

SAI-AU SB

Manual



Content

1	About this documentation	3
1.1	Symbols and notes	3
1.2	Complete documentation	3
2	Safety	4
3	SAI-AU-SB System description	6
3.1	System structure	6
3.2	DESINA	6
4	Project planning	8
4.1	Criteria for the SAI modules selection	8
4.2	Power supply	8
4.3	Dimensions and distances of the SAI subbus	9
4.4	Calculation example for total current and power supply	9
5	Module descriptions	11
5.1	SAI-AU M8 SB 8DI-V2	11
5.2	SAI-AU M12 SB 8DI-V2	14
5.3	SAI-AU M8 SB 8DIO-V2	17
5.4	SAI-AU M12 SB 8DIO-V2	22
5.5	SAI-AU M8 SB 8DO 2A V2	27
5.6	SAI-AU M12 SB 8DO 2A-V2	31
5.7	SAI-AU M12 SB 4AI-V2	35
5.8	SAI-AU M12 SB 4AO-V2	40
6	Installation	46
6.1	Mounting direction and dimensions	46
6.2	Mounting an SAI module	47
6.3	Connecting functional earth (FE)	48
6.4	Connecting cables and devices	48
6.5	Marking the modules	48
7	Disassembling and disposing SAI modules	49
7.1	Disassembling	49
7.2	Disposal	49
ANNEX		50
	Accessories	51
	Mounting dimensions	52
	Service	54

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1 About this documentation

1.1 Symbols and notes

The safety notices in this documentation are designed according to the severity of the danger.

	DANGER
	Imminent risk to life! Notes with the signal word "Danger" warn you of situations which will result in serious injury or death if you do not follow the instructions given in this manual.

	WARNING
	Possible danger to life! Notes with the signal word "Warning" warn you of situations which may result in serious injury or death if you do not follow the instructions given in this manual.

	CAUTION
	Risk of injury! Notes with the signal word "Caution" warn you of situations which may result in injury if you do not follow the instructions given in this manual.

ATTENTION
Material damage! Notes with the signal word "Attention" warn you of hazards which may result in material damage.



Text next to this arrow are notes which are not relevant to safety, but provide important information about proper and effective work procedures.

The situation-dependent safety notices may contain the following warning symbols:

Symbol	Meaning
	Warning against hazardous electrical voltage
	Warning against explosive atmospheres
	Warning against electrostatically charged components
	Instruction: observe the documentation

- All instructions can be identified by the black triangle next to the text.
- Lists are marked with a tick.

1.2 Complete documentation



- The usage of UR20-I/O modules is described in the **Remote-I/O-System u-remote** manual (Document No. 1432790000).
- The usage of the Webserver is described in the **u-remote Webserver manual** (Document No. 2112220000).

You can find the documents in the [Weidmüller Support Center](#).

2 Safety

This section includes general safety instructions for handling the described products. Specific warning notices for specific tasks and situations are given at the appropriate places in the documentation. Failure to observe the safety and warning notices can result in damage to persons and material.

2.1 General safety notice

Work on the SAI-AU modules may only be performed by qualified electricians with the support of trained persons. As a result of their professional training and experience, an electrician is qualified to perform the necessary work and identify any potential risks.

Before any work is carried out on the products (installation, maintenance, retrofitting), the power supply must be switched off and secured against being switched on again. Work may be carried out with safety extra-low voltage (SELV/PELV). When working during continued operations, the emergency stop mechanisms must not be made ineffective.

The SAI-AU modules do not comprehend any components or parts that can be maintained by the operator. If a malfunction on a SAI-AU module cannot be fixed after following the recommended measures, the product in question must be sent back to Weidmüller. Weidmüller does not assume any liability if the product has been tampered with!

Electrostatic discharge

SAI-AU modules can be damaged or destroyed by electrostatic discharge. When handling the products, the necessary safety measures against electrostatic discharge (ESD) according to IEC 61340-5-1 and IEC 61340-5-2 must be observed.

All devices are supplied in ESD-protected packaging. The packing and unpacking as well as the installation and disassembly of a device may only be carried out by qualified personnel and in accordance with the ESD information.

The standards and guidelines applicable for the assembly of switch cabinets and the arrangement of data and supply lines must be complied with.

