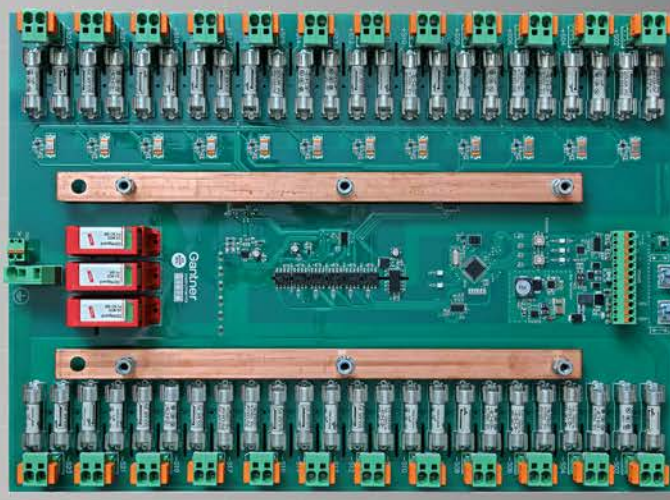
Gantner instruments

string.bloxx AIO 24/12

Manual



Vers. No. 1.1

Table of Contents

1 Safety Instructions

Please read and follow all warnings and safety instructions in this manual before beginning the installation, commissioning and maintenance.

Installation, commissioning, operation and maintenance of the modules must be carried out in accordance with specifications, i.e. within the operating conditions outlined in this manual and the technical data of the relevant module.

1.1 Intended use

The modules of the string.bloxx series are designed for monitoring and testing of solar modules. Solar module strings (interconnection of multiple solar modules), hereafter referred to as strings, can be connected to the modules. The modules may be used only for these measurement and control tasks. Any other use above and beyond this is considered as improper use.

To ensure safe operation, the modules may be operated only in accordance with the information in the manuals and technical data sheets. In addition, the legal and safety regulations required for the individual application have to be observed.

1.2 Check for transport damage

Directly on receipt of the goods, inspect both the packaging and the module itself for any signs of damage. Also check that the delivery is complete (accessories, documentation, auxiliary devices, etc.). If the packaging has been damaged in transport or should you suspect that the product has been damaged or that it may have a fault, the product must not be put into service. In this case, contact your customer advisor or Gantner Instruments Environment Solutions GmbH.

1.3 Personnel

Installation, commissioning and maintenance of the modules must only be carried out by suitably trained personnel. Persons are suitably trained when they have acquired sufficient knowledge in the field of electrical installation through their training as specialists in the electrical trade or similar training, and when they are familiar with the relevant national occupational health and safety regulations, accident prevention regulations, standards and approved rules of technique. They must be able to assess the results of their work safely, and they must be familiar with the contents of this manual.

Please observe in particular:

- the national installation and mounting regulations (e.g. VDE in Germany)
- the generally recognized rules of technology
- details on transportation, installation, operation, maintenance and disposal in this manual
- the parameters, limit values and specifications for the operating and environmental conditions on the type plates and in the data sheets.

1.4 Special risks

The modules are used as a component in installations of solar systems and must therefore be integrated into the safety concept of the system. The modules are not safety components and cannot perform any safety-related shutdowns. This requires additional components that must be provided by the company setting up and/or operating the system.

A very high voltage is permanently present at the modules after connection of solar modules, which upon contact can result in death or serious bodily harm. Therefore, please make sure that only qualified personnel have access to the modules and the modules can be switched off for servicing by means of a load break switch.

1.5 Installation sites

The modules have to be mounted in an enclosed housing so that they are accessible only to authorized personnel. If required by the environmental conditions, the modules can be installed in water-protected or water-proof enclosures.

Please note the permissible ambient temperatures specified in the technical data.

1.6 Alterations

It is prohibited to make alterations to the modules.

1.7 Maintenance and cleaning

Installation and maintenance work on the modules is exclusively to be carried out when the modules are disconnected from the power supply. Check before carrying out any work on the module that the voltage has been disconnected.

Do not attempt yourself to repair devices after a defect, failure or damage, or to put the devices back into operation again. In such

cases, please contact your customer adviser or Gantner Instruments Environment Solutions GmbH.

1.8 Disposal

Equipment that is no longer suitable for use must be disposed of in accordance with national and local regulations for environmental protection and resource recycling. Electronic components must not be disposed of together with household garbage.

1.9 General hazards in the event of failure to comply with safety regulations

The modules employ state-of-the-art technology and are safe to operate. However, an element of risk remains if the modules are used or operated by untrained personnel.

Any person commissioned with the installation, start-up, maintenance or repair of a module of the string.bloxx series must have read and understood the manual, especially the safety-related function recommendations.

1.10 Markings on the string.bloxx module

This symbol is the CE marking. It guarantees that our product complies with the requirements of relevant EU directives.

For the declaration of conformity please refer to Chapter 8 on page 37.

This symbol is the marking for disposal required by law. Equipment that is no longer suitable for use must be disposed of in accordance with national and local regulations for environmental protection and resource recycling, separate from regular household waste.

1.11 Markings and warnings in this manual

To avoid personal injury and damage to property, please follow the warnings and safety instructions in this operating manual.

⚠ DANGER	**Indicates an immediate danger which will result in death or serious bodily harm if not avoided.**

Symbol: 

Meaning: High voltage may be present on the module connections. Connections may only be made by particularly educated persons.

Symbol: 

Meaning: Before connecting or disconnecting cables make sure that all sources of power are Locked Out.

1.12 Conventions in this manual

To make it easier for you to read this manual, we will use the following conventions:

IMPORTANT
Paragraphs with this symbol give important information about the product or about using the product.

Tip
Contains application hints and other particularly useful information.

italic font	indicates emphasis
➡	refers to special features or restrictions

2 Introduction

Dear customer!

Thank you for purchasing a module of the string.bloxx series by Gantner Instruments Environment Solutions GmbH. We are sure that with this module you have acquired an excellent product that enables you to perform reliable measurements.

The scope of supply also includes this manual. Always keep this manual within easy reach. To avoid personal injury and property damage, please follow the warnings and safety instructions in this manual (Chapter 1, page 5). If you still can't resolve an issue, despite studying this manual, please do not hesitate to contact us.

Should you discover any fault with the product or in its accompanying documentation, or have any suggestions for improvement, you may confidently approach either your customer adviser or Gantner Instruments Environment Solutions GmbH directly. We are looking forward to your suggestions.

