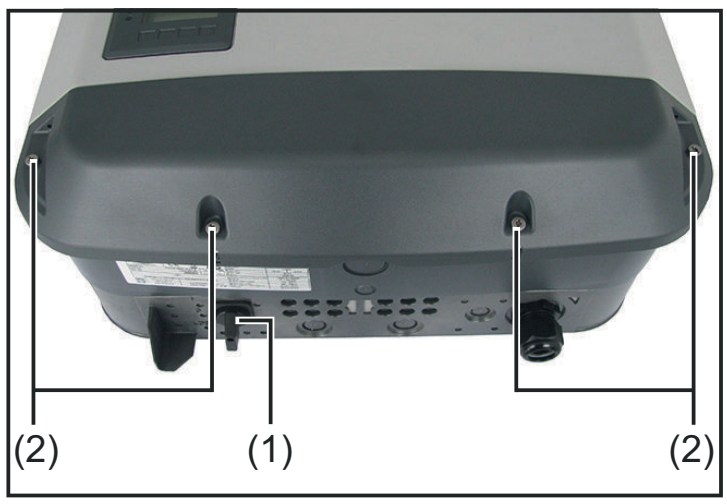
NOTE!

Requirements concerning electrical installations may be subject to national standards and directives, which must be observed.

A safety inspection must be carried out after replacement, modification, maintenance or repair work on any component (see "Safety inspection").

Opening and closing the device

Opening the device:



⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

1. Set the DC disconnector (1) to the O position
2. Undo the four 5x25 TX25 screws (2) and remove the Datcom cover



3. If applicable, disconnect all plug connections
4. Undo the two 5x25 TX25 screws (3)



NOTE!

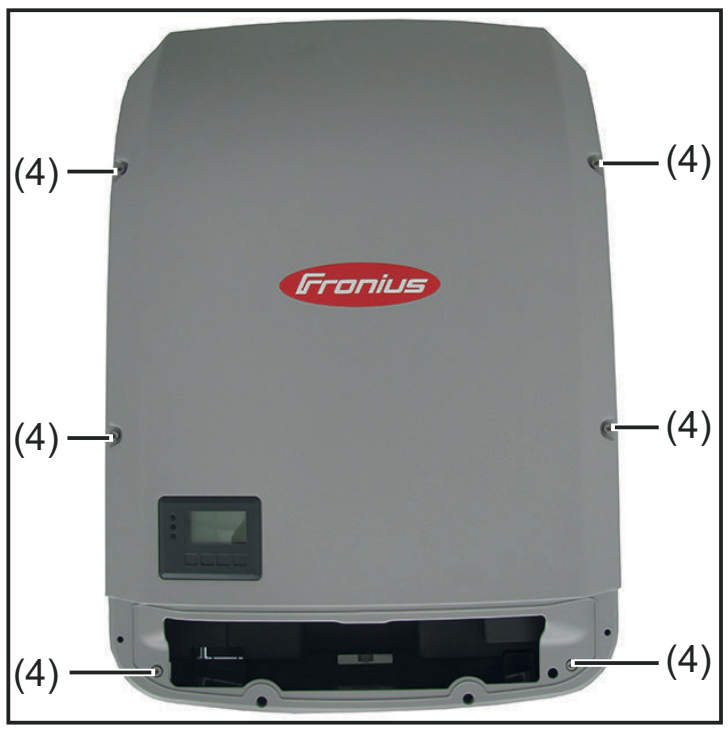
To avoid damaging the base shell, do not angle the inverter by more than 11°.

⚠ WARNING!

Wait for the capacitors to discharge before continuing.

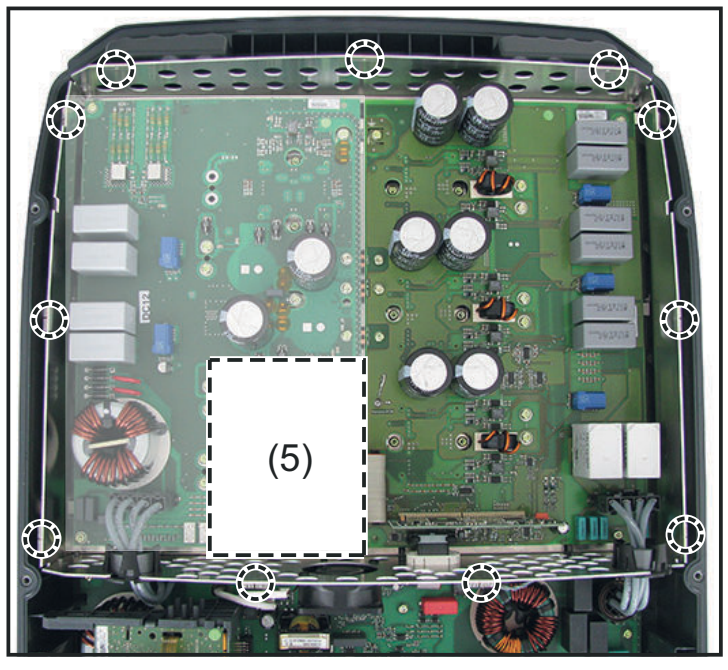
5 Lift the inverter from the Datcom area, disconnecting the connection to the mounting bracket

6 Detach the inverter by lifting it upwards



7 Undo the six 5x16 TX20 screws (4) and remove the power stage set cover
- Fronius Eco: remove the EMC bracket

Closing the device:



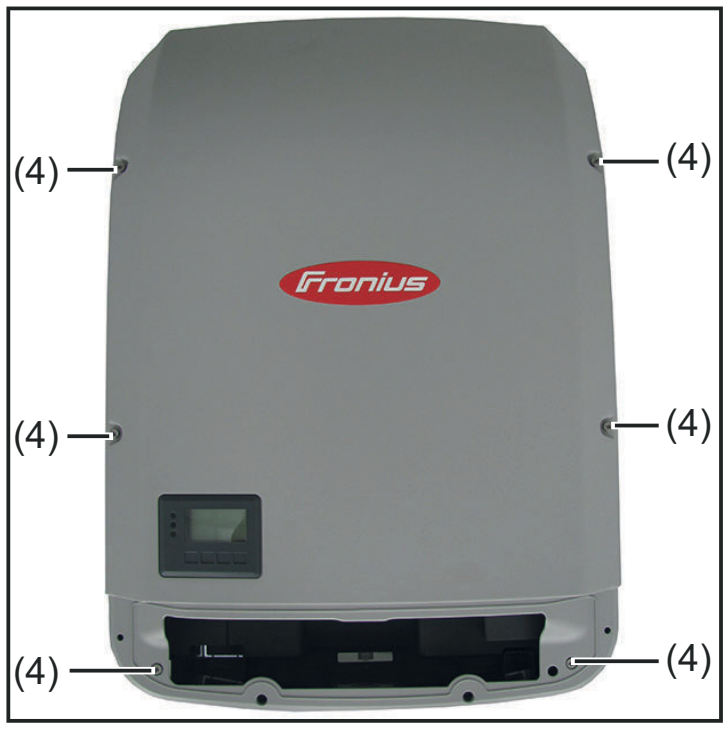
Symo 10-20 / US, Eco / 15.0

NOTE!

To ensure a sufficient EMC connection is established, all EMC springs must be present

1 Make sure that the eleven EMC springs are seated correctly - slight notches hold the EMC springs in place

(The overvoltage PC board may be located in the marked area (5))



2 Position the power stage set cover and fit it using six 5x16 TX20 screws (4)

[3 Nm]

- Fronius Eco: fit the EMC bracket

NOTE!

If the screws no longer fit tightly, they must be replaced with new 5x25 TX25 screws [42,0401,4231]



NOTE!

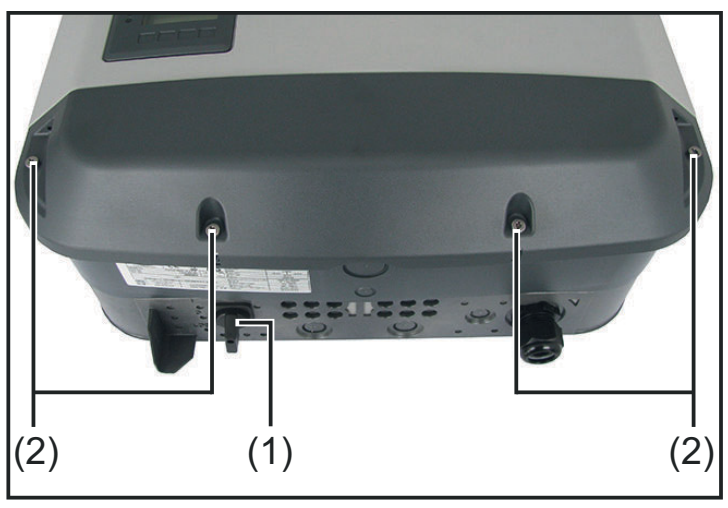
To avoid damaging the base shell, do not angle the inverter by more than 11°.

3 Attach the inverter at the top and allow it to engage in the mounting bracket

4 Fit the two 5x25 TX25 (3) screws to hold the inverter securely in the mounting bracket

[2.5 Nm]

5 If applicable, connect all plug connections

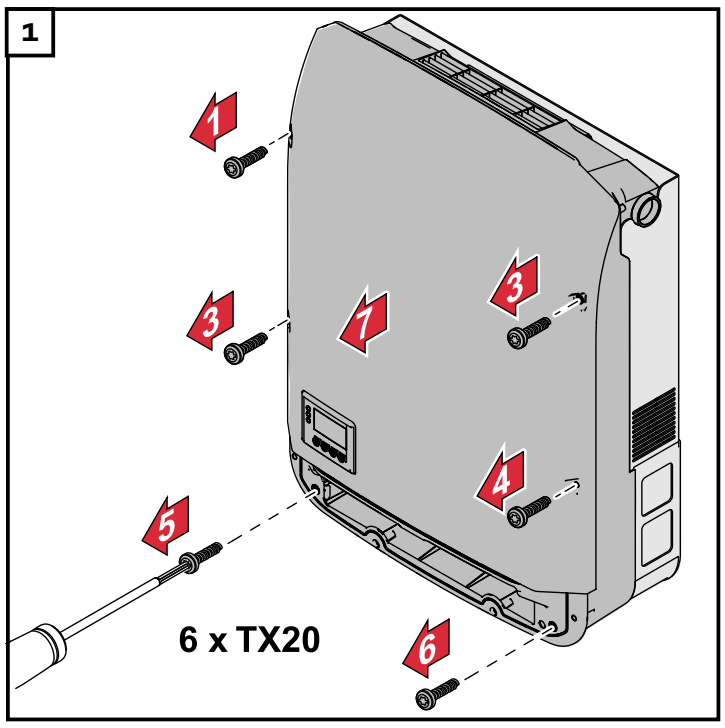


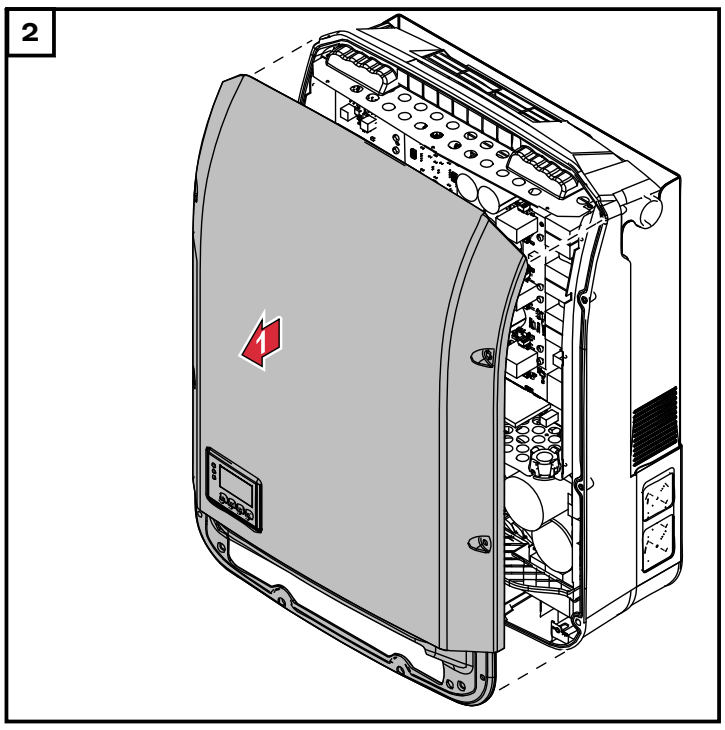
6 Fit the Datcom cover using four 5x25 TX25 screws (2)

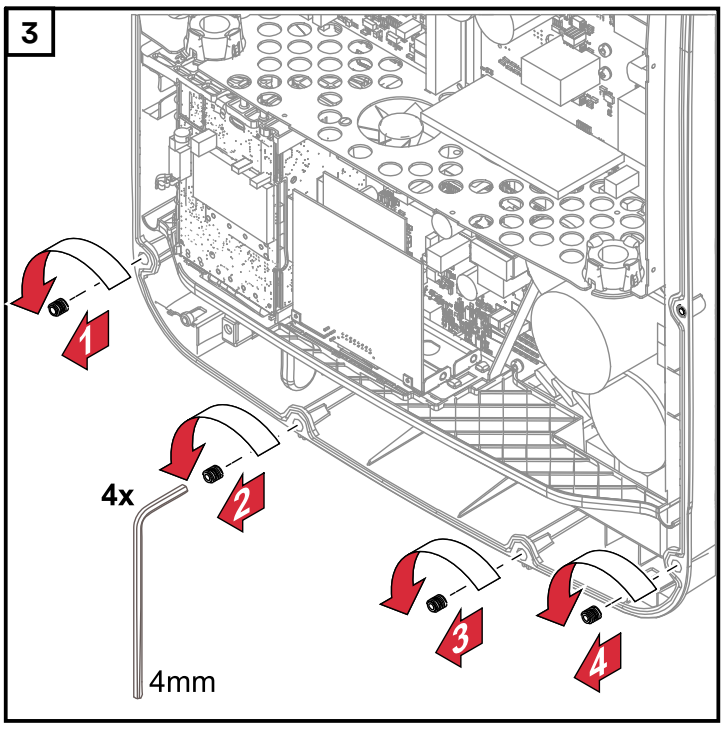
[2.5 Nm]

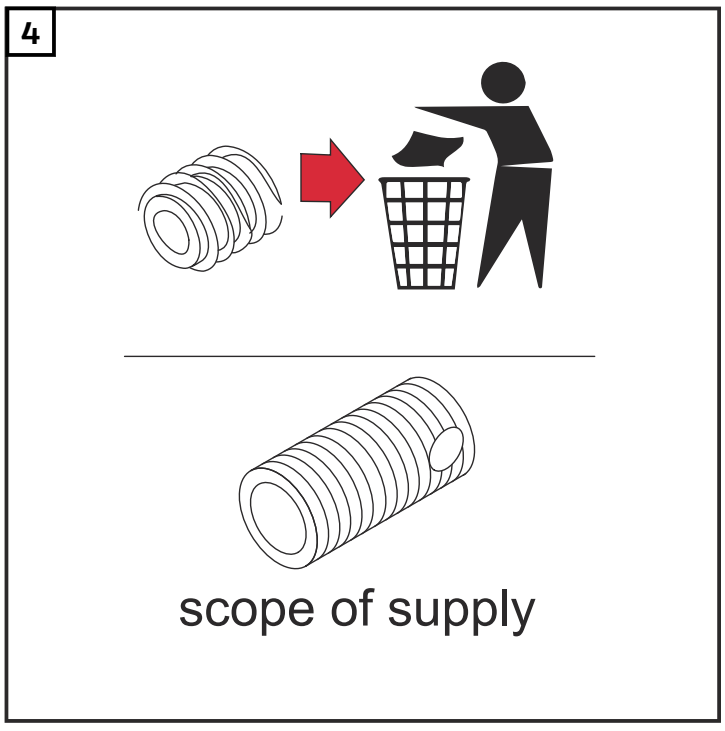
7 Set the DC disconnector (1) to the I position

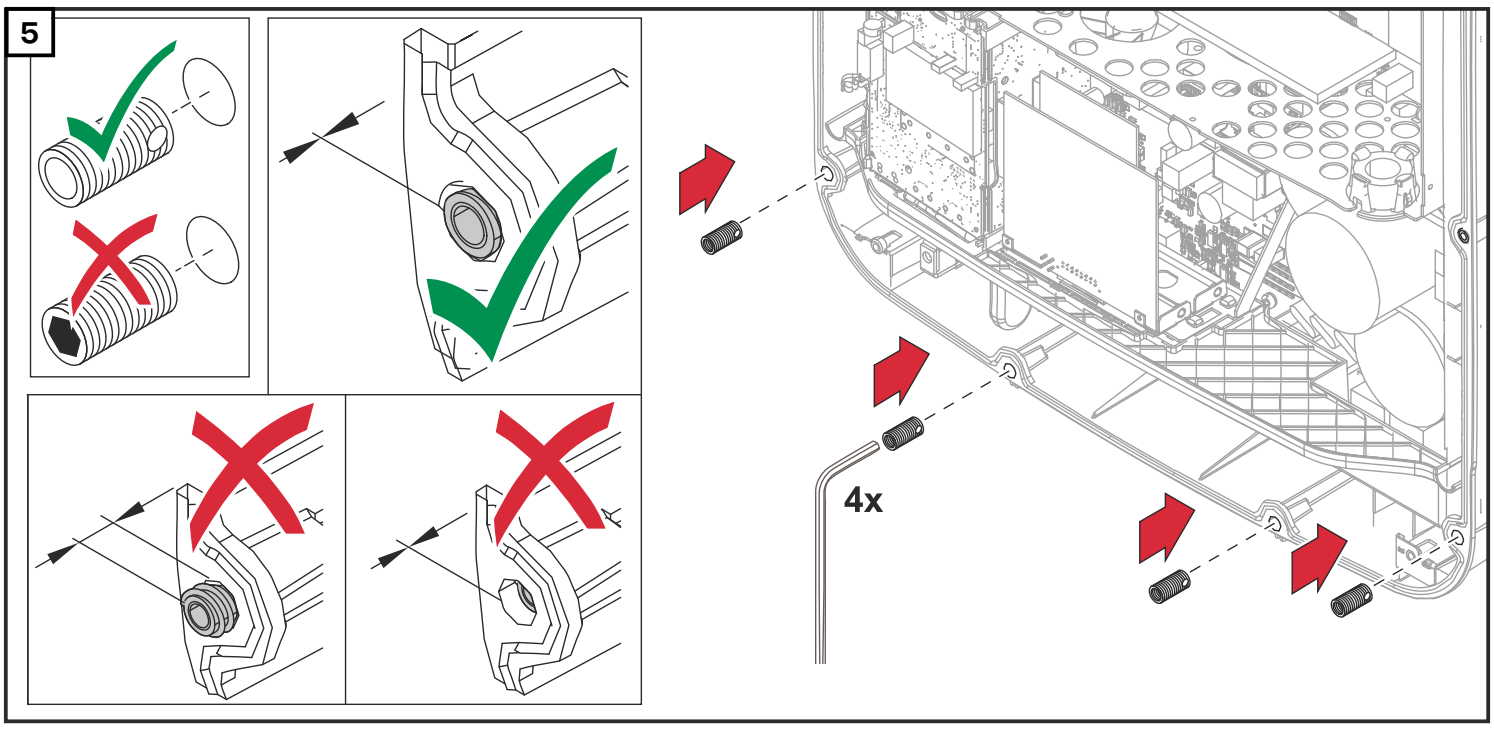
Replacing threaded bushings in the base shell

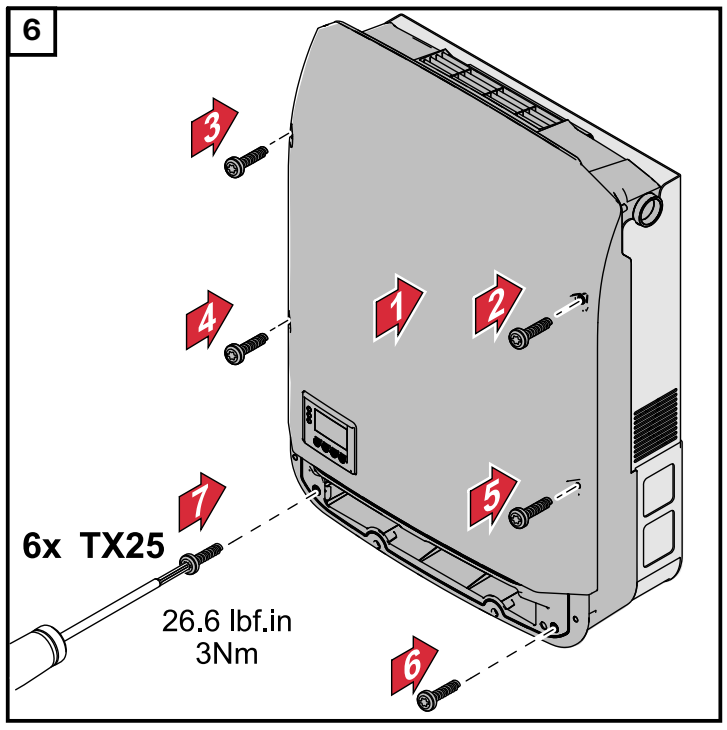






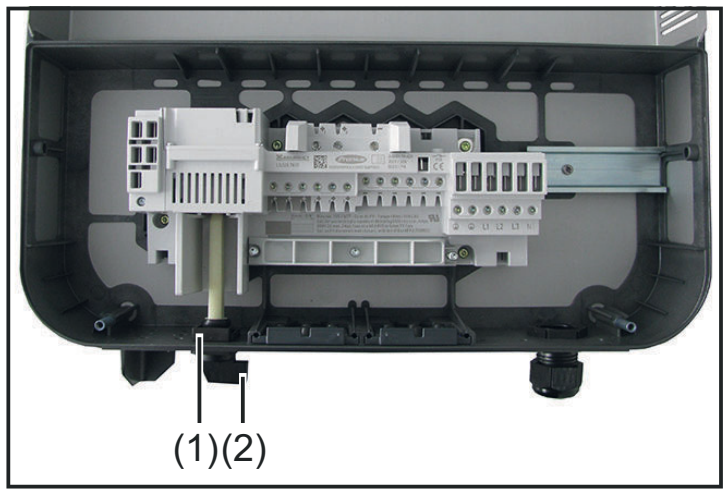





6
3
4
1
2
5
7
6x TX25
26.6 lbf.in
3Nm
6

Replacing the DC disconnector

Removing the DC disconnector:



⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

1 Remove the inverter from the mounting bracket (see "Opening and closing the device")

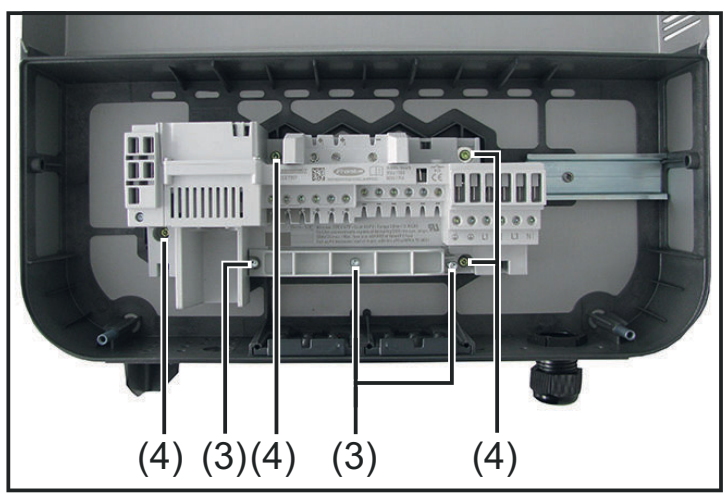
⚠ WARNING!

Take safety precautions.

Observe the safety rules - DC voltage present!