Fuse protection

The operator must set up the equipment so that it is protected against overloading. The power supply units for supplying the system with 24 V DC as well as the power supply units for feeding the UR20-1COM-SAI-PRO gateway module must comply with the class 2 and SELV category. The output voltage of the power supply unit for the system supply must correspond to overvoltage category II in accordance with IEC 61010. The corresponding overvoltage category must be observed for each individual module when connecting to external circuits (see technical data).

The main switch, the switches of the subsequent circuits, the cable cross sections and the fuse protection have to be configured according to IEC 61010. The current demand must be calculated separately for each single SAI-AU module.

In the case of modules without fused sensor/actuator power supplies, all lines to the connected sensors/actuators must be fused corresponding to their conductor cross-section (as per DIN VDE 0298 Part 4).

To meet UL-specifications in accordance with UL 248-14, a UL-certified automatic fuse (e.g. ABB Type S201-B10) or a 10 A fuse with a medium time-lag (e.g. ESKA Part No. 522.227) must be used.

All connections of the SAI-AU modules are EMC compliant in accordance with IEC 61131-2, Zone B. The operator has to decide whether additional overvoltage protection according to IEC 62305 is required. Voltages that exceed ± 30 V may cause the destruction of modules.

Earthing

Each SAI-AU module must be connected to the functional earth to discharge electromagnetic pulses. Alternatively, a low-resistance short FE conductor can be connected to the FE connection.

The UR20-1COM-SAI-PRO communication module in the u-remote station is electrically connected to the DIN rail via an FE spring on its underside, see u-remote manual.

Shielding

Shielded lines are to be connected with shielded plugs and fixed on a shield bus in compliance with the relevant standard (see Chapter Mounting).

2.2 Intended use

SAI-AU modules are intended for use in industrial automation. A SAI-AU module is designed for the decentralised control of systems or sub-systems. The modules are intended for use in NFPA 79 applications or equivalent only.

Each SAI-AU module is integrated into a fieldbus structure by connecting it to a UR20-1COM-SAI-PRO communication module (2007430000), which is part of a u-remote station. The fieldbus coupler of the station is connected to a superordinate control unit.

SAI-AU modules provide a IP67 degree of protection (acc. to IEC 60529).

The observance of the documentation is part of the intended use. The products described in this manual may only be used for the intended applications and only in connection with certified third-party devices or components. The product-specific protective measures can become ineffective in the event of deviating use.

2.3 Legal notice

SAI-AU modules are CE-compliant with the following EU Directives:

- 2014/30/EU Directive (EMV Directive)
- 2014/35/EU Directive (Low Voltage Directive)

The test reports according to CISPR 16-2-3 demonstrate the compliance of the SAI-AU-modules to the limits for radiated emissions as defined by CFR 47 Part 15, Subpart B, §15.109, Class A (2010) and ICES-003, Issue 5, Class A (2012).

3 SAI-AU-SB System description

3.1 System structure

Sensor Actuator Interface modules (SAI-modules) are used to collect and distribute signals in a decentralised way. A subbus chain of SAI modules can be connected to a u-remote station via a UR20-1COM-SAI-PRO (2007430000) communication module. The SAI modules communicate with the fieldbus coupler via the communication module. The module electronics of the communication module supply the connected SAI subbus modules with 24 V DC (max. 2.5 A) from the input current path (i_{IN}).

A subbus chain can have a maximum of 15 SAI modules, which can be placed in a IP67 environment. The distance between the UR20 communication module and the last connected subbus module should not exceed 50 metres (164 ft). The bus output of the last module of the subbus chain has to be terminated with a SAIEND terminating resistor. For more information on designing a subbus, see Chapter 4.

All connected subbus modules have to be considered as active modules when planning the u-remote station. The communication status is indicated by two LEDs. The SAI subbus modules as well as the UR20 modules are visible on the web server.