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2.1 The documentation for string.bloxx

The documentation for the string.bloxx module AIO 24/12 consists of this manual. You can also download this manual as a PDF file from our home page www.gantner-environment.com.

2.2 About this manual

This manual describes the installation, configuration and operation of the string.bloxx module AIO 24/12.

The manual is divided into several chapters:

- Safety information in Chapter 1, page 5ff.
- You will find a description of the system and the main combination and expansion options in the next section.
- The description of the installation and the terminal assignments can be found in Chapter 3, *Installation and Removal*, page 13ff.
- The description of the interface configuration can be found in Chapter 4, *Initial Operation*, page 19ff.
- Chapter 5 from page 22 contains maintenance hints (fuses and overvoltage protection).
- The Modbus RTU commands and functions applicable to the module can be found in Chapter 6, *Modbus Communication*, page 25ff.
- A block diagram of the string.bloxx module and all technical data can be found in Chapter 7, *Technical Data*, page 33ff.
- The declaration of conformity can be found in Chapter 8 on page 37.

2.3 System description

The string.bloxx series has been developed for measurement and test engineering on solar power systems, in particular for multi-channel measurements of electrical and thermal quantities. The modules enable the direct voltage side of photovoltaic systems (PV systems) to be monitored independently of the inverter and you can also detect errors promptly and rectify them:

- soiling due to pollen, dust and soot
- influence of the weather, e.g. hail, snow loads
- installation errors
- production errors
- theft and vandalism

You can combine individual modules as desired in one system, when more than 24 solar module strings (interconnection of multiple solar modules), hereafter referred to as PV strings, are to be connected.

The modules have a Modbus interface for control and for reading out data.

3 Installation and Removal

DANGER

The cables to be connected may be carrying voltages of up to 1000 volts!

Before connecting cables make sure that all sources of power are Locked Out.

Follow the safety information in Chapter 1, page 5.

3.1 Integration of the module into a solar power system

A typical example for the wiring of the string.bloxx module AIO 24/12 within a solar power system is shown in Fig. 3-1 on page 14.

The combinations of the individual photovoltaic modules (PV strings) are connected to the inputs +S (positive voltage) and –S (negative voltage). The summed currents of two strings in each case are measured by the string.bloxx module AIO 24/12. Up to 24 strings can be connected to a string.bloxx module. The total current is brought out via two terminals, the bus terminals OUT+ and OUT–.

NOTICE

For a proper connection further components are required which are not included with the string.bloxx module, e.g. a DC disconnector (main switch) or a control cabinet (case).

Install these components to suit the system (size, spatial layout, etc.).

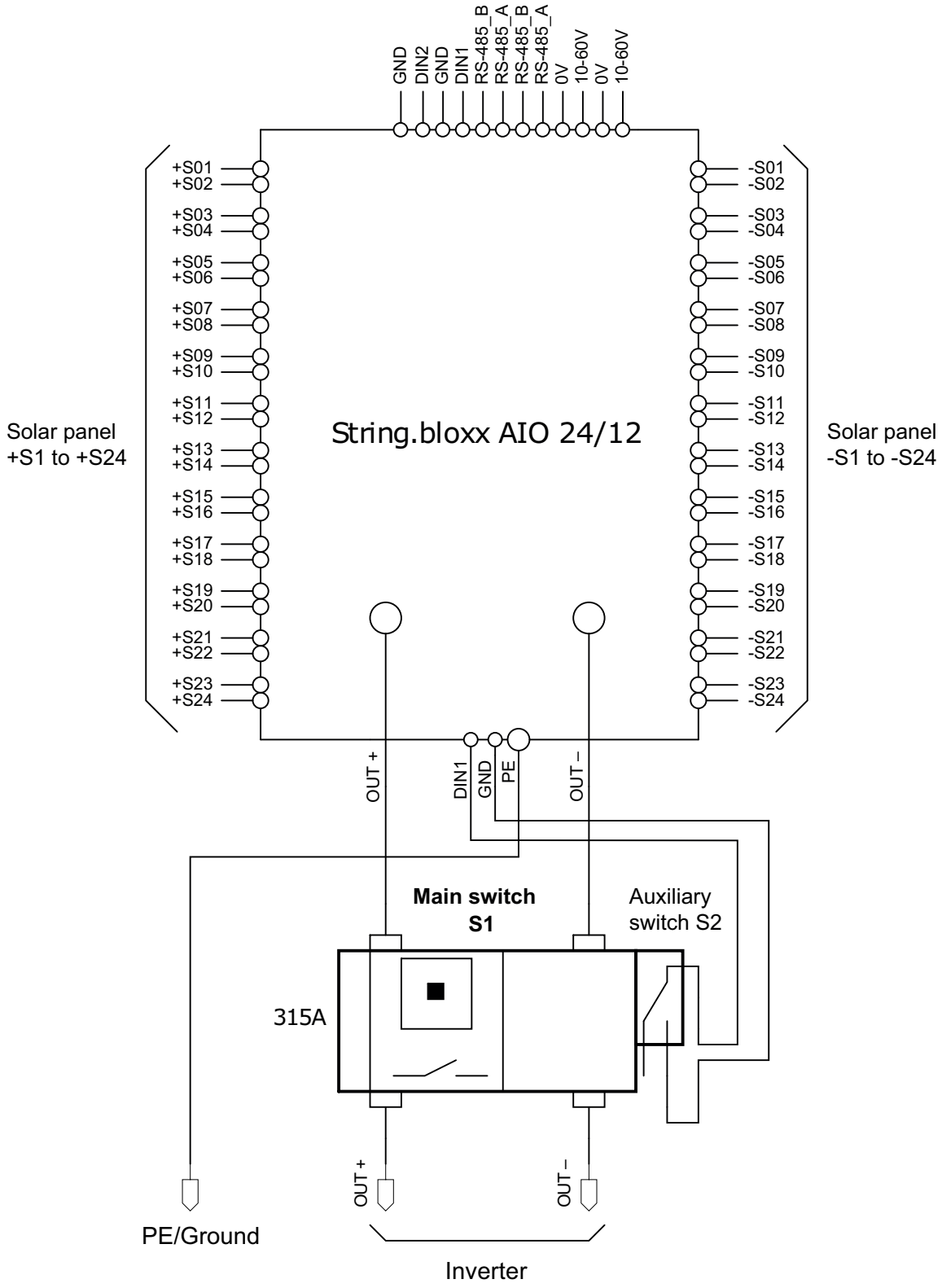


Fig. 3-1 Typical wiring configuration.