2 Disconnect the AC and DC leads from the terminal block of the DC disconnector

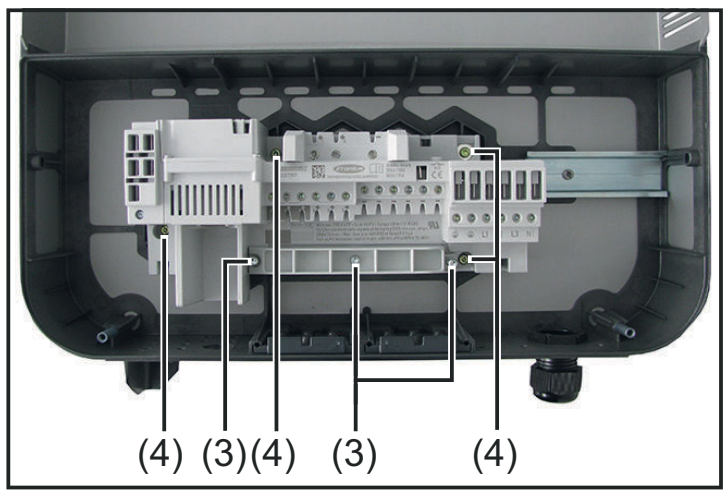
3 Remove the retaining clip (1) and control switch with shaft (2)



4 Undo the three 4x20 TX20 screws (3) and remove the strain relief clamp

5 Undo the four 4x9 TX20 screws (4) and remove the DC disconnector

Installing the DC disconnector:

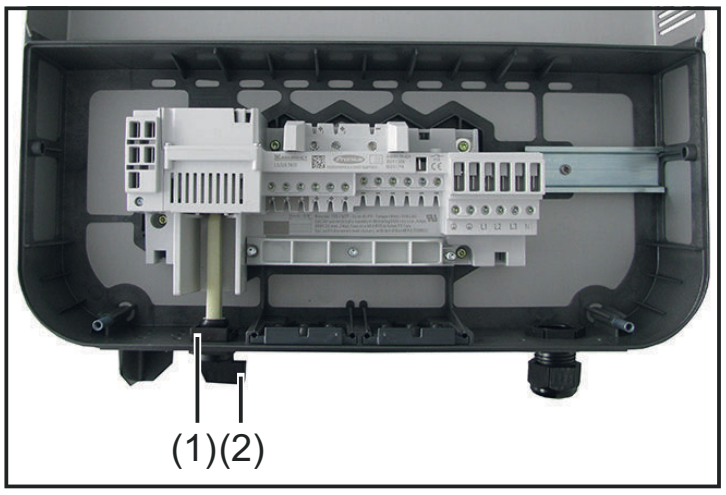


1 Insert the new DC disconnector and secure it using four 4x9 TX20 screws (4)

[2 Nm]

2 Fix the strain relief clamp using three 4x20 TX20 screws (3)

[3-4 turns]



3 Insert the control switch and shaft (2) and secure it using the retaining clip (1)

⚠ WARNING!

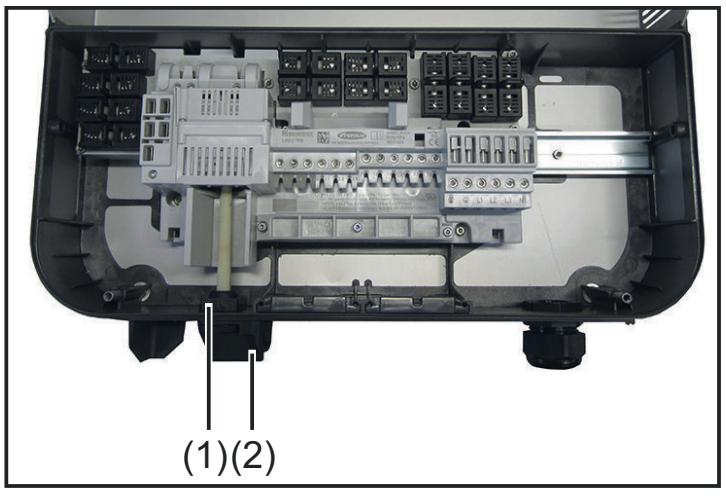
Take safety precautions.
Observe the safety rules - DC voltage present!

4 Connect the AC and DC lines to the terminal block of the DC disconnector

5 Place the inverter in the mounting bracket (see "Opening and closing the device")

Replacing the Eco DC disconnector

Removing the DC disconnector:



⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

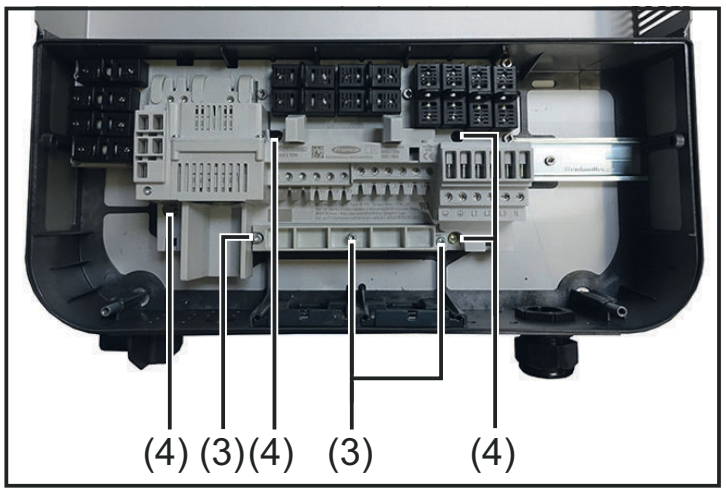
1 Remove the inverter from the mounting bracket (see "Opening and closing the device")

⚠ WARNING!

Take safety precautions.
Observe the safety rules - DC voltage present!

2 Disconnect the AC and DC leads from the terminal block of the DC disconnector

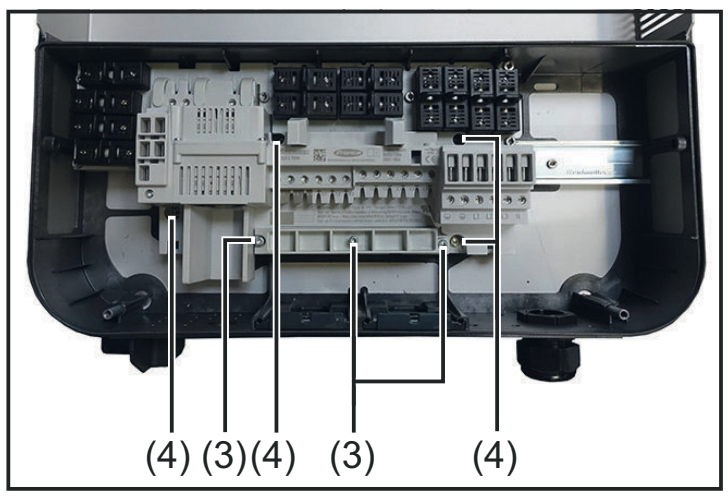
3 Remove the retaining clip (1) and control switch with shaft (2)

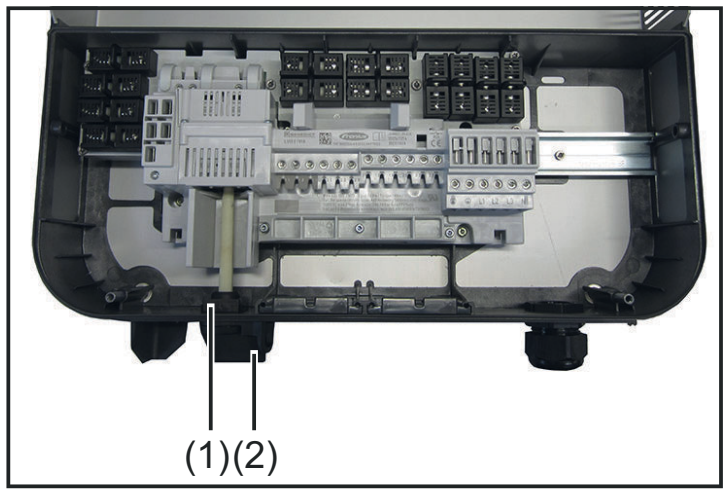


4 Undo the three 4x20 TX20 screws (3) and remove the strain relief clamp

5 Undo the four 4x9 TX20 screws (4) and remove the DC disconnector

Installing the DC disconnector:





1 Insert the new DC disconnector and secure it using four 4x9 TX20 screws (4)

[2 Nm]

2 Fix the strain relief clamp using three 4x20 TX20 screws (3)

[3-4 turns]

3 Insert the control switch and shaft (2) and secure it using the retaining clip (1)

⚠ WARNING!

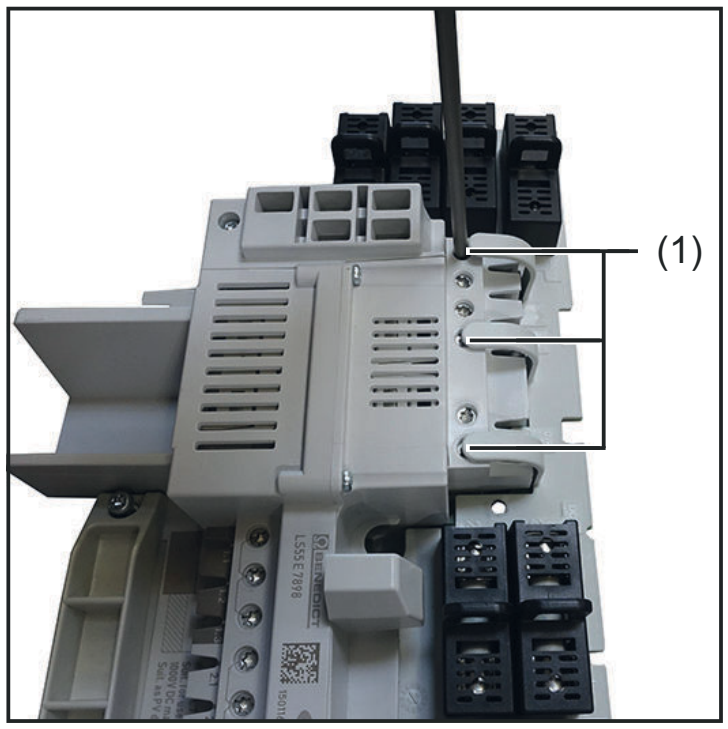
Take safety precautions.
Observe the safety rules - DC voltage present!

4 Connect the AC and DC lines to the terminal block of the DC disconnector

5 Place the inverter in the mounting bracket (see "Opening and closing the device")

Replacing the Eco fuse

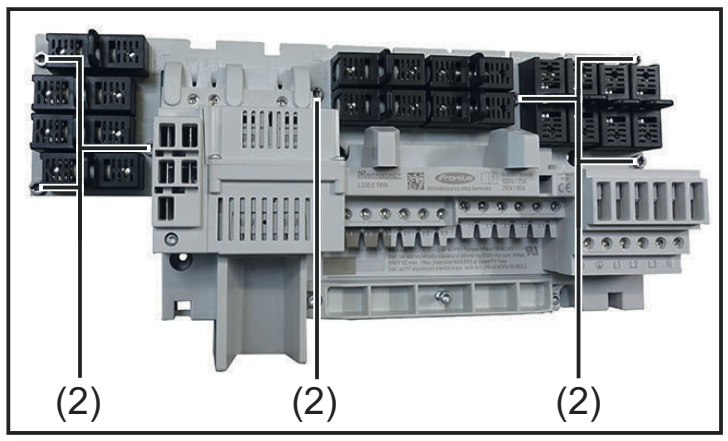
Removing the Eco fuse:



⚠ WARNING!

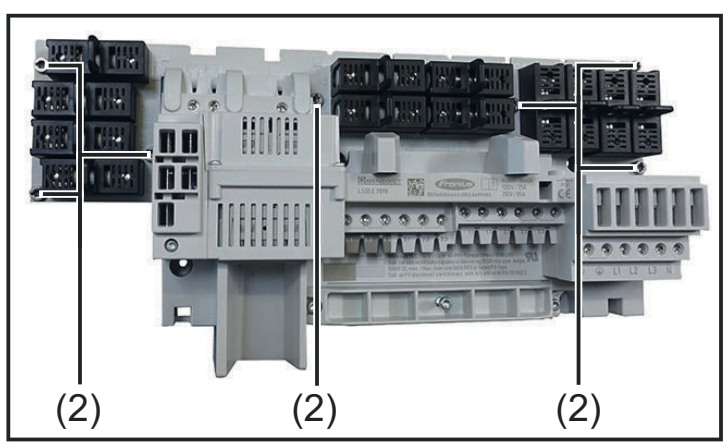
Observe the safety rules (see the beginning of the "Safety" section)

1. Take the inverter out of the mounting bracket and remove the Eco DC disconnector (see "Opening and closing the device" and "Replacing the Eco DC disconnector" sections)
2. Undo the three TX20 screws (1)



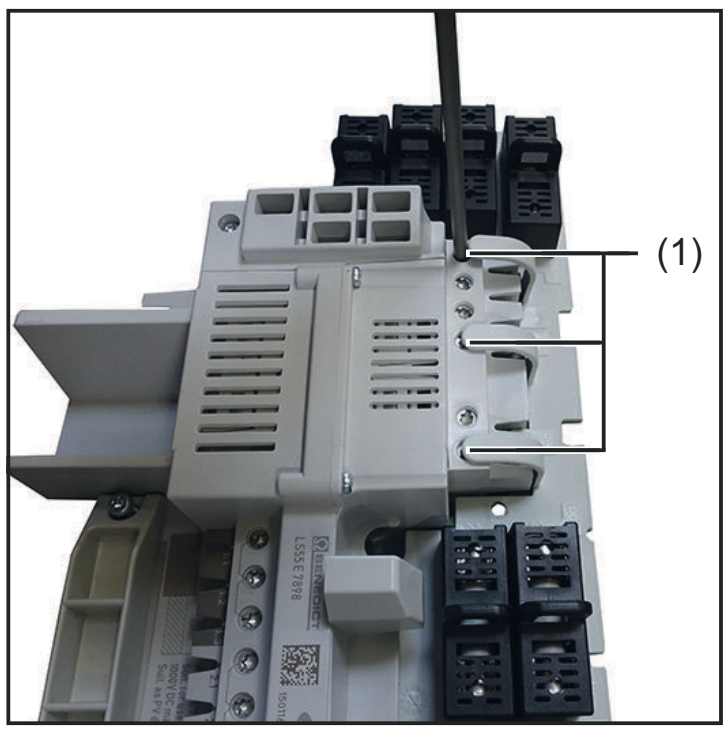
3. Undo the seven 4x12 TX20 screws (2) and remove the Eco fuse

Installing the Eco fuse:



1. Insert the new Eco fuse and secure it using seven 4x12 TX20 screws (2)

   [1.5 Nm]



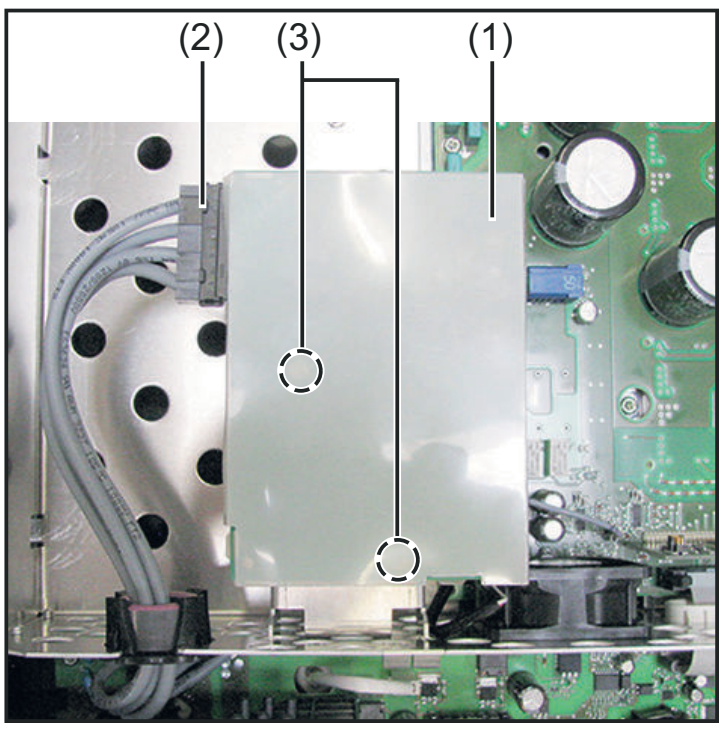
2. Tighten the three TX20 screws (1)
3. Insert the Eco DC disconnector, close the inverter and place it in the mounting bracket (see "Replacing the Eco DC disconnector" and "Opening and closing the device" sections)

Replacing the Overvoltage PC board Eco

NOTE!

The SymoPS DC power board from version V1.
4A_B already has an integrated overvoltage function. If the SymoPS DC replacement PC board is version V1.4A_B or higher, any existing OVP SYMPRI overvoltage PC board must be removed.

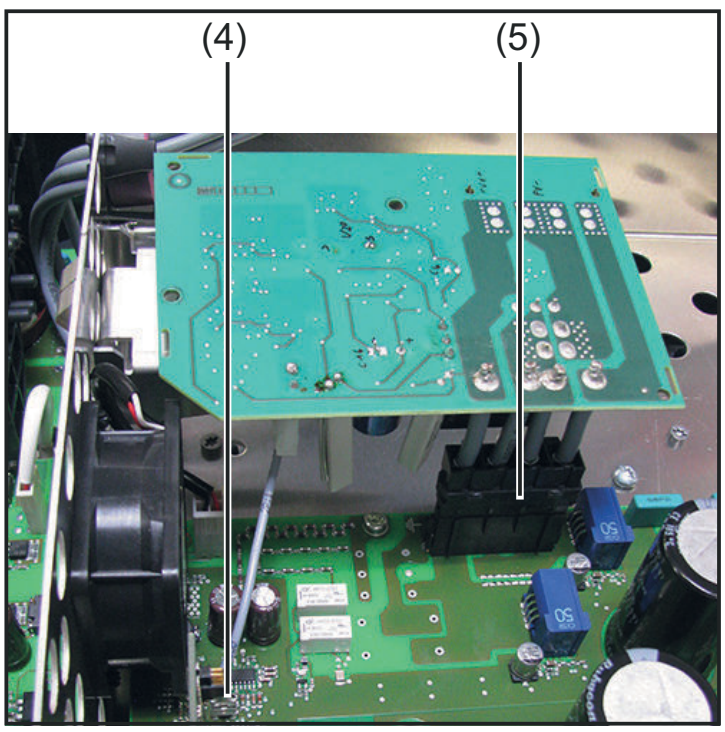
Removing the overvoltage PC board:



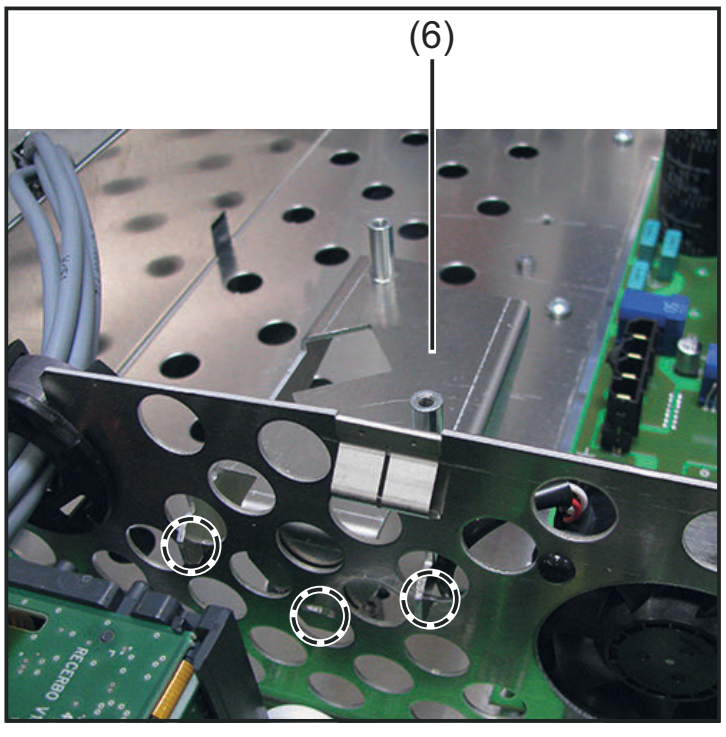
⚠ WARNING!

Observe the safety rules (see the beginning of the “Safety“ section)

1. Take the inverter out of the wall bracket and open it (see “Opening and closing the device“ section)
2. Remove the insulation sheet (1)
3. Undo the plug connection to the OVP (2)
4. Undo the two 4x9 TX20 screws (3)

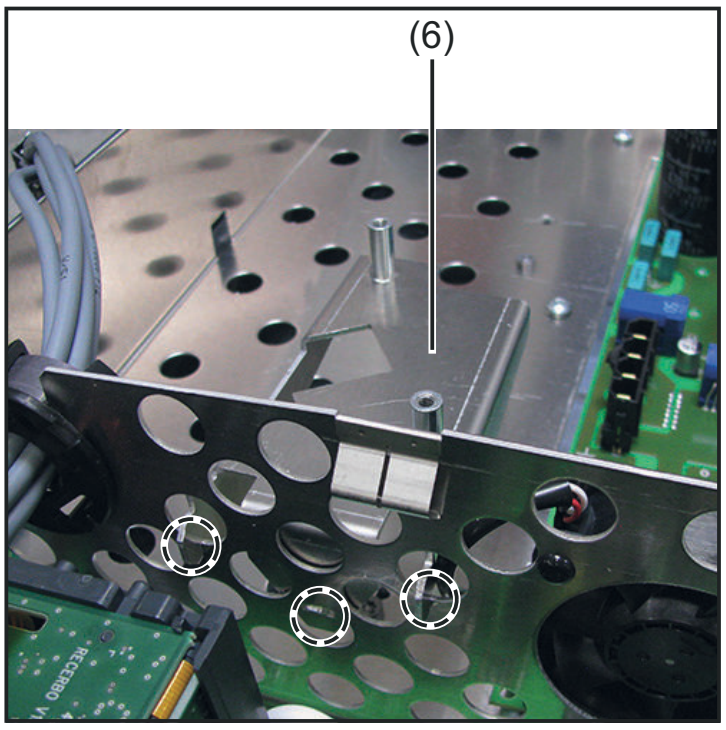


5. Undo cable connection (4)
6. Undo the plug connection to the PS (5)
7. Remove the overvoltage PC board

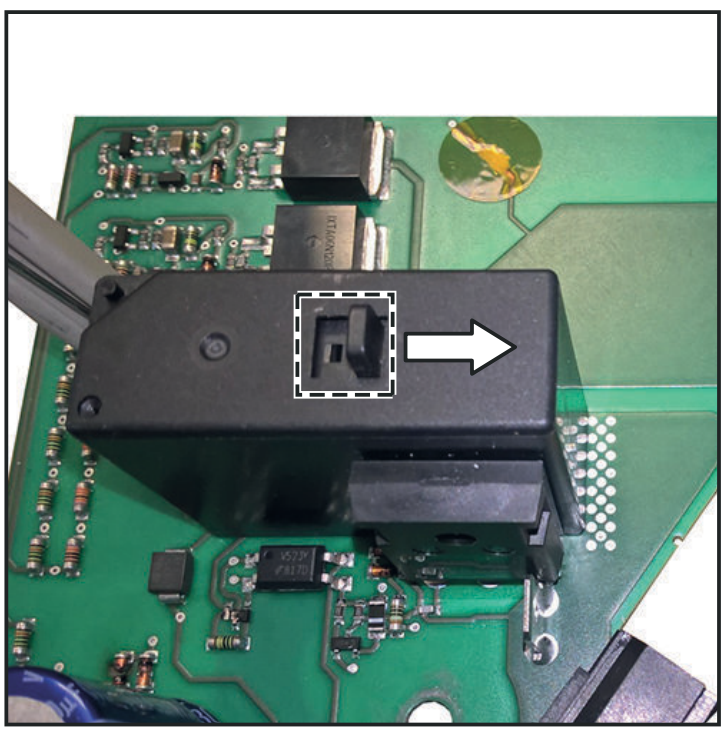


8 Detach and remove the OVP retaining plate (6) at he marked spots

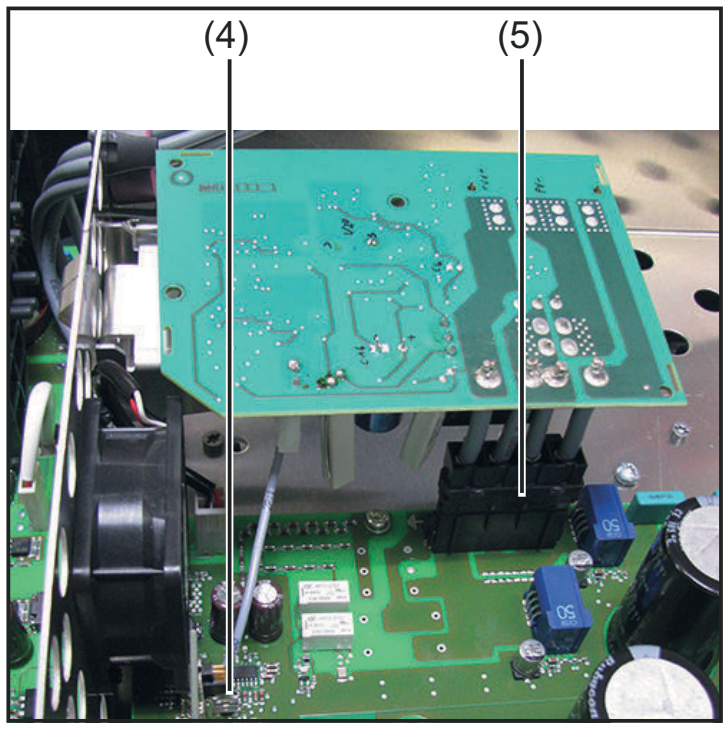
Inserting the overvoltage PC board:



1 Attach the OVP retaining plate (6) at the marked spots



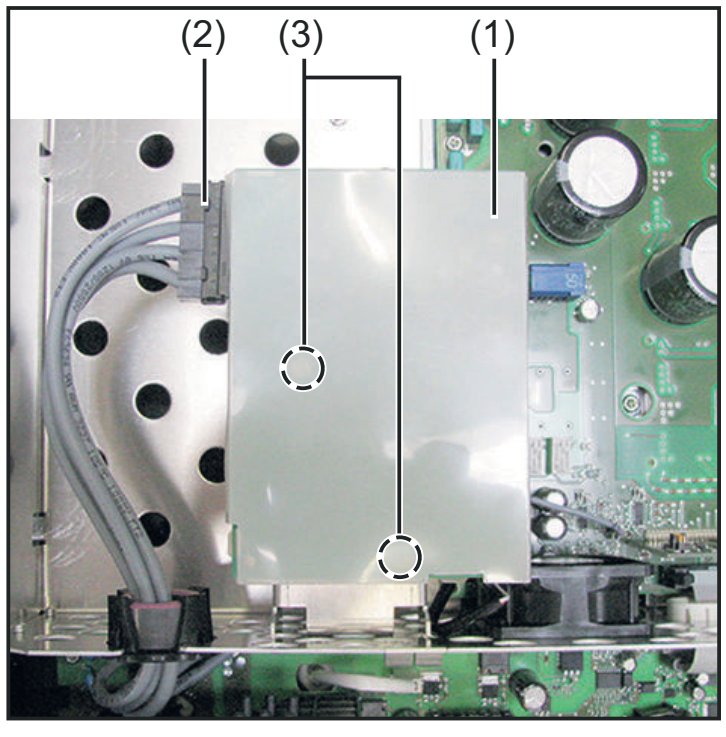
2 Move the relay switch to the correct position



3 Insert the overvoltage PC board

4 Establish cable connection (4)

5 Establish a connection to the PS (5)



6 Mount the new overvoltage PC board with two 4x9 TX20 screws (3)

[2 Nm]

7 Establish a connection to the OVP (5)

8 Insert insulating sheet (1)

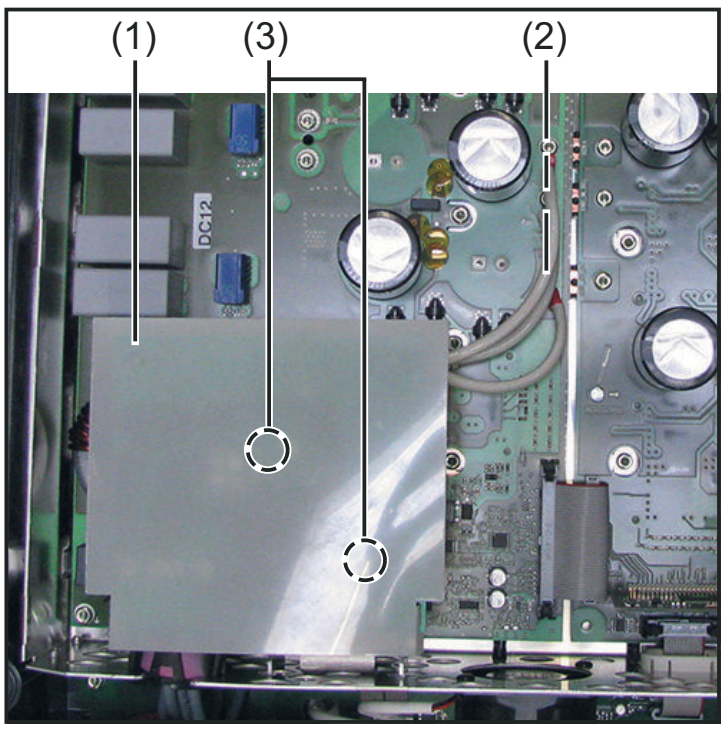
9 Close the inverter and place it into the wall bracket (see “Opening and closing the device“ section)

Replacing the overvoltage PC board - Symo

NOTE!

The SymoPS DC power board from version V1.
4A_B already has an integrated overvoltage function. If the SymoPS DC replacement PC board is version V1.4A_B or higher, any existing OVP SYMPRI overvoltage PC board must be removed.

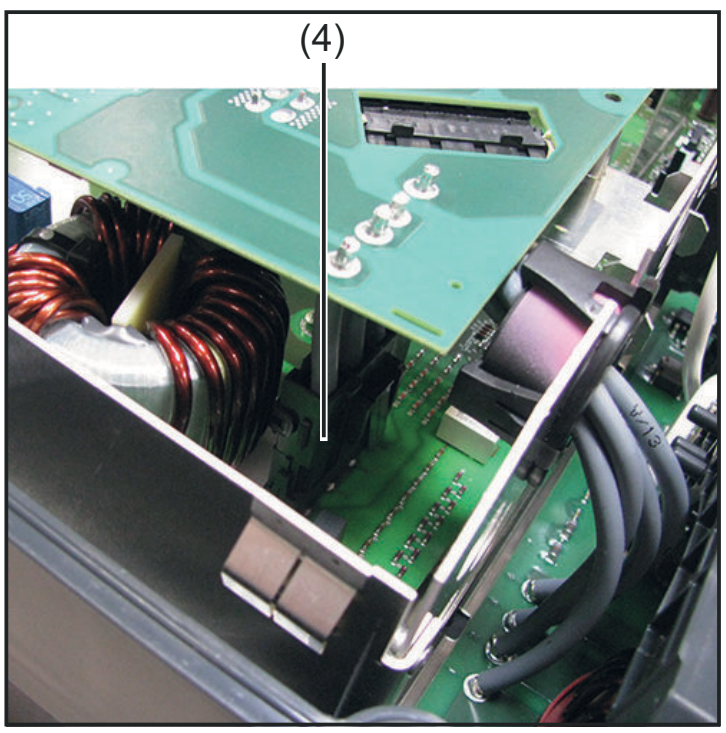
Removing the overvoltage PC board:



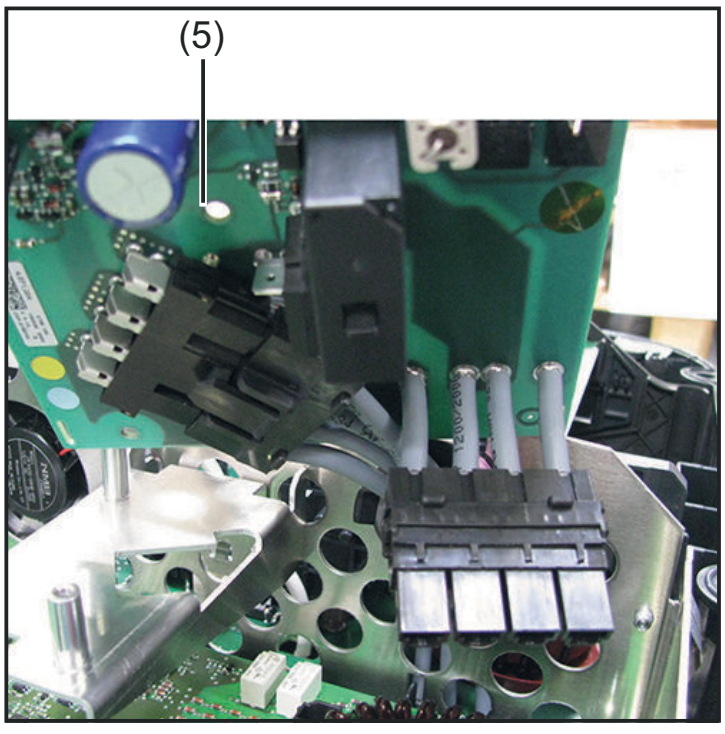
⚠ WARNING!

Observe the safety rules (see the beginning of the “Safety“ section)

1. Take the inverter out of the wall bracket and open it (see “Opening and closing the device“ section)
2. Remove the insulation sheet (1)
3. Undo the three 4x9 TX20 screws of the cable connections (2)
4. Undo the two 4x9 TX20 screws (3)

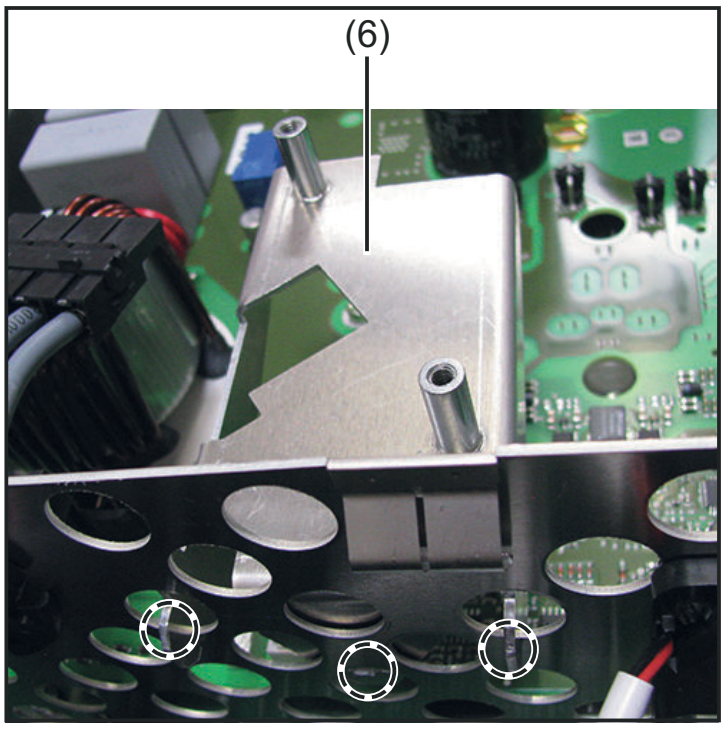


5. Undo the plug connection to the PS(4)



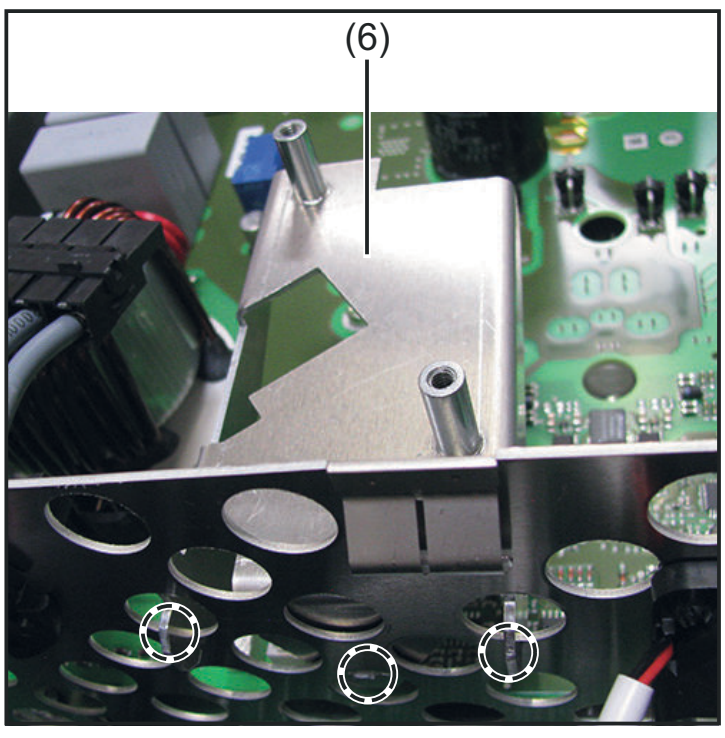
6 Undo the plug connection to the OVP (5)

7 Remove the overvoltage PC board

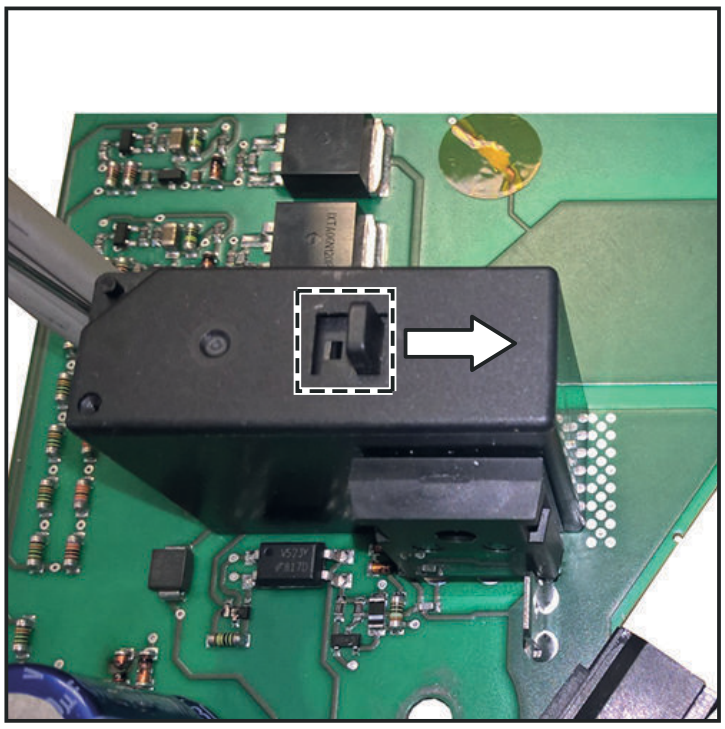


8 Detach and remove the OVP retaining plate (6) at he marked spots

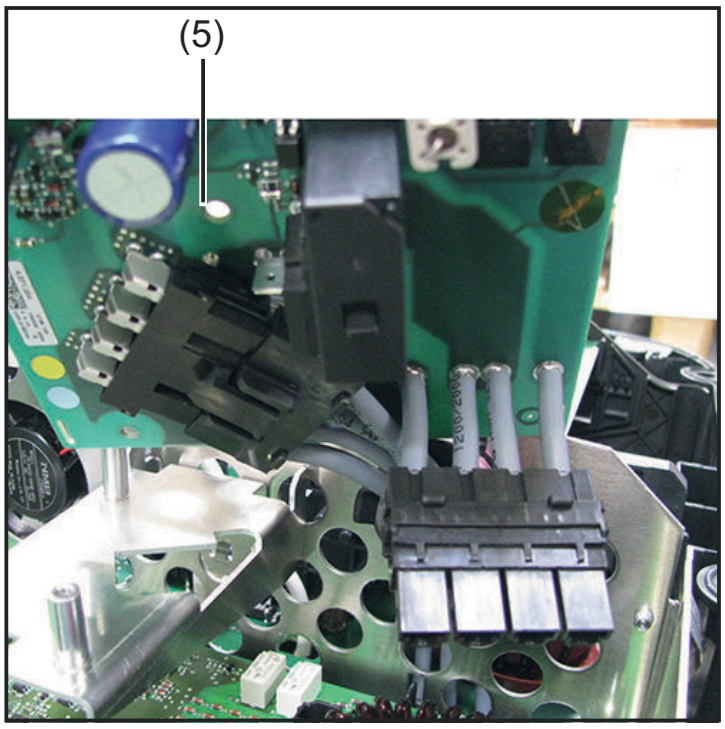
Inserting the overvoltage PC board:



1 Attach the OVP retaining plate (6) at the marked spots

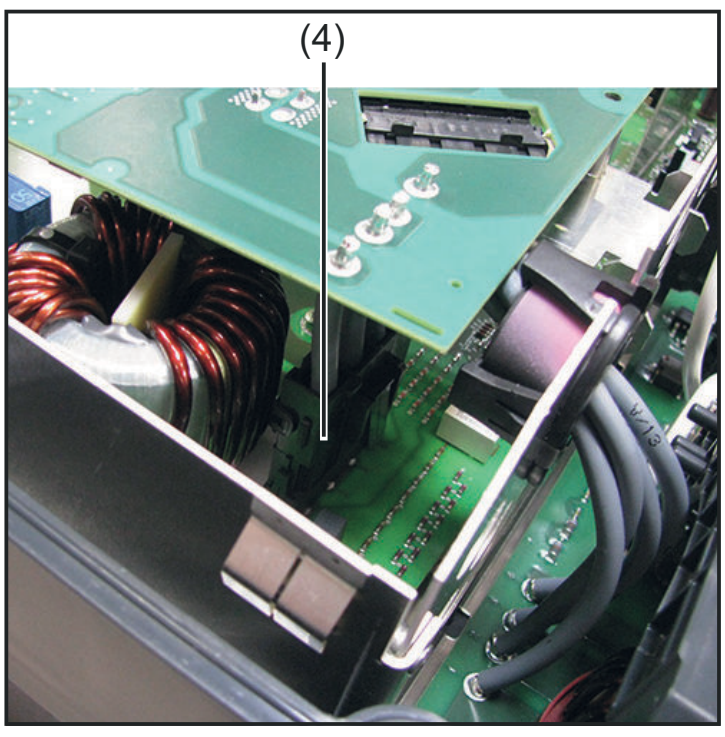


2 Move the relay switch to the correct position

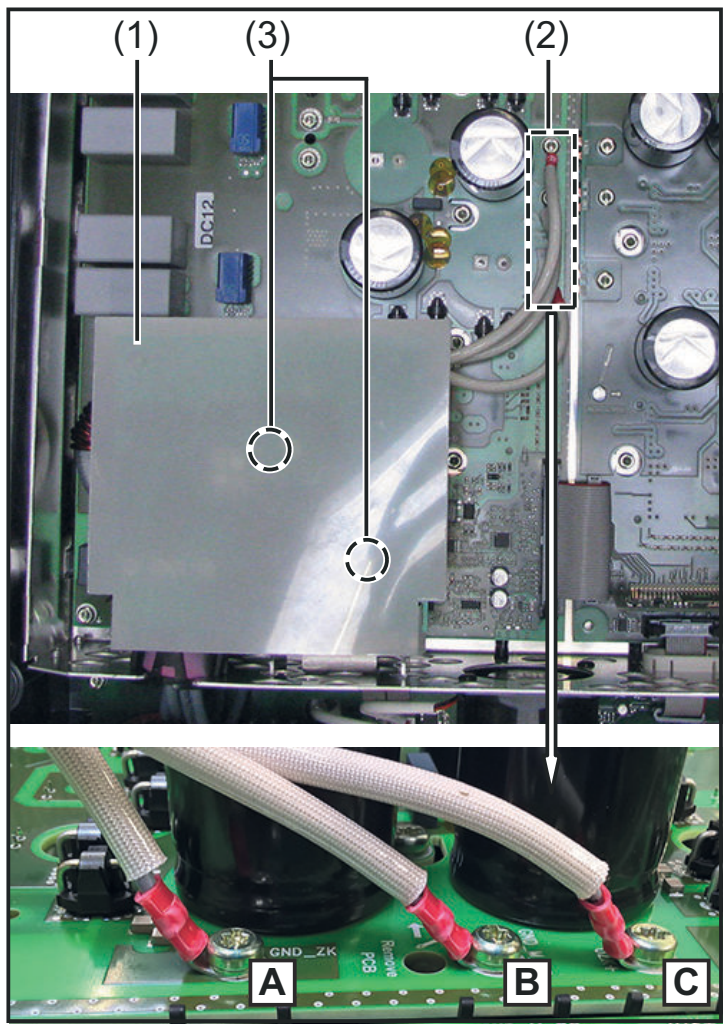


3 Insert the overvoltage PC board

4 Establish a connection to the OVP (5)



5 Establish cable connection (4)



6 Mount the new overvoltage PC board with two 4x9 TX20 screws (3)

[2 Nm]

IMPORTANT!

Make sure that cable connections A (short), B (medium) and C (long) are bent in such a way they point away from the PC board (see illustration)

---

7 Mount cable connection (2) with three 4x9 TX20 screws

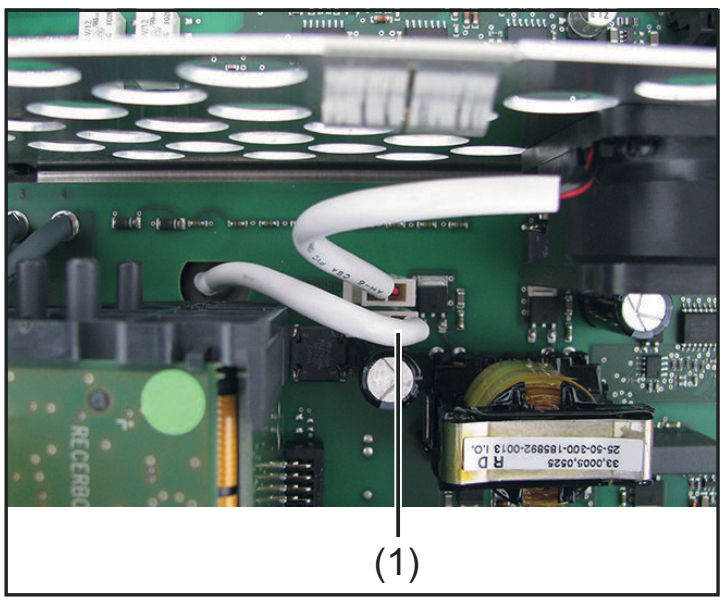
[2 Nm]

8 Insert insulating sheet (1)

9 Close the inverter and place it into the wall bracket (see “Opening and closing the device“ section)

Replacing the external fan

Removing the external fan:



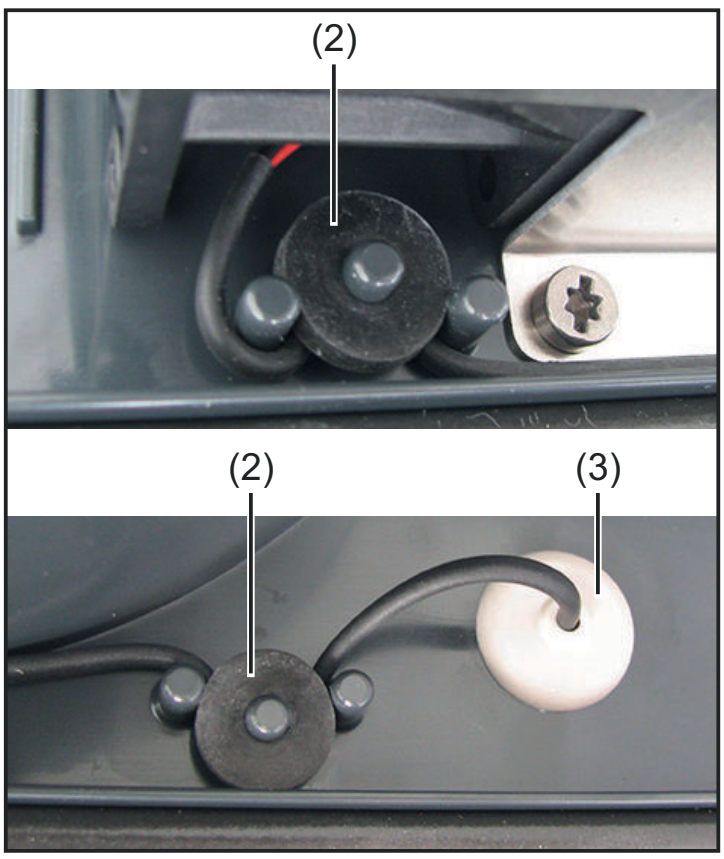
⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

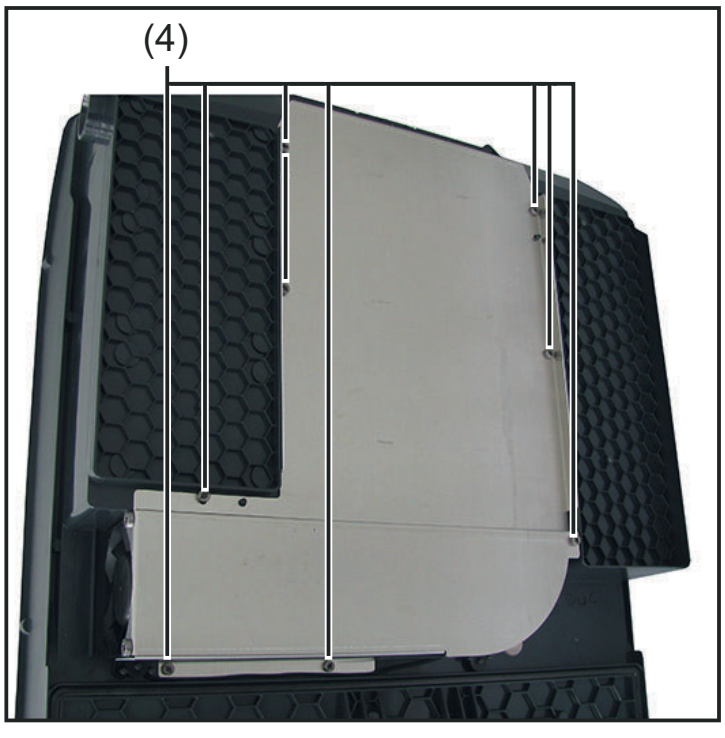
1. Take the inverter out of the wall bracket and open it (see "Opening and closing the device")
2. Unplug the fan cable (1) from the SymoFIL / EcoFIL

NOTE!