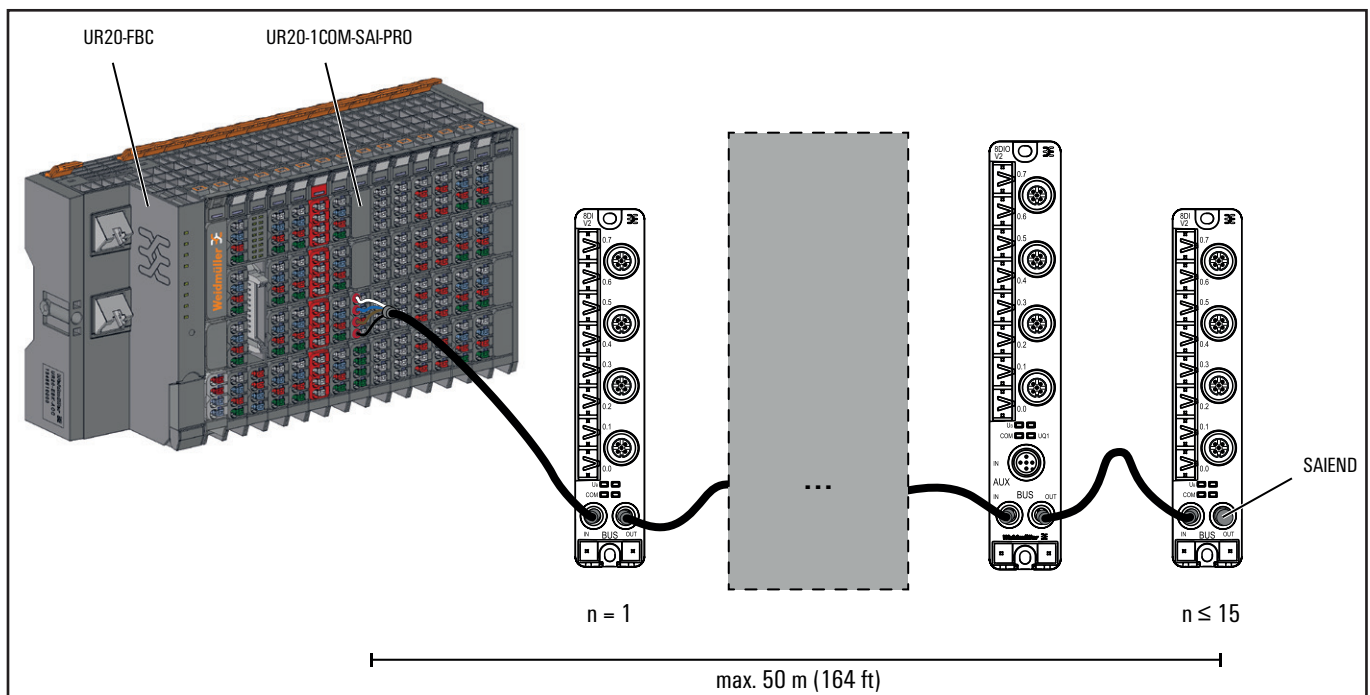
Observe the description of the UR20-1COM-SAI-PRO module in the u-remote manual. You can find the u-remote manual (Document No. 1432790000) in the Weidmüller Support Center.

The SAI modules are configured in the hardware configurator of the control like UR20 modules and they are covered in the device description file of the fieldbus couplers. The entire system is implemented as modular system. In the hardware configuration, the SAI modules as well as the UR20 modules are connected behind the fieldbus coupler in the order of their physical position.

3.2 DESINA

Standards for the electrical, hydraulic and pneumatic installation of automated machine tools and production plants are described in **DE**centralised and **St**andardised **IN**stallation technology (**DESINA**) and in the ISO 23570 standard. You can find more information on <https://www.iso.org/standards.html>.

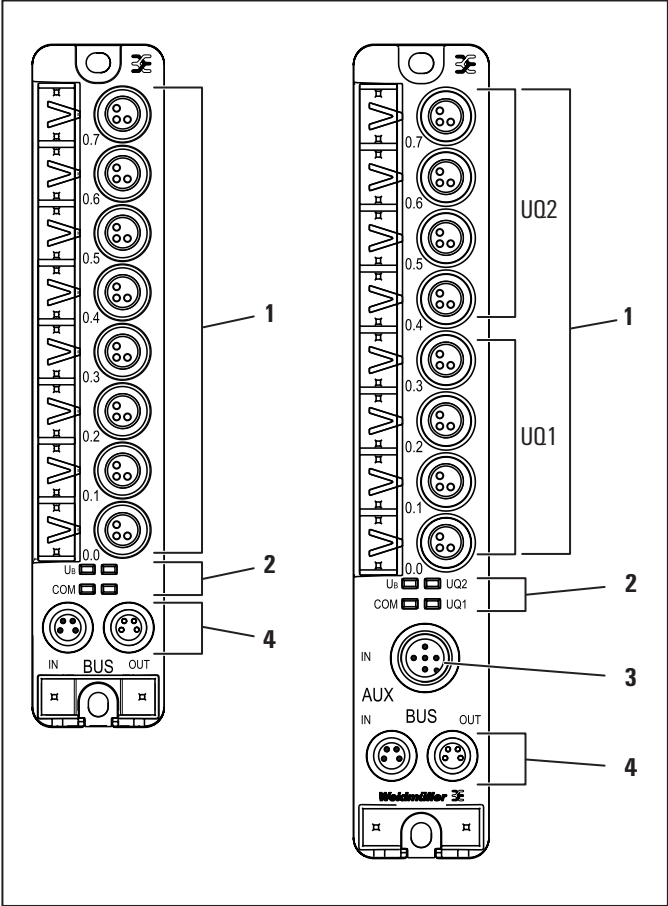
In order to use the DESINA diagnostic function, pin 2 of the port must be parameterised as a diagnostic input. This input can then be used for cable break monitoring, for example. The error message is output by a sensor with DESINA specification on pin 2 as an NC signal (OK = high level; not OK = low level).



