

Short guide for replacement power

VARTA element backup





Legal notice

Original short guide for replacement power VARTA element backup

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If you require assistance in troubleshooting or installing your device, we will be glad to help you. Please contact your local technical support. You will find the contact details at www.varta-ag.com.

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1. General

1.1. Target groups

This manual is directed at various target groups:

- End customer (operator),
- Electrical specialists responsible for installation, commissioning and maintenance.

1.2. Other applicable documents

The operating manual and the data sheet of the VARTA element backup. You can download the operating manual by scanning the following QR code.



2. Safety instructions

In addition to the legal provisions, all safety instructions of the operating manual VARTA element backup apply.

2.1. Intended use

In the event of a power failure, the replacement power function of the VARTA element backup is to enable the supply of selected consumers in the household.

The technical parameters described in chapter 6 indicate the efficiency of the store. In the rarest of cases, these power values will suffice to supply a home completely with power.

- Connect selected consumers to the replacement power network. To ensure that these consumers will be safely supplied in the event of a power failure, test the function as described in chapter 9: "Testing the replacement power function" on page 8.

2.2. Erroneous use

Any use that goes beyond the intended use or other use of the energy storage system or individual parts can lead to life-threatening situations. This includes all applications:

- where the omission of the replacement power supply leads to material damage.
- where the omission of the replacement power supply leads to personal damage.

The store does not provide a UPS functionality.

- When switching from mains to replacement power and back, a supply interruption occurs.

2.3. Prohibited use

The VARTA element backup must not be used:

- for mobile use on land, water or air,
- for permanent off-grid operation,
- for use with medical equipment,
- for use as a safety power supply,
- to connect the backup power grid of several storage units in parallel,
- to cascade further energy storage units in the standby power grid,
- for the connection of generator systems to the battery-backup grid.

3. Disclaimer

VARTA Storage GmbH assumes no liability for damage to consumers in the replacement power network that has occurred due to the triggering of the grid and plant protection owing to network faults.

4. General description

With a VARTA element backup, selected electrical consumers can be supplied with electrical energy on the replacement power network even in the event of a power failure. To this end, the store keeps a reserve capacity ready that can be used in the event of a power failure.

In the integrated network operation, the electrical consumers connected to the replacement power network are supplied from the integrated network. To this end, the energy is not conducted through the batteries, but "looped through" the store (bypass). In the event of a power failure in the integrated network, the replacement power network is supplied after a short interruption.

Once the integrated network is stable again, the supply is switched to the integrated network.

Here, there is a short interruption in the replacement power network.

In the event of a power failure, the "black start" button allows manual start-up in the replacement power mode.

4.1. Term definition

4.1.1. Bypass

Consumers connected to the replacement power network are also monitored in the integrated network operation by grid and plant protection. If a network fault is detected in the integrated network mode, these consumers must be switched off, provided the network fault is pending.

- Thus, interruptions of the consumers on the replacement power connection can occur in the integrated mode.

4.1.2. Integrated network operation

The public electricity network (integrated network) is available. Electrical consumers connected to the replacement power network are supplied by the integrated network.

4.1.3. Replacement power network

The public electricity network (integrated network) is not available. Electrical consumers connected to the replacement power network are supplied by the storage system. Replacement power network refers to the part of the customer's system that is connected to the replacement power connection of the store (compare chapter 12: "*Connection diagram*" from page 10). This includes the safety equipment (fuses, RCDs) as well as the connected consumers.

4.1.4. Black start

Starting the store during the time of a failure of the public electricity network is referred to as a black start.

5. Cascade mode:

- In cascade mode, only one energy store can be used to supply replacement power.
- If the replacement power function is activated on several energy stores, no energy store will supply replacement power.