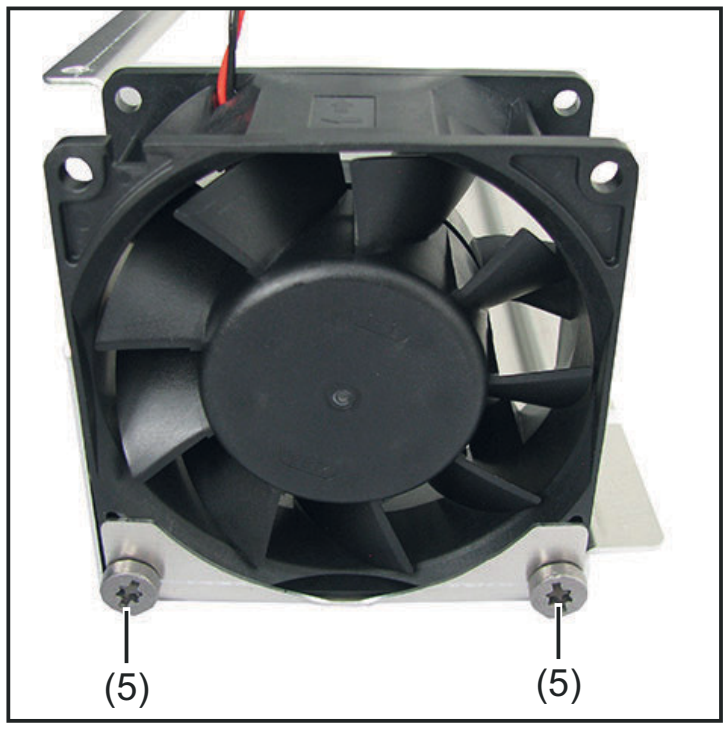
Turn the inverter carefully so that the back of the inverter is accessible.



3. Pull off the two rubber seals (2)
4. Take the fan cable out of both strain-relief devices
5. Pull off the cable gland (3)
6. Thread out the fan cable

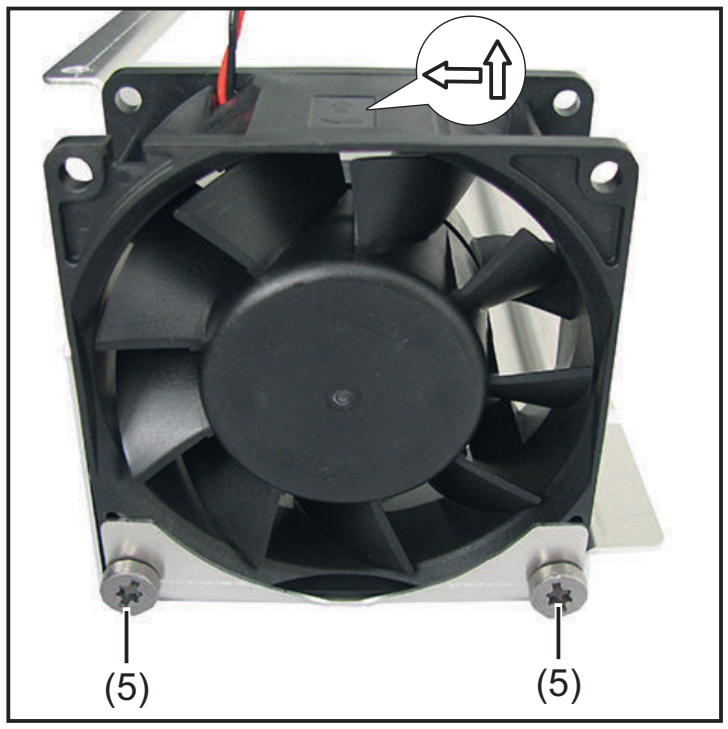


7. Undo the eight 4x8 TX25 screws (4) and remove the air guide plate



8 Undo the two 5x10 TX25 screws (5) and remove the external fan

Inserting the external fan:

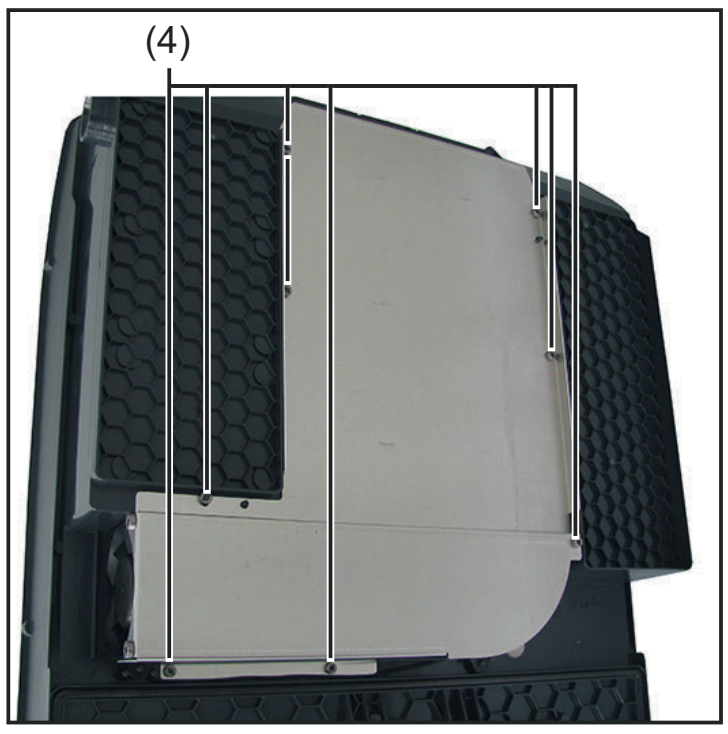


NOTE!

Ensure the flow of air is into the device!

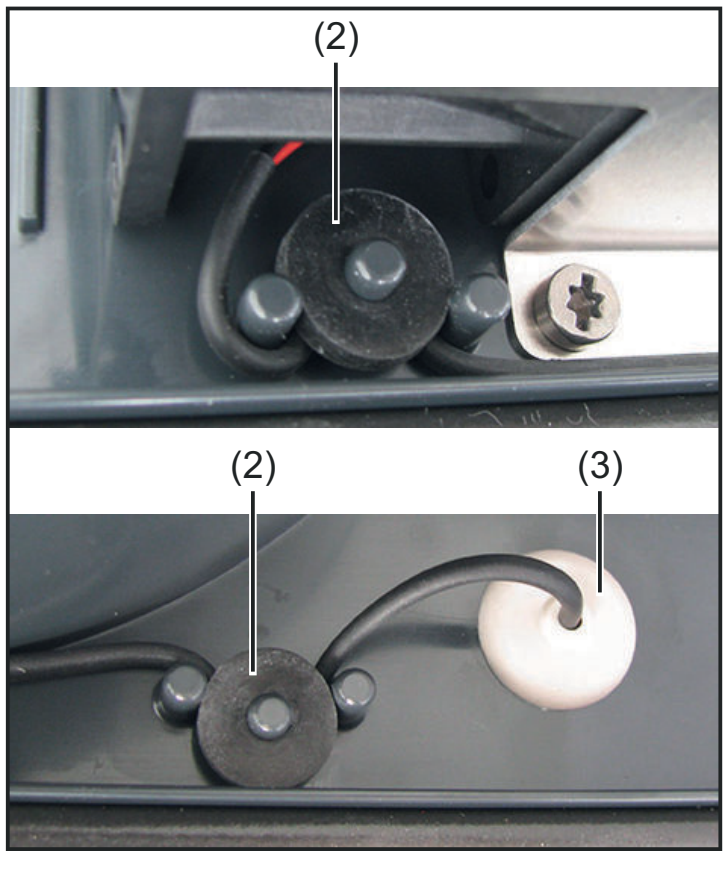
1 Fit the new external fan with two 5x10 TX25 screws (5)

[1.5 Nm]



2 Fit the air guide plate with eight 4x8 TX25 screws (4)

[1.5 Nm]



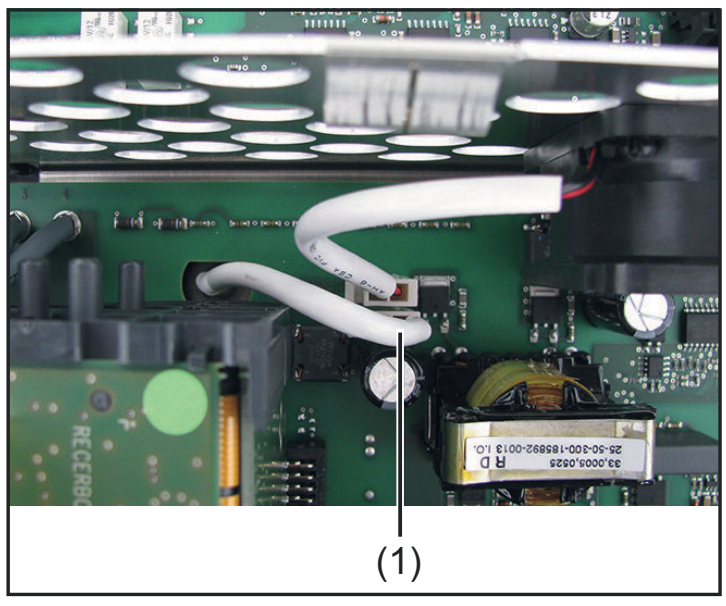
3 Thread in the fan cable, pushing in the cable gland (3) as you do so

4 Feed the fan cable through both strain-relief devices

5 Fit the two rubber seals (2)

⚠ WARNING!

To ensure there are no leaks, the cable gland must be securely in place



NOTE!

Carefully turn the inverter round.

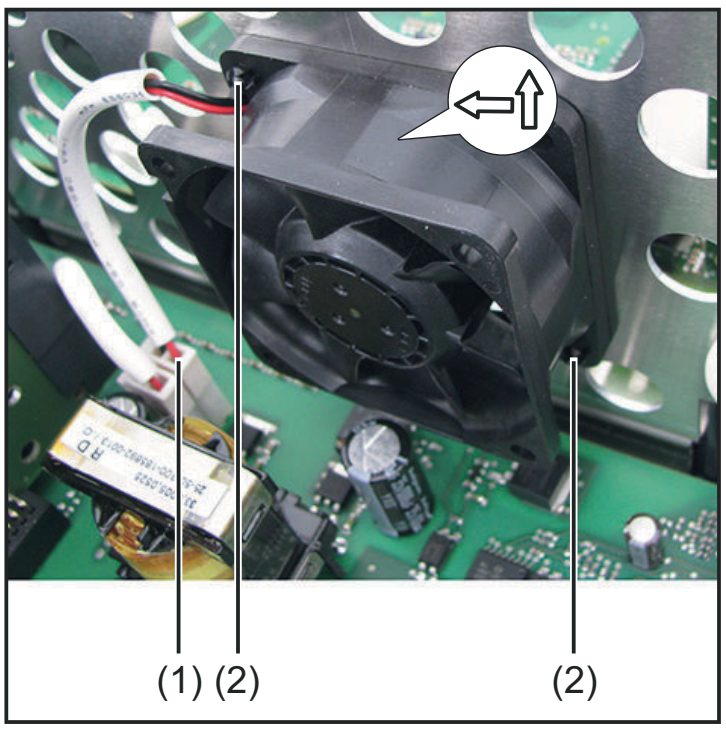
5 Plug the fan cable (1) into the SymoFIL / EcoFIL

6 Close the inverter and place it in the wall bracket (see "Opening and closing the device")

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing the Symo internal fan

Removing the internal fan:

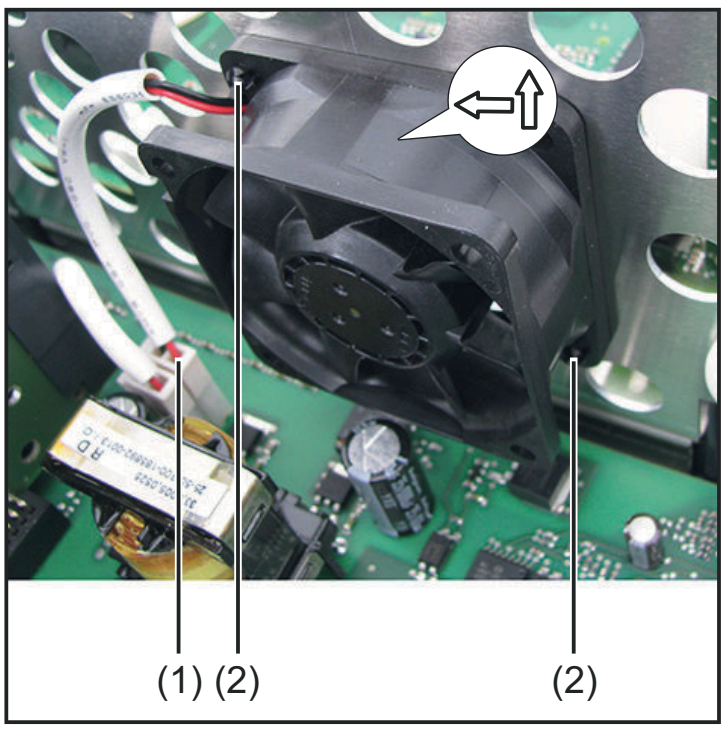


⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

1. Take the inverter out of the wall bracket and open it (see "Opening and closing the device")
2. Unplug the fan cable (1) from the SymoPS
3. Use a slotted screwdriver to undo the expanding rivets (2)
4. Remove the internal fan

Inserting the internal fan:



NOTE!

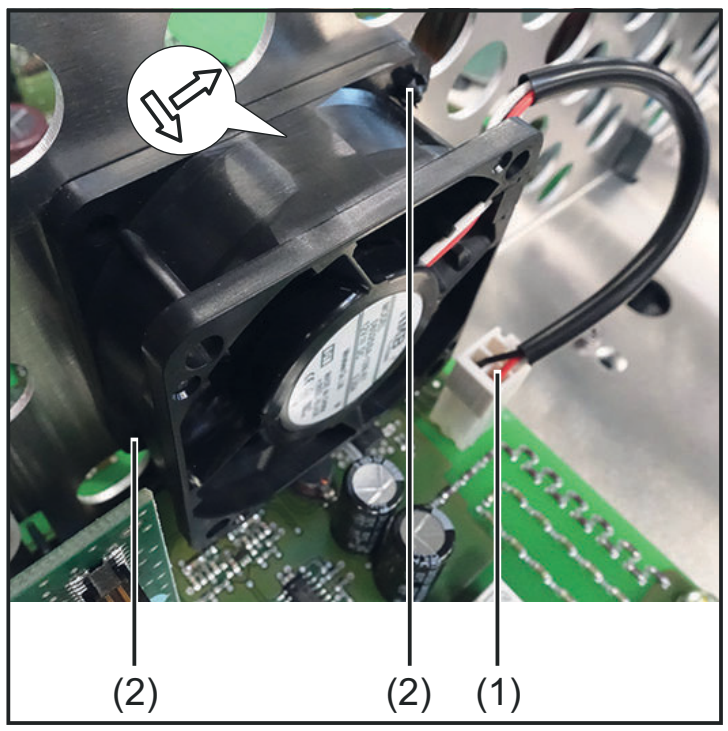
Observe the direction of the air flow in the device.

1. Insert the internal fan
2. Use a slotted screwdriver to press in the expanding rivets (2)
3. Plug in the fan cable (1) into the SymoFIL
4. Close the inverter and place it in the wall bracket (see "Opening and closing the device")

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing the Eco internal fan

Removing internal fan 1:

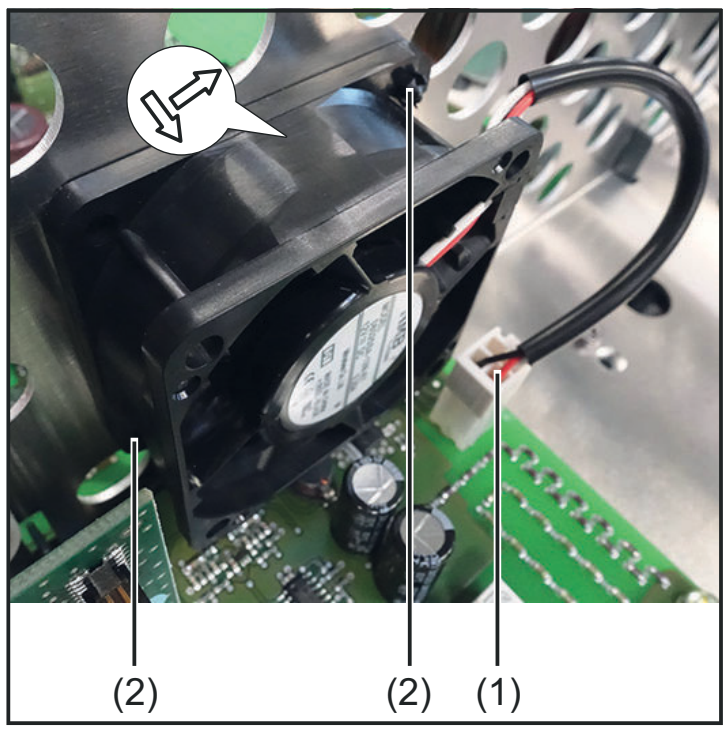


⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

1. Take the inverter out of the wall bracket and open it (see "Opening and closing the device")
2. Disconnect the fan cable (1) from the EcoPS
3. Use a slotted screwdriver to undo the expanding rivets (2)
4. Remove the internal fan

Inserting internal fan 1:



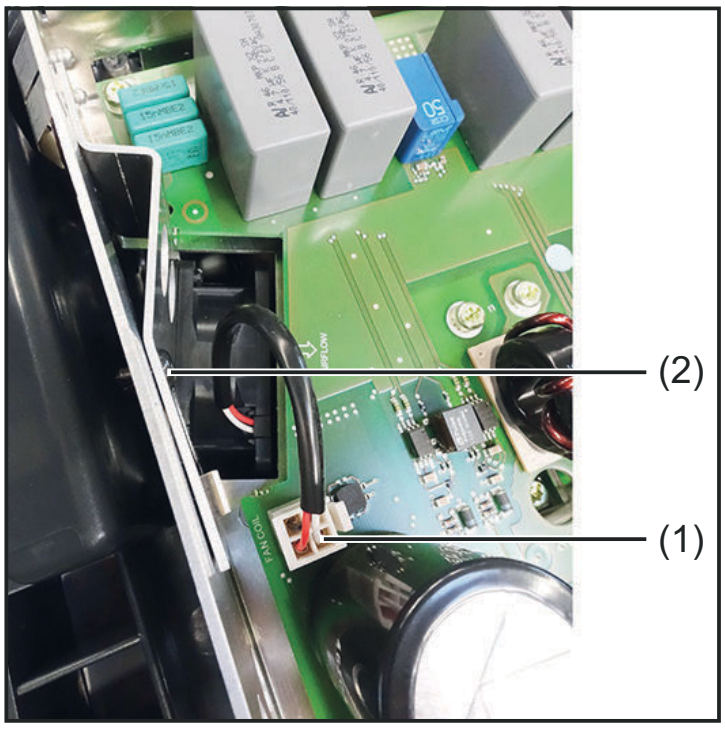
NOTE!

Ensure the flow of air is into the device!

1. Insert the internal fan
2. Use a slotted screwdriver to press in the expanding rivets (2)
3. Connect the fan cable (1) to the EcoPS
4. Close the inverter and place it in the wall bracket (see "Opening and closing the device")

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

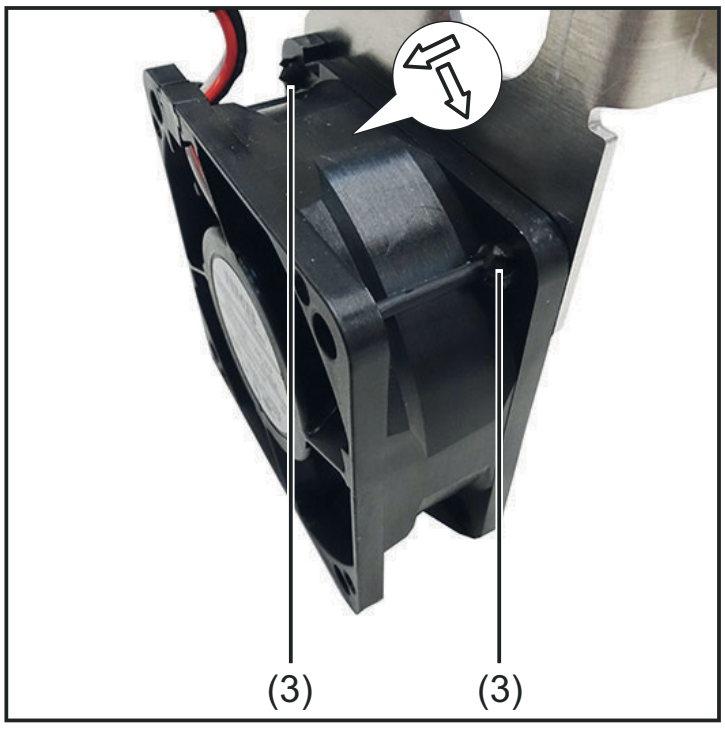
Removing internal fan 2:



⚠ WARNING!