System overview

General module description

The general design of the SAI modules is shown in the following figure.



General design of a SAI module

- 1 I/O connectors and status LEDs
- 2 LEDs for power supply and subbus
- 3 Power supply AUX IN (only modules with digital outputs)
- 4 Combi connectors for power supply and subbus



For detailed descriptions of the SAI modules see Chapter 5.

List of SAI modules

Order No.	SAI module
3096500000	SAI-AU M8 SB 8DI-V2
3096470000	SAI-AU M12 SB 8DI-V2
3096510000	SAI-AU M8 SB 8DIO-V2
3096480000	SAI-AU M12 SB 8DIO-V2
3096630000	SAI-AU M8 SB 8DO 2A-V2
3096490000	SAI-AU M12 SB 8DO 2A-V2
3096450000	SAI-AU M12 SB 4AI-V2
3096460000	SAI-AU M12 SB 4AO-V2



Each subbus module can be replaced by an identical module without having to restart the u-remote station. If a subbus module is replaced by another module type or the subbus chain is extended, the u-remote station must be restarted.

4 Project planning

When designing a subbus system, you should consider the following aspects:

- Location of the machine or plant
- Assignment of signals to the plant in logic groups
- Selection of field devices
- Assignment of the signals to the field devices
- Mounting location of the field devices

4.1 Criteria for the SAI modules selection

Inputs, outputs and signals

Select the SAI-AU modules suitable to the digital or analogue signals to be transferred. For digital signals, there are also DIO modules with configurable inputs and outputs.

Sensor connections

Select the M8 (3-pole) or M12 (5-pole) suitable to the application and the sensors to be connected.

Y-Distributor

There are Y-distributors for 5-pole M12 sensor connectors, see accessories. This allows you to route 2 sensor cables (M8 or M12) to one I/O input.

Shielding

Shielding cables must be used for the connection of the SAI-AU modules and also for analogue signals of 4AI or 4AO to limit temporary deviation to max 1% during electromagnetic interference.



Observe the notes given in the **Earthing and Shielding** chapter of the u-remote manual.

You can find an overview of cables, connectors and Y-distributors in the attachment.

4.2 Power supply

Supply connections

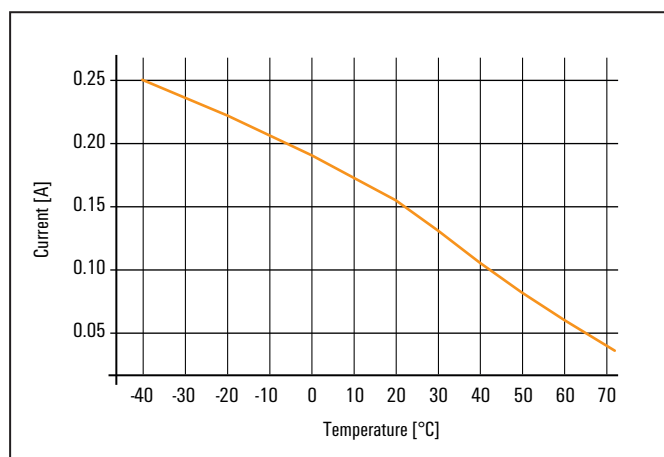
The SAI-AU modules are connected to each other via SAI cables (4-pole M8 connection). The electronics and the inputs are supplied from the UB potential.

Modules with digital outputs have an additional M12 AUX IN connection for the 24 V DC output power supply (max. 28.8 V).

