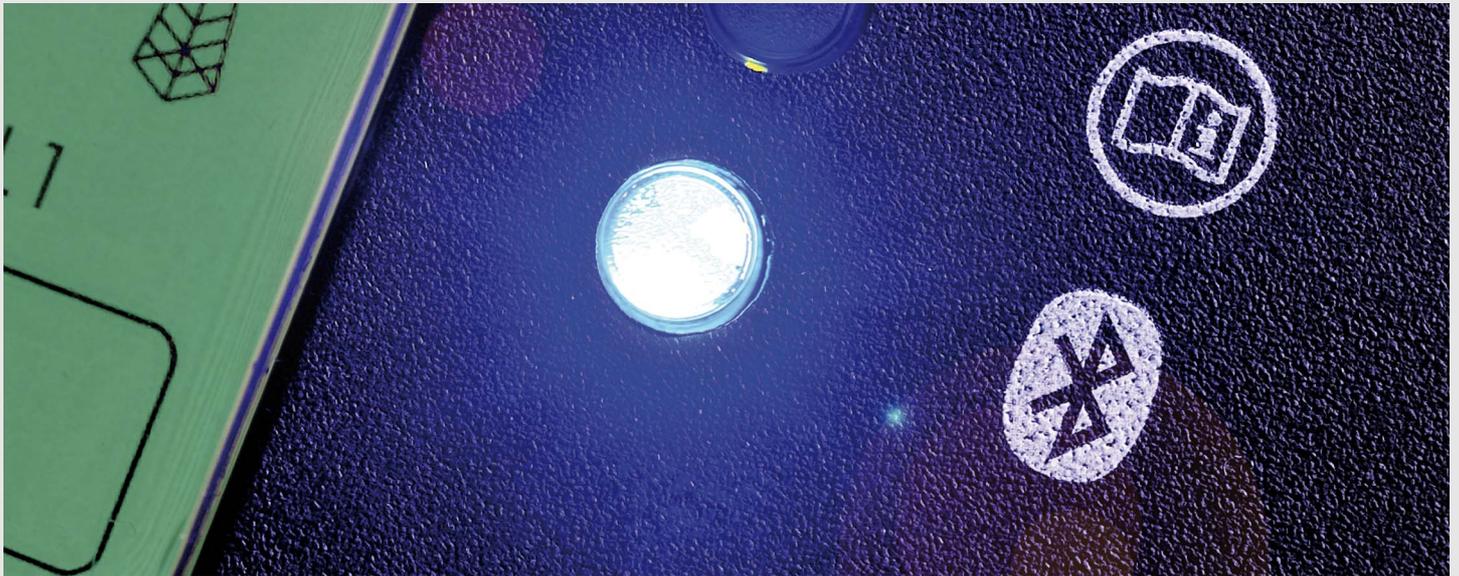


SMA Bluetooth

SMA Bluetooth[®] Wireless Technology in practice



Contents

This document summarizes the main features of SMA Bluetooth Wireless Technology and provides answers to questions from practice.

Further documents on SMA Bluetooth

The Technical description "SMA Bluetooth Wireless Technology" is available at www.SMA.de/en in the download area of Bluetooth products.

1 RS485 and *Bluetooth* Compared

SMA Solar Technology AG provides wired and wireless communications for PV plants. What type is suitable for your PV plant depends on your preference, the size of your PV plant and the distance between the devices.

The following table provides a brief overview of the differences between wired (RS485) and wireless (*Bluetooth*) communication from SMA Solar Technology AG.