3.2 Terminal assignment

Fig. 3-1 on page 14 illustrates the terminal assignment of the string.bloxx module. The connections for the supply voltage and the RS-485 interface are provided double to simplify the connection of further modules.

Reserved names for the digital input functions

D_IN 1: Main Switch

D_IN 2: Surge Protection

The inputs are permanently wired internally to these functions and are connected to the internal module operating voltage of +5V. The inputs must be switched to ground to trigger the function. Therefore, wire the inputs, for example, to ground through a relay contact or an optocoupler.

3.3 Installation

Use, for example, rails of a non-conductive material into which you can insert the board. Mount the board with a spacing of at least 4.5 mm to a non-conductive mounting plate.

3.3.1 Fitting the PV-string cables into the push-in terminals

To connect cables to the push-in plug terminals insert a narrow screwdriver into the slot in the terminal next to the cable entry (conductor shaft). This opens the clamping fastener and the wire can be pushed into the spring cage. Once the screwdriver is removed, the spring pulls the conductor against the bus bar.

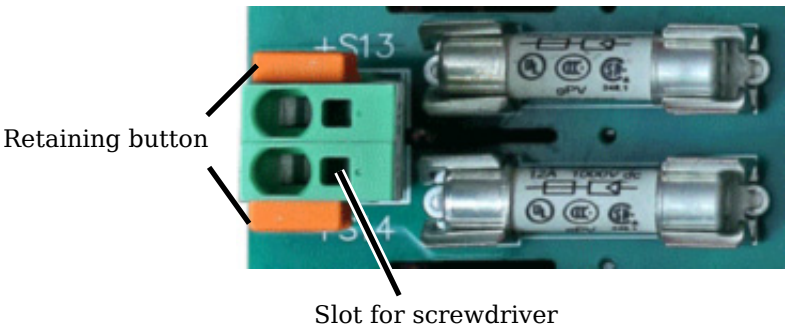


Fig. 3-2 Push-In plug terminals

The plugs themselves can be removed by pressing the orange retaining button down (onto the board) to unlock the plug.

3.3.2 Fitting the cables to the bus terminals

Use the hole in the copper bars and a nut/screw combination (M8). Tighten the combination with a maximum of 24 Nm.

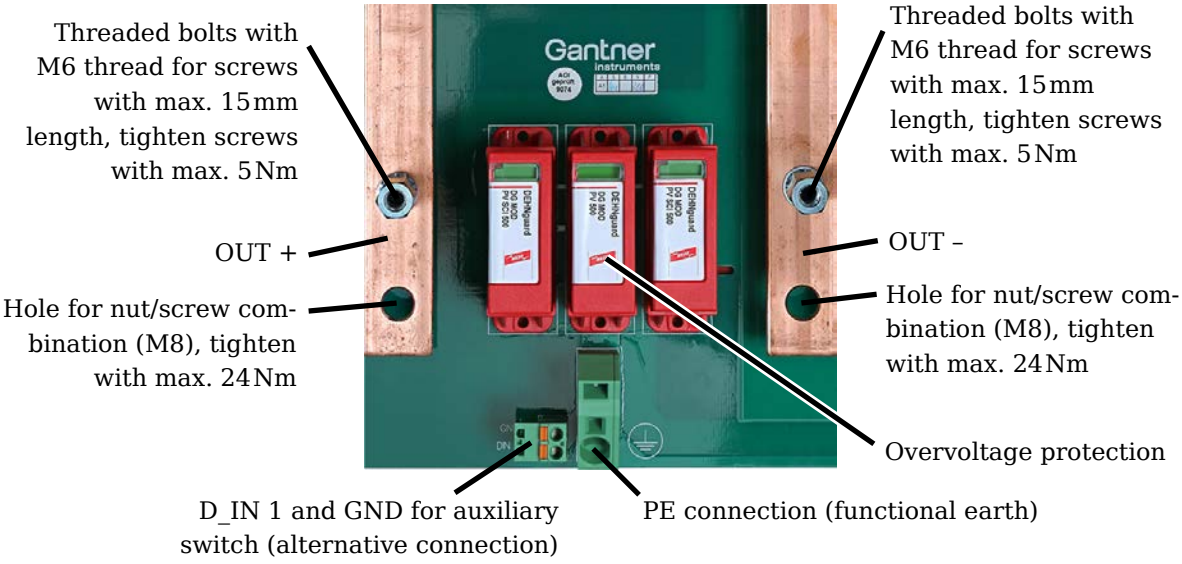


Fig. 3-3 Circuit board connections on the side for connecting the main switch.

3.3.3 Interface wiring

Use twisted-wire cables, with a screen if possible. Connect all bus devices in a chain configuration (one behind the other, refer to Fig. 3-4); avoid star configurations or stub lines. For the chain configuration the modules have doubled, internally linked through-connections: you use one bus connection as input, the other as output to the next bus device. The order of left or right is here unimportant.

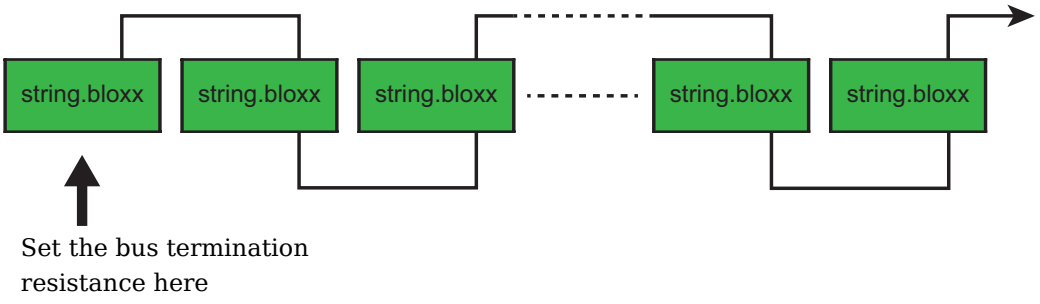


Fig. 3-4 Bus wiring for RS-485 or Modbus.

Place the screen of the bus cable flat on the screen terminal (do not point-connect it). We recommend that the screens are only earthed at one point and between the modules are only connected one to the other.

