Communication Interface for SMA Inverters

485 Data Module

Installation Manual
# Table of Contents

1. **Information on this Document** ........................................... 4  
2. **Safety** .............................................................................. 6  
   2.1 Intended Use ................................................................. 6  
   2.2 Qualification of Skilled Persons ....................................... 6  
   2.3 Safety Precautions ......................................................... 7  
3. **Scope of Delivery** ............................................................ 8  
   3.1 Order Option "485 Data Module" Pre-Installed in the Inverter  . 8  
   3.2 Order Option "485 Data Module" as Retrofit Kit .................. 8  
4. **Product Description** ......................................................... 9  
   4.1 485 Data Module ............................................................. 9  
   4.2 Type Label ..................................................................... 10  
   4.3 Cable Gland ................................................................... 11  
5. **Connection** ...................................................................... 12  
   5.1 Device Overview ............................................................. 12  
   5.2 Installing the 485 Data Module in the Inverter ................. 13  
   5.3 Connecting the 485 Data Module ..................................... 15  
6. **Decommissioning** .............................................................. 18  
   6.1 Disassembling the 485 Data Module ................................. 18  
   6.2 Packaging the 485 Data Module for Shipping .................. 19  
   6.3 Disposing of the 485 Data Module ................................. 19  
7. **Troubleshooting** ............................................................... 20  
8. **Technical Data** ................................................................. 21  
9. **Contact** ........................................................................... 22
1 Information on this Document

Validity
This document is valid for device type "485I-MOD-G1 BGCB" as of hardware version B5 and firmware version 4.00.

Target Group
This document is for skilled persons. Only skilled persons with appropriate qualification are allowed to perform the tasks set forth in this document (see Section 2.2 "Qualification of Skilled Persons", page 6).

Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>![DANGER]</td>
<td>Indicates a hazardous situation which, if not avoided, will result in death or serious injury</td>
</tr>
<tr>
<td>![WARNING]</td>
<td>Indicates a hazardous situation which, if not avoided, could result in death or serious injury</td>
</tr>
<tr>
<td>![CAUTION]</td>
<td>Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury</td>
</tr>
<tr>
<td>![NOTICE]</td>
<td>Indicates a situation which, if not avoided, could result in property damage</td>
</tr>
<tr>
<td>![INFO]</td>
<td>Information that is important for a specific topic or goal, but is not safety-relevant</td>
</tr>
<tr>
<td>![CHECKBOX]</td>
<td>Indicates an essential requirement for achieving a specific goal</td>
</tr>
<tr>
<td>![CHECKMARK]</td>
<td>Desired result</td>
</tr>
<tr>
<td>![X]</td>
<td>A problem that might occur</td>
</tr>
</tbody>
</table>
Typographies

<table>
<thead>
<tr>
<th>Typography</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bold</strong></td>
<td>• Display messages&lt;br&gt;• Elements of a user interface&lt;br&gt;• Connections&lt;br&gt;• Elements to be selected&lt;br&gt;• Elements to be entered</td>
<td>• The value can be read from the <strong>Energy</strong> field.&lt;br&gt;• Select Settings.&lt;br&gt;• Enter the value 10 in the <strong>Minutes</strong> field.</td>
</tr>
<tr>
<td>&gt;</td>
<td>• Connects several elements that are to be selected</td>
<td>• Select Settings &gt; Date.</td>
</tr>
<tr>
<td>[Button/Key]</td>
<td>• Button or key to be selected or pressed</td>
<td>• Select [Next].</td>
</tr>
</tbody>
</table>

Nomenclature

<table>
<thead>
<tr>
<th>Complete designation</th>
<th>Designation in this document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Solar Switch</td>
<td>ESS</td>
</tr>
<tr>
<td>PV plant</td>
<td>Plant</td>
</tr>
<tr>
<td>SMA inverter</td>
<td>Inverter</td>
</tr>
</tbody>
</table>

