



Backup-Systeme
AUTOMATIC SWITCH BOX M
Installation Guide



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1 Notes on this Manual

This manual describes the installation and mounting of the Automatic Switch Box. This content was previously described in the technical description of the Sunny Backup 5000.

Store this manual where it will be accessible at all times.

1.1 Validity

This manual is valid for device type AS-BOX-M.

1.2 Target Group






This manual is for qualified personnel. The tasks described in this manual may only be performed by qualified personnel.

1.3 Additional Information

Additional information regarding the Sunny Backup system and the automatic Switch Box can be found in the FAQ section at www.SMA.de.

1.4 Symbols Used

The following types of safety precautions and general information are used in this manual:

	DANGER!
DANGER indicates a hazardous situation which, if not avoided, will directly result in death or serious injury.	
	WARNING!
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.	
	CAUTION!
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.	
	NOTICE!
NOTICE indicates a situation that can result in property damage if not avoided.	
	Information
Information provides tips that are valuable for the optimal installation and operation of your product.	

2 Security

2.1 Appropriate Usage

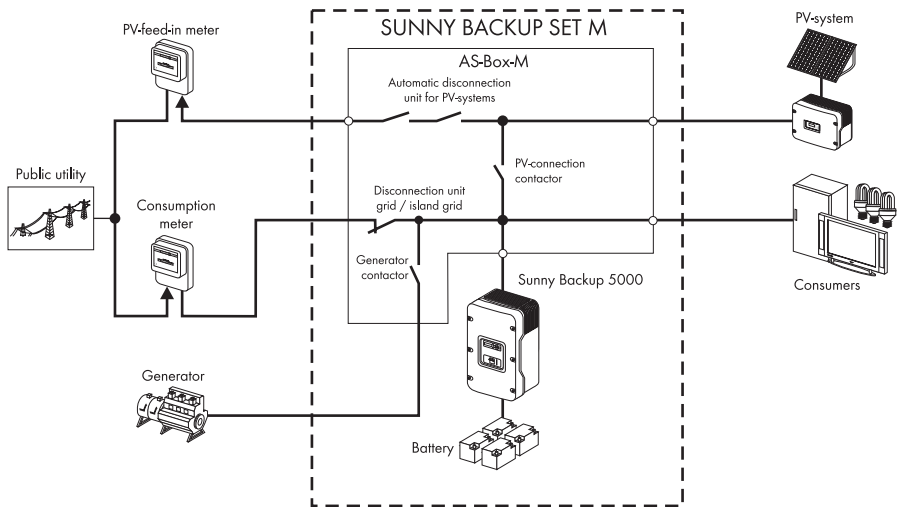
The Automatic Switch Box is a component of a Sunny Backup system M. In case of a grid failure, the Automatic Switch Box will disconnect the PV system and the loads from the public grid and connect them to the Sunny Backup. The optional generator is also integrated into the stand-alone grid in the Automatic Switch Box in case of a grid failure.



Connection requirements

The Sunny Backup system is only certified for TN grids and may not be installed in TT grids.

Principle of an Automatic Switch Box in a Sunny Backup System



The Automatic Switch Box may only be operated in combination with a Sunny Backup. The Sunny Backup evaluates the data collected by the Automatic Switch Box and coordinates all switching operations.

The maximum connection power of the individual outgoing lines (e.g. maximum AC PV power to be connected: 5.7 kW) in the Automatic Switch Box may not be exceeded.

Do not use the Automatic Switch Box for purposes other than those described here. Alternative uses, modifications, as well as installing components not recommended or sold by SMA may void the warranty and any applicable interconnection agreements.

2.2 Safety Precautions



DANGER!

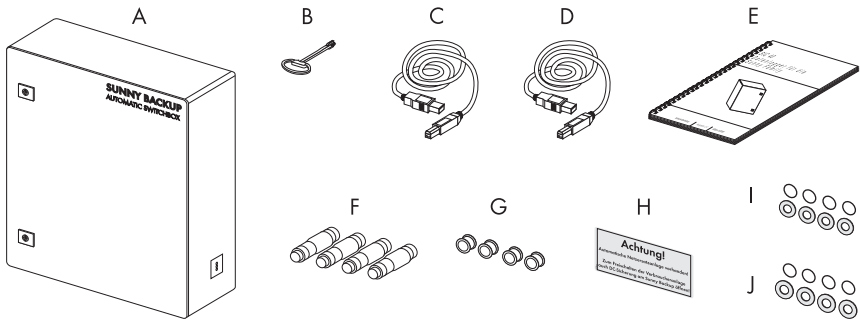
Danger to life due to high voltages in the Automatic Switch Box.

- All work on the Automatic Switch Box must be performed by a qualified electrician.

3 Unpacking

3.1 Scope of Delivery

Check the delivery for completeness and for any visible external damage. Please contact your dealer in case you find any damage or if there are parts missing.



Object	Quantity	Description
A	1	Automatic Switch Box
B	1	Switch cabinet key
C	1	Communication cable (black)
D	1	Control and measurement cable (red)
E	1	Installation guide
F	4	Fuse (35 A)
G	4	Headed sleeve (for 35 A fuse)
H	1	Label
I	8	4 sealing washers and 4 washers (diameter: 6 mm)
J	8	4 sealing washers and 4 washers (diameter: 8 mm)

3.2 Identifying the product

You can identify the Automatic Switch Box by means of the device type specified on the type label. The type label is on the right side of the enclosure.

4 Mounting the Device

4.1 Selecting the Mounting Location



DANGER!

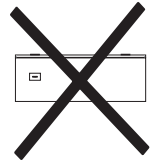
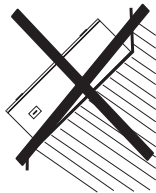
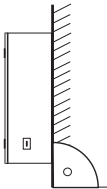
Danger to life due to fire or explosion.

Despite careful construction, a fire can occur with electrical devices.

The following installation locations are not permitted:

- on flammable construction materials,
- in areas where highly flammable materials are stored
- in potentially explosive areas!

- The mounting location and method must be suitable for the weight and dimensions.
- Installation on a solid surface.
- The installation location must be accessible at all times.
- The ambient temperature must be between $-25\text{ }^{\circ}\text{C}$ and $+50\text{ }^{\circ}\text{C}$.
- Mount vertically.