3.3.4 Procedure for connection

1. Connect the functional earth (PE) (refer to Fig. 3-3).
2. Connect the supply voltage (Fig. 3-5).

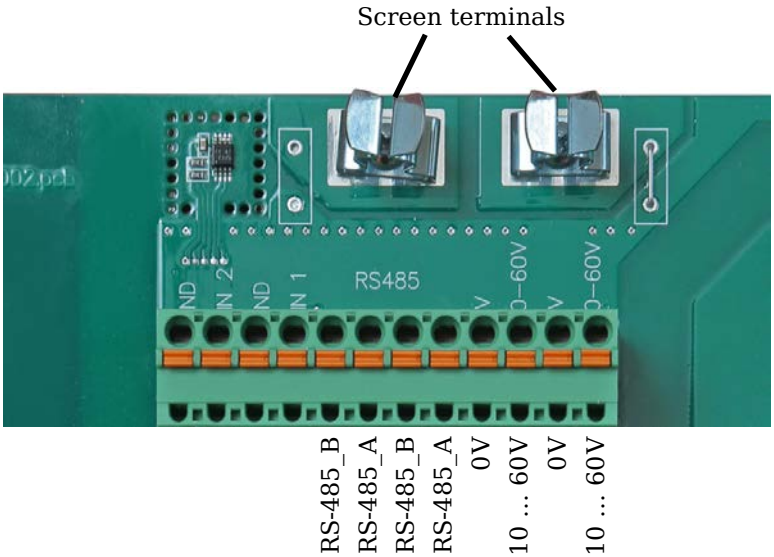


Fig. 3-5 Connections for supply voltage and interface.

3. If required, connect the interface links (RS-485 / Modbus) (Fig. 3-5). Refer also to Section 3.3.3, page 16 for wiring the bus cables.
4. Connect the auxiliary switch to the digital input D_IN1 (Fig. 3-3).
5. Connect the cable for the positive output voltage to the bus terminal OUT + (left threaded bolt in Fig. 3-3).
6. Connect the cable for the negative output voltage to the bus terminal OUT – (right threaded bolt in Fig. 3-3).
7. Connect the single strings (+S01 to +S24 and –S01 to –S24).

With that the string.bloxx module is fully connected and can be put into operation, refer to Chapter 4, *Initial Operation*, page 19.

3.4 Removal, cessation of operation

DANGER

The connected cables may be carrying voltages of up to 1000 volts!

Before removal check that all sources of power are Locked Out.

Follow the safety information in Chapter 1, page 5.

IMPORTANT

The “Warning” LED on the circuit board (Fig. 4-1 on page 19) lights when a voltage exceeding 40 V is present on one of the terminals for the PV strings.

Removal of the cables

To remove cables from the push-in terminals insert a narrow screwdriver into the slot in the terminal next to the cable entry (conductor shaft). This opens the clamping fastener and the conductor can be easily pulled out.

The plugs themselves can be removed by pressing the orange retaining button down (onto the board) to unlock the plug (refer also to Fig. 3-2 on page 15).

4 Initial Operation

The only settings which you have to make manually are the setting of the bus address and the terminating resistances for the interface.

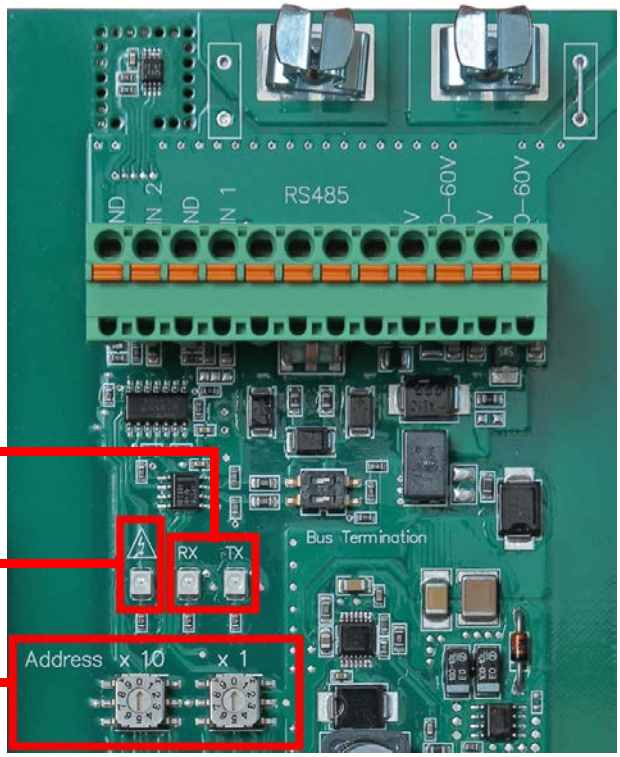
4.1 Setting the interface bus address

The RS-485 interface is an interface capable of bus operation, i.e. basically up to 256 devices can be connected to *one* interface. In order to be able to establish a connection to a device, each device must therefore have a unique address.

On the string.bloxx module you can enter addresses 1 to 99; the address 0 is reserved.

Procedure

1. Set the decade place of the address with the switch x 10 (to the left in Fig. 4-1).
2. Set the unit address with the switch x 1.



Communication LEDs Rx and Tx

Warning LED, refer to Section 3.4, page 18

Address switches

Fig. 4-1 Switches for setting the bus address.

Example

To set the address 45 set the switch x 10 to 4 and the switch x 1 to 5.

4.2 Rx and Tx LED indicators

The Rx LED lights when communication is taking place on the bus. Tx lights when the module itself is transmitting. Refer to Fig. 4-1, page 19 for the location of the LEDs.

4.3 Setting the bus termination (terminating)

To prevent signal reflections on the interface lines each section (bus segment) must be terminated at its physical start and end with a certain resistance. To do this, a terminating resistance is connected between the bus lines A and B. The line A is then connected via a pull-up resistor to +5 V and line B is connected via a pull-down resistor to 0 V. This cascade of three resistors ensures interference-free data transmission and defined potentials (voltage levels) when no data are being transmitted over the bus (the interface). The string.bloxx modules AIO 24/12 already have these resistors built in. You activate the resistors via *both* DIP switches; in this way both bus lines are connected to the resistance circuit: Push the switch in Fig. 4-2 to the left (ON). The DIP switches must always be both actuated, i.e. both set to ON or both set to OFF.