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Alternating Current</td>
<td>–</td>
</tr>
<tr>
<td>DC</td>
<td>Direct Current</td>
<td>–</td>
</tr>
</tbody>
</table>

Figures

The figures in this document can vary slightly for inverters of types STP 1x000TL-10, STP xx000TLHE-10, STP xx000TLEE-10, SB x000TL-21 and WB xx00TL-21.
2 Safety

2.1 Intended Use

The 485 Data Module enables you to setup cable-connected RS485 communication for SMA inverters of type:

<table>
<thead>
<tr>
<th>Sunny Boy</th>
<th>Sunny Tripower</th>
<th>Windy Boy</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB 3000TL-20</td>
<td>STP 8000TL-10</td>
<td>WB 3600TL-20</td>
</tr>
<tr>
<td>SB 3600TL-20</td>
<td>STP 10000TL-10</td>
<td>WB 5000TL-20</td>
</tr>
<tr>
<td>SB 4000TL-20</td>
<td>STP 12000TL-10</td>
<td>WB 3000TL-21</td>
</tr>
<tr>
<td>SB 5000TL-20</td>
<td>STP 15000TL-10</td>
<td>WB 3600TL-21</td>
</tr>
<tr>
<td>SB 3000TL-21</td>
<td>STP 17000TL-10</td>
<td>WB 4000TL-21</td>
</tr>
<tr>
<td>SB 3600TL-21</td>
<td>STP 15000TLHE-10</td>
<td>WB 5000TL-21</td>
</tr>
<tr>
<td>SB 4000TL-21</td>
<td>STP 20000TLHE-10</td>
<td></td>
</tr>
<tr>
<td>SB 5000TL-21</td>
<td>STP 15000TLEE-10</td>
<td></td>
</tr>
<tr>
<td>SB 2500TLST-21</td>
<td>STP 20000TLEE-10</td>
<td></td>
</tr>
<tr>
<td>SB 3000TLST-21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The 485 Data Module is only suitable for use with the above mentioned inverter types. The 485 Data Module is available as a retrofit kit or is pre-installed in the inverter.

For safety reasons, it is not permitted to modify the product or install components that are not explicitly recommended or distributed by SMA Solar Technology AG for this product. Only use the 485 Data Module in accordance with the information provided in the enclosed documentation. Any other use may result in personal injury or property damage.

The enclosed documentation is an integral part of this product.

- Read and observe the documentation.
- Keep the documentation in a convenient place for future reference.

2.2 Qualification of Skilled Persons

The work described in this document must only be performed by skilled persons. Skilled persons must have the following qualifications:

- Training in the installation and commissioning of electrical devices and plants
- Knowledge of how to deal with the dangers and risks associated with installing and using electrical devices and plants
- Knowledge of all applicable standards and directives
- Knowledge of how an inverter works and is operated
- Knowledge of and compliance with this document and all safety precautions
2.3 Safety Precautions

Electric Shock
Lethal voltages are present in the conductive parts of the inverter.
• Prior to performing any work on the inverter, disconnect the inverter from any voltage sources on the AC and DC sides (see inverter installation manual).

Burn Hazards
Some parts of the inverter enclosure can get hot during operation.
• During operation, touch the inverter on the enclosure lid only.

Environmental Influences
When closed and with the ESS plugged in, the inverter has the degree of protection IP65. The inverter is thus protected against dust intrusion and water penetration. Dust intrusion and water penetration can damage the inverter.
• If the ESS is not plugged in, the inverter must be protected against dust and water.
• Firmly plug the ESS in again after performing any work on the inverter.

Electrostatic Discharge
By touching electronic components, you can damage or even destroy the inverter through electrostatic discharge (ESD).
• Earth yourself before touching any inverter components.