4.2 Mounting the Product on the Wall

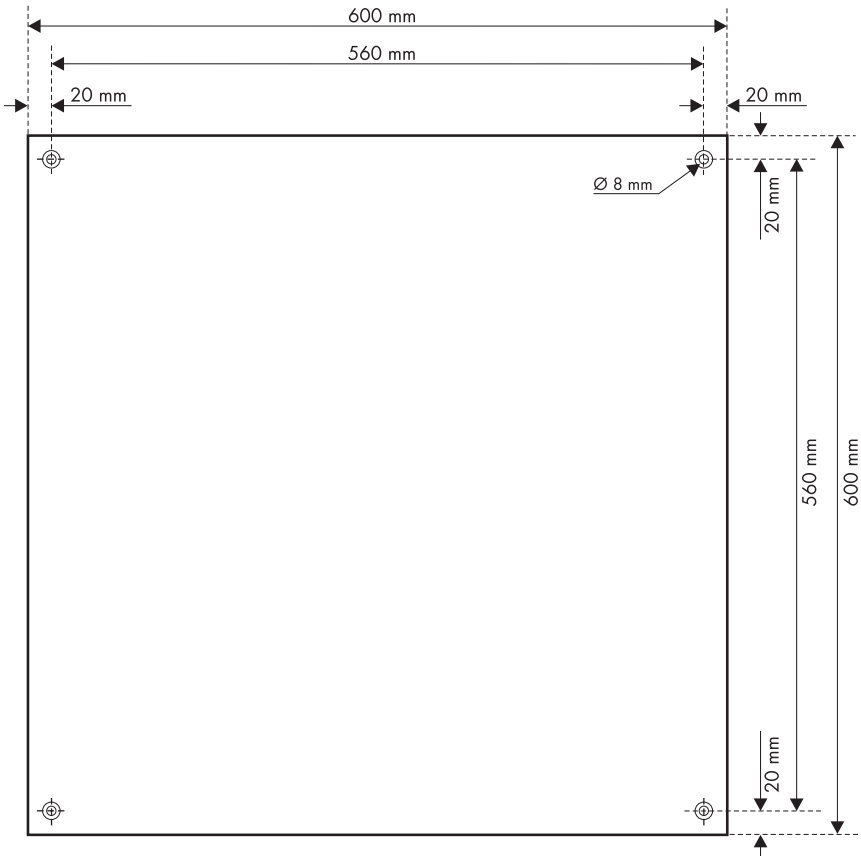


CAUTION!

Risk of injury due to the heavy weight of the Automatic Switch Box.

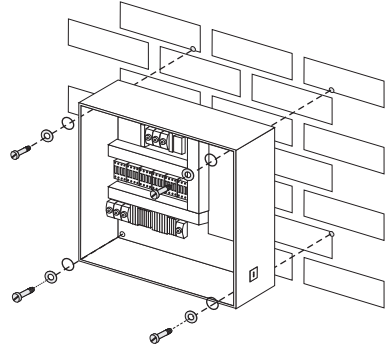
- Take the weight of 29 kg of the Automatic Switch Box into account for mounting.

1. Mark the position of the drill holes.



2. Drill the holes (recommended diameter: 6 mm) at the marked position.
3. Open the Automatic Switch Box with the enclosed switch cabinet key.

4. Attach the Automatic Switch Box to the wall using suitable screws and washers.



5. Check that the unit is securely in place.
 - The Automatic Switch Box is mounted securely on the wall.

5 Electrical Connection



NOTICE!

Destruction of the Automatic Switch Box due to excessive cable load.

- Note the bending radii of the cables used.
- Trap cables accordingly (e.g. using a cable anchoring rail).



NOTICE!

Electrostatic discharges can damage the Automatic Switch Box.

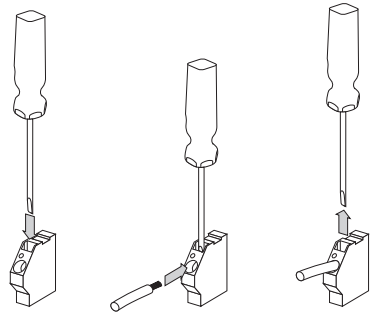
Internal components of the Automatic Switch Box can be irreparably damaged by static discharge.

- Ground yourself before touching a component inside the Automatic Switch Box.



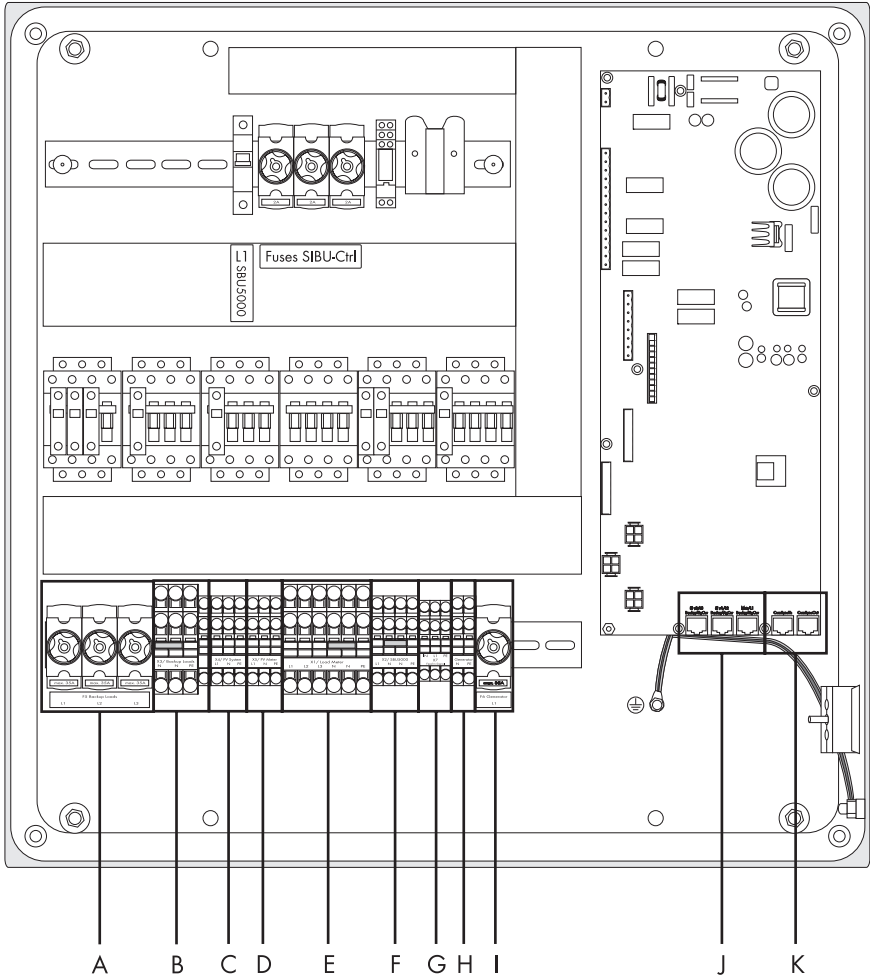
Spring-type terminals

Proceed as shown in the figure in order to connect a cable to a spring-type terminal inside the Automatic Switch Box:



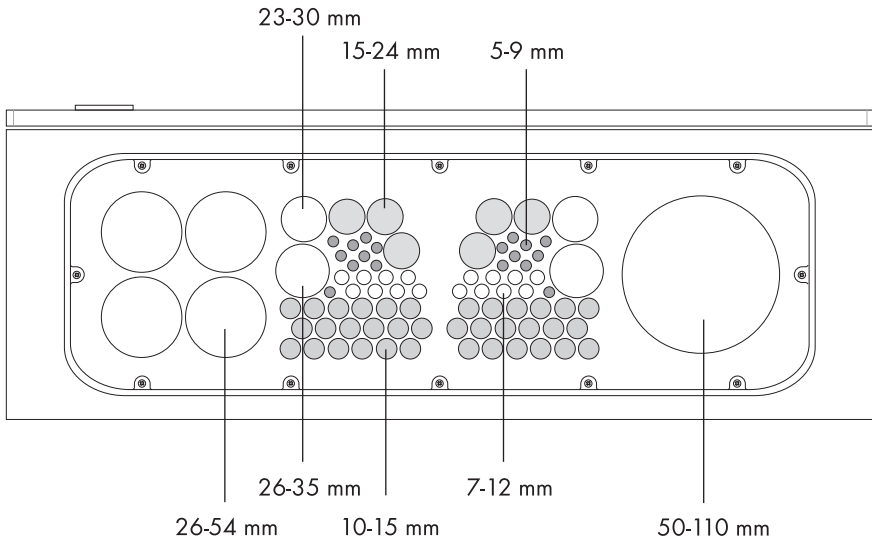
5.1 Connection Area Overview

5.1.1 Interior View



Object	Description
A	Screw type fuse element "F5 Backup Loads" for connecting loads (L1, L2, L3)
B	Connection terminal "X3/Backup Loads" for connecting loads (N, PE)
C	Connection terminal "X4/PV System" for connecting the PV system
D	Connection terminal "X5/PV Meter" for connecting the feed-in counter
E	Connection terminal "X1/Load Meter" for connecting the power supply counter
F	Connection terminal "X2/SBU 5000" for connecting the Sunny Backup
G	Connection terminals "X7/Feed in Signal" for feed-in from the battery
H	Connection terminal "Generator" for connecting the generator (N, PE) (optional)
I	Screw type fuse element "F6 Generator" for connecting the generator (L1) (optional)
J	RJ45 socket for control and measurement cable
K	RJ45 socket for communication cable

5.1.2 Exterior View



5.2 Connecting Loads

The cables of the loads are led through fuse elements in the Automatic Switch Box. The fuses are necessary in order to protect the output cable from overload in stand-alone grid operation. Note that in stand-alone operation, both the Sunny Backup as well as the PV system can power the loads, and the upstream fuse on the grid side has no effect in this situation. Determine the required fuse size according to layout type of the cable and installation conditions, and install appropriate fuse plugs. The maximum fuse plugs D02 with a nominal current of 35 A which may be used are included in the scope of delivery.



DANGER!

Risk of death from feedback of the Sunny Backup system into the public grid.

In case of backup, feedback into the public grid can occur through the backup phase and the 3-phase loads.

Feeding of the PV system and potentially from the diesel generator only occurs at phase L1 in case of grid failure.

- When connecting 3-phase loads whose coils or resistors are switched in a triangle, always connect all three phases to the Automatic Switch Box.



Selectivity of thermal fuses

In unfavorable constellations (e.g. the same fuse value twice in a row), it may happen that it is not possible to select whether to install the thermal fuses as upstream or downstream fuses. This is unavoidable due to the complexity of the Sunny Backup system with several feeding sources.



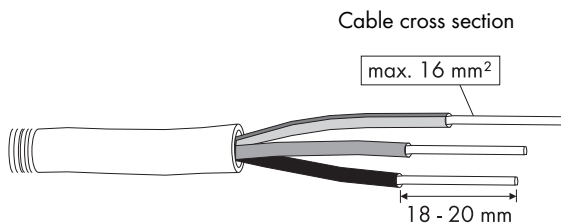
Cable end sleeves

When using fine-wired cables, use cable end sleeves as well.

This only applies to cables connected to the "F5 Backup Loads" fuse element.

Cable Requirements

The cable type and laying method must be suitable for the application and use location.



Sizing the Thermal Fuse



Load disconnection unit

Use only line circuit breakers as load disconnection units!

A screw type fuse element, e.g. D system (Diazed) or DO system (Neozed) is not a load disconnection device, and thus may **not** be used as a load disconnection unit.

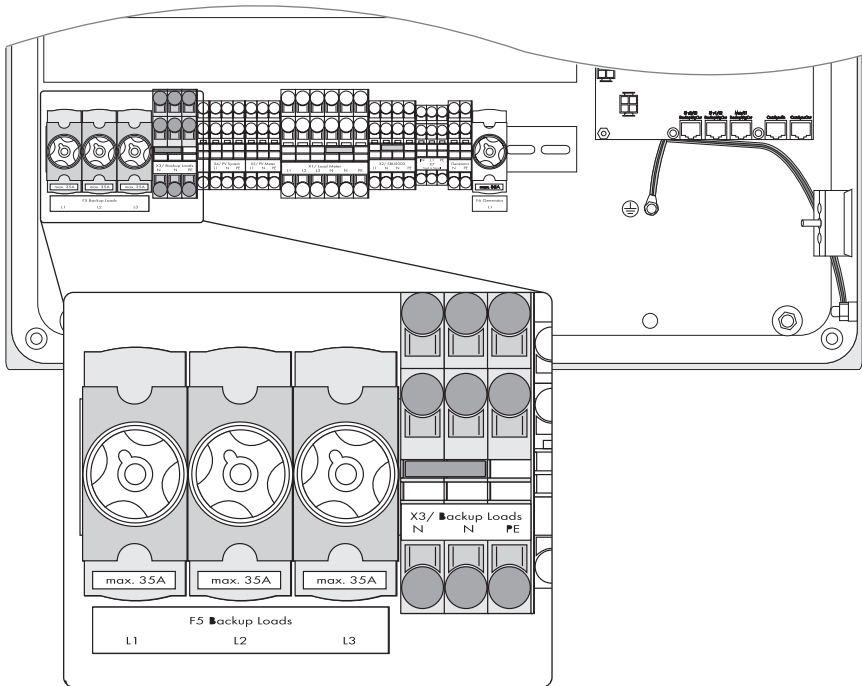
Upon disconnection under load, the screw type fuse element of the Automatic Switch Box may be destroyed, or its functionality may be inhibited by contact burning. It only acts as cable protection.

In the table, select the condition applying to you and observe the corresponding recommendation by SMA Solar Technology.

Condition	Recommendation
The rating of the back-up fuse in the distribution is equal to the nominal current of the Automatic Switch Box during grid operation (35 A).	<ul style="list-style-type: none"> Use a fuse with a nominal current of 35 A in the fuse element "F5 Backup Loads" in the Automatic Switch Box.
The rating of the back-up fuse in the distribution is lower than the nominal current of the Automatic Switch Box during grid operation (35 A).	<ul style="list-style-type: none"> Install a fuse with the same nominal current as in the distribution into the "F5 Backup Loads" fuse element in the Automatic Switch Box. Set the maximum grid current through the Sunny Backup with the parameter 232.02 GdCurNom to the value of the rating of the back-up fuse.
The rating of the back-up fuse in the distribution is higher than the nominal current of the Automatic Switch Box (35 A).	<ul style="list-style-type: none"> According to the installation, install as fuse not exceeding 35 A into the fuse element "F5 Backup Loads" in the Automatic Switch Box. Install a fuse with max. 35 A in the distribution.