6. Technical parameters

Expansion stages	6	12	18
Nominal capacity (kWh)	6.5	13.0	19.5
Integrated network operation			
AC charging power (kW)	2.2	4.0	4.0
AC discharging power (kW)	1.8	3.7	4.0
Batter converter layout	without isolating transformer		
Grid connection	400 V AC, 3-phase, 50 Hz		
Inrush current	< max. operating current for input and output		
Replacement power network operation			
AC discharging power (kW)	1.8	3.7	4.0
Network	230 V AC, 1-phase, 50 Hz		
	400 V AC, 3-phase, 50 Hz		
Max. current per phase	5.8 A		
Short-term overload per phase	max. 12 A		
Safeguard			
Safeguard grid-side	16 A (B-character)	RCD type A 0.03/25 A (TT network)	
Safeguard consumer replacement power network	6 A (B-character)	RCD type B 0.03/25 A	
Performance recording	3-phase, by means of current sensor		

Switchover time (interruption time)

The switchover time between the separation of the power supply and the replacement power mode is normally under 90 seconds. This also applies to the switchover time to the integrated network mode.

7. Electrical consumers in the replacement power operation

The technical requirements described in chapter 6 apply to the connection of electrical consumers to the replacement power network. In addition to the general connection values, such as mains voltage, power and nominal current, the inrush current is to be taken into account in the replacement power mode.

Please note: The starting or inrush current can reach multiple times the nominal current. This affects, for example, transformers, switching power supplies or halogen lamps. In general, this value is not indicated on the type plates and data sheets of the consumers. In general, this value is of subordinate importance for connecting consumers to the integrated network, as the integrated network allows very high inrush currents.

For devices that are to be connected to the replacement power network of the VARTA element backup, the inrush current is limited to 12 A. Here, the total of all connected consumers is to be taken into account.

- Consumers with a short-term starting current < 12 A can be started.
- If the starting current of the consumers is greater than 12 A and falling to permanently under 6 A, the store will build up the replacement power network in that the internal regulator starts the store dependent on the internal current and voltage limit.
- Consumers in the replacement power path do not necessarily have to start in replacement power mode, even if they can be operated in the integrated network mode.

Notes on connection:

- Ensure that the loads are spread as equally as possible over the individual phases.

7.1. Example of possible loads

Please note that indicated values are a recommendation for individual devices. The data can deviate in individual cases. The combination of various consumers must be tested individually at the end customer's premises as described in chapter 9: *"Testing the replacement power function"* on page 8. The loads are to be spread as equally as possible over the individual phases.

Small household appliance:	up to 200 Watt.
Illuminant:	up to 500 Watt.
Cooling/freezing units:	up to 100 Watt.
Entertainment electronics:	up to 200 Watt.
Heating facilities:	up to 150 Watt.
Machine tools:	<u>not</u> recommended.
Motorised consumers:	<u>not</u> recommended.

7.2. Overload

If electrical consumers with too high a power or too high an inrush current are installed on the replacement power network, the store cannot operate them. If the starting current of 12 A is not sufficient to switch on the consumer, for example, in the event of too high a breakaway torque of a motor, the consumer cannot be operated on the replacement power network.

- If the mains voltage cannot be built up within 3 attempts, the store goes into a fault state. In this way, the connected consumers are protected.
- After a waiting time of 30 minutes in this fault state, the store switches itself off automatically.
- In this waiting time, you have the chance to have the fault state shown to you. (See chapter 9: *"Testing the replacement power function"* on page 8.)

Remedial measures:

- Reduce the power of the connected consumers.
- Redistribute the consumers across the 3 phases.

To recommission the VARTA element backup:

- Switch the energy store off and on again.
- Actuate the black start button.

8. Black start

With the black start button, the store can be started, even if no integrated network is available.

Examples:

- The store was switched off at the time of the power failure.
- A fault necessitates a restart.

Please use the following procedure for the start:

- Switch the store on at the *on switch*,
- keep the *black start button* pressed down for approx. 1 second.

Please note: If the store is fully discharged, a black start cannot be carried out.

9. Testing the replacement power function

Please regularly check the replacement power function, especially after new or additional consumers have been connected.

Please note: To test the least favourable case, activate all the consumers simultaneously.