	Wired: RS485	Wireless: <i>Bluetooth</i>
Typical application	Medium and large PV plants	Especially small and medium PV plants
Advantages	High speed and reliability	Reduced costs and effort
Number of nodes (plant monitoring and inverters)	Up to 50 per RS485 bus	Up to 50 per <i>Bluetooth</i> network (inverter and SMA <i>Bluetooth</i> Repeater)
Number of data retrieval devices (for example, Sunny Beam, Sunny WebBox)	1 device per RS485 bus	Up to four devices per <i>Bluetooth</i> network (depending on the number of nodes)
Range	1200 m per RS485 bus	Up to 100 m in the open air between individual devices
Possibility for feeding-in and grid stability management	Power Reducer Box from SMA Solar Technology AG	None [*]

^{*} see section 3 "Feeding-in and Grid Safety Management" (page 6)

2 SMA Bluetooth

2.1 Range

SMA Bluetooth has a range of up to 100 m in the open air with direct visual contact. Because of the inverter enclosure, the SMA Bluetooth Piggy-Back, with which you can retrofit the Bluetooth on SMA inverters, achieves a wireless range of up to 50 m outdoors in direct line of sight.

The range depends on various influencing factors, which are partly manipulable. The following factors can influence the range:

- Damping obstacles

Since the devices do not often stand in direct visual range of each other, the radio signals must penetrate ceilings, walls and doors, for example. As a result of these obstacles the radio signals are weakened to various extents (damped). To what extent an obstacle damps the radio signals depends on the thickness and material of the obstacle.

- Changing conditions

Changing conditions are changes that can occur during operation of the Bluetooth network, such as occasionally parked vehicles or temporarily closed gates.

- Reflections

Radio waves that hit obstacles and are deflected from there in a different direction are called reflections. They cause radio signals to take multiple paths to reach the receiver or not to reach it at all. Depending on the local conditions, reflections can lead to the receiving conditions appearing to be better or worse than assumed when purely considering the damping effects.

- Transmitting power

The transmitting power of the Bluetooth node with the lower transmission power limits the possible distance between two Bluetooth nodes. If, for example, a node has a wireless range of 100 m and the other nodes a wireless range of 10 m, the nodes may not be more than 10 m apart.

- Receiver sensitivity

The receiver sensitivity is a measure of the minimum strength the radio signals have to have in order that they can be received without errors. The more sensitive the device is set, the weaker the radio signals can be which the device still can perfectly receive. The receiver sensitivity depends on the hardware and software of a device.

2.2 Number of Nodes

Up to 50 devices with the same NetID can participate in an SMA Bluetooth network^{*}). These devices include inverters and SMA Bluetooth Repeaters. In case you want to link more than 50 devices, you have to divide your PV plant into several Bluetooth networks by assigning them different NetIDs. If your Bluetooth PV plant consists of 90 devices, for example, you can assign the NetID 3 for 45 devices and the NetID4 for the remaining 45 devices. In this case, divide the PV plant into Bluetooth networks with an approximately equal number of devices (example: PV plant with 90 devices should be divided not into 60 and 30 devices, but into 45 and 45 devices). The fewer devices there are within a NetID, the faster the network structure and the data transfer are. When the Sunny Explorer is used, the number of nodes depends on the number of masters; see section "Sunny Explorer and number of slaves" (page 5).

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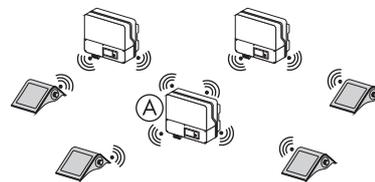
2.3 Masters and Slaves

Masters and slaves are terms used in network technology. In a network, a master is a device that for example requests other devices (slaves) to receive or send data. In a Bluetooth network from SMA Solar Technology AG, the following products are master and slaves:

Role	Products	Properties
Master	<ul style="list-style-type: none"> • Communication products, e.g.: <ul style="list-style-type: none"> - Sunny Beam with Bluetooth - Sunny Explorer (software for computer) 	<ul style="list-style-type: none"> • Initiates the setup of the Bluetooth network • Requests data • Sends data to slaves
Slave	<ul style="list-style-type: none"> • Inverter • SMA Bluetooth Repeater 	<ul style="list-style-type: none"> • Implements the requests and inputs of the master

2.4 Number of Masters in the Bluetooth Network

A maximum of four masters can participate in a Bluetooth network at the same time; however, the number of masters depends on the number of slaves. The root node (A) is the slave which the master directly connects to the Bluetooth network and initiates the setup of the complete Bluetooth network. Two masters can be connected to this slave. Every other inverter can only accept the connection of one master. In order to participate simultaneously with the maximum number of 4 masters in a Bluetooth network, at least 3 slaves are required.