Connection Procedure

1. Select the suitable opening for the loads cable and poke a hole in it with a pointy device.
The cable has to be tightly enclosed by the cable gland after insertion.
 2. Pull the loads cable through the cable opening into the inside of the Automatic Switch Box.
 3. Connect PE and N to the "X3/Backup Loads" connection terminal according to the label. The second connection terminal "N" is not assigned.
 4. Connect L1 and possibly (in case of 3-phase loads) L2 and L3 according to the labels to the "F5 Backup Loads" fuse elements.
- The loads are connected.



5.3 Connecting the PV System



Cable Protection

The Automatic Switch Box S is not intended to serve as a distributor box or fuse box for the PV system. For safety and disconnection, a line circuit breaker must be installed between Automatic Switch Box and PV system. Be sure to observe all standards applicable to the installation and site.



Connection of additional energy sources

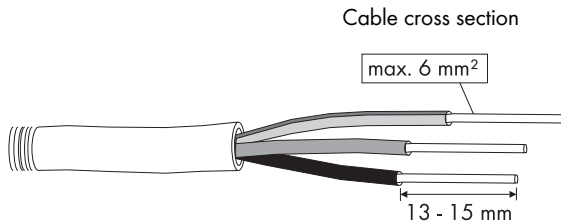
Only those energy sources may be connected to the Automatic Switch Box for which the corresponding tariff of the feed-in counter is valid. Instead of the PV system, you can also connect other energy sources (e.g. small wind energy systems) to the Automatic Switch Box. One prerequisite is the fact that a corresponding feed-in meter is connected to the Automatic Switch Box.

Since only one feed-in meter may be connected to the Automatic Switch box, only one tariff is specified. The connection of a PV system and a small wind energy system (energy sources mix) is not possible.

Cable Requirements

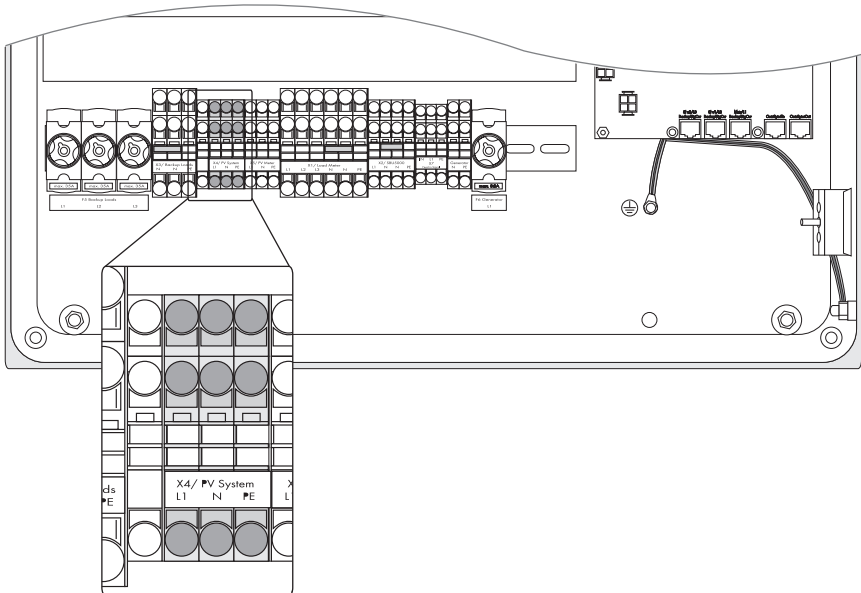
The cable type and laying method must be suitable for the application and use location. The cable after the upstream fuse on the grid side must be selected.

For Sunny Backup systems with a generator connection, attention must also be paid to the fuse protection of the generator feed-in. If the generator feed-in at the "X6/Generator" connection terminal has a greater fuse protection than the supply cable from the feed-in meter (upstream of "X5/PV Meter"), then the output cable from the PV System (X4/PV system) must be implemented with this higher fuse value.



Connection Procedure

1. Select suitable opening for the cable of the PV system and poke a hole in it with a pointy device.
The cable has to be tightly enclosed by the cable gland after insertion.
 2. Pull the cable of the PV system through the opening into the Automatic Switch Box.
 3. Connect PE conductor to the "X4/PV system" connection terminal according to the label.
 4. Connect L1 and N to the "X4/PV system" connection terminal according to the label.
- The PV system is now connected to the Automatic Switch Box.



5.4 Connecting the Feed-in Meter



Cable Protection

For safety and disconnection, a line circuit breaker must be installed between Automatic Switch Box and feed-in meter. Be sure to observe all standards applicable to the installation and site.



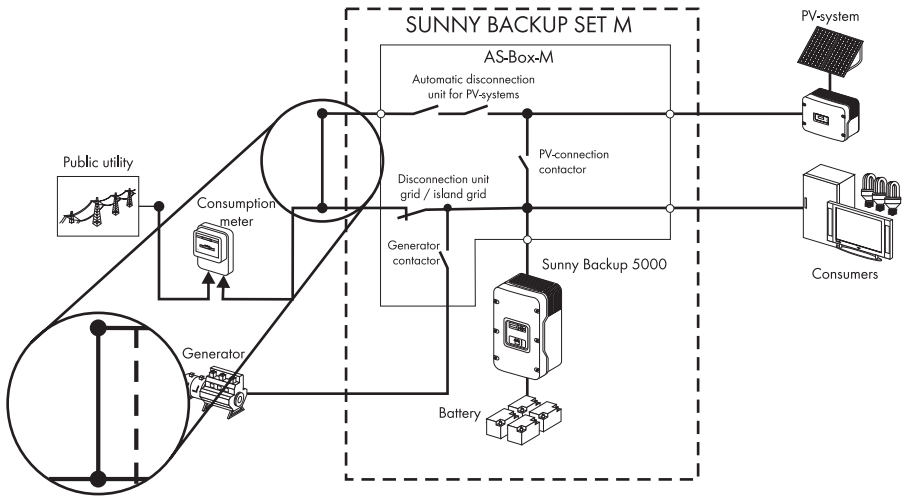
Connection requirements

The Sunny Backup system is only certified for TN grids and may not be installed in TT grids. Comply with all connection regulations of your utility operator.



PV systems without feed-in meter

The Sunny Backup system can also be used in PV systems without feed-in meter. If you do not connect a feed-in meter to the Automatic Switch Box, you must bridge the feed-in counter (X5/PV Meter) and the consumption meter (X1/Load Meter) outside of the Automatic Switch Box.