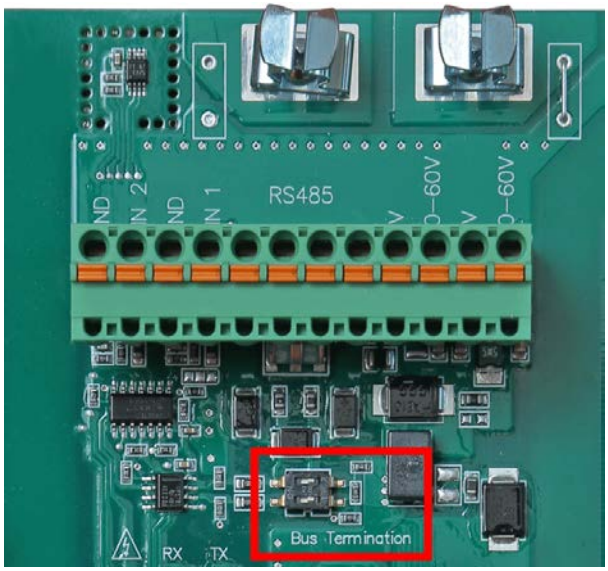


Fig. 4-2 DIP switches for activating the bus termination resistances; current setting: OFF (right, default setting).

IMPORTANT

The terminating resistances may only be activated at the end points of the interface line (of the bus segment). If resistances are also activated in between, the signal is weakened and interference or even interruption of the data transmission occurs.

5 Maintenance

If required, you can change the fuses or replace the overvoltage protection.

DANGER

The cables to be connected may be carrying voltages of up to 1000 volts!

Before changing the fuses, check that all sources of power are Locked Out.

Follow the safety information in Chapter 1, page 5.

Replacing the overvoltage protection

The overvoltage protection can be replaced without sources of power being locked out if the safety distances to live parts are maintained.

Fig. 5-1 Overvoltage protection.

If the indicator (refer to marking in Fig. 5-1) is no longer green, but red instead, the overvoltage module must be replaced. To do this, grasp the relevant module at the top and bottom, press the gray module release buttons and pull out the module. Then replace it with a module of the same type. Make sure that you press the module in as far as it will go.

6 Modbus Communication

This chapter contains the list of interface parameters (Section 6.1), the list of available registers with the relevant functions (Section 6.2) and the explanation of the advantages and disadvantages of particular functions (Sections 6.3.1 to 6.3.4).

6.1 Interface parameters

The string.bloxxmodule supports the Modbus RTU protocol with the following interface parameters:

Bit rate	1200 ... 38400bit/s
Format	8n1, 8e1 or 8o1
Max. cable length	1.2km
Unit load	1/8
Byte order	MSBit–LSBit
Word order	LSByte–MSByte
Address range	1 – 99
Max. frame length	256 bytes

The following are supported as function codes:

03	Read content of a holding register
04	Read content of an input register
06	Write content of a R/W register (preset single register)

For reading the registers the following therefore arises:

	Address basis	**Function code for reading**	**Function code for writing**
Input register	30001	0x04	–
Holding register	40001	0x03	0x06

The table in Section 6.2 contains a list of the functions, the associated registers and data types and the admissible or possible values.

6.2 List of registers and functions

Abbreviations used	Explanation
UINT16	Data type unsigned integer, 16 bit
UINT32	Data type unsigned integer, 32 bit
Float32	Data type floating, 32 bit
R	Only read access possible (Read only)
R/W	Read and write access possible (Read/Write)

Register (integer)	Data type	Channel (description)	Possible values	Unit	R/W
0000	UINT16	Digital input 01 (Main switch)	0: OFF 1: ON		R
0001	UINT16	Digital input 02 (1000V_{DC} overvoltage protection)	0: NOK 1: OK		R
0002, 0003		Reserved			
0004, 0005	Float32	Current I_1	-30,00 ... +30,00	A	R
0006, 0007	Float32	Current I_2	-30,00 ... +30,00	A	R
0008, 0009	Float32	Current I_3	-30,00 ... +30,00	A	R
0010, 0011	Float32	Current I_4	-30,00 ... +30,00	A	R
0012, 0013	Float32	Current I_5	-30,00 ... +30,00	A	R
0014, 0015	Float32	Current I_6	-30,00 ... +30,00	A	R
0016, 0017	Float32	Current I_7	-30,00 ... +30,00	A	R
0018, 0019	Float32	Current I_8	-30,00 ... +30,00	A	R
0020, 0021	Float32	Current I_9	-30,00 ... +30,00	A	R
0022, 0023	Float32	Current I_{10}	-30,00 ... +30,00	A	R
0024, 0025	Float32	Current I_{11}	-30,00 ... +30,00	A	R
0026, 0027	Float32	Current I_{12}	-30,00 ... +30,00	A	R
0036, 0037	Float32	Summed current	-480,00 ... +480,00	A	R
0038, 0039	Float32	Voltage	0 ... 1000,0	V	R
0040, 0041	Float32	Power	0 ... 480,000	W	R
0042, 0043	Float32	Temperature	-40,0 ... +160,0	°C	R

Register (integer)	Data type	Channel (description)	Possible values	Unit	R/W
0050, 0051	UINT32	Firmware date	0xDDMMYYYY Example: 0x040507DB 04.05.2011		R
0052, 0053	UINT32	Software version	0xBBBBMMNN Example: 0x12510102 V102.1251		R
0054	UINT16	Error code	1: OK ≠1: NOK		R
0059	UINT16	Sync ID[1)]	User code of Reg. 0302		R
0060, 0061	Float32	Sync_current I_1[1)]	-30,00 ... +30,00	A	R
0062, 0063	Float32	Sync_current I_2	-30,00 ... +30,00	A	R
0064, 0065	Float32	Sync_current I_3	-30,00 ... +30,00	A	R
0066, 0067	Float32	Sync_current I_4	-30,00 ... +30,00	A	R
0068, 0069	Float32	Sync_current I_5	-30,00 ... +30,00	A	R
0070, 0071	Float32	Sync_current I_6	-30,00 ... +30,00	A	R
0072, 0073	Float32	Sync_current I_7	-30,00 ... +30,00	A	R
0074, 0075	Float32	Sync_current I_8	-30,00 ... +30,00	A	R
0076, 0077	Float32	Sync_current I_9	-30,00 ... +30,00	A	R
0078, 0079	Float32	Sync_current I_{10}	-30,00 ... +30,00	A	R
0080, 0081	Float32	Sync_current I_{11}	-30,00 ... +30,00	A	R
0082, 0083	Float32	Sync_current I_{12}	-30,00 ... +30,00	A	R
0092, 0093	Float32	Sync_summed_current	-480,00 ... +480,00	A	R
0094, 0095	Float32	Sync_voltage	0 ... 1000,0	V	R
0096, 0097	Float32	Sync_power	0 ... 480.000	W	R
0098, 0099	Float32	Sync_temperature	-40,0 ... +160,0	°C	R
0200	UINT16	Device identification	2009		R
0202	UINT16	Serial number low	e.g. 34		R
0203	UINT16	Serial number high	e.g. 1		R