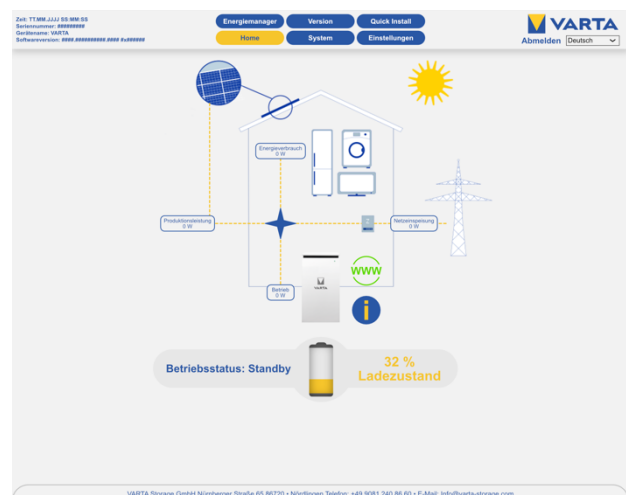
- Test the function by switching off the fuse in the supply line of the store (compare chapter 12: "*Connection diagram*" from page 10; "F1").

The store will build up the replacement power network automatically within the defined switchover time and supply the connected consumers. Should this not be the case, carry out the remedial measures described in chapter 7.2: "*Overload*" on page 7.

Note: Any faults that occur are displayed on the homepage of the web interface.

- Click on the i symbol with the mouse cursor.
- A window opens. Here, a current system error and the last five network errors can be read.

Note: According to the *expansion stage of the energy store* and after a *software update*, the website can deviate from the image shown.



10. Settings

Activate replacement power function

The parameters of the replacement power supply can be set in the Energy Manager tab *Replacement power* (1). The replacement power function of the store is activated in field (3).



Replacement power reserve

The storage system is discharged up to this charging status in the integrated network mode. The capacity set in field (4) is reserved for the supply in the event of a power failure. Values between 0 % - 30 % SOC can be set here.

Notes on setting the value:

The value is a weighting between capacity for own consumption optimisation and supply duration in the event of a power failure. The smaller the set reserve capacity, the greater the capacity that can be used for the normal own consumption optimisation. At the same time, however, the capacity reserved for a power failure is smaller.

11. Replacement power box

The replacement power box is intended for connecting consumers to the replacement power network.

The following components are installed in the replacement power box:

- F2 (safeguard consumer on the replacement power network),
- Q2 (residual current device type B for consumers on the replacement power network).

Note: If the replacement power box is not used, the corresponding protection elements must be set up in the customer distribution (see chapter 12: “*Connection diagram*”).



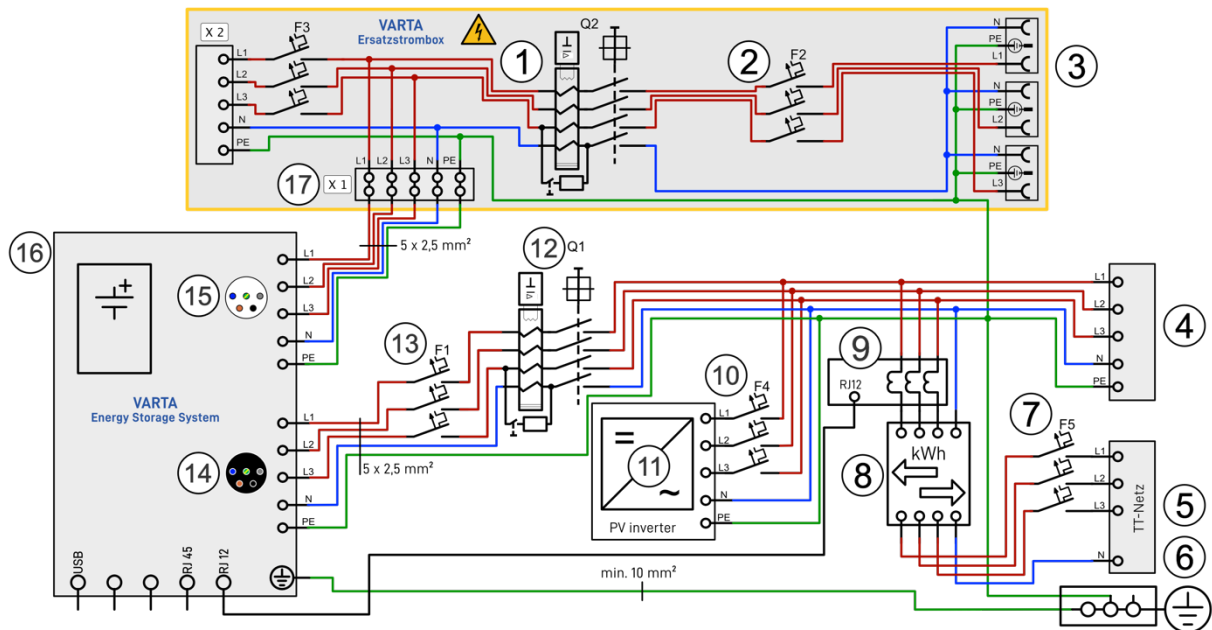
Installation of the replacement power box