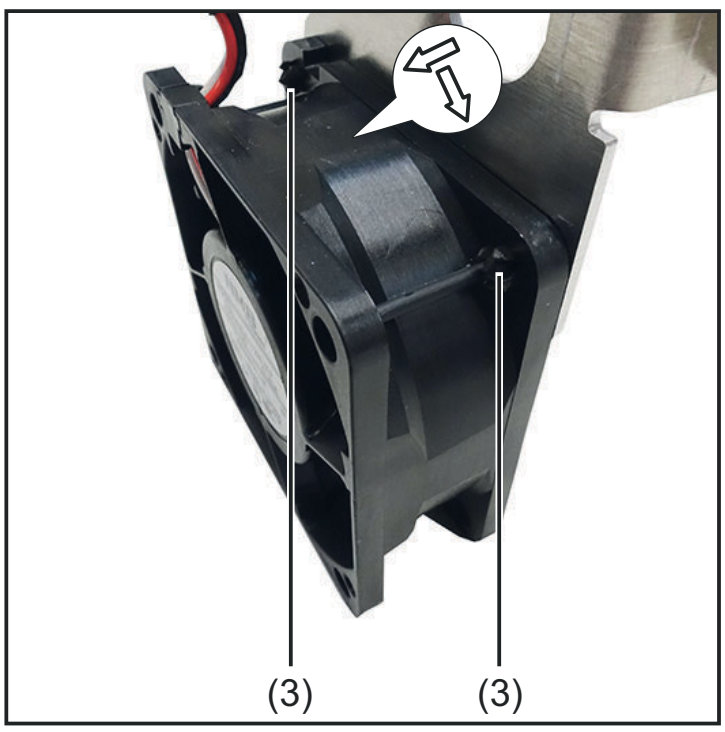
Observe the safety rules (see the beginning of the "Safety" section)

1. Disconnect the fan cable (1) from the EcoPS
2. Use a slotted screwdriver to undo the expanding rivets (2)
3. Remove the internal fan module



4. Use a slotted screwdriver to undo the expanding rivets (3)
5. Remove the internal fan

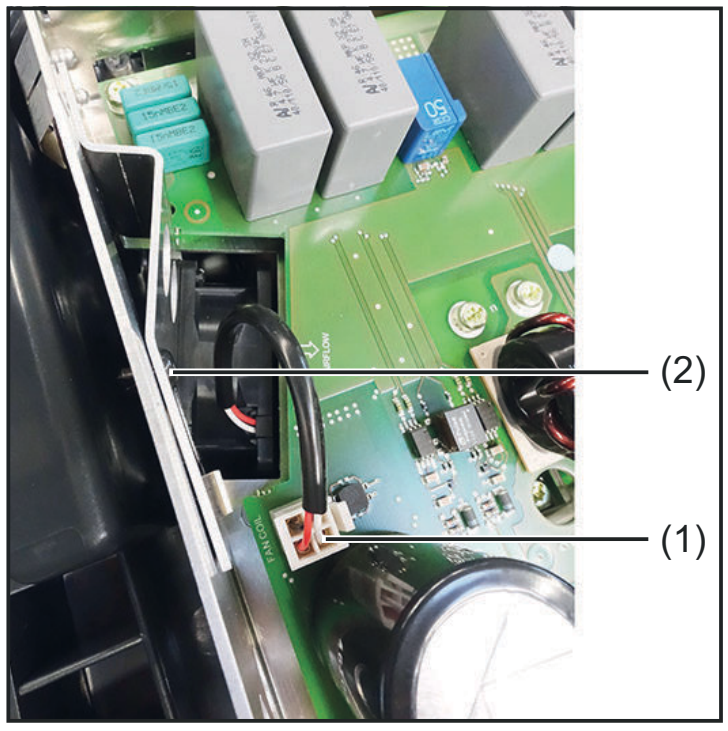
Inserting internal fan 2:



NOTE!

Ensure the flow of air is away from the fan holder!

1. Insert the internal fan
2. Use a slotted screwdriver to press in the expanding rivets (3)



3 Insert the internal fan module

4 Use a slotted screwdriver to press in the expanding rivets (2)

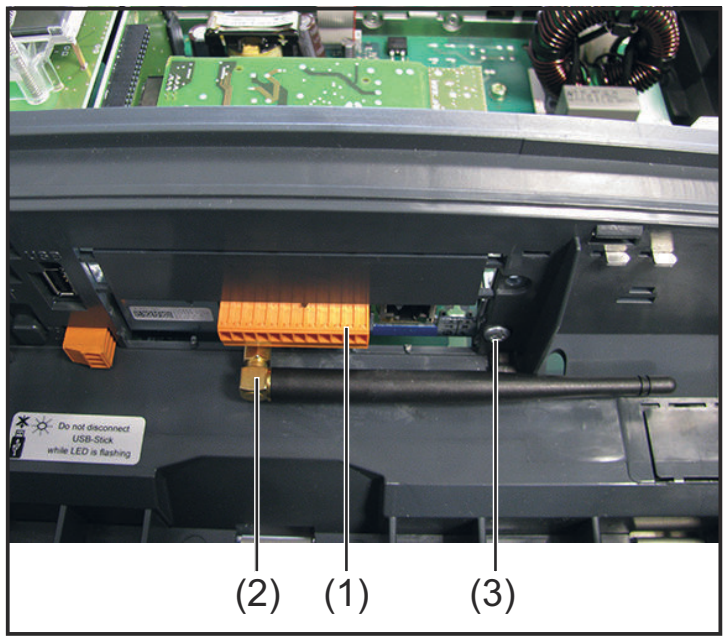
5 Connect the fan cable (1) to the EcoPS

6 Close the inverter and place it in the wall bracket (see "Opening and closing the device")

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing the Datamanager card WLAN option

Removing the Datamanager card:



⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

1 Take the inverter out of the wall bracket and open it (see "Opening and closing the device")

Datamanager Card:

2 Unplug the 12-pin plug connector (1) from the Datamanager PC board

3 Use a flat spanner to take off the antenna (2)

4 Undo the 4x8 TX20 Taptite screw (3)

5 Unplug the Datamanager card from the Recerbo PC board and remove it

Datamanager Card 2:

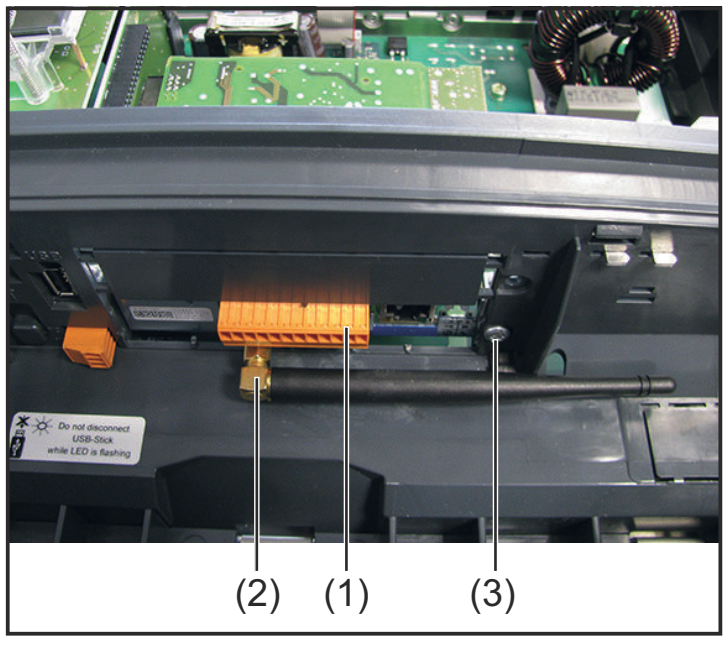
2 Unplug the 16-pin plug connector (1) from the Datamanager 2 PC board

3 Use a flat spanner to take off the antenna (2)

4 Undo the 4x9 TX20 Taptite screw (3)

5 Unplug the Datamanager card from the Recerbo PC board and remove it

Inserting the Datamanager card:



1 Insert the new Datamanager card and connect it to the Recerbo PC board

Datamanager Card:

2 Fit the Datamanager PC board with a 4x8 TX20 Taptite screw (3)

[1.2 Nm]

3 Use a flat spanner to fit the antenna (2)

[0.6 Nm]

4 Fit the 12-pin plug connector (1) to the Datamanager PC board

5 Close the inverter and place it in the wall bracket (see "Opening and closing the device")

Datamanager Card 2:

2 Fit the Datamanager 2 PC board with a 4x9 TX20 Taptite screw (3)

[1.2 Nm]

3 Use a flat spanner to fit the antenna (2)

[0.6 Nm]

4 Fit the 16-pin plug connector (1) to the Datamanager 2 PC board

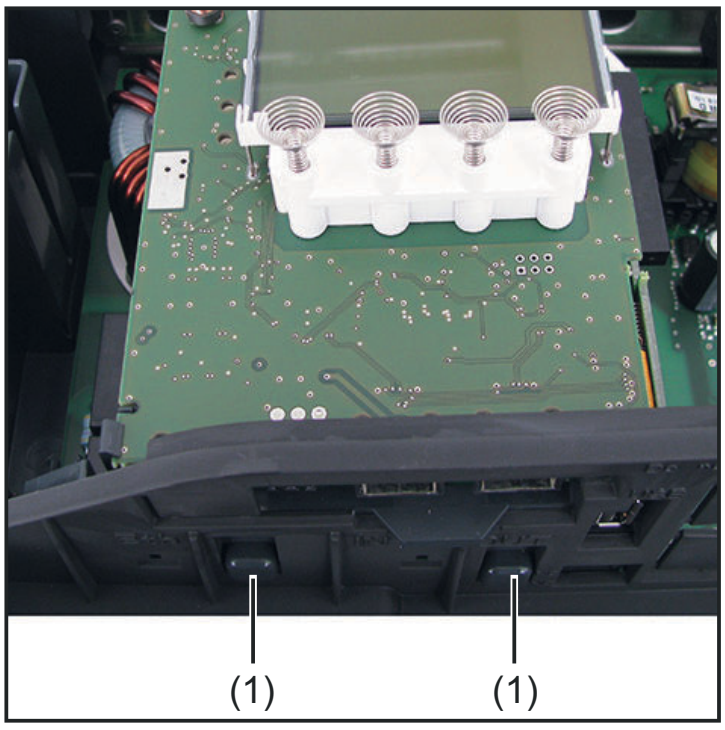
5 Close the inverter and place it in the wall bracket (see "Opening and closing the device")

Replacing the display PC board - Recerbo

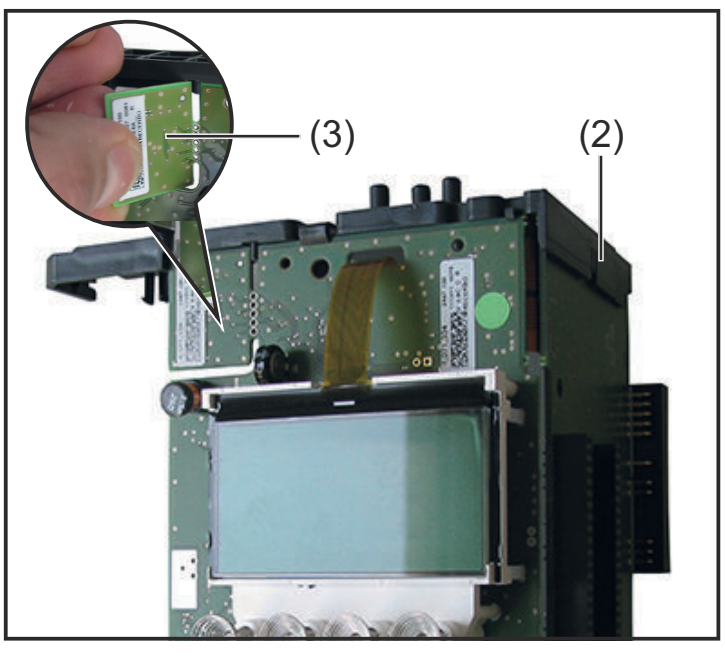
Removing the Recerbo:

⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)



1. Take the inverter out of the mounting bracket, open it and remove the Datamanager card (see "Opening and closing the device" and "Replacing the Datamanager card" sections)
2. Disconnect all connections from the Recerbo
3. Push the Recerbo holder locking devices (1) upwards
4. Remove the Recerbo module



NOTE!

Take care not to damage any of the components when carrying out the next two steps

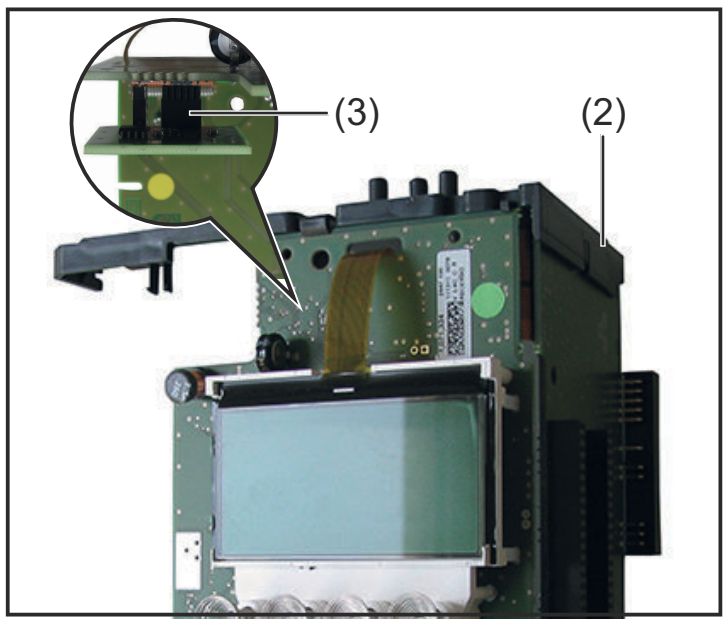
5. Take the holder (2) off the Recerbo
6. Break off the device data unit (3) from the faulty Recerbo

Installing the Recerbo:

1. Break off the device data unit from the new Recerbo

NOTE!

If you forget to connect the device data unit or do not connect it correctly, the inverter will show status code 482 on the display

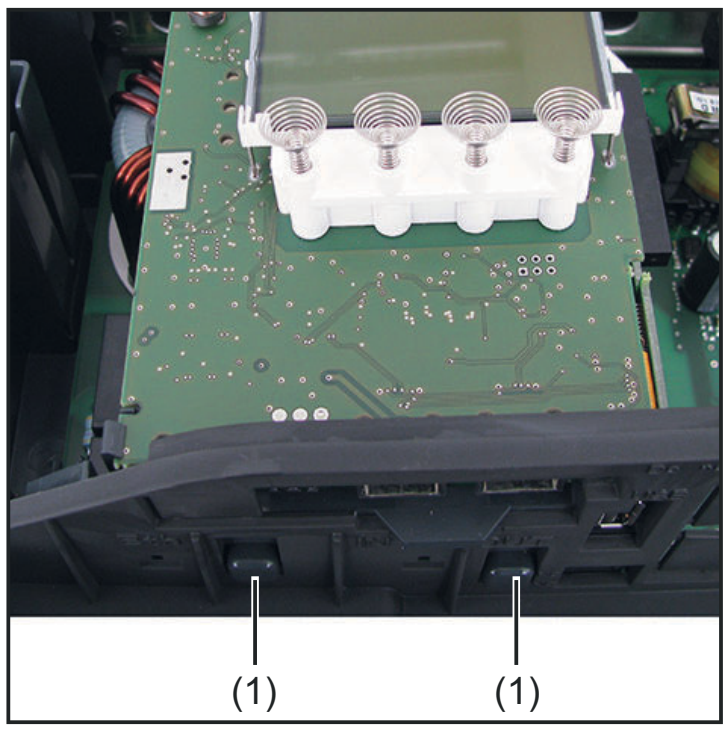


2 Connect the broken off device data unit (3) to the inside of the new Recerbo

3 Fit the Recerbo holder (2) to the new Recerbo
- feed it in from above
- press downwards

NOTE!

All guide bolts and pins must be properly engaged



4 Insert the new Recerbo module

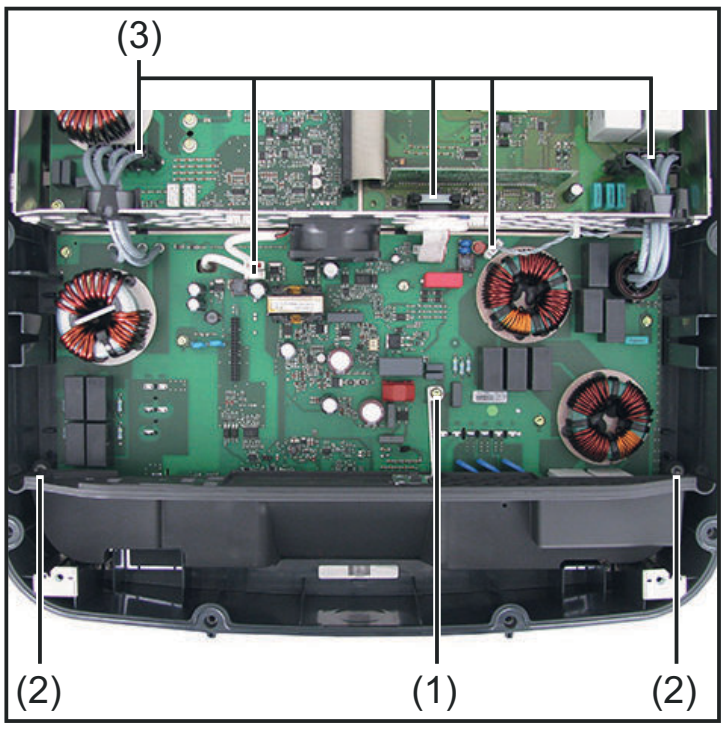
5 The Recerbo holder locking devices (1) must be fully engaged in the housing shell

6 Reconnect all connections to the Recerbo

7 Insert the Datamanager card, close the inverter and place it in the mounting bracket (see "Replacing the Datamanager card" and "Opening and closing the device" sections)

Replacing the filter PC board - SymoFIL

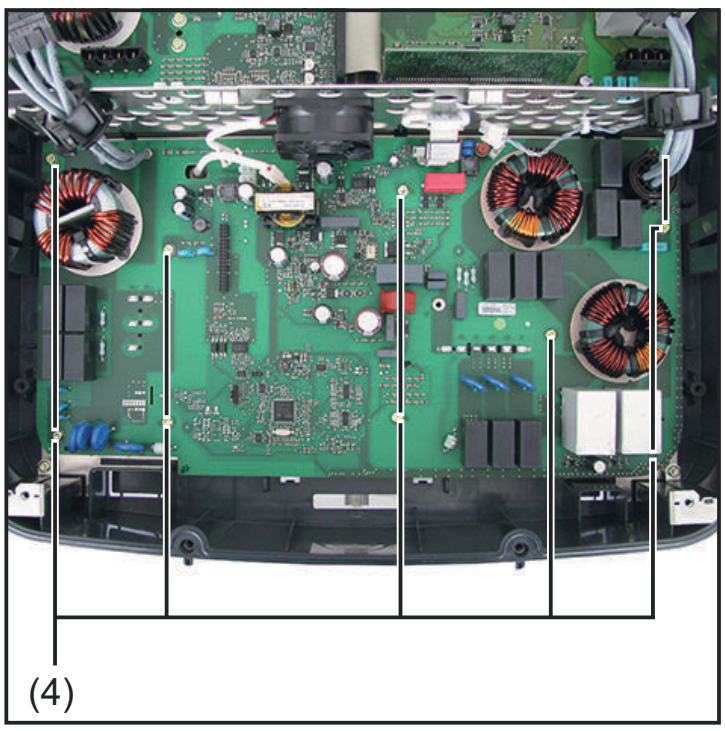
Removing the SymoFIL:



⚠ WARNING!

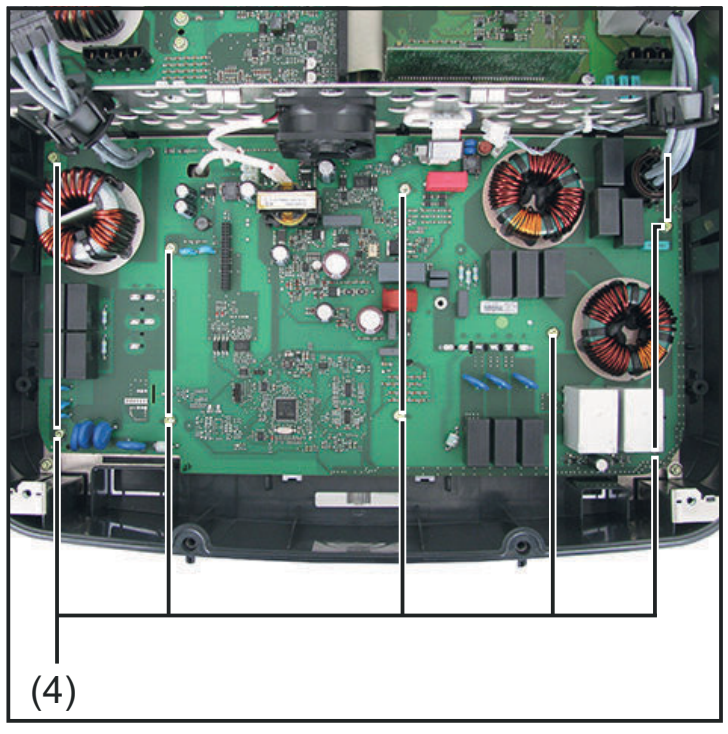
Observe the safety rules (see the beginning of the "Safety" section)

1. Take the inverter out of the wall bracket and remove the Recerbo without detaching the device data unit (see "Opening and closing the device", "Replacing the display PC board - Recerbo" and necessary „Replacing the Overvoltage PC board“ sections)
2. Undo the 4x9 TX20 screw (1) on the ground connection
3. Undo the two 5x10 TX25 screws (2) and remove the Datcom insert
4. Disconnect all cables and plug connections (3) from the SymoFIL and thread them out



5. Undo the nine 4x9 TX20 screws (4)
6. Thread out the SymoFIL and remove it

Inserting the SymoFIL:

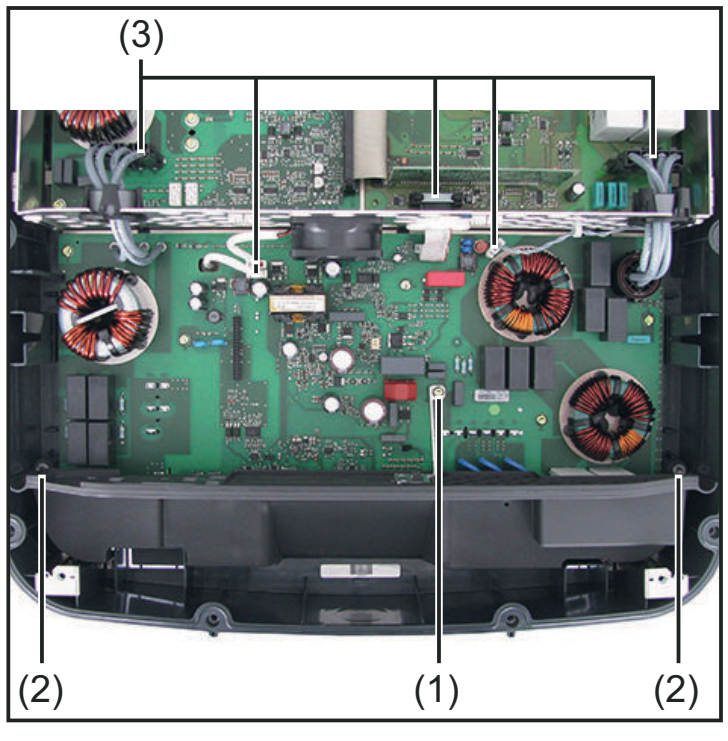


1 On the new PC board SymoFIL, remove the protective film from the heat-transfer pad

2 Thread in the new SymoFIL and position it

3 Fit the SymoFIL with nine 4x9 TX20 screws (4)

[2 Nm]



3 Connect all cables and plug connections (3) to the SymoFIL

4 Fit the Datcom insert with two 5x10 TX25 screws (2)

[1,2 Nm]

5 Fit the ground connection with a 4x9 TX20 screw (1)

[2 Nm]

6 Insert the Recerbo, close the inverter and place it in the wall bracket (see "Replacing the display PC board - Recerbo", "Opening and closing the device" and necessary „Replacing the Overvoltage PC board“ sections)

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing the filter PC board - EcoFIL