Register (integer)	Data type	Channel (description)	Possible values	Unit	R/W
0205	UINT16	Modbus address	1 ... 99		R/W
0206	UINT16	Configuration for register current measurement[2)]	0: normal 1: fast		R/W
0208	UINT16	Response delay in ms[3)]	0 ... 250		R/W
0209	UINT16	Bit rate and parity	For values refer to table below		R/W
0300	UINT16	EcoMode[4)]	0: OFF (Factory setting) 1: ON		R/W
0302	UINT16	Sync register[1)]	User code Write: Trigger sync		R/W

1) For the explanation of the sync register and the advantages of synchronization refer to Section 6.3.3, page 30.

2) For the explanation of both types of current measurement refer to Section 6.3.1, page 30.

3) For the explanation of the response delay refer to Section 6.3.4, page 32.

4) For the explanation of the EcoMode refer to Section 6.3.2, page 30.

Table of values for setting the bit rate and parity

Setting	Specified value (decimal)
No parity (8n1)	0 ... 5
Even parity (8e1)	100 ... 105
Odd parity (8o1)	200 ... 205
1200 bit/s	0 | 100 | 200
2400 bit/s	1 | 101 | 201
4800 bit/s	2 | 102 | 202
9600 bit/s	3 | 103 | 203
19.2 kbit/s	4 | 104 | 204
38.4 kbit/s	5 | 105 | 205

For even parity and a baud rate of 9600 bit/s enter 103 as the value. The number of stop bits cannot be changed (always 1).

The factory setting is: no parity, 19.2 kbit/s.

6.3 Extended configuration options

In order to adapt the string.bloxxmodule optimally to your requirements, you can control the behavior using several parameters. The following table gives you an overview of the available options; a comprehensive explanation can be found in the sections stated in the table (“Refer to” column).

	Mode	Properties	Explanation	Register	Refer to
Measurement modes	Default	Low noise, good interference suppression	The readings are written into the register every second. Due to the longer measuring time however the reaction time of the Modbus communication is approx. 20 ms.	206 = 0	6.3.1
	Fast	High sample rate	The readings are written into the register every 100 ms.	206 = 1	
Operating modes	Default	Fast reading refresh	The string.bloxx module is permanently and fully in operation. Power consumption 0.9 W	300 = 0	6.3.2
	Eco	Minimal power requirement, supply from the PV system possible	The measurement section is only switched on briefly once each minute to perform the measurement and to write the values into the registers. The display illumination is switched off. The communication section is permanently active. Power consumption 0.2 W	300 = 1	
Data acquisition modes	Default	Simple communication	With several string.bloxx modules on a bus the data are acquired sequentially, i.e. with a time offset.	–	6.3.3
	Sync	Synchronous measurements of all modules in a system	In the synchronized mode the controller sends a broadcast value to all modules (register 302). The modules save the current measurements simultaneously in special registers. Then the measurements are transmitted sequentially. Consequently, all values are acquired simultaneously even in large systems.	302	

	Mode	Properties	Explanation	Register	Refer to
Delay	Default	Short response times	Bus master requests are answered as quickly as possible.	–	6.3.4
	Delayed	Adaptation to PLC reaction time	Bus master requests are only answered after the specified time.	208	

6.3.1 Selecting the measurement mode

You can carry out the measurement of the input currents and the total voltage in two different ways:

1. In the *default* setting all the inputs are measured over about one second (1000ms) and this value is transferred to the registers.

   Due to this relatively long measuring time, over which averaging of the individual measurements of the A/D converter occurs, the noise content in the signal is low and you obtain good interference suppression.

2. In the *Fast* mode (register 206 = 1) measurement takes place only over about 100ms (milliseconds).

   This means that you obtain a high sample rate or refresh rate and the reaction time on the Modbus interface (Response delay, refer also to Section 6.3.4) is reduced from approx. 20ms to approx. 5 to 8ms.

6.3.2 Use EcoMode

Activating the EcoMode (register 300 = 1) enables you to drastically reduce the string.bloxx module power demand: from approx. 0.9W to only 0.2W.

To do this the measurement section in the string.bloxx module is switched off completely after each measurement and also the display illumination. Every minute the measurement section is activated for a new measurement and then switched off again. The module communication section (Modbus interface) is however always active, i.e. the measurements can be read out any time. New measurements are however only produced once per minute.

6.3.3 Synchronization of modules (data acquisition modes)

A problem with larger solar power systems arises due to the serial transmission of data and the limited transmission speed of the Modbus link: The values of each PV string (or each module with string.bloxx) are normally interrogated individually and sequentially. Consequently a time offset arises between the data of the first (t_1) and the last PV string (t_n), which can be in the

range of several seconds (Fig. 6-1). The measurements are therefore not acquired synchronously and cannot be directly compared. (With the string.bloxx modules all PV strings are acquired simultaneously within a module.)

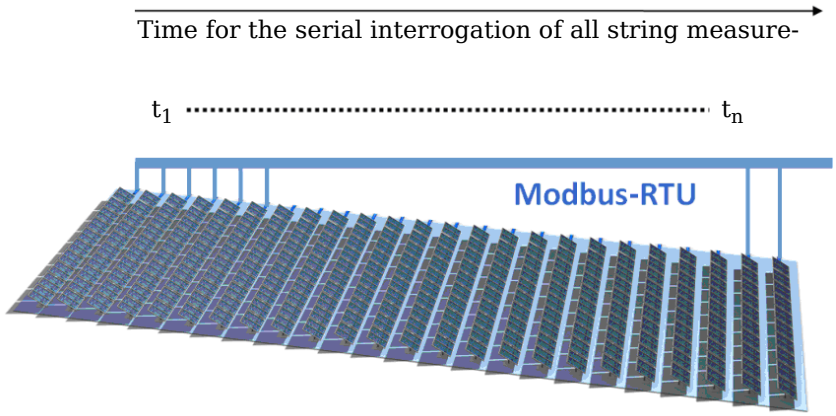


Fig. 6-1 Time offset due to serial communication in standard PV systems.