Number of slaves (Inverter or SMA Bluetooth Repeater)	Possible number of masters (e.g. Sunny Beam with Bluetooth, Sunny Explorer)
1	2
2	3
3	4
>3	4*

* For PV plants with Sunny Explorer, note the following section.

Sunny Explorer and number of slaves

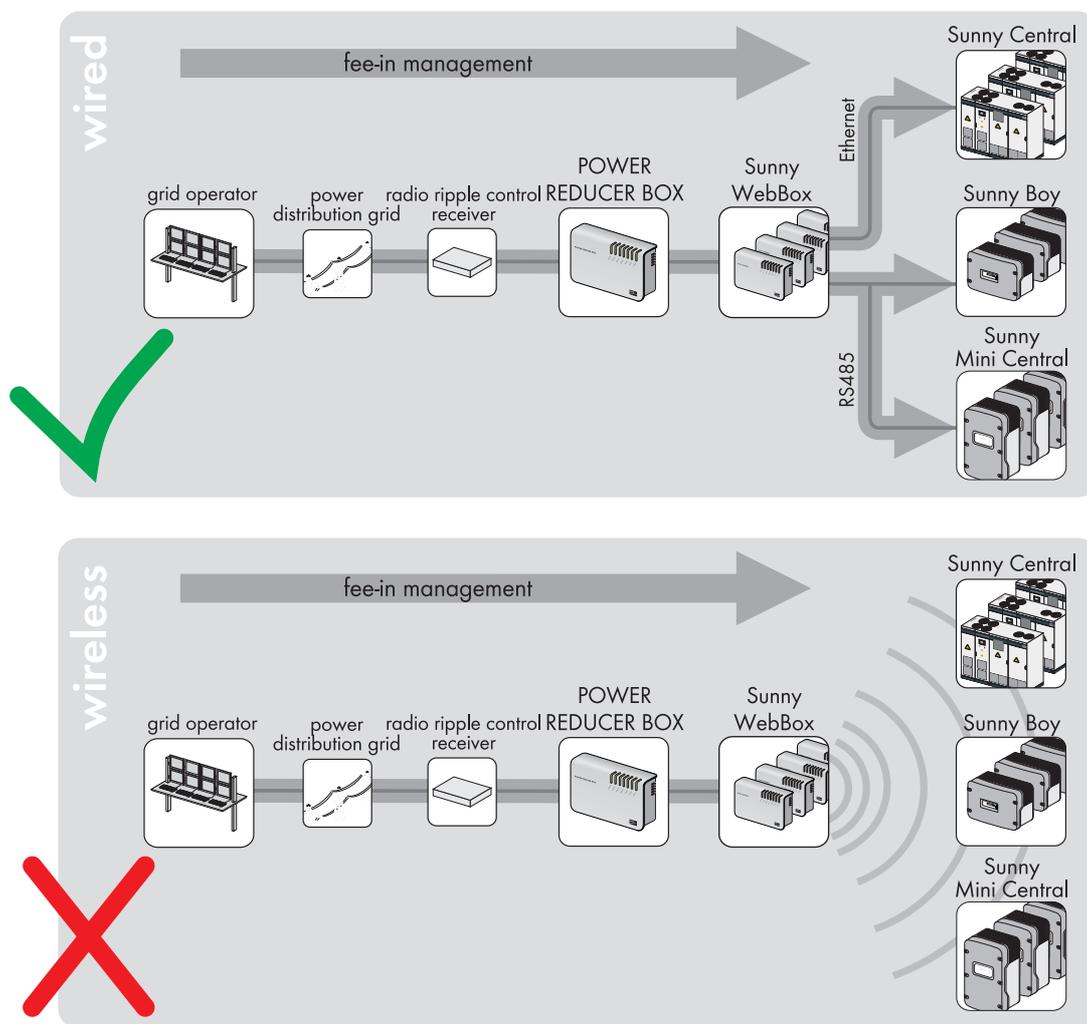
With Sunny Explorer you can manage up to 50 devices (slaves). If you want to use other communication products besides Sunny Explorer, your PV plant should comprise fewer slaves. The following table lists the number of possible slaves:

Number of masters	Possible number of slaves
1 Sunny Explorer	up to 50
1 Sunny Explorer and 1 other communication product	up to 25
1 Sunny Explorer and 2 other communication products	up to 12
1 Sunny Explorer and 3 other communication products	3 to 6

3 Feeding-in and Grid Safety Management

Feeding-in and grid safety management means that in the event of a grid overload, the grid operator can remotely limit the feed-in power of the PV plant. The PV plant must be equipped with a system that allows the grid operator to limit the power for the sake of safety. Information on regulations for feeding-in and grid safety management in your country can be obtained from your grid operator. For PV plants with planned grid safety management, SMA Solar Technology AG recommends wired communication. Using wired communication ensures that the grid operator has access to the PV plant at all times.

The following illustration shows SMA Solar Technology AG's solution for PV plants that must be integrated into the feeding-in management. The Power Reducer Box allows the operator to implement active power limitation or reactive power specification. The Power Reducer Box can be used only with wired PV plants.



4 Safety of SMA Bluetooth

SMA Solar Technology AG offers inverters of different power classes with SMA Bluetooth. Measurement, event, and counter information can be retrieved and parameters changed wirelessly via SMA communication products.

SMA Solar Technology AG provides a comprehensive security concept that protects the Bluetooth devices of your PV plant from unauthorized access.

- Plant password: securing all Bluetooth devices of your PV plant via a system password, transmitted encrypted, for each user group (user/installer)
- SMA Grid Guard: controlled access to safety-relevant parameters via SMA Grid Guard

Plant password

The inverters with integrated Bluetooth or an SMA Bluetooth Piggy-Back are delivered ex works with preset plant passwords. These are the same for all SMA Bluetooth Piggy-Backs and all inverters with Bluetooth. To protect the PV plant from unauthorized access, you should change the default plant passwords for the user groups "Installer" and "User" or turn the NetID of all inverters to 0 (Bluetooth switched off) when no wireless system communication is to be used. However, we recommend changing the plant passwords because the preset NetID 1 and higher makes access by a service technician easier. You can change the passwords only by using a computer with Bluetooth and the Sunny Explorer software. The Sunny Explorer user manual describes how to change the plant passwords. You can obtain the Sunny Explorer for free in the download section of www.SMA.de/en. Inform the user of the changed user password.

SMA Grid Guard

SMA Grid Guard is a security concept for country-specific settings in the inverter, which determine the network behavior within a power distribution grid. These settings (SMA Grid Guard parameters) are pre-installed in the devices and can only be configured with the SMA Grid Guard password.

In order to change SMA Grid Guard parameters, you must be logged in as an installer and you will also need your personal SMA Grid Guard password, which you can obtain from SMA Solar Technology AG. Contact the SMA Serviceline.

5 Storage Capacity of the Inverters

Inverters with integrated SMA Bluetooth

Inverters with integrated SMA Bluetooth have the following storage capacity:

- Total yield "E-Total" in 5-minute averages for 63 days
- Daily yield "E-Tag" as end-of-day values for 30 years
- 250 "Events" for the user group "User"
- 250 "Events" for the user group "Installer"

Inverters with retrofitted SMA Bluetooth (SMA Bluetooth Piggy-Back)

The value "E-Tag" can be saved by inverters with retrofitted SMA Bluetooth of the SMA Bluetooth Piggy-Back firmware version 2.00.01.R or higher. Otherwise these inverters have the same storage capacity as inverters with an integrated SMA Bluetooth. However, the SMA Bluetooth Piggy-Back can save the data only if a master is connected to the PV plant at least once a day and transmits the time. The reason is that otherwise the SMA Bluetooth Piggy-Back cannot assign the data any time and date and thus cannot save it. Note that the master can connect to the inverter and an SMA Bluetooth Piggy-Back only when the inverter is in feeding operation.