	CAUTION
	Risk of injury! Actuators can be triggered by external voltage and e.g. motors can start up in an uncontrolled manner. The module can be destroyed by overvoltage. ► Never apply external voltage to the outputs.

Derating of the current supply for sensors and actuators

The maximum current for supplying sensors and actuators is temperature dependant. The maximum supply current is 0.140 A at 25 °C.



Derating curve

Total current

	CAUTION
	Risk of injury! The total current at the communication module UR20-1COM-SAI-PRO in the u-remote station must not exceed 2.5 A DC.

The maximum permissible total current limits the number of loads, which can be connected to a subbus system. To calculate the total current, the total current consumption of each SAI-AU module in the subbus system has to be determined:

Total current consumption of a SAI-AU module =
 Own current consumption (50 mA)
 + Current consumption of connected sensors

The current consumption of the sensors can be found in the data sheets of the manufacturers. The total current results from the addition of total current consumption of all SAI-AU modules in a subbus system.

Voltage drop and maximum extension

The possible extension of a subbus chain is limited by the voltage drop that occurs. The voltage drop depends on the following aspects:

- Total current consumption of each SAI module (see above)
- Length of the cables in the subbus chain
- Line resistance of the cables used

The voltage drop is calculated as follows:

Voltage drop of the line =

$$\text{total current consumption of the module} \times (\text{line resistance} \times \text{cable length} \times 2)$$

Total voltage drop =

Voltage drop at UR20-1COM-SAI-PRO (0,125 V)
 + Voltage drop cable 1
 + Voltage drop cable 2
 + ...
 + Voltage drop cable n (last cable in the chain)

The voltage at the last module of the subbus chain is calculated as follows:

24 V feed-in at UR20-1COM-SAI-PRO
 – total voltage drop

For the subbus chain to function properly with all connected loads, the voltage at the last SAI module must be at least 18 V DC.

4.3 Dimensions and distances of the SAI subbus

The SAI-System with all participants must be arranged in such a way that the following distances are kept

Distance between the UR20-1COM-SAI-PRO module and the last SAI module in the subbus	max. 50 m
Distance between the UR20-1COM-SAI-PRO module and the first SAI module in the subbus and between two SAI modules.	max. 30 m
Distance between SAI module and AUX power/IO cable	max. 30 m
Distance between 24 V DC power cable and UR20 fieldbus coupler	max. 30 m



When exceeding 30 m for the UR20 fieldbus coupler power cable, additional overvoltage protection according to IEC 61643-22 needs to be considered.

4.4 Calculation example for total current and power supply

A subbus chain shall be designed for 44 sensors and 14 actuators. The following SAI modules shall be used:

6 x SAI module SAI-AU M12 SB 8DI-V2 (3096470000)
 2 x SAI module SAI-AU M12 SB 8DIO-V2 (3096480000)
 1 x SAI module SAI-AU M12 SB 8DO 2A-V2 (3096490000)

The current consumption of the connected sensors is 10 mA each.

The cable length within the SAI subbus chain varies between 0,3 and 10 metres, see figure on the next page.