Disturbance of Data Transmission due to AC Cables
During operation, AC cables generate an electromagnetic field which may induce interference in plant communication.
• Lay the cables for RS485 communication using suitable fastening material and with a minimum clearance of 50 mm to the AC cables.
3 Scope of Delivery

3.1 Order Option "485 Data Module" Pre-Installed in the Inverter

Check the delivery for completeness and any visible external damage. Contact your specialist dealer if the delivery is incomplete or you find any damage.

Figure 1: Components included in the scope of delivery: 485 Data Module pre-installed in the inverter

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Installation manual</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>Technical Description &quot;RS485 Cabling Plan&quot;</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>Cable gland</td>
</tr>
</tbody>
</table>

3.2 Order Option "485 Data Module" as Retrofit Kit

Check the delivery for completeness and any visible external damage. Contact your specialist dealer if the delivery is incomplete or you find any damage.

Figure 2: Components included in the scope of delivery for the 485 Data Module as retrofit kit

<table>
<thead>
<tr>
<th>Position</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>485 Data Module with:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 2 conductive adhesive foils</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 plug</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 plug with a connected terminator</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>Cable gland</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>Installation manual</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>Technical Description &quot;RS485 Cabling Plan&quot;</td>
</tr>
</tbody>
</table>
4 Product Description

4.1 485 Data Module

The 485 Data Module enables you to setup cable-connected RS485 communication for SMA inverters.

![Design of the 485 Data Module](image)

Figure 3: Design of the 485 Data Module

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Hexagon socket screw</td>
</tr>
<tr>
<td>B</td>
<td>Plug</td>
</tr>
<tr>
<td>C</td>
<td>Plug with connected resistor</td>
</tr>
<tr>
<td>D</td>
<td>Ribbon cable plug</td>
</tr>
<tr>
<td>E</td>
<td>Ribbon cable</td>
</tr>
<tr>
<td>F</td>
<td>Type label</td>
</tr>
</tbody>
</table>
4.2 Type Label

The type label clearly identifies the 485 Data Module. The type label is located at the bottom right on the back of the 485 Data Module.

![Type Label Diagram]

Figure 4: Information on the type label

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Serial No.</td>
<td>Serial number of the 485 Data Module</td>
</tr>
<tr>
<td>B</td>
<td>Version</td>
<td>Hardware version of the 485 Data Module</td>
</tr>
<tr>
<td>C</td>
<td>Type</td>
<td>Device type</td>
</tr>
</tbody>
</table>

You require the information on the type label to use the 485 Data Module safely and for customer support from the SMA Service Line. The type label must be permanently affixed to the 485 Data Module.

Symbol on the Type Label

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>CE marking</td>
<td>The 485 Data Module complies with the requirements of the applicable EC directives.</td>
</tr>
</tbody>
</table>
4.3 Cable Gland

The cable gland provides a sturdy, tightly sealed connection of the cables with the inverter enclosure. The cable gland also protects the inverter from dust intrusion and moisture penetration.

Figure 5: Product description: Cable gland

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Filler-plug</td>
</tr>
<tr>
<td>B</td>
<td>Seal</td>
</tr>
<tr>
<td>C</td>
<td>Swivel nut</td>
</tr>
<tr>
<td>D</td>
<td>Counter nut</td>
</tr>
</tbody>
</table>
5 Connection

5.1 Device Overview

Figure 6: Overview of the connection area

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Flipped up display with screw</td>
</tr>
<tr>
<td>B</td>
<td>Cable route to the plugs of the 485 Data Module</td>
</tr>
<tr>
<td>C</td>
<td>Inverter enclosure opening for cable gland</td>
</tr>
<tr>
<td>D</td>
<td>Mounting position of the 485 Data Module in the inverter</td>
</tr>
</tbody>
</table>
5.2 Installing the 485 Data Module in the Inverter

1. **DANGER**
   
   Danger to life due to electric shock when opening the inverter
   
   Death or serious injuries
   
   - Disconnect the inverter from voltage sources on the AC and DC sides and open it (see the inverter installation manual).