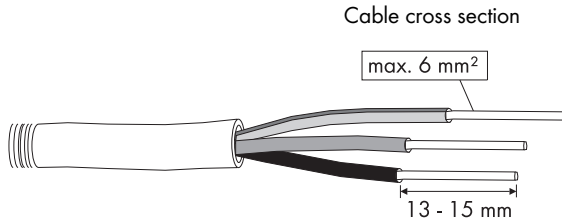
Cable Requirements

The cable type and laying method must be suitable for the application and use location.



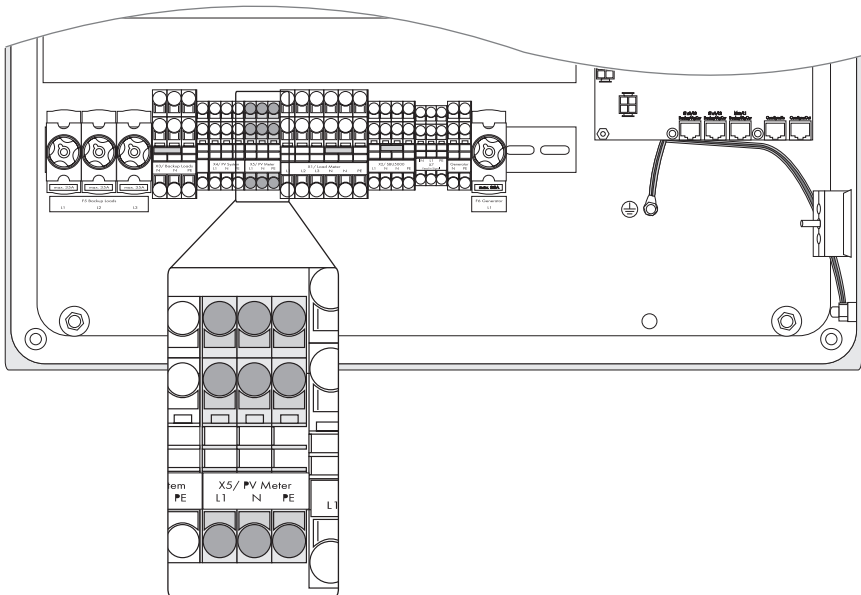
Cable cross section

The required cross-section of the cables depends on the upstream fuse.



Connection Procedure

1. Select the suitable opening for the feed-in counter cable and poke a hole in it with a pointy device.
The cable has to be tightly enclosed by the cable gland after insertion.
 2. Pull the cable of the feed-in counter through the opening into the Automatic Switch Box.
 3. Connect PE to the "X5/PV Meter" connection terminal according to the label.
 4. Connect L1 and N to the "X5/PV Meter" connection terminal according to the label.
- The feed-in meter is now connected to the Automatic Switch Box.



5.5 Connecting the Consumption Meter



DANGER!

Risk of lethal electric shock!

Residual current devices (RCD) between grid and Automatic Switch Box would lose their protective function due to the Backup System.

- Do not connect a residual current device (RCD) between grid and Automatic Switch Box.
- Do connect a residual current device (RCD) between loads and Automatic Switch Box.



DANGER!

Risk of death from feedback of the Sunny Backup system into the public grid.

In case of backup, feedback into the public grid can occur through the backup phase and the 3-phase loads.

Feeding of the PV system and potentially from the diesel generator only occurs at phase L1 in case of grid failure.

- When connecting 3-phase loads whose coils or resistors are switched in a triangle, always connect all three phases to the Automatic Switch Box.



DANGER!

Risk of lethal electric shock!

The Sunny Backup system requires a grounded neutral conductor in order to form a TN grid in case of grid failure and be able to apply the corresponding protective measures.

- Do not install any switching elements in the grounded neutral conductor to the Automatic Switch Box.



DANGER!

Risk of lethal electric shock!

- Connect the PEN conductor on the grid side within the house connection box to protective earth.

Example: Connection from house connection box to the equipotential bonding bar.

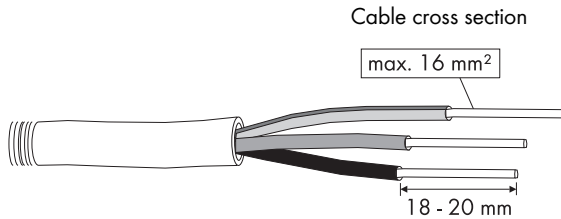
Cable Requirements

The cable type and laying method must be suitable for the application and use location.



Cable cross section

The required cross-section of the cables depends on the upstream fuse.



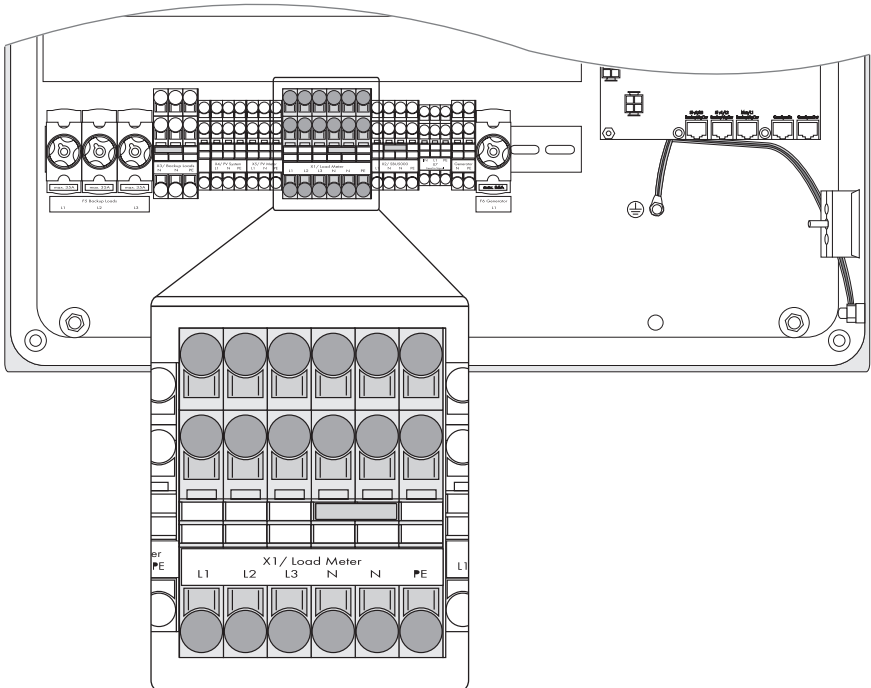
NOTICE!

Destruction of the Automatic Switch Box due to overload.

- Use max. one 35 A fuse as back-up fuse in the distribution.