Removing the EcoFIL:



⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

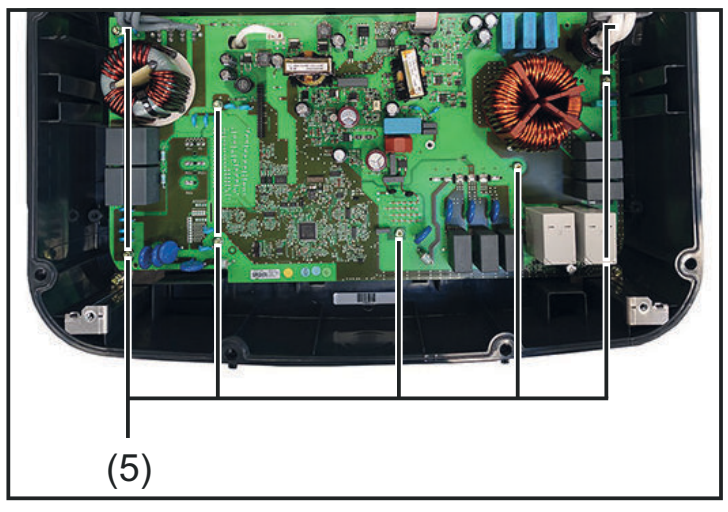
---

1 Take the inverter out of the wall bracket and remove the Recerbo without detaching the device data unit (see "Opening and closing the device", "Replacing the display PC board - Recerbo" and necessary „Replacing the Overvoltage PC board“ sections)

2 Undo the 4x9 TX20 screw (1) on the ground connection

3 Undo the two 5x10 TX25 screws (2) and remove the Datcom insert

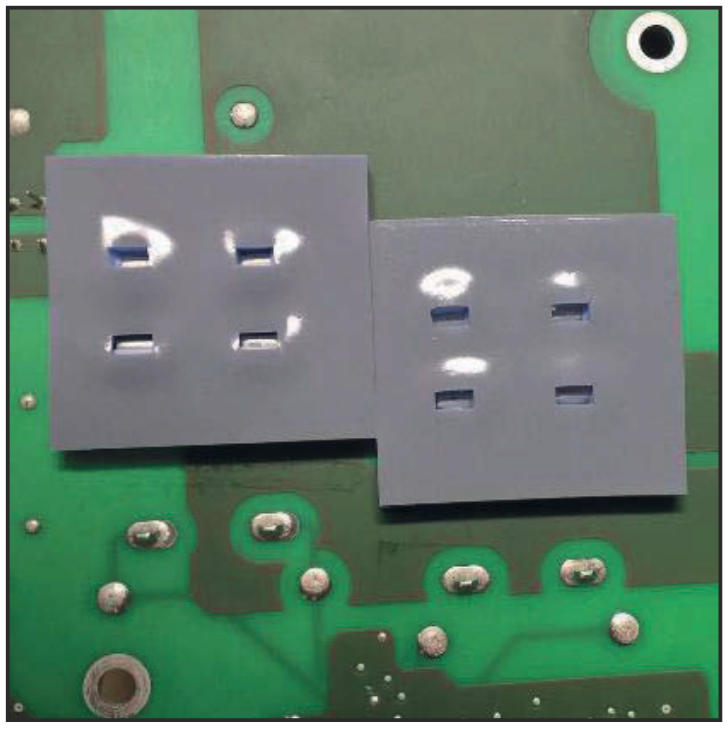
4 Disconnect all cables and plug connections (3-4) from the EcoFIL and thread them out



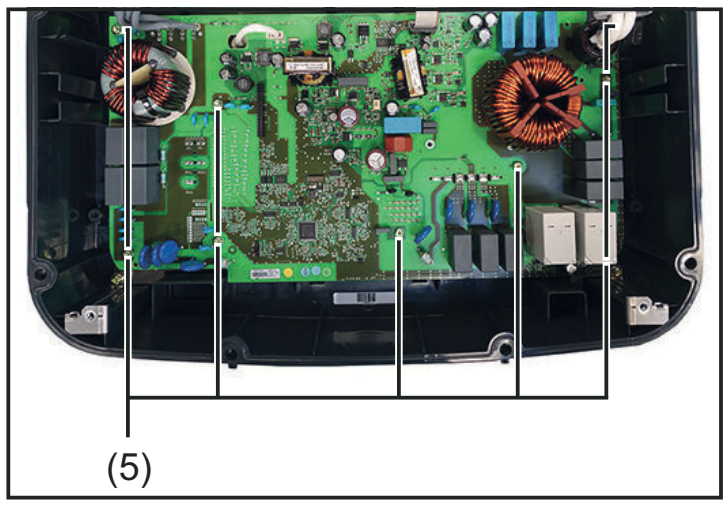
5 Undo the nine 4x9 TX20 screws (5)

6 Thread out the EcoFIL and remove it

Inserting the EcoFIL:



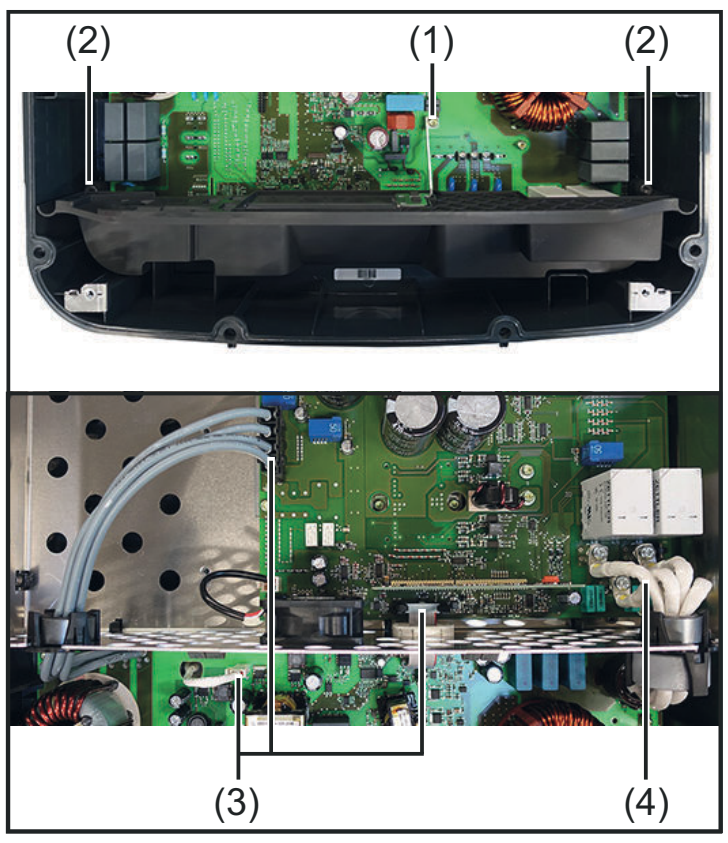
1 Remove the protective film from the thermally conductive pad fort he new EcoFil PC board and ensure that the pads do not slip out of place or fall off during installation.



2 Thread in and position the new EcoFIL

3 Fit the EcoFIL with nine 4x9 TX20 screws (5)

[2 Nm]



4 Connect all cables and plug connections (3) to the EcoFIL

5 Fit the Datcom insert with two 5x10 TX25 screws (2)

[1.2 Nm]

6 Fit the ground connection with a 4x9 TX20 screw (1)

[2 Nm]

7 Fit the AC cable harness with four 5x10 TX20 screws (4)

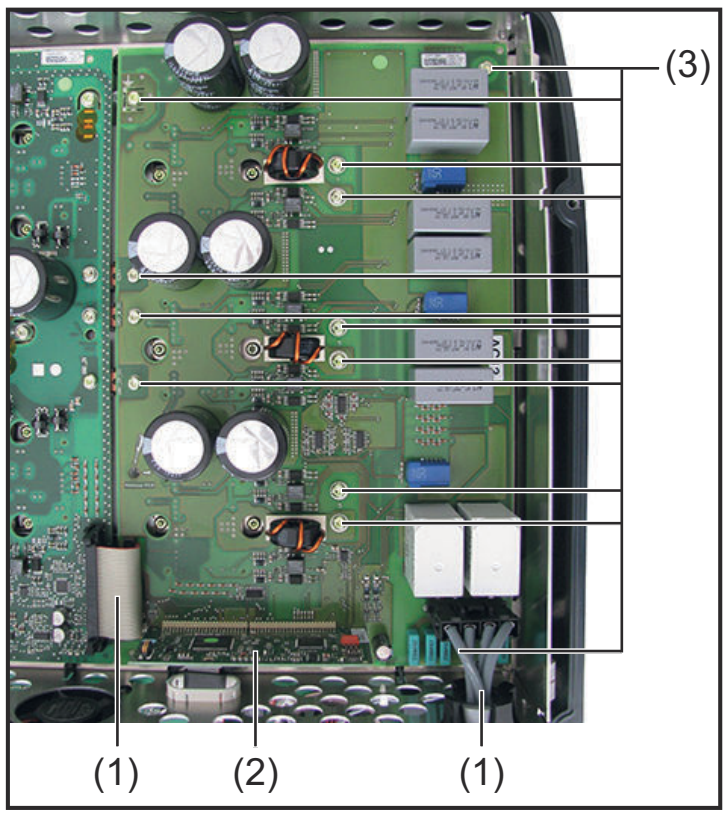
[3.5 Nm]

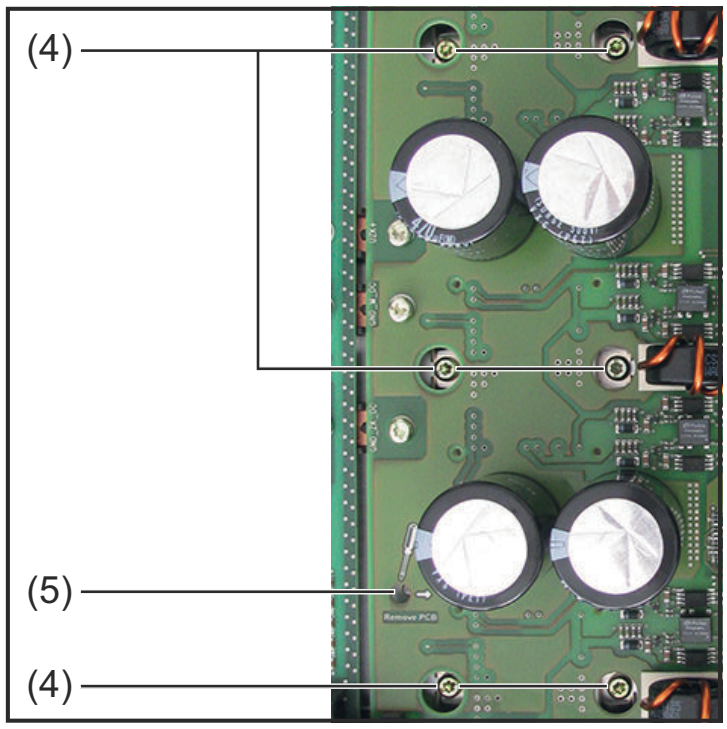
8 Insert the Recerbo, close the inverter and place it in the wall bracket (see "Replacing the display PC board - Recerbo", "Opening and closing the device" and necessary „Replacing the Overvoltage PC board“ sections)

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing the power board - SymoPS AC

Removing the SymoPS AC:





⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

1. Take the inverter out of the wall bracket and open it (see "Opening and closing the device")
2. Disconnect all cables and plug connections (1-2) and thread them out
3. Undo the twelve 4x9 TX20 screws (3)
4. Undo the six 4x9 TX20 screws (4) on the solar modules
5. Insert the screwdriver into the "Remove Print" hole (5) and detach the SymoPS AC from the heat sink in the direction of the arrow
6. Remove the SymoPS AC
7. Remove any old PCM paste residues from the heat sink using a clean cloth

NOTE!

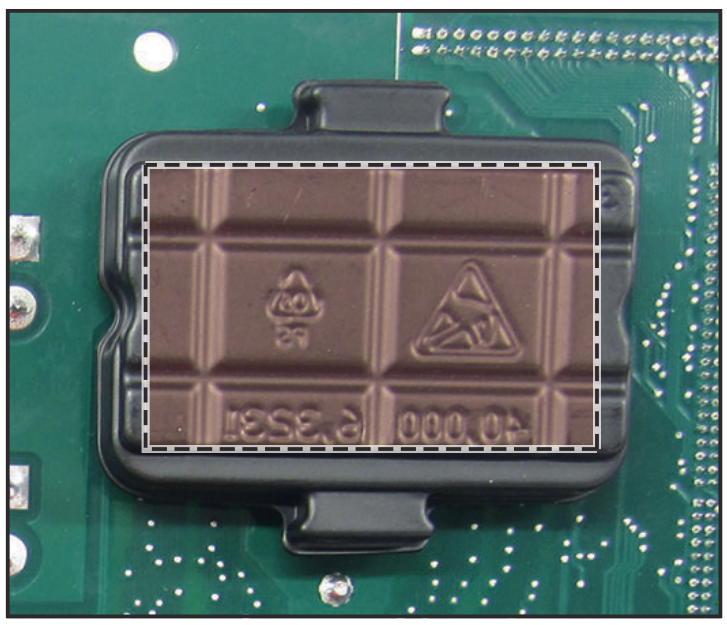
Ensure you remove all PCM paste residues

NOTE!

If you are returning the SymoPS AC, the solar modules must also be cleaned with a clean cloth.

- Take the PCM film from the small parts kit
- Position it on the solar modules and smooth it out
- Ensure that all the protective film is removed!

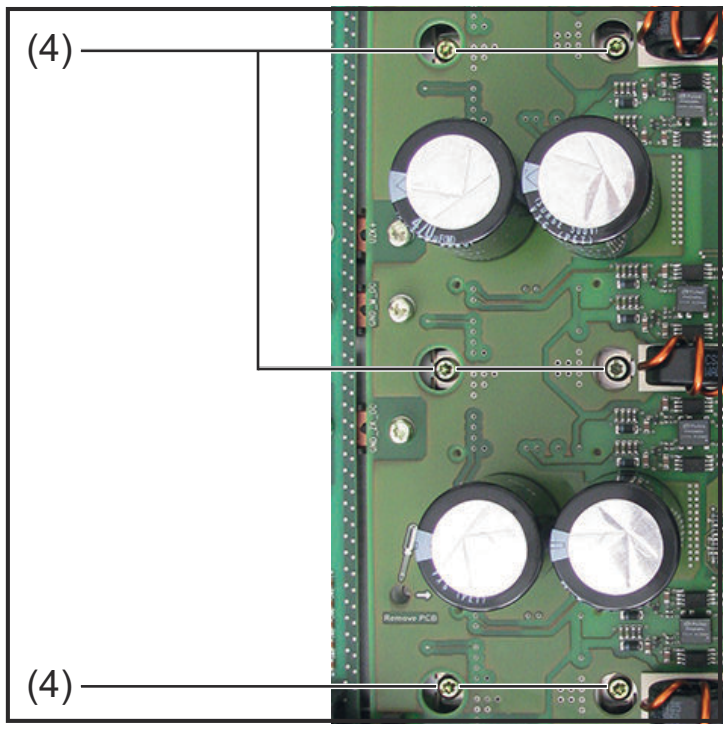
Inserting the SymoPS AC:



NOTE!

**Do not press on the marked area ->
this will damage the PCM material**

1 Detach the blister packs from the new SymoPS AC at the tabs and place them on the faulty SymoPS AC



⚠ CAUTION!

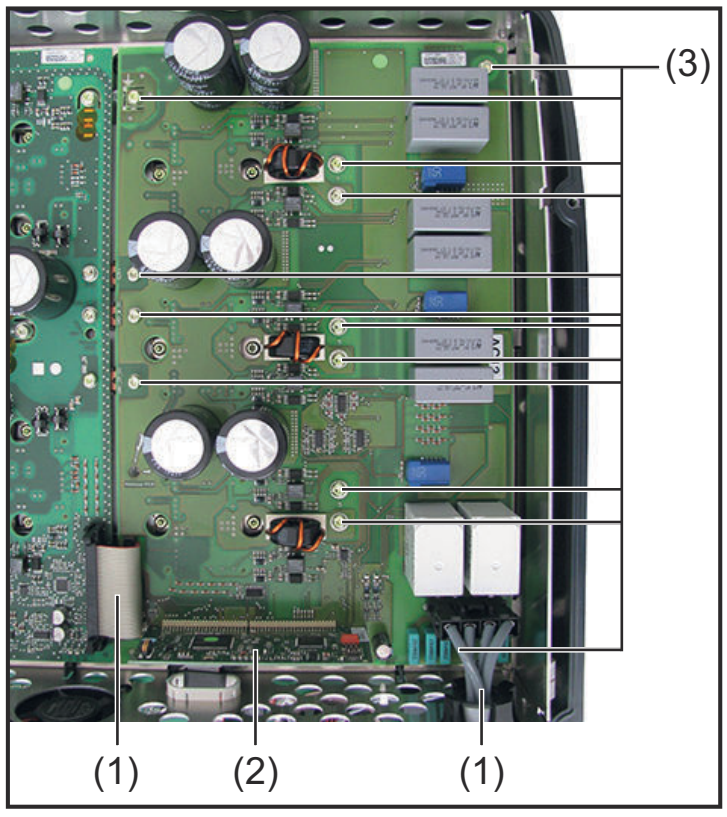
The PCM paste must not be damaged or removed when inserting the Sym-oPS AC

2 Insert the new SymoPS AC and position accordingly

NOTE!

To avoid applying mechanical stress to the solar modules, apply the torque in the same sequence

3 Fit the SymoPS AC solar modules with six 4x9 TX20 screws (4). Observe the torque sequence to avoid applying mechanical stress
First pretension all six screws to **[0.5 Nm]** and then tighten them to **[2 Nm]**



4 Thread in and connect all cables and plug connections (1-2)

5 Fit the SymoPS AC with twelve 4x9 TX20 screws (3)

[2 Nm]

NOTE!

Ensure that the ferrite cores and their holders are fitted correctly

6 Close the inverter and place it in the wall bracket (see "Opening and closing the device")

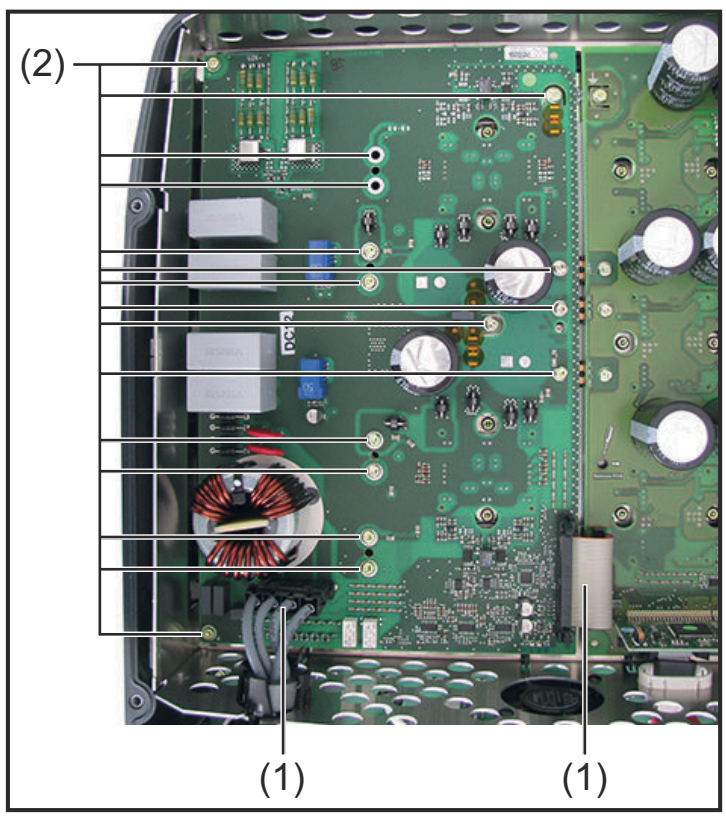
Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing the power board - SymoPS DC

NOTE!

The SymoPS DC power board from version V1.
4A_B already has an integrated overvoltage function. If the SymoPS DC replacement PC board is version V1.4A_B or higher, any existing OVP SYMPRI overvoltage PC board must be removed.

Removing the SymoPS DC:



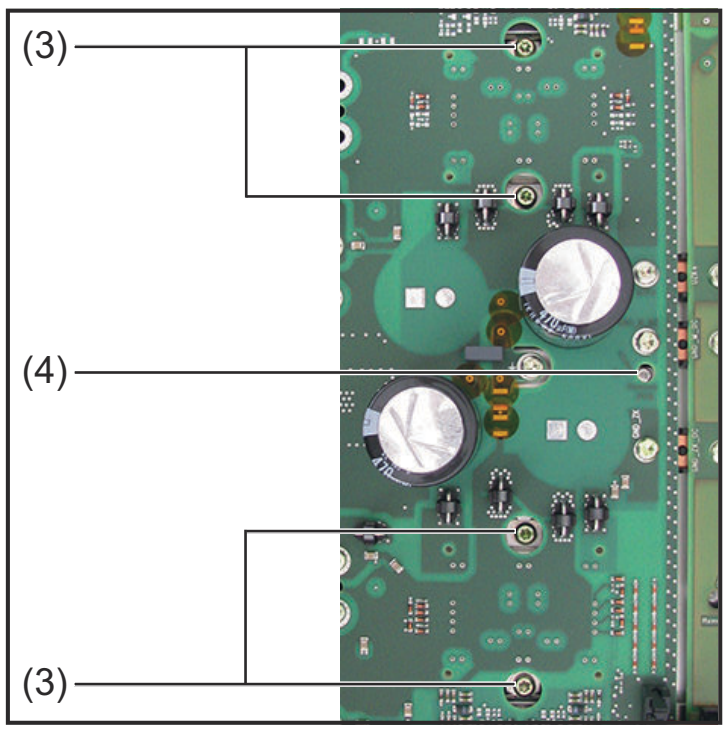
⚠ **WARNING!**

Observe the safety rules (see the beginning of the "Safety" section)

1 Take the inverter out of the wall bracket and open it (see "Opening and closing the device" and necessary „Replacing the Overvoltage PC board“ sections)

2 Disconnect all cables and plug connections (1) and thread them out

3 Undo the 13/15 4x9 TX20 screws (2)



4 Undo the four 4x9 TX20 screws (3) on the solar modules

5 Insert the screwdriver into the "Remove Print" hole (4) and detach the SymoPS DC from the heat sink in the direction of the arrow

6 Remove the SymoPS DC

7 Remove any old PCM paste residues from the heat sink using a clean cloth

NOTE!

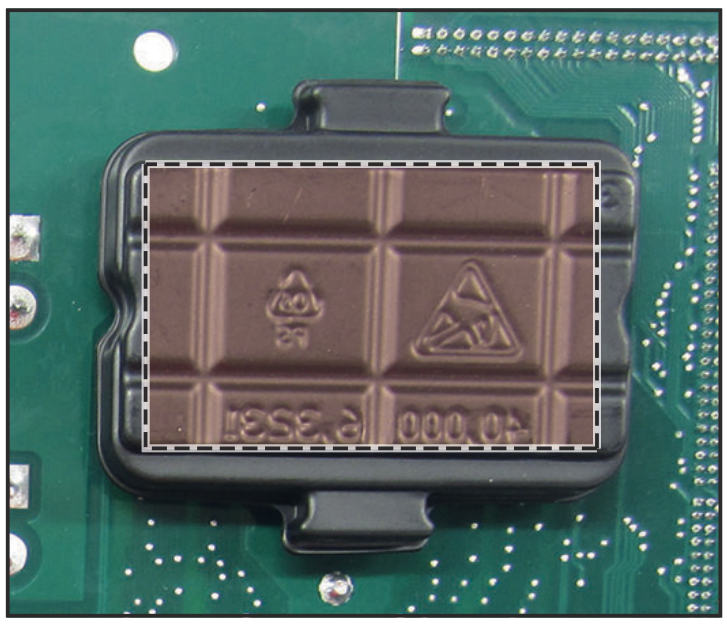
Ensure you remove all PCM paste residues

NOTE!

If you are returning the SymoPS DC, the solar modules must also be cleaned with a clean cloth.