- Open the replacement power box.
- Fasten the replacement power box to a flat and stable wall with screws.
- Bore the necessary cable ducts.
- Introduce the lines.
- Clip the lines onto the labelled terminals.
- Close the box.

12. Connection diagram

- The regulations of the country-specific standards, such as DIN VDE 0100, are to be complied with.
- Meter concepts are to be coordinated with the electricity grid operator.

12.1. VARTA element backup with replacement power box in the TT network



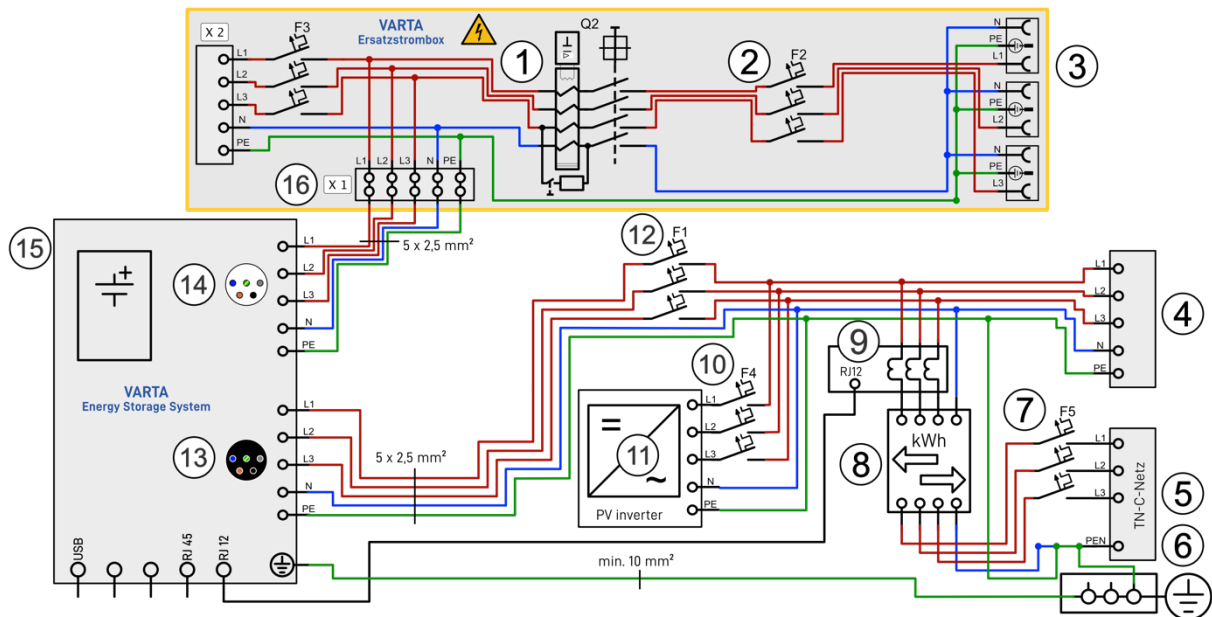
1	Q2 Residual current device type B $I_{\Delta n}$ 30 mA
2	F2 Circuit breaker 6 A type B
3	Three sockets for consumers entitled to replacement power



To prevent electrical accidents: Label the distributor for the replacement power.