Connection Procedure

1. Select suitable cable opening for the cable of the power supply counter and poke a hole in it with a pointy device.
The cable has to be tightly enclosed by the cable gland after insertion.
 2. Pull the cable of the power supply counter through the opening into the Automatic Switch Box.
 3. Connect PE to the "X1/Load Meter" connection terminal according to the label.
 4. Connect L1 and potentially (in case of 3-phase loads) L2 and L3 to the "X1/Load Meter" connection terminals according to the label.
 5. Connect N to the "X1/Load Meter" connection terminals according to the label. The second connection terminal "N" is not assigned.
- The consumption meter is now connected.



5.6 Connecting the Sunny Backup



Securing the Sunny Backup

The Sunny Backup is secured with a C32 A line circuit breaker inside the Automatic Switch Box.

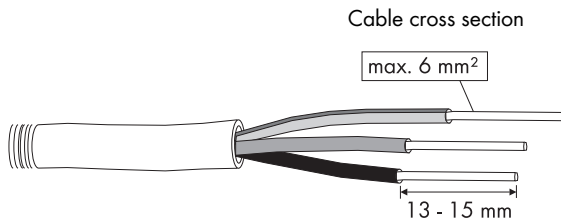
Cable Requirements

The cable type and laying method must be suitable for the application and use location.



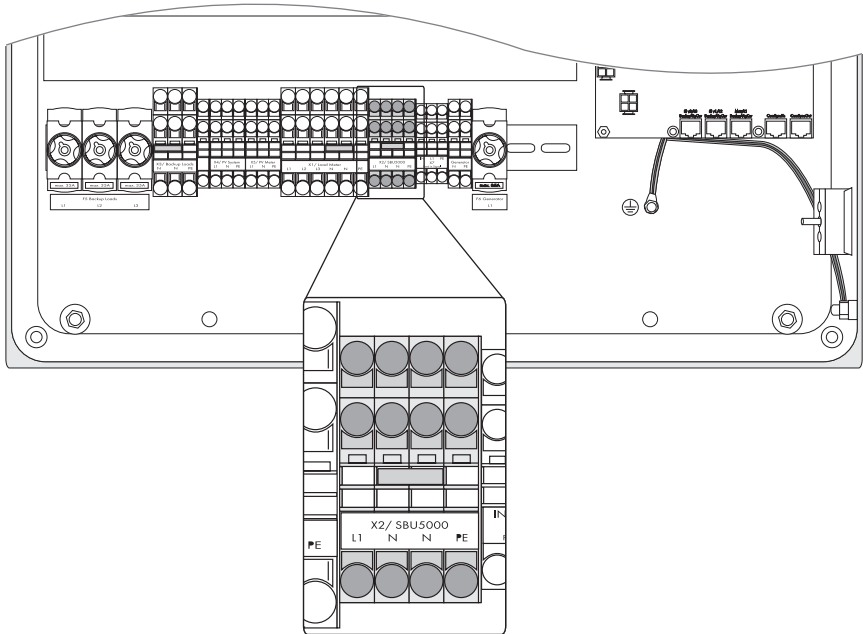
Cable cross section

SMA Solar Technology recommends cables with a cross-section of 6 mm^2 .



Connection Procedure

1. Select suitable cable opening for the cable of the Sunny Backup and poke a hole in it with a pointy device.
The cable has to be tightly enclosed by the cable gland after insertion.
 2. Pull the cable of the Sunny Backup through the opening into the Automatic Switch Box.
 3. Connect PE to the "X2/SBU5000" connection terminal according to the label.
 4. Connect L1 and N to the "X2/SBU5000" connection terminal according to the label. The second connection terminal "N" is not assigned.
- The cable for the connection of the Sunny Backup is now connected.



5.7 Connecting External Signal for Battery Feed-In



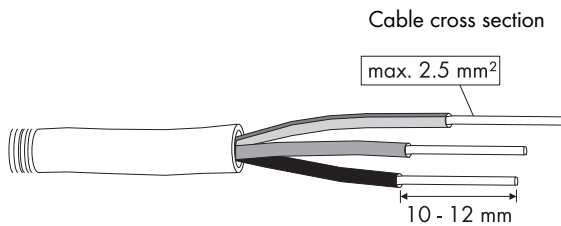
Consent of the utility operators

Battery feed-in into the public grid may only be carried out with the consent of the responsible utility operators.

The grid feeding from the battery can be started or stopped through the floating contact "Feed-In Signal". The relay output of a ripple control receiver, for example, can be connected to this contact which can receive e.g. signals from the utility operator.

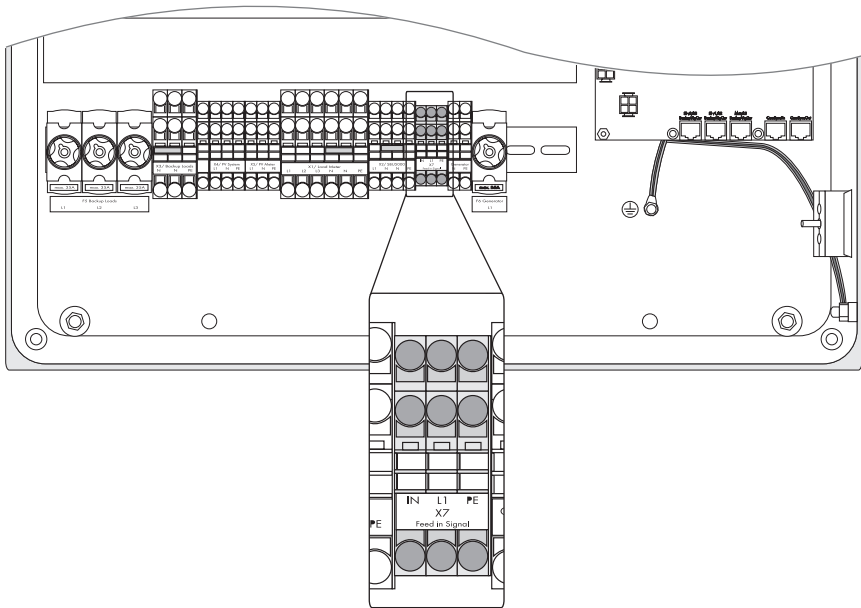
Cable Requirements

The cable type and laying method must be suitable for the application and use location.



Connection Procedure

1. Select suitable for the cable of the feed-in signal and poke a hole in it with a pointy device.
The cable has to be tightly enclosed by the cable gland after insertion.
 2. Pull the cable through the opening into the Automatic Switch Box.
 3. Connect PE to the "X7/Feed-In Signal" connection terminal according to the label.
 4. Connect the cables to "IN" and "L1".
- The external signal for battery feed-in is now connected.



5.8 Connecting a Generator (Optional)

Cable Requirements

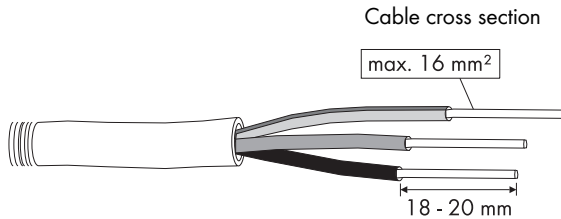


NOTICE!