The string.bloxx modules offer you the possibility of preventing this time delay in that you send a special command simultaneously to all modules (broadcast) to “freeze” the current measurements of all PV strings of all modules simultaneously. Then you can interrogate and transmit these values consecutively from all string.bloxx modules. Although the data here arrive at the controller with a time offset, the values themselves have been acquired simultaneously and simultaneously.

Procedure

1. Send a broadcast message by writing a value in register 302 (sync register) via the Modbus address 0 (broadcast address).
   With that the current measurements in each module are written to the (internal) registers 70 to 127 and the broadcast value is transferred into register 69.
2. Now read out the measurements of all strings from the registers 70 to 127 and the value of register 302 from register 69 from all modules consecutively.

Since the modules transfer the measurements of the individual strings simultaneously into the sync registers 70 to 127, with this method you obtain synchronously acquired measurements of all PV strings.

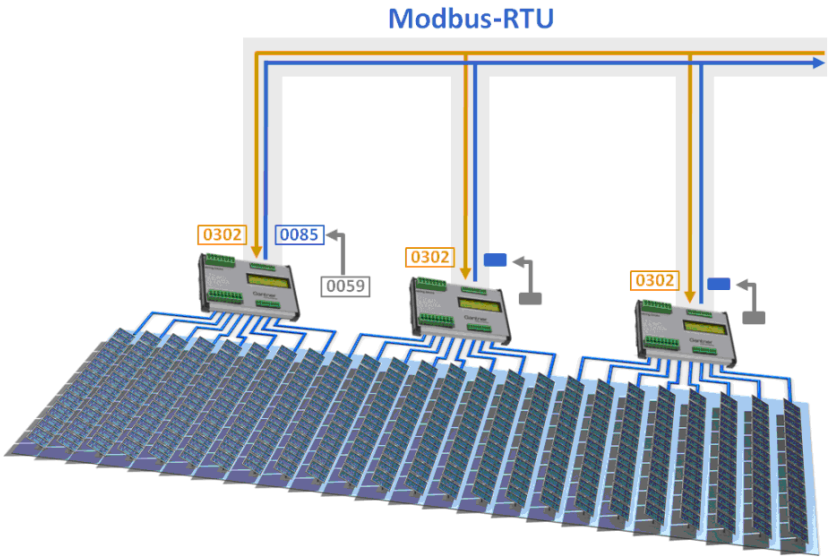


Fig. 6-2 Synchronous acquisition of all measurements of all PV strings with string.bloxx

Tip

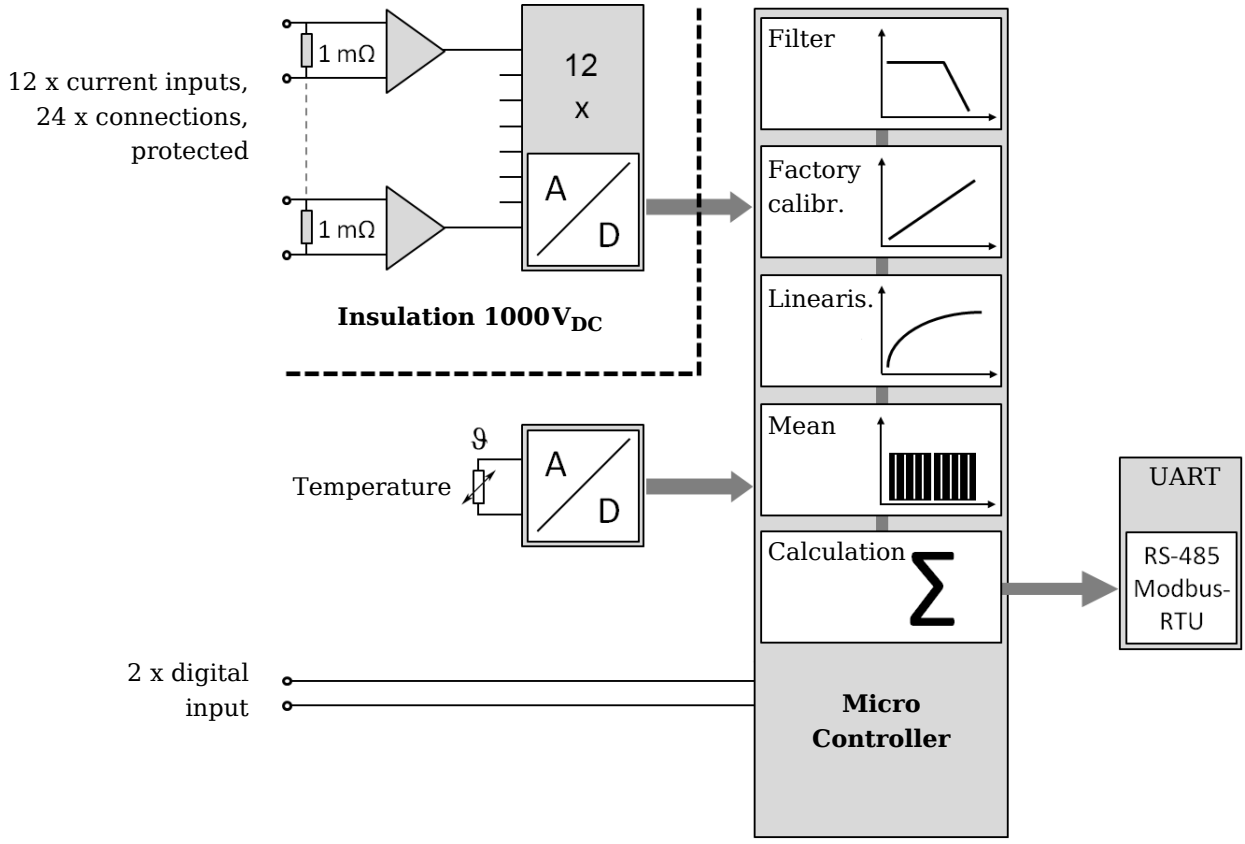
If you write a different value into register 302 for each broadcast, you can check with the value from register 69 whether the broadcast has been received and that the current measurement (same value) is involved.