2. Loosen the screw of the display until the display can be flipped up.

3. Flip up the display until it clicks into place.

4. Push the pre-mounted filler-plug out of the second hole from the left in the inverter enclosure.

5. Attach the cable gland with the counter nut to the enclosure opening.
6. Insert the 485 Data Module and slide the ribbon
cable upwards behind the display. The key on the
top edge of the 485 Data Module must fit into the
hole in the plastic retainer in the inverter.

7. Fasten the 485 Data Module hand-tight with the
hexagon socket screw.

8. Flip down the display.
9. Plug the ribbon cable plug onto the centre
connector strip.
5.3 Connecting the 485 Data Module

To achieve a good signal quality, observe the cable recommendation (see technical description "RS 485 Cabling Plan")

ℹ️ Disturbance of Data Transmission due to AC Cables

During operation, AC cables generate an electromagnetic field which may induce interference in plant communication.
- Lay the RS485 communication cables using suitable fastening material and with a minimum clearance of 50 mm to the AC cables.

Procedure:

To connect the 485 Data Module, perform the following actions in the prescribed sequence. The following sections show the exact sequence.
- Preparing the cable
- Connecting the cable to the 485 Data Module

Preparing the Cable

1. Remove 40 mm of the cable sheath at the end of the cable which is to be connected to the 485 Data Module.
2. Shorten the cable shield to 15 mm.
3. Fold the surplus cable shield back onto the cable sheath.

4. Wrap the cable shield with conductive adhesive foil.

5. Strip the insulation on the three wires by 6 mm. Two wires for communication must be a twisted pair.
6. Shorten all other wires flush with the cable sheath.
Connecting the Cable to the 485 Data Module

1. Flip up the display until it clicks into place.
2. Unscrew the swivel nut of the cable gland on the inverter.

3. Press the seal out of the cable gland from the inside.

4. Route the cable from the outside into the inverter through the loose swivel nut and the cable gland.
5. Remove one of the filler-plugs from the seal for each cable.

6. Insert the cable into the seal.
7. Push the seal into the cable gland. Make sure that any unused cable openings are sealed with filler-plugs.

8. Screw the swivel nut of the cable gland on lightly.

9. Remove or connect the terminator:
   - If two cables are connected, open the spring clamp terminals of the plug with the connected terminator and remove the terminator.
   - If one cable is connected, the terminator in the unused plug must be connected in terminals 2 and 7.

10. Open the spring clamp terminals on the plug.

11. Connect the wires to the plug terminals and note down the colour of the wires. The cables can be allocated to any plugs of your choosing.

<table>
<thead>
<tr>
<th>Signal</th>
<th>485 Data Modules</th>
<th>Insulated wire colour</th>
<th>RS485 bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Data+</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Data-</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

12. Close the spring clamp terminals.

13. Push the cable with the cable shield into the shield connection terminal on the 485 Data Module.

14. Fasten the swivel nut on the cable gland hand-tight. This relieves pull strains on the cables.

15. Flip the display down and fasten it hand-tight with the display screw.

16. Close the inverter (see inverter installation manual).

17. Connect the other cable end to the RS485 bus (for information on the terminal assignment and wiring in the system, see the technical description "RS485 Cabling Plan").
6 Decommissioning

6.1 Disassembling the 485 Data Module

1. **DANGER**
   
   Danger to life due to electric shock when opening the inverter
   
   Death or serious injuries
   
   • Disconnect the inverter from voltage sources on the AC and DC sides and open it (see the inverter installation manual).

2. Press the left-hand and right-hand lock hooks outwards and remove the ribbon cable plug from the centre connector strip of the inverter.