- Take the PCM film from the small parts kit
- Position it on the solar modules and smooth it out
- Ensure that all the protective film is removed!

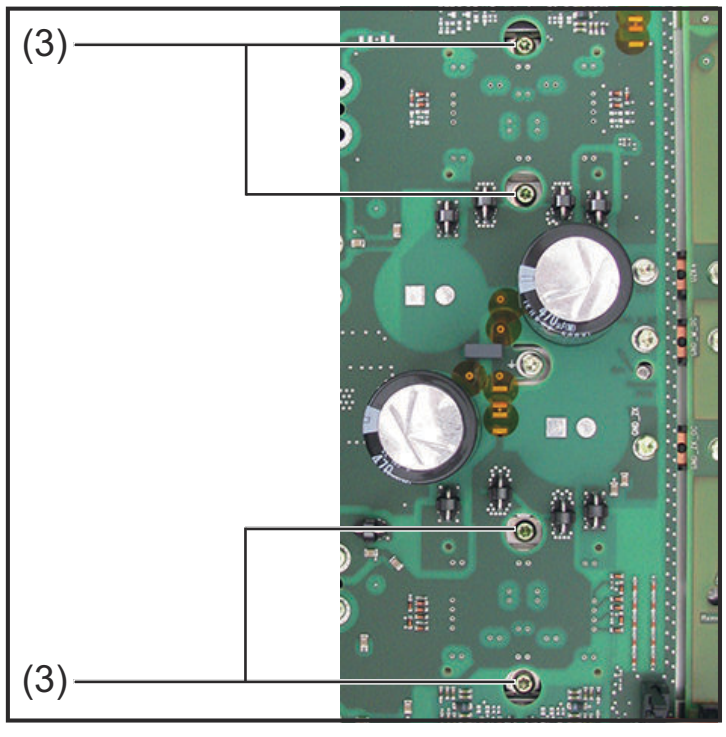
Inserting the SymoPS DC:



NOTE!

Do not press on the marked area -> this will damage the PCM material

1 Detach the blister packs from the new SymoPS DC at the tabs and place them on the faulty SymoPS DC



⚠ CAUTION!

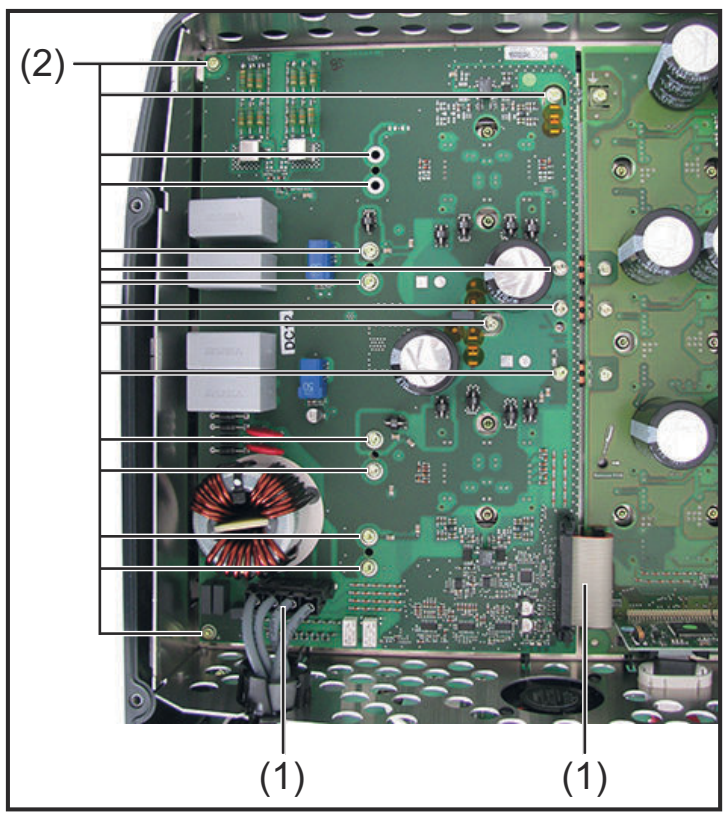
The PCM paste must not be damaged or removed when inserting the SymoPS DC

2 Insert the new SymoPS DC and position accordingly

NOTE!

To avoid applying mechanical stress to the solar modules, apply the torque in the same sequence

3 Fit the SymoPS DC solar modules with four 4x9 TX20 screws (3). Observe the torque sequence to avoid applying mechanical stress
First pretension all four screws to **[0.5 Nm]** and then tighten them to **[2 Nm]**



4 Thread in and connect all cables and plug connections (1)

5 Fit the SymoPS DC with 13/15 4x9 TX20 screws (2)

[2 Nm]

NOTE!

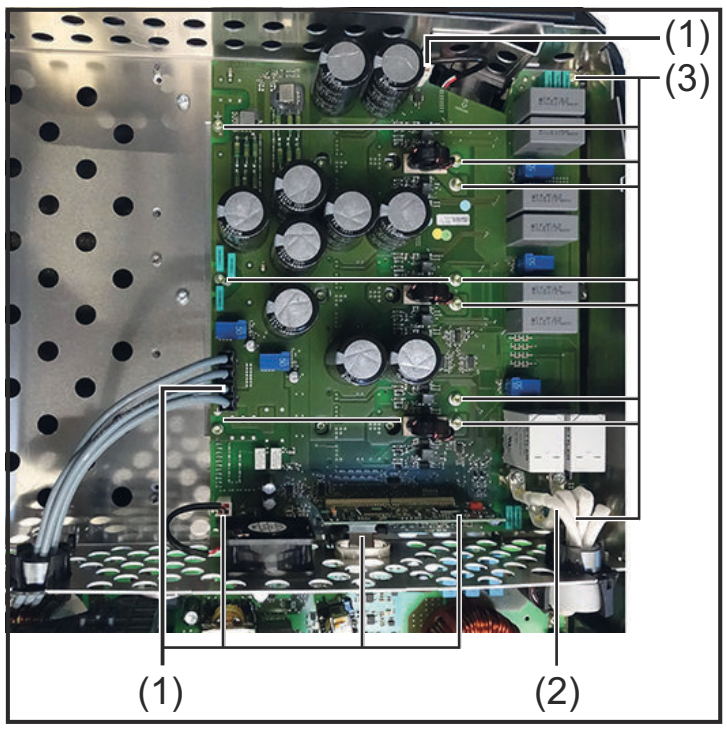
Ensure that the ferrite cores and their holders are fitted correctly

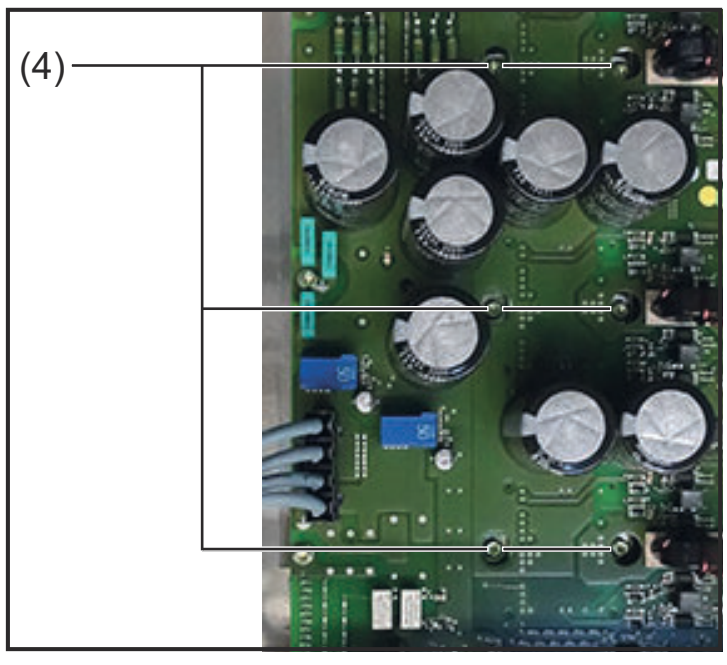
6 Close the inverter and place it in the wall bracket (see "Opening and closing the device" and necessary „Replacing the Overvoltage PC board“ sections)

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing the power board - EcoPS

Removing the EcoPS:





⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

1. Take the inverter out of the wall bracket and open it (see "Opening and closing the device" and necessary „Replacing the Overvoltage PC board“ sections)
2. Disconnect all cables and plug connections (1-2) and thread them out
3. Undo the 11 4x9 TX20 screws (3)
4. Undo the six 4x9 TX20 screws (4) on the solar modules
5. Remove the EcoPS
6. Remove any old PCM paste residues from the heat sink using a clean cloth

NOTE!

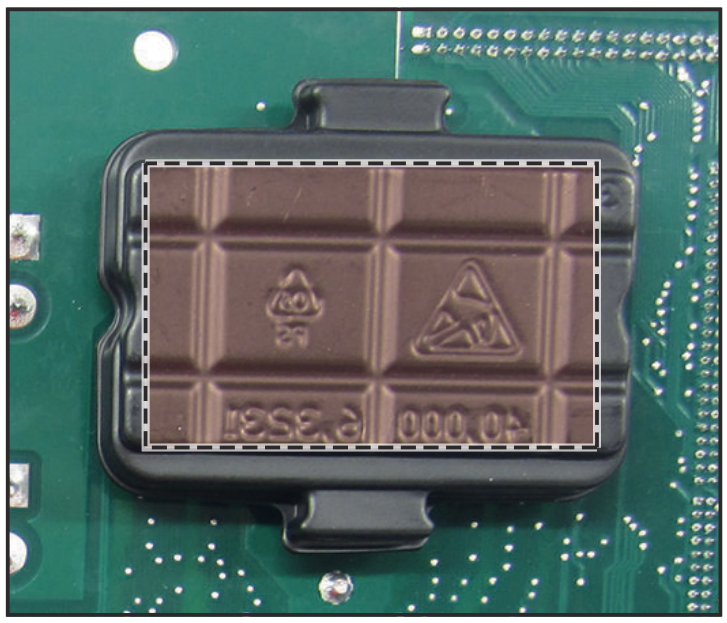
Ensure you remove all PCM paste residues

NOTE!

If you are returning the EcoPS, the solar modules must also be cleaned with a clean cloth.

- Take the PCM film from the small parts kit
- Position it on the solar modules and smooth it out
- Ensure that all the protective film is removed!

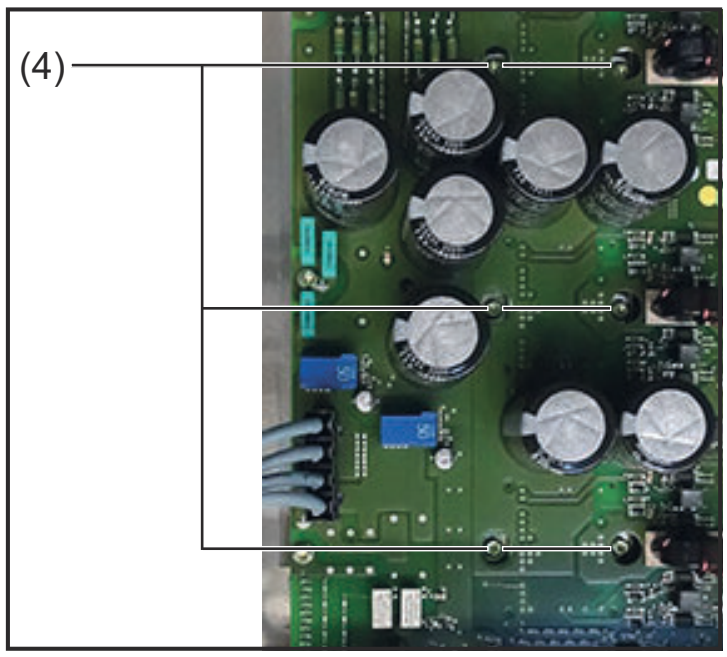
Inserting the EcoPS:



NOTE!

**Do not press on the marked area ->
this will damage the PCM material**

1 Detach the blister packs from the new EcoPS at the tabs and place them on the faulty EcoPS



⚠ **CAUTION!**

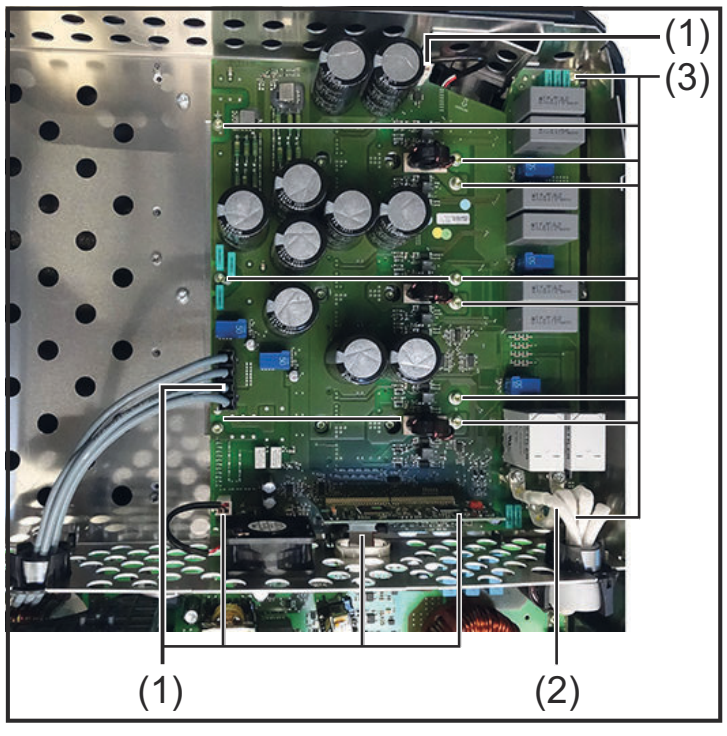
The PCM paste must not be damaged or removed when inserting the EcoPS

2 Insert the new EcoPS and position accordingly

NOTE!

To avoid applying mechanical stress to the solar modules, apply the torque in the same sequence

3 Fit the EcoPS solar modules with six 4x9 TX20 screws (4). Observe the torque sequence to avoid applying mechanical stress
First pretension all six screws to **[0.5 Nm]** and then tighten them to **[2 Nm]**



4 Thread in and connect all cables and plug connections (1)

NOTE!

Observe the correct sequence for the screw joints

5 Fit the AC cable harness with four 5x10 TX25 screws (2)

[3.5 Nm]

6 Fit the EcoPS with 11 4x9 TX20 screws (3)

[2 Nm]

NOTE!

Ensure that the ferrite cores and their holders are fitted correctly

7 Close the inverter and place it in the wall bracket (see "Opening and closing the device" and necessary „Replacing the Overvoltage PC board“ sections)

Switch on the inverter and then carry out a fan test via the display (see operating instructions)

Replacing other components

⚠ WARNING!

Observe the safety rules (see the beginning of the "Safety" section)

If the following components are faulty, the entire inverter must be replaced:
- Housing parts (excluding covers)
- Inductors
- Heat sinks
- Seals (not including the seals on the covers)

The covers (Datcom cover and power stage set cover) can be replaced as a component with an injection-moulded seal.

Safety Inspections

Safety Inspections

Applicable standards

This chapter describes the safety inspection for the device described in these service instructions as per the following standards:
- EN 50678
- EN 50699

Please also observe the requirements and standards for your particular country, since there may be deviations in the measured values or inspection steps.
If there are no requirements and standards for your particular country, the manufacturer recommends that this inspection is still carried out.

Additional information for inspections

WI-000350 (safety inspection of battery chargers and solar inverters) serves as additional information for inspections. You can obtain this from your Fronius service center or by visiting the MyFronius portal at **www.myfronius.com** .

Scope

A safety inspection must be performed after any repair, maintenance or modification work, or if stipulated by applicable national standards.

Safety instructions

Familiarize yourself with the general safety instructions before starting the tests (see chapter **Safety**).

Qualifications of testing personnel

The safety inspection may only be carried out by a qualified electrician. These are the people who, on the basis of their technical training, knowledge, and experience as well as knowledge of the applicable regulations, can assess the assigned tasks and detect and prevent electrical and other possible dangers.

Responsibility

The electrician is responsible for the proper performance and documentation of the safety inspection, and for the correct inspection result. The manufacturer assumes no liability for this.

If a defect is identified during the inspection, the safety inspection must be repeated once the defect has been eliminated.

The inspection steps described below must be carried out in the sequence specified. Every inspection must be passed before the next inspection can begin. If one of the inspections cannot be carried out, the inspector must take the decision, and the responsibility and liability fall to them regarding whether the safety of the device can still be confirmed. This decision must be justified accordingly and included in the inspection log under Notes.

Measuring equipment

Ground conductor resistance:
- The measurement voltage may be an AC or a DC voltage.
- The open-circuit voltage must be between 4 V and 24 V.
- The measurement current must be at least 0.2 A (10 A recommended).
- The values must be measured using a suitable device tester.

Insulation resistance:

- The value of the measured voltage from the measuring equipment must correspond to at least the rated voltage of the device to be tested against grounding, but no less than 500 V DC voltage.
- The measurement current must be at least 1 mA (this corresponds to a load resistance of 0.5 MΩ).
- The values must be measured using a suitable device tester.

Ground conductor current:

- The effective inner resistance of the ground conductor current measuring device may not exceed 5 Ω. With higher resistances, measures must be taken to prevent the occurrence of hazardous contact voltages.
- The measurement range must be between 0.25 mA and 19 mA.
- The inspection facility must assess the measured current to be an effective value regardless of the waveform.
- The values must be measured using a suitable device tester.

Contact current:

- The effective inner resistance of the contact current measurement instrument must be between 1 kΩ and 2 kΩ.
- If the current test circuit is accidentally connected to a voltage up to 120% of the nominal grid voltage, the user must not be endangered and the test circuit must not be damaged.
- The inspection facility must assess the measured current to be an effective value regardless of the waveform.
- The values must be measured using a suitable device tester.

Visual inspections

General

The following must be visually inspected without any further dismantling of the device. Obvious defects in any safety-related device components are unacceptable. Defects that could pose a risk during the visual inspection must also be recorded.

Any defects that could cause other hazards must be repaired immediately or restrictions placed on the further use of the system until repairs have been performed.

This also includes:
- Missing or damaged housing components, insulation or protective covers
- Dirt or blockages in cooling openings
- Missing or damaged safety labels (e.g. warnings, earthing symbols, rating plates)
- Illegible safety labels or symbols, measurement data and positioning indicators

Mains supply and connecting lines

IMPORTANT!
IEC 60364-5-52 serves as the basis for determining the cross-section and current capacity of mains cables.
Due to the way the cables are laid and insulated, the ambient temperature and the current capacity can vary. The requirements set out in IEC 60364-5-52 must therefore be observed when changing the mains lead. Also refer to the applicable requirements and standards in your country.

In addition, the following applies:
- Connecting lines and external lines must be intact and functioning properly.
- Insulation must be in perfect condition (do not use insulating or adhesive tapes to repair damage).
- Plugs and plug connections must be intact and functioning properly.
- Strain-relief devices, bending-protection devices, line routings or mountings must all be effective.
- Lines and plugs must be suitable for the application and the power level.
- Fuse cartridges and device fuse holders must be in perfect condition.

Housing and covers

- Housing parts, insulation and protective covers must be present and in perfect condition,
- Unauthorised modifications must not be present (e.g. installations, conversions that have not been approved by the manufacturer).
- Cooling openings must be clean and an unobstructed air flow must be ensured. Proper air filters must be present.
- All components must be free from dirt, corrosion or degradation that could impair safety.
- All components must be free from signs of overloading and improper use.
- The housing must be free from conductive objects.

Adjustment and display devices

- All control elements and displays must be intact and functioning properly.

Safety labels, signs and notices	- Safety labels (e.g. warning notices, earthing symbols, rating plates) must be present. - All safety labels or symbols, measurement data and positioning indicators must be legible. - Replace, update or correct the labels in a suitable form as required.

Electrical tests

Insulation resistance

⚠ WARNING!

An electric shock can be fatal.
Some of the insulation resistance measurements are taken under high voltage. The process must be completely understood before starting the test. Observe the following safety precautions:

- ▶ Restrict access to the work area as far as possible.
- ▶ Do not touch any other person while performing the test and take measures to prevent other people touching any metallic surfaces.
- ▶ A voltage is applied to the area under test each time that the insulation resistance testing equipment is switched on. The insulation resistance testing equipment must be fitted with an automatic self-discharge device.
- ▶ Wear suitable protective clothing/protective equipment while conducting the test.
- ▶ When carrying out the insulation resistance test, do not touch any other person and put measures in place to prevent other people touching the back of the solar module or the terminals of the solar module with any part of their body.
- ▶ Ensure that the polarity is correct while conducting the insulation resistance test to avoid unreliable test results.

⚠ WARNING!

As the module array voltage has not been isolated from the mounting bracket, the PV voltage is still present on the terminals.

These tests must be carried out while the cover is open. The insulation resistance test must be carried out separately on the mounting bracket and on the inverter.

- A thorough understanding of the tests is required before starting the work.
- The inverter must be taken out of the mounting bracket.
- The device being tested must be safely isolated from the AC grid (the grid lead [L, N] must not be connected). If the AC grid cannot be disconnected from the mounting bracket, the torques applied to all ground terminals must be checked.

⚠ CAUTION!

Take safety precautions.
Observe the safety rules - DC voltage present!

- Strings must not be disconnected from the mounting bracket. The insulation resistance test can be carried out when the module array is connected.
- All switches (DC disconnector at position I), controllers, etc. must be closed during the measurements.
- The inverter must be disconnected from Fronius Solar Net and from the Datcom ring.
- The polarity must be correct when the insulation resistance test is conducted.

The following minimum insulation values apply. The test voltages specified must be observed:

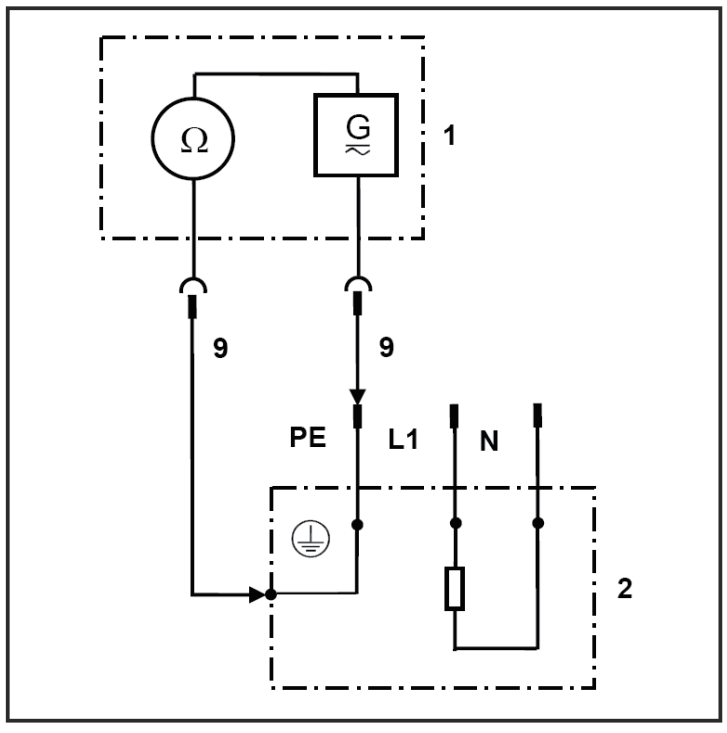
Measurement	Test voltage	Limit value
Primary -> ground	at least the max. DC input voltage of the device, however max. 1000 V	>= 1 MW
Secondary -> ground	>= 500 V	>= 1 MW

Legend: Primary = DC (DC+ and DC-) | Secondary = AC (L and N) | Ground = PE

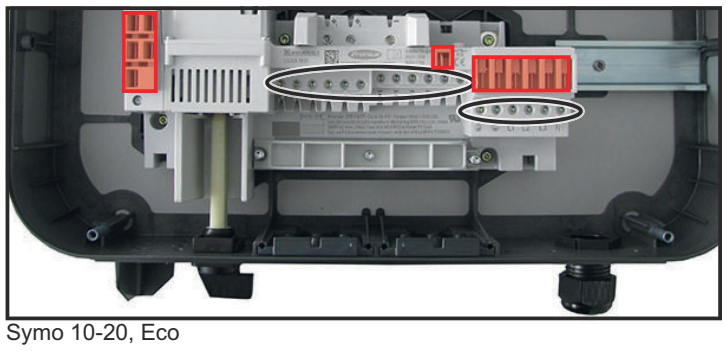
The insulation resistance test must be conducted between the following points on both the inverter and the mounting bracket.