Destruction of the cables through faulty cable design.

- Select the required cable cross-section according to the nominal power of the generator.
- The design of the output fuse of the generator may affect the design of the cable to the PV system.
- If the generator does not have an output fuse, implement the cable connection to the Automatic Switch Box in a ground-fault proof and short-circuit proof manner. As an alternative - especially for long cable distances - you can install an additional fuse box close to the generator.
- Install fuses and protect the cable to the generator against short-circuit currents from the grid and against overload.

The cable type and laying method must be suitable for the application and use location.



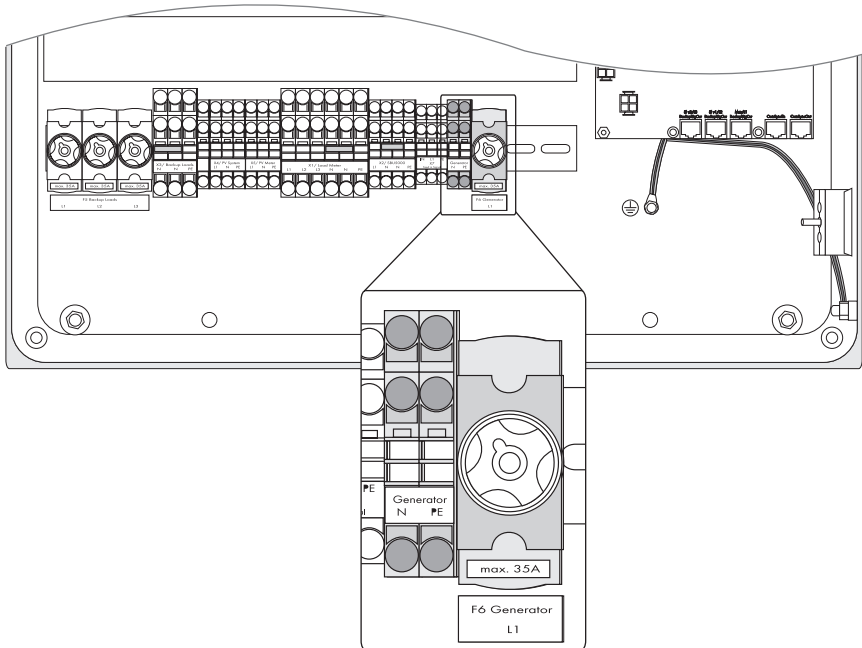
Cable end sleeves

When using fine-wired cables, use cable end sleeves as well.

This only applies for the cable connected to the "F6 Generator" fuse element.

Connection Procedure

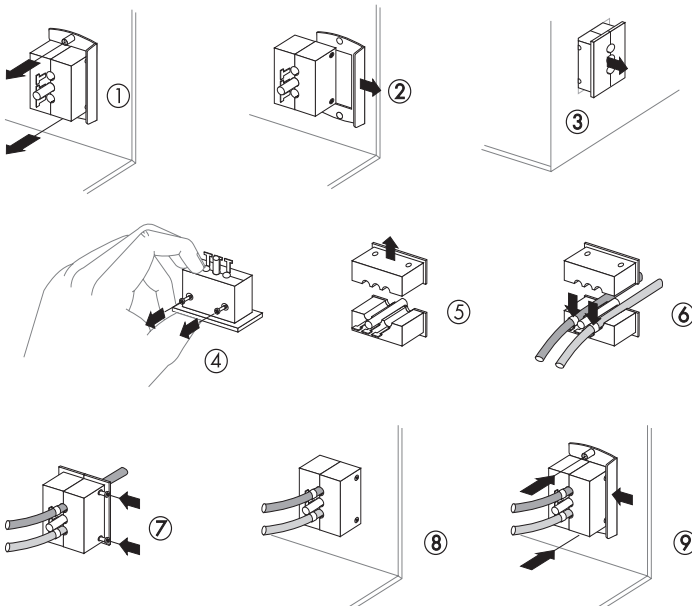
1. Select suitable opening for the cable of the generator and poke a hole in it with a pointy device.
The cable has to be tightly enclosed by the cable gland after insertion.
 2. Pull the cable of the generator through the opening into the Automatic Switch Box.
 3. Connect PE to the "Generator" connection terminal according to the label.
 4. Connect L to "L1" of the "F6 Generator" fuse element.
Torque: 4 Nm +/- 20 %
 5. Connect N to the "Generator" connection terminal according to the label.
- The generator is now connected.



5.9 Communication

Preparatory Work:

1. Loosen the screws of the fastening plate of the dual cable gland inside the Automatic Switch Box.
 2. Remove fastening plate and place to the side.
 3. Remove cable gland from the housing.
 4. Loosen screws of the dual cable gland.
 5. Detach the half without the T-shaped fastening pieces.
 6. Lay the communication cable as well as the control and measurement cable with sufficient length from the gland to the desired connection through the part of the cable gland with the T-shaped fastening pieces and fix them with cable ties.
 7. Screw both halves back together. Fasten the screws so that they could be loosened by hand.
- The cables as well as the placeholder (plastic rod) have to be fitted tightly between both sides of the dual cable gland. Otherwise, a proper seal of the housing cannot be guaranteed.
8. Insert cable gland including cable into the housing.
 9. Attach fastening plate of the dual cable gland and fasten screws by hand.
- The cables are led into the Automatic Switch Box.



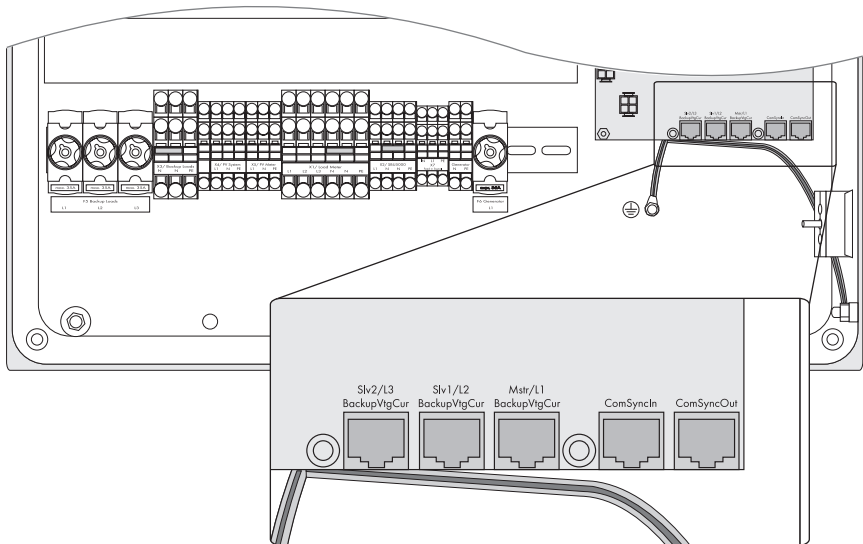
5.9.1 Connecting Control and Measurement Cable

The Automatic Switch Box transfers voltage measurement signals and current measurement signals to the Sunny Backup.