4	Subdistribution
5	House connection
6	Equipotential bus bar
7	F5 Line protection/fuse house connection
8	Consumption and feed-in meter
9	Current sensor
10	F4 Circuit breaker according to converter regulation
11	Converter for photovoltaic systems
12	Q1 Residual current device type A $I_{\Delta n}$ 30 mA
13	F1 Circuit breaker 16 A type B 6 kA
14	Integrated network connection (black)
15	Replacement power connection (light grey)
16	VARTA element backup with integrated section switches according to AR 4105
17	X1 Feed clamp for energy store

12.2. VARTA element backup with replacement power box in the TN-C network



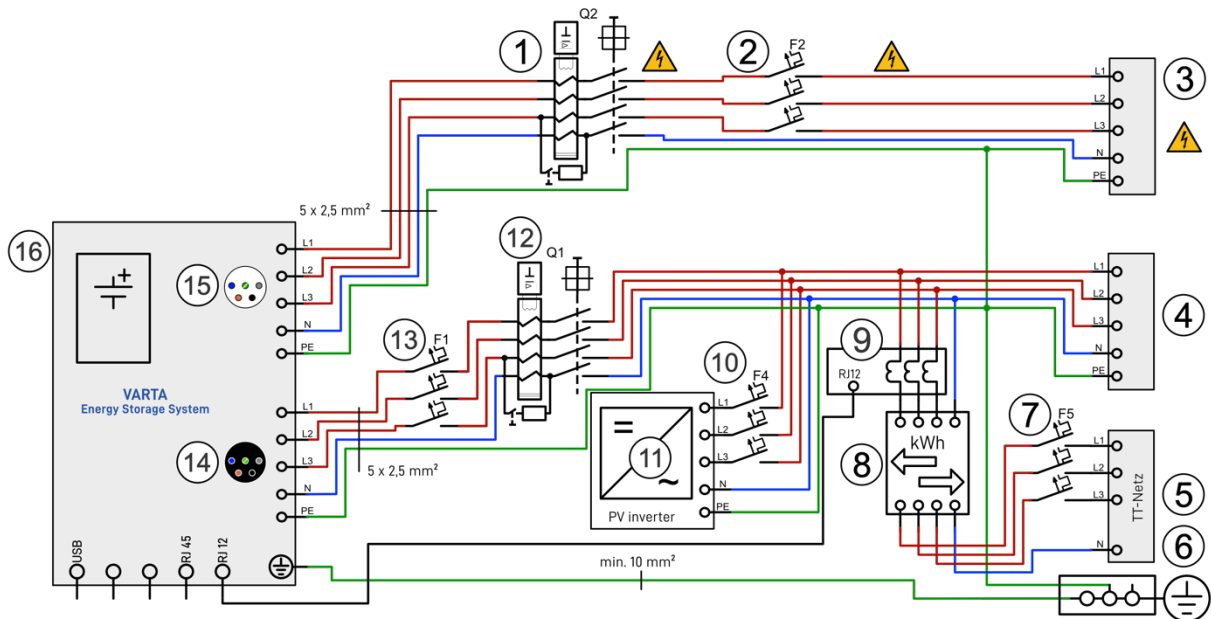
1	Q2 Residual current device type B I Δ n 30 mA
2	F2 Circuit breaker 6 A type B
3	Three sockets for consumers entitled to replacement power



To prevent electrical accidents: Label the distributor for the replacement power.