However, on the DC disconnector, the measurements should only be taken at the screws, not the contacts.

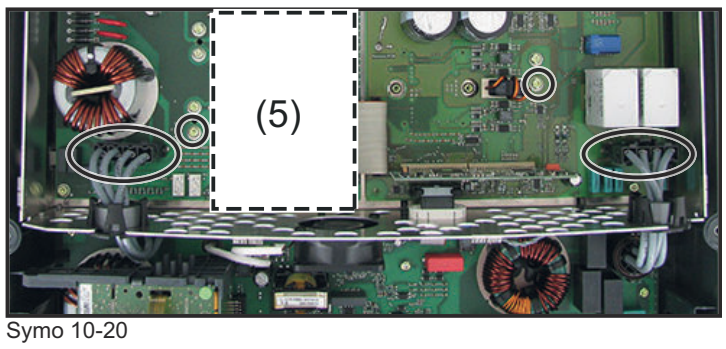
Ground to AC / Ground to DC



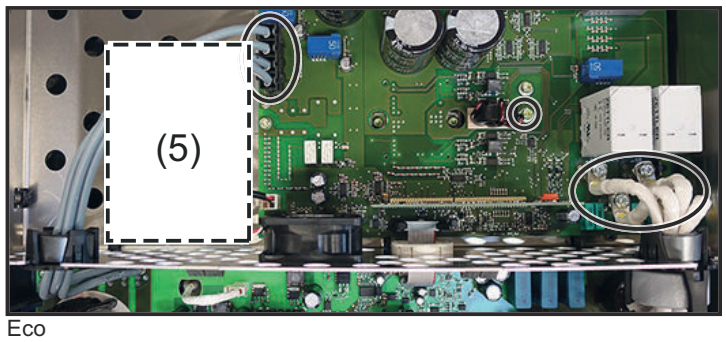
1 Measuring device
2 Inverter
9 Measuring line



Symo 10-20, Eco



Symo 10-20



Eco

Examples of measuring the insulation resistance. Overvoltage PC board (5)

⚠ WARNING!

An electric shock can be fatal.
Capacitors can charge during the insulation resistance measurement. After carrying out the insulation resistance test, check that all tested potentials are de-energised before continuing with the safety inspection. Alternatively, the capacitors can be discharged by short-circuiting the tested potentials or via the discharge function on the insulation tester.

Capacitor discharge time is at least 6 min.

Ground conductor resistance

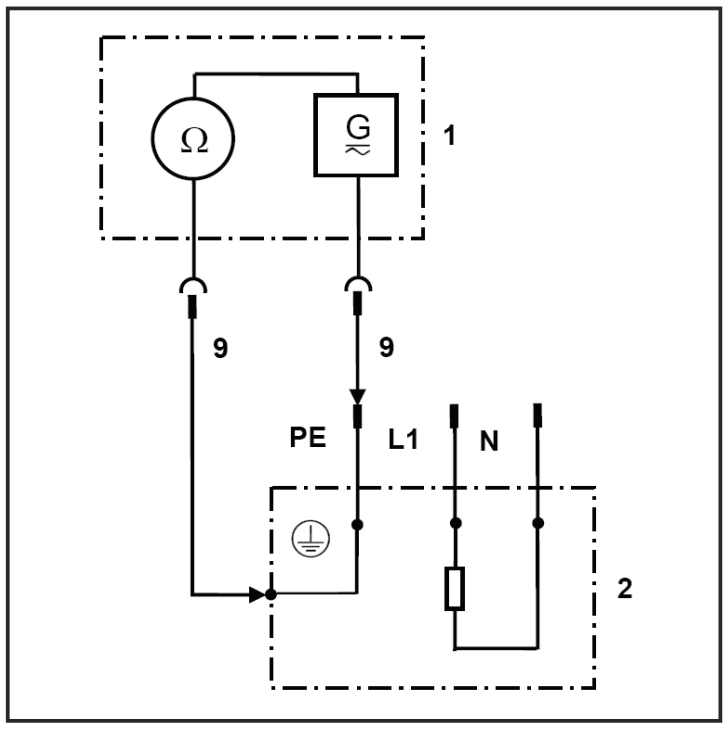
- Only perform the measurement if the insulation resistance test produced an acceptable result.
- Fit the cover back onto the inverter.
- Correct functioning of the ground conductor is only guaranteed if the results of the measurement between the cover and the mounting bracket are acceptable.
- The device being tested must be safely isolated from the AC grid (the grid lead [L, N] must not be connected). If the AC grid cannot be disconnected from the mounting bracket, the relevant safety precautions must be taken.
- Put the inverter back in the mounting bracket.

⚠ CAUTION!

Take safety precautions.
Observe the safety rules - DC voltage present!

⚠ WARNING!

Set the inverter DC disconnector to the O position and place the inverter in the mounting bracket.
Placing the inverter in the mounting bracket causes a voltage to be applied to the inverter.



1 Measuring device
2 Inverter
9 Measuring line



Example: measuring the ground conductor resistance
(A) - release on the power stage set cover

- Maybe you have to make a raw on the mounting bracket, that you get an electrical contact thru the oxide film or powder coating of the mounting bracket

- The resistance must not exceed 0.3 W

Ground conductor current

Preparations
- Only perform the measurement if a ground conductor resistance test has been carried out successfully
- Direct method: The device must be isolated from earth. No other connections to the ground potential are permitted (e.g. data lines, fitting, etc.)
- Remove conductive objects from the housing
- Fit any missing housing parts

⚠ WARNING!

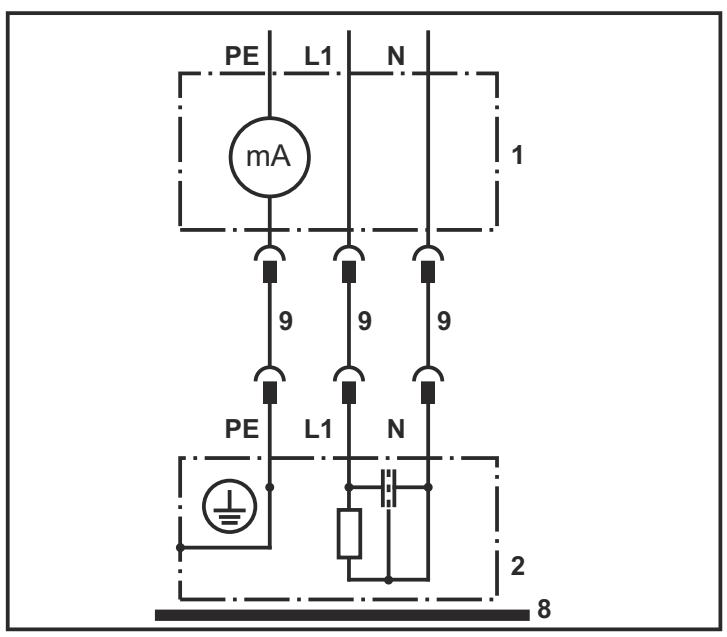
An electric shock can be fatal.
The inverter is live during the measurement.

Once the inverter has been connected, switch it back on. The inverter must be feeding energy during the measurement to avoid unreliable results.
Only the leakage currents that occur at grid frequency may be included (50 - 60 Hz function of ammeter). High-frequency leakage currents distort the measurement results.

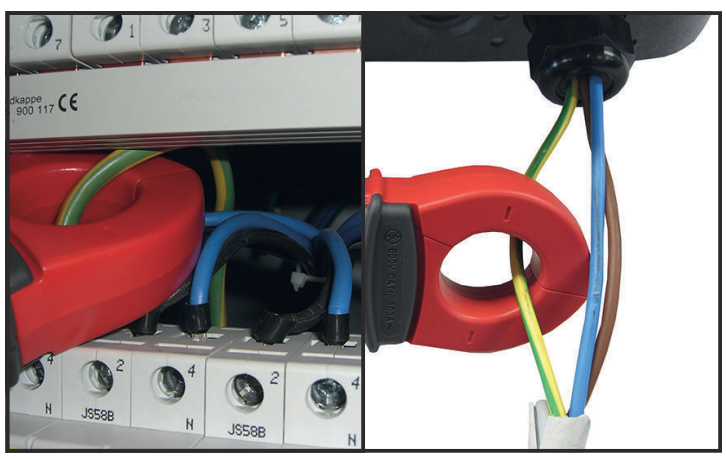
There are two methods that may be used to measure the ground conductor current:
- Direct method: Device must be completely isolated and must not exhibit any links to another earth potential
- Differential current method

The measurement can be taken on the inverter (loop outside the device) or in the distributor. If taking the measurement in the distributor, ensure that there are no live conductors in the immediate vicinity and that no other consumers are connected to the same circuit.

Direct method - Ground conductor current measured using ammeter on the ground conductor



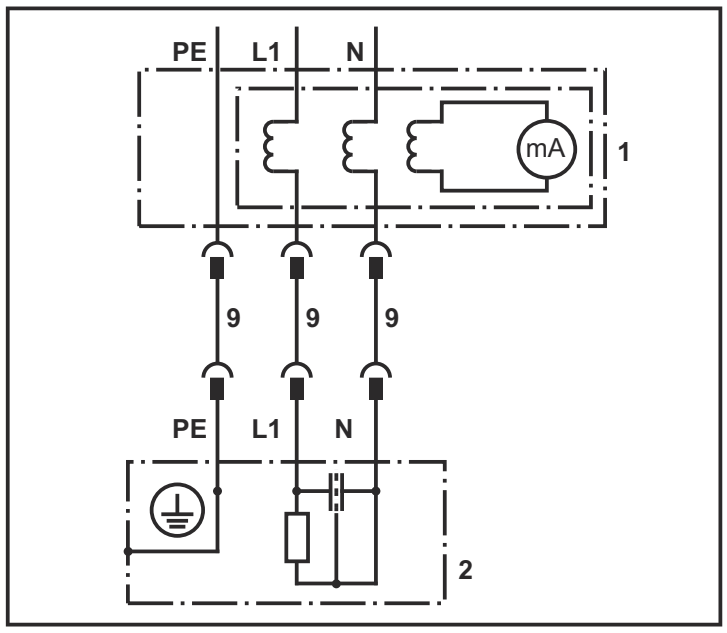
1 Measuring device
2 Inverter
8 Isolated setup of test piece
9 Measuring line



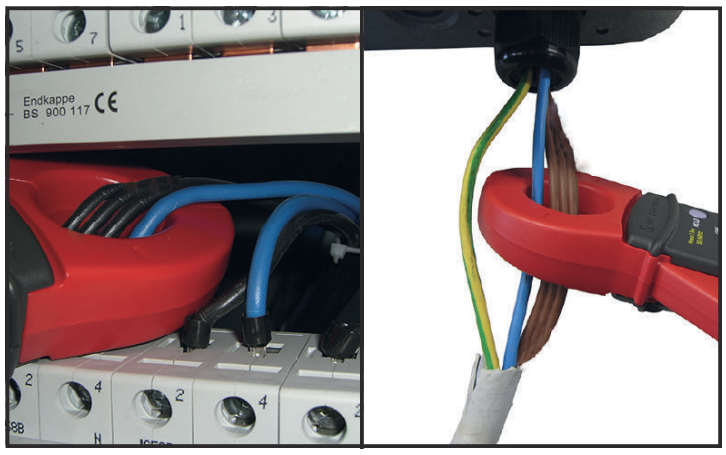
Examples of measuring the ground conductor current

Differential current method - Ground conductor current measured using an ammeter on the N and L conductors

As with an FI switch, the currents between the outer conductor (L) and the neutral conductor (N) are compared using a converter. The difference is displayed.



1 Measuring device
2 Inverter
9 Measuring line



Examples of measuring the ground conductor current

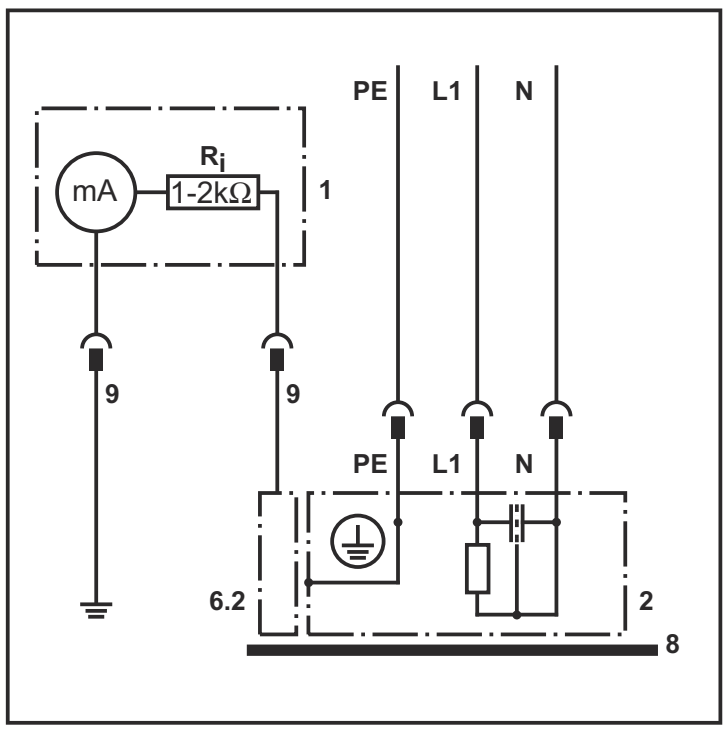
The ground conductor leakage current must not exceed 3.5 mA during this measurement (direct or differential current method).

Contact current

- Only perform the measurement if a ground conductor current measurement has been carried out successfully
- As before, the device must be switched on.

The measurement is taken between a grounded point and the touchable, conductive part that is not connected to the ground conductor.

The contact current must not exceed 0.5 mA.



1 Measuring device
2 Inverter
6.2 Touchable, conductive part not connected to the ground conductor
8 Isolated setup of test piece
9 Measuring line
Ri 1 - 2 kW



Touchable, conductive parts not connected to the ground conductor

Finally...

General

- Disconnect the inverter from the AC grid and DC supply when it is not under load (set the DC disconnector to position 0).
- Re-attach/connect all the Datcom leads that were removed (restore the inverter to the state it was in before the repair or safety inspection).
- If necessary, replace the AC lead in the PG gland.
- Check whether any conductive objects have been placed in the housing.
- Fit the Datcom cover with two 5x16 TX25 screws - **2 Nm**

General

Any defects that could cause other hazards must be rectified immediately or restrictions placed on the further use of the system until repairs have been effected.

- Missing or damaged housing parts, insulation or protective covers.
- Dirt or blockages in cooling openings.
- Check that all safety-related labels (e.g. warning notices, grounding symbols, rating plates, etc.) are present. If required, replace, supplement or amend them as appropriate.
- Ensure that all safety-related labels or symbols, measurement data and positioning indicators are legible.

Function tests

Function	Functions that the testing personnel consider to be relevant must be tested for correct operation. Energising and feeding-in of the inverter.
Grid on/off devices	Evidence of proper operation must be provided by measurement or visual inspection. AC and DC main switch check (perform when under no or minimal load, but not in standby mode) - Switch off DC main switch -> inverter must switch to error and stop feeding in energy - Switch off AC main switch -> inverter switches off and display goes out - Switch on AC main switch and DC main switch - Perform a fan test - see operating instructions
Indicators and control elements	- Check display for correct function - Check that controls work in line with the operating instructions

Documentation

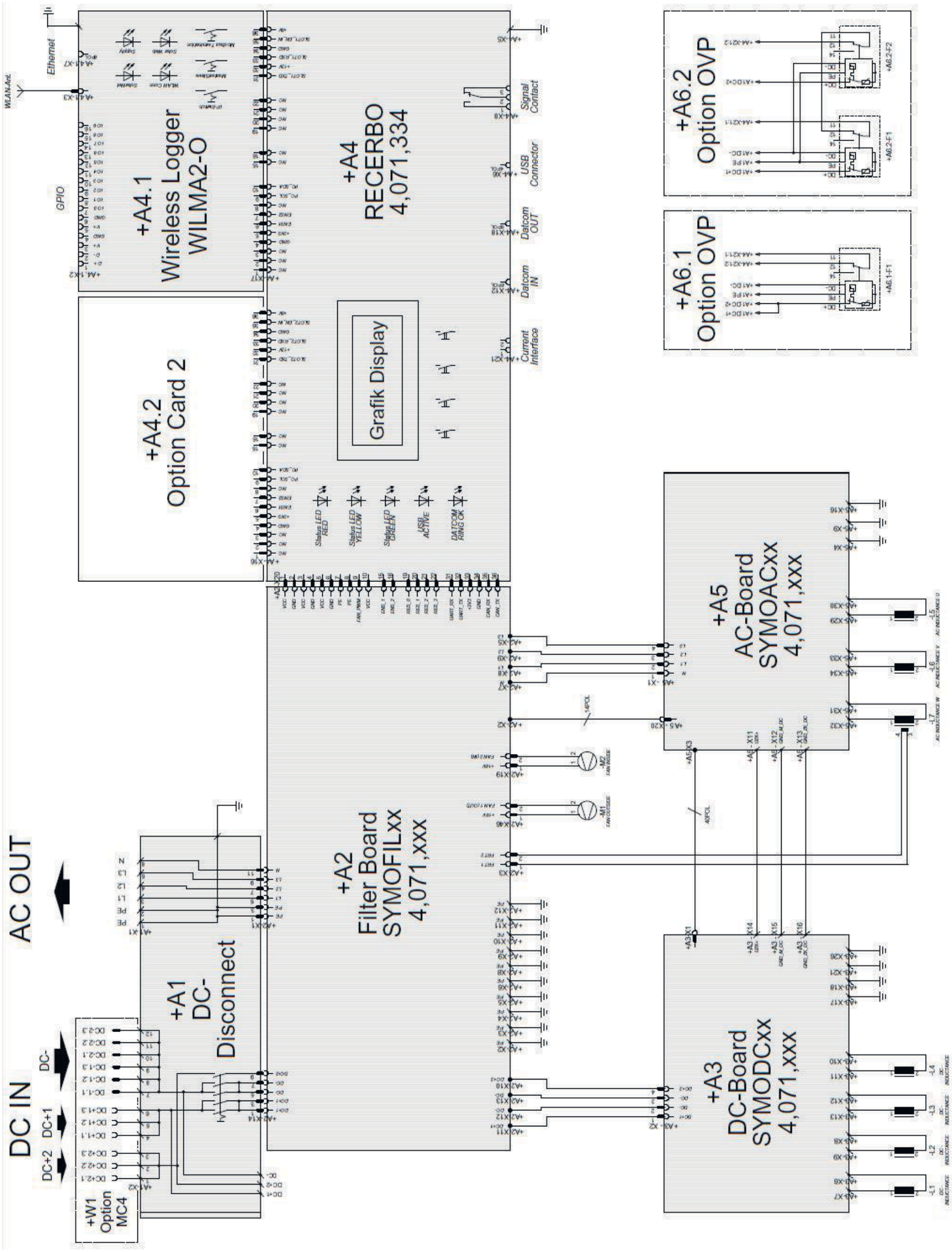
Documentation

- The electrician who performed the test is responsible for compiling the proper documentation
- Document all completed tests in a test record. Enter both the measured values and the equipment/calibration data used
- If an individual test cannot be performed, the resulting decision must be justified and documented by the examiner
- Any device that fails a test must be clearly marked as unsafe and the operator informed. The device may no longer be used.

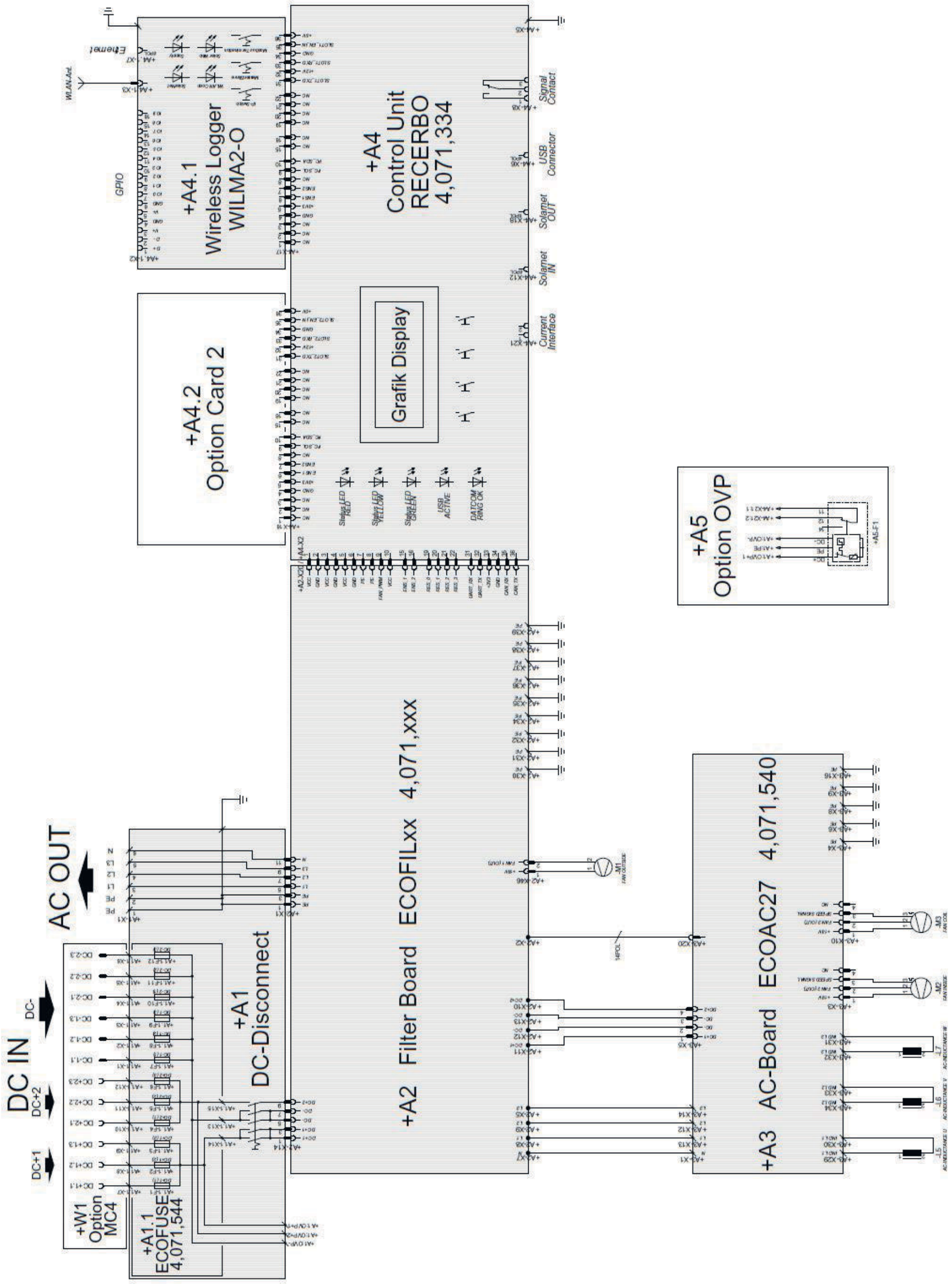
The "Safety inspection" test record is available on the Fronius Partnerweb.

Appendix

Circuit diagram: Fronius Symo



Circuit diagram: Fronius Eco



fronius.com/en/solar-energy/installers-partners/products-solutions/monitoring-digital-tools

MONITORING &
DIGITAL TOOLS

Fronius International GmbH
Froniusstraße 1
4643 Pettenbach
Austria
contact@fronius.com
www.fronius.com

At www.fronius.com/contact you will find the contact details of all Fronius subsidiaries and Sales & Service Partners.