3. Loosen the screw of the display until the display can be flipped up.
4. Flip up the display until it clicks into place.
5. Unscrew the swivel nut of the cable gland.
6. Open the spring clamp terminals of the plug on the 485 Data Module.
7. Remove the cables from the 485 Data Module.
8. Unscrew the counter nut of the cable gland
9. Pull the cable gland and cables out of the inverter.
10. Release the screw of the 485 Data Module and remove the 485 Data Module.
11. Close the spring clamp terminals of the plugs on the 485 Data Module.
12. Flip down the display and fasten the display screw hand-tight.
13. Seal the inverter enclosure opening with the filler-plug for enclosure openings.
14. Close the inverter (see inverter installation manual).
6.2 Packaging the 485 Data Module for Shipping

- Pack the 485 Data Module. Use the original packaging or packaging that is suitable for the weight and size of the 485 Data Module.

6.3 Disposing of the 485 Data Module

- Dispose of the 485 Data Module in accordance with the regulations for the disposal of electronic waste applicable at the installation site.
  
  or
  
  Return the 485 Data Module to SMA Solar Technology AG at your own expense labelled "ZUR ENTSORGUNG" ("FOR DISPOSAL") (see Section 9 "Contact", page 22).
## 7 Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause and corrective measures</th>
</tr>
</thead>
</table>
| The emergency channel list "Emergncy" or "EmgncyXX" is displayed in the communication product (e.g. Sunny WebBox, Sunny Explorer). The inverter is displayed by device class "Other" in the Sunny Portal. | The 485 Data Module is installed in an inverter without first disconnecting the inverter on the AC and DC sides. That prevents the inverter detecting the new 485 Data Module. **Corrective measures:**  
  - Prior to performing any work on the inverter, disconnect the inverter from any voltage sources on the AC and DC sides (see inverter installation manual). |
| Several SMA communication products query data simultaneously from the devices via Bluetooth (e.g. Sunny Explorer, Sunny Beam with Bluetooth) and RS485 communication (e.g. Sunny WebBox). This can cause data congestion if a lot of data is transmitted simultaneously. If this condition lasts for more than five minutes, the inverter resets the 485 Data Module. Due to the data congestion, the inverter cannot detect the 485 Data Module after the reset. | **Corrective measures:**  
  - Wait until the inverter restarts the next morning, then the inverter will detect the 485 Data Module.  
  or  
  Disconnect the inverter from voltage sources on the AC and DC sides and recommission it (see the inverter installation manual). |
8 Technical Data

**Mechanical Data**

<table>
<thead>
<tr>
<th>Width x height x depth</th>
<th>73 mm x 88 mm x 34 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>71 g</td>
</tr>
</tbody>
</table>

**Communication**

<table>
<thead>
<tr>
<th>Communication interface</th>
<th>RS485</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum cable length</td>
<td>1,200 m</td>
</tr>
</tbody>
</table>

**Connections**

<table>
<thead>
<tr>
<th>Type of plug</th>
<th>4-pole spring clamp terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of RS485 connections</td>
<td>2</td>
</tr>
</tbody>
</table>

**Ambient Conditions during Operation**

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>−25 °C ... +85 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity, non-condensing</td>
<td>5% ... 95%</td>
</tr>
<tr>
<td>Maximum height above sea level (MSL)</td>
<td>3,000 m</td>
</tr>
</tbody>
</table>

**Ambient Conditions for Storage/Transport**

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>−40 °C ... +85 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity, non-condensing</td>
<td>5% ... 95%</td>
</tr>
<tr>
<td>Maximum height above sea level (MSL)</td>
<td>3,000 m</td>
</tr>
</tbody>
</table>
9 Contact

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

- Type, serial number and firmware version of the inverter
- Type, serial number, hardware and firmware version of the 485 Data Module
- Number of 485 Data Modules connected

SMA Solar Technology AG
Sonnenallee 1
34266 Niestetal, Germany
www.SMA.de

SMA Service Line
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Communication: +49 561 9522 2499
Fax: +49 561 9522 4699
E-Mail: ServiceLine@SMA.de
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