4	Subdistribution
5	House connection
6	Equipotential bus bar
7	F5 Line protection/fuse house connection
8	Consumption and feed-in meter
9	Current sensor
10	F4 Circuit breaker according to converter regulation
11	Converter for photovoltaic systems
12	F1 Circuit breaker 16 A type B
13	Integrated network connection (black)
14	Replacement power connection (light grey)
15	VARTA element backup with integrated section switches according to AR 4105
16	X1 Feed clamp for energy store

12.3. VARTA element backup in the house installation in the TT network



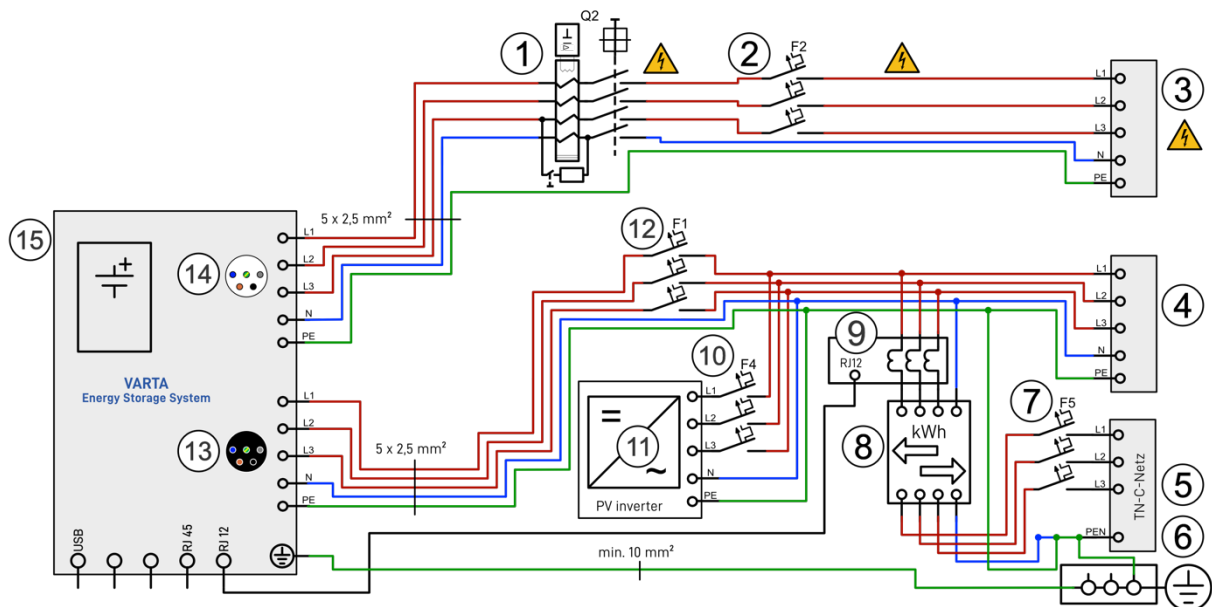
1	Q2 Residual current device type B $I_{\Delta n}$ 30 mA
2	F2 Circuit breaker 6 A type B
3	Output terminal for consumers entitled to replacement power



To prevent electrical accidents: Label the distributor for the replacement power.

4	Subdistribution
5	House connection
6	Equipotential bus bar
7	F5 Line protection/fuse house connection
8	Consumption and feed-in meter
9	Current sensor
10	F4 Circuit breaker according to converter regulation
11	Converter for photovoltaic systems
12	Q1 Residual current device type A $I_{\Delta n}$ 30 mA
13	F1 Circuit breaker 16 A type B
14	Integrated network connection (black)
15	Replacement power connection (light grey)
16	VARTA element backup with integrated section switches according to AR 4105

12.4. VARTA element backup in the house installation in the TN-C network



1	Q2 Residual current device type B I Δ n 30 mA
2	F2 Circuit breaker 6 A type B
3	Output terminal for consumers entitled to replacement power



To prevent electrical accidents: Label the distributor for the replacement power.

4	Subdistribution
5	House connection
6	Equipotential bus bar
7	F5 Line protection/fuse house connection
8	Consumption and feed-in meter
9	Current sensor
10	F4 Circuit breaker according to converter regulation
11	Converter for photovoltaic systems
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