6.3.4 Use response delay (Delay)

Depending on the measurement mode for the current and voltage measurements the response time for a request (Request) through the Modbus interface is between 5 and 20 milliseconds. With register 208 you can extend the time up to the response if this is too fast for the Modbus master used and there is therefore the risk that responses are not detected, because they were already available on the bus shortly after the request. Specify the *additionally* desired delay in milliseconds in register 208 as a numerical value.

7 Technical Data

7.1 Block diagram string.bloxx AIO 24/12



7.2 Technical Data string.bloxx AIO 24/12

Current input	
Number	24, two of them are in each case measured together
Measuring range	±26A per input, ±13A per String
Accuracy	0.25% of full scale reading
Connection (push-in spring connector)	0.2mm^2 to 10mm^2 for rigid conductor 0.2mm^2 to 6mm^2 for flexible conductor
Fuse	15 A or to customer requirements, 48 pieces
Current output	
Number	1
Maximum summed current	±312A
Connection	Bore hole for M8 screw/nut combination in copper bar, max. 24Nm tightening torque
Cable connection, max.	SM 70-240mm^2, RM 50-185mm^2, RE 70-240mm^2
Voltage measurement	
Number	1 (internal)
Measuring range	0V to 1000V$_{DC}$
Accuracy	0.2% of full scale reading
Temperature measurement	
Number	1 (integrated, digital)
Measuring range	-20°C to +125°C
Accuracy	±1K

Digital input	
Number	2
Type Upper switching threshold Lower switching threshold	Status >3.5V (logical 0, the input is internally pulled up to +5V) <1.0V (logical 1)
Maximum input voltage	30V_{DC}
Assignment	D_IN 1: Main Switch D_IN 2: Surge Protection
Connection (push-in spring connector)	0.2mm^2 to 4mm^2 for rigid conductor 0.2mm^2 to 2.5mm^2 for flexible conductor
Protection devices	
Standard	Overvoltage protection 2/II according to EN 61643 / IEC 61643-1/11
Max. current on tripping	20kA with triple direct voltage switches for up to 1000V_{DC}
Type	Gas-discharge tube GDT, peak current 10kA, 600W transient voltage suppression
Type of protection to DIN EN 60529 (IEC 529)	IP44
Supply	
Supply voltage	10V_{DC} to 55V_{DC}, overvoltage and reverse polarity protection
Power consumption	approx. 0.9W; 0.2W in EcoMode (refer to Section 6.3.2, page 30)
Connection (push-in spring connector)	0.2mm^2 to 4mm^2 for rigid conductor 0.2mm^2 to 2.5mm^2 for flexible conductor
Communication interface	
Standard	RS-485 (TIA/EIA-485), 2-wire
Data format	8n1, 8e1 or 8o1, default setting: 8n1
Protocols	Modbus-RTU
Bit rate	1200 to 38400bit/s, default setting: 19200bit/s
Number of bus devices	≤32 recommended, max. 99
Maximum cable length	500m recommended, max. 1200m without repeater
Connection (push-in spring connector)	0.2mm^2 to 4mm^2 for rigid conductor 0.2mm^2 to 2.5mm^2 for flexible conductor

Ambient conditions	
Operating temperature	-20 °C to +55 °C: max. 312 A
Storage temperature	-40 °C to +85 °C
Relative humidity	5 % to 95 % at 50 °C, non-condensing
Dimensions	
Height (without overvoltage protection)	870 mm
Height (with overvoltage protection)	950 mm
Length x width	590 mm x 320 mm

8 Declaration of Conformity

Konformitätserklärung – Declaration of Conformity – Déclaration de Conformité

The undersigned, representing:

Gantner Instruments Environment Solutions GmbH
Am Mühlgraben 8 – 08297 Zwönitz /Germany
tel: +49 /37754-3351-0 – www.gantner-environment.com

herewith declares, that the product:

String.bloxx-AIO24/12
Certificate Ref No: **151118JS-08**

is in conformity with the following EC directive(s), including all applicable amendments:

Directives		Short Title
X	2004 / 108 / EC	EMC Directive
	99 / 5 / EEC	R&TTE Directive
X	2006 / 95 / EC	Low Voltage Directive
	2006 / 42 / EC	Machinery Directive
	99 / 519 / EEC	Limitation of human exposure to electromagnetic Fields

Only "x"-marked directives are relevant for the product and for this declaration of conformity!

and that the standards and/or technical specifications referenced below have been applied:

Standards			Short Title
EMC		EN 61000-6-1 : 2007	Generic immunity standard for residential, commercial and light-industrial environments
	X	EN 61000-6-2 : 2005	Generic immunity standard for industrial environments
		EN 61000-6-3 : 2007	Generic emission standard for residential, commercial and light-industrial environments
	X	EN 61000-6-4 : 2007	Generic emission standard for industrial environments
	X	EN 61326: 1997+A1+A2	Electrical equipment for measurement, control and laboratory use – EMC requirements
R&TTE		EN 300220-1/3 : 2010	Electromagnetic compatibility for Short Range Devices (SRDs) from 25 to 1000 MHz
		EN 300330-1/2 : 2010	Electromagnetic compatibility for Short Range Devices (SRDs) from 9 kHz to 25 MHz
		EN 301489-1/3 : 2008	Electromagnetic compatibility for Short Range Devices (SRDs) from 9 kHz to 40 GHz
Safety	X	EN 61010 : 2001	Safety requirements for electrical equipment for measurement, control and laboratory use
		EN 60950 : 2000	Safety requirements for information technology equipment
		EN 60335 : 2002	Safety of household and similar electrical appliances
		IEC 62109 - 1	Safety of power converters for use in photovoltaic power systems
Machinery		EN 12100-1: 2003+A1:09	Safety of machinery – Basic concepts, general principles for design
		EN 954-1: 1996	Safety of machinery – Safety-related parts of control system
		EN 60204-1: 2006/A1:09	Safety of machinery – Electrical equipment
Human Expos.		EN 50364 : 2001	Limitation of human exposure to electromagnetic fields
		EN 50371 : 2002	Limitation of human exposure to electromagnetic fields (10MHz-300GHz) – Generic Standard

Remarks: Only "x"-marked standards are relevant for the product and for this declaration of conformity! Concerning safety aspects, the general and the product specific warning and safety instruction in the product accompanying documents must also be regarded!

This declaration is based upon the respective technical documentation held by the manufacturer.

CE

Zwönitz, 18th November 2014

Jörg Scholz, General Manager

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Subject to change in the course of further technical development

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