Connection Procedure

Plug the control and measurement cable (red) into the "Mstr/L1 BackupVtgCur" socket on the circuit board inside the Automatic Switch Box.

- The control and measurement cable is now connected.



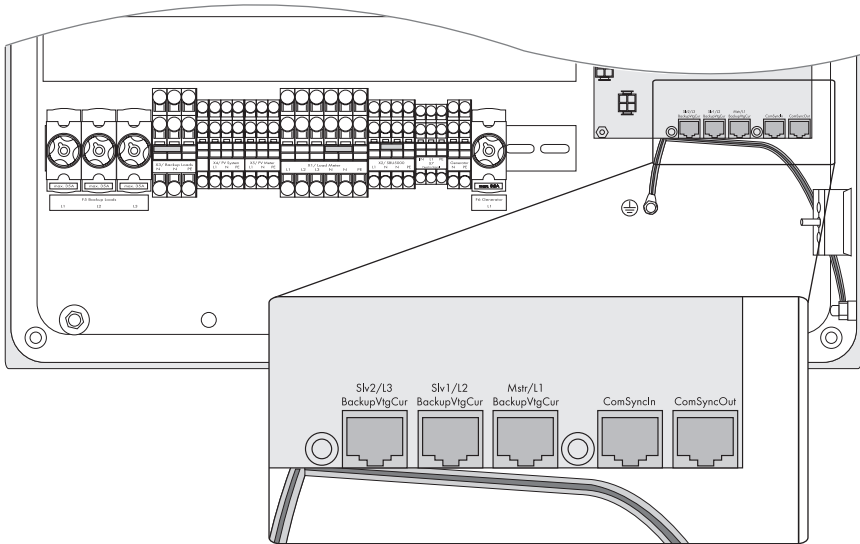
5.9.2 Connecting the Communication Cable

The Automatic Switch Box is controlled by the Sunny Backup via a CAN bus.

Connection Procedure

Plug the communication cable (black) into the "ComSyncln" socket on the circuit board inside the Automatic Switch Box. Leave the termination resistor plugged in the "ComSyncOut" socket.

- The communication cable is now connected.



6 Commissioning

Requirements

Check the following requirements before commissioning:

- Automatic Switch Box is mounted securely to the wall
- All cables are correctly and completely connected
- All cables are tightly enclosed by the cable glands

Commissioning procedure

1. Loosen screw caps of all fuse elements.
 2. Insert headed sleeves into all fuse elements.
 3. Insert fuses into the screw caps.
 4. Install screw caps including fuse into the fuse elements.
 5. Lock Automatic Switch Box with the switch cabinet key.
 6. Attach enclosed label visibly in the consumer system.
- The Automatic Switch Box is now ready for operation.

7 Opening and Closing

7.1 Opening the Product

**DANGER!**

Danger to life due to high voltages in the Automatic Switch Box.

- Switch off the line circuit breaker and secure it to prevent it from being reactivated.
- Ensure that no voltage is present in the system.

**NOTICE!**

Electrostatic discharges can damage the Automatic Switch Box.

Internal components of the Automatic Switch Box can be irreparably damaged by static discharge.

- Ground yourself before touching a component inside the Automatic Switch Box.

Open the housing lid with the switch cabinet key.

7.2 Closing the Product

1. Close the housing lid with the switch cabinet key.
 2. Switch on the line circuit breaker.
- The Automatic Switch Box is now closed.

8 Decommissioning

8.1 Disassembling the Product

**CAUTION!**

Risk of injury due to the heavy weight of the Automatic Switch Box.

- Take the Automatic Switch Box's weight of 29 kg into account.

1. Open the Automatic Switch Box, as described in Section 7.1 "Opening the Product" (page 37).
 2. Remove all cables from the Automatic Switch Box.
 3. Lock the Automatic Switch Box with the switch cabinet key.
 4. Dismount the Automatic Switch Box.
- The Automatic Switch Box is disassembled.

8.2 Storing the Product

Store the Automatic Switch Box in a dry place where the ambient temperature is always between $-25\text{ }^{\circ}\text{C}$ and $+50\text{ }^{\circ}\text{C}$.

8.3 Disposing of the Product

Dispose of the Automatic Switch Box at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time.

9 Technical Data

General	AS-BOX M
Number of phases	1-phase
Nominal voltage	202 ... 253 V
Nominal frequency	45 ... 55 Hz
Number of Sunny Backups	1 x Sunny Backup 5000
Mounting type	suspended
Permitted grid structure	TN-C / TN-S

Load Connection	
Nominal output power / current during grid operation	8 kW / 35 A
Maximum cable cross section (suitable for connection)	16 mm ²
Fuse (maximum to be used)	D02 (35 A)
Clamping position	Fuse / spring-type terminals

Consumption meter connection	
Nominal output power / current	8 kW / 35 A
Maximum cable cross section (suitable for connection)	16 mm ²
Clamping position	Spring-type terminals

PV system / feed-in meter connection	
Nominal output power / current	5.7 kW / 25 A
Maximum cable cross section (suitable for connection)	6 mm ²
Clamping position	Spring-type terminals

Sunny Backup connection	
Nominal output power / current	5 kW / 22 A
Maximum cable cross section (suitable for connection)	6 mm ²
Fuse	C 32 A
Clamping position	Fuse / spring-type terminals

Generator connection (optional)	
Nominal output power / current	8 kW / 35 A
Maximum cable cross section (suitable for connection)	16 mm ²

Generator connection (optional)	
Fuse (maximum to be used)	D02 (35 A)
Clamping position	Fuse / spring-type terminals
Power consumption	
Internal consumption during the day	21 W
Internal consumption at night	16 W
Certificates	
Independent disconnection device per DIN VDE 0126-1-1	Yes, in combination with the Sunny Backup 5000
EC Declaration of Conformity	enclosed, download area www.SMA.de
Mechanical Data	
Dimensions (W x H x D in mm)	600 x 600 x 210
Weight	29 kg
Ambient Conditions	
Ambient temperature	-25 °C ... +50 °C
Air humidity	0 ... 100 %
Protection Rating	
Protection rating according to DIN EN 60529	IP 65

10 Contact

If you have technical problems concerning our products, contact our Service Line. We require the following information in order to provide you with the necessary assistance:

- Type of Automatic Switch Box
- Series number of the Automatic Switch Box
- Type and number of the connected Sunny Backup(s)

SMA Solar Technology AG

Sonnenallee 1
34266 Niestetal, Germany
www.SMA.de

Service Line

Inverters: +49 561 9522 1499
Communication: +49 561 9522 2499
Fax: +49 561 9522 4699
E-Mail: serviceline@SMA.de

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- Altering the product or supplied software without authority
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