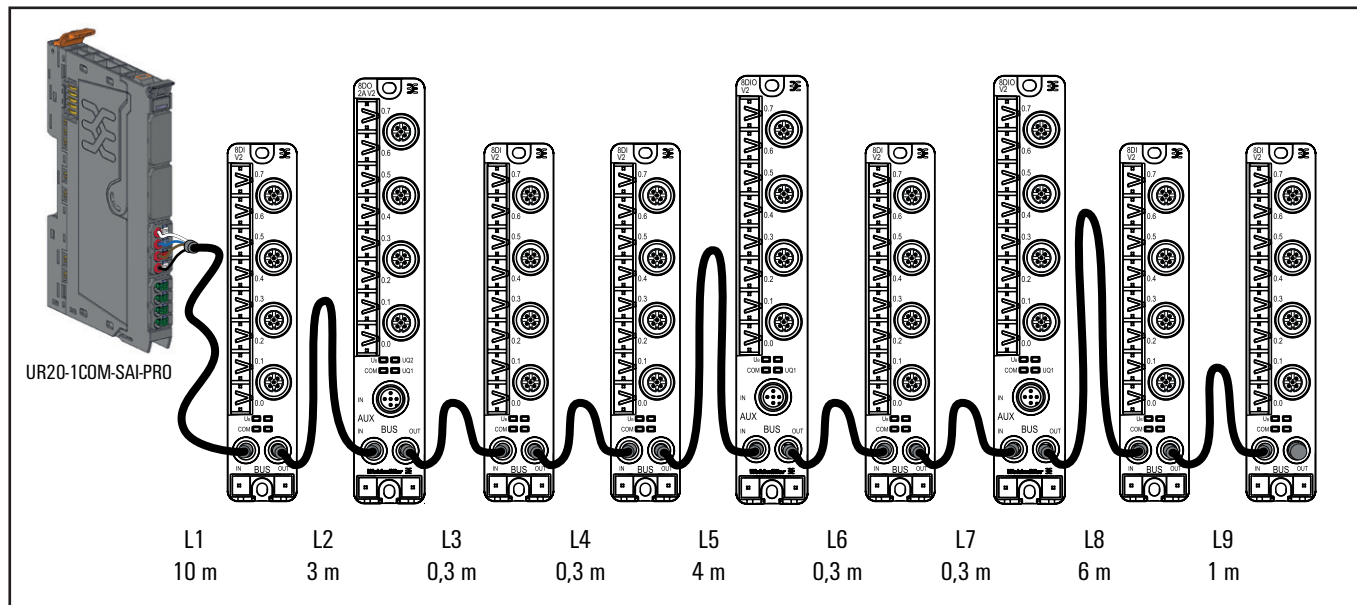
The line resistance of the used subbus cables is 0,05 Ohm/m.

Total current calculation

Total current consumption of the SAI modules

No.	Order No.	Current module	Current sensors	Total current
1	3096470000	50 mA	6 x 10 mA = 60 mA	110 mA
2	3096490000	50 mA	–	50 mA
3	3096470000	50 mA	6 x 10 mA = 60 mA	110 mA
4	3096470000	50 mA	6 x 10 mA = 60 mA	110 mA
5	3096480000	50 mA	4 x 10 mA = 40 mA	90 mA
6	3096470000	50 mA	6 x 10 mA = 60 mA	110 mA
7	3096480000	50 mA	4 x 10 mA = 40 mA	90 mA
8	3096470000	50 mA	6 x 10 mA = 60 mA	110 mA
9	3096470000	50 mA	6 x 10 mA = 60 mA	110 mA
				890 mA

In this example, the total current sum of 0,89 A is clearly below the maximum permissible total current of 2.5 A



Example arrangement of a subbus chain with 9 SAI modules

Voltage drop calculation

Voltage drop between the modules

Line	Calculation	Voltage drop
L9	$110 \text{ mA} \times (0.05 \text{ Ohm/m} \times 1 \text{ m} \times 2)$	0.011 V
L8	$(110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 6 \text{ m} \times 2)$	0.132 V
L7	$(90 \text{ mA} + 110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 0,3 \text{ m} \times 2)$	0.0093 V
L6	$(110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 0,3 \text{ m} \times 2)$	0.0126 V
L5	$(90 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 4 \text{ m} \times 2)$	0.204 V
L4	$(110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 0,3 \text{ m} \times 2)$	0.0186 V
L3	$(110 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 0,3 \text{ m} \times 2)$	0.0219 V
L2	$(50 \text{ mA} + 110 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 3 \text{ m} \times 2)$	0.234 V
L1	$(110 \text{ mA} + 50 \text{ mA} + 110 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 90 \text{ mA} + 110 \text{ mA} + 110 \text{ mA}) \times (0.05 \text{ Ohm/m} \times 10 \text{ m} \times 2)$	0.89 V
Voltage drop at UR20-1COM-SAI-PRO		0.125 V
Total voltage drop:		1.6584 V

The voltage at the last SAI module of the subbus chain is calculated as follows:

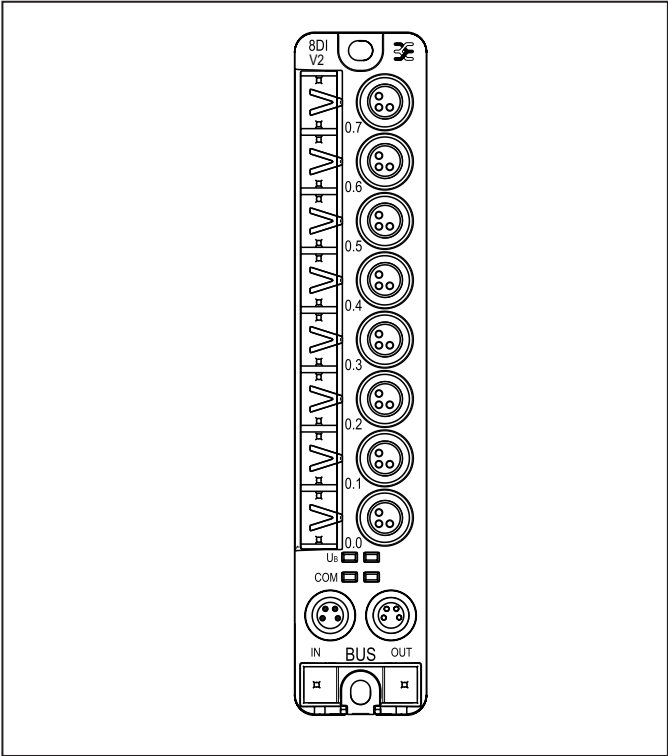
$$\begin{aligned}
 &\text{Voltage at the last SAI module} = \\
 &\quad 24 \text{ V feed-in at UR20-1COM-SAI-PRO} \\
 &\quad - 1.6584 \text{ V} \\
 &\quad \hline
 &\quad 22.3416 \text{ V}
 \end{aligned}$$

In this example, the voltage at the last SAI module is 22.3416 V, which is clearly above the minimum required value of 18 V.

5 Module descriptions

5.1 SAI-AU M8 SB 8DI-V2

The SAI-AU M8 SB 8DI-V2 is a module for the connection of 8 digital sensors via 8 M8 connections.



SAI-AU M8 SB 8DI-V2 (Order No. 3096500000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
0.0 to 0.7	8 digital inputs

LED	Display
0.0 ... 0.7	Digital inputs
	Yellow Status digital input Pin 4
	Red Short circuit at 24 V DC Sensor voltage Pin 1
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
	Red Power supply < 18 V DC
	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO master
	Green flashing (approx. 10 s) Communication is being established
	Green flashing Pre-Operational mode, no communication
	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted

Subbus power supply



Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module.
 The power supply and the digital inputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

M8 Pin, 4-pole

Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

Power supply BUS OUT

M8 Socket, 4-pole

Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

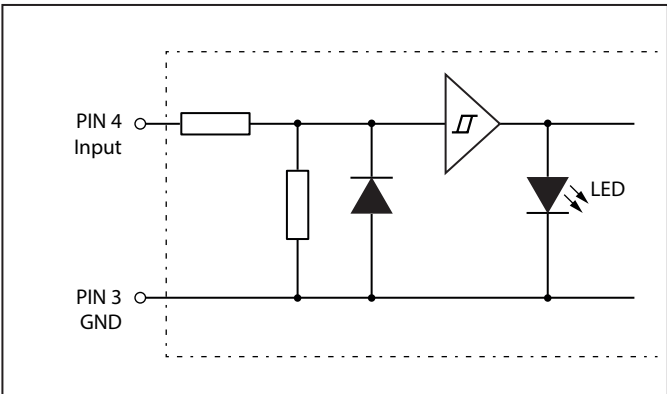
Digital input connection

M8 Socket, 3-pole

Pin 1: + 24 V DC sensor voltage
Pin 3: GND
Pin 4: Input

Circuit principle of the digital input

Port wiring of Pin 3 and Pin 4 at DI0.0 to DI0.7:



Circuit principle of the digital input for SAI-AU M8 SB 8DI-V2

Diagnostic data SAI-AU M8 SB 8DI-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal Error	
		2	External error	
		3	Channel Error	
		4	Error	0
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3	Channel information available	1
		4		
5 ... 7	Reserved	0		
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 3	Reserved	0
		4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0 ... 3	Channel type 0x70	0
		4 ... 6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	8
Channel error	7	0	Error at channel 0	
		...	...	
		7	Error at channel 7	
	8 ... 10	0 ... 31	Reserved	0
Channel 0 error	11	0 ... 3	Reserved	
		4	Line break (DESINA)	
...	...			
Channel 7 error	18	5	Sensor supply fault	
		6 ... 7	Reserved	
Channel 8 error				
...				
Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data inputs SAI-AU M8 SB 8DI-V2

Byte	Bit	Name
IB0	0	DI0
	1	DI1
	2	DI2
	3	DI3
	4	DI4
	5	DI5
	6	DI6
	7	DI7

Parameters SAI-AU M8 SB 8DI-V2

Channel	Description	Options ¹⁾	Default
0, 2, 4, 6	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms
1, 3, 5, 7	Desina Function	Input (0) / Desina diagnosis (1)	Input
	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms

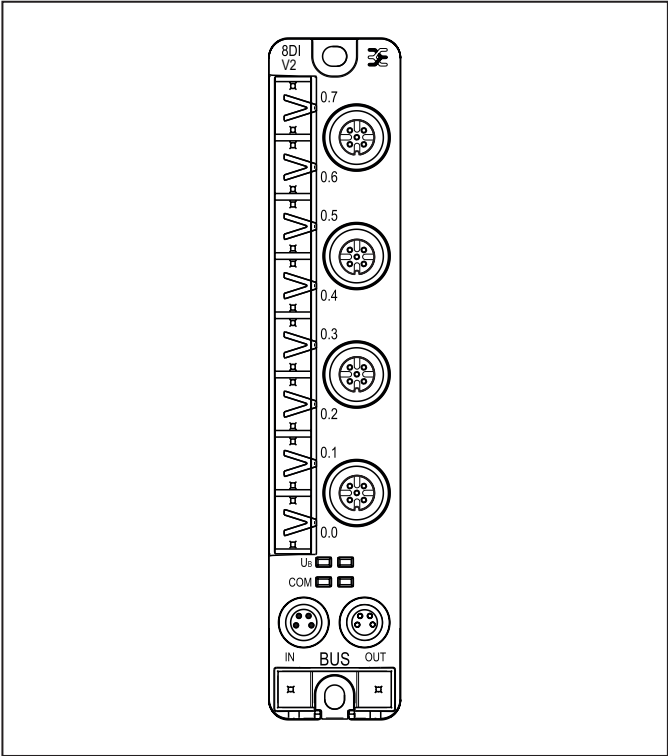
1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M8 SB 8DI-V2 (Order No. 3096500000)

Supply	
Power supply	24 V DC +20 %/-15 %
Contact load	3 A per Pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Digital inputs	
Number	8
Permissible input voltage	-30 V DC ... +30 V DC
Input voltage low	<5 V DC acc. to IEC 61131-2 Type 1
Input voltage high	>15 V DC acc. to IEC 61131-2 Type 1
Input current low	<15 mA acc. to IEC 61131-2 Type 1
Input current high	2 mA ... 15 mA acc. to IEC 61131-2 Type 1
Input filter	Adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Reverse polarity protection	Yes
Potential isolation to module electronics	No
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	155 x 30 x 32 mm
Weight	150 g

5.2
SAI-AU M12 SB 8DI-V2

The SAI-AU M12 SB 8DI-V2 is a module for the connection of 8 digital sensors via 4 M12 connections



SAI-AU M12 SB 8DI-V2 (Order No. 3096470000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
0.0 to 0.7	8 digital inputs

LED	Display
0.0 ... 0.7	Digital inputs
	Yellow Status digital input Pin 2/4
	Red Short circuit at 24 V DC Sensor voltage Pin 1
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
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	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO master
	Green flashing (approx. 10 s) Communication is being established
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	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted

Subbus power supply

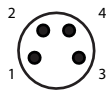


Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module.

The power supply and the digital inputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

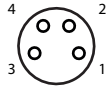
M8 Plug, 4-pole



Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

Power supply BUS OUT

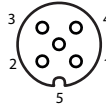
M8 Socket, 4-pole



Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

Digital input connection

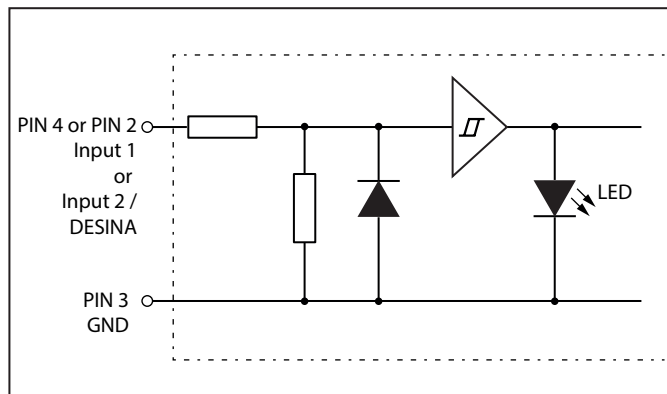
M12 Socket, 5-pole, A-coded



Pin 1: + 24 V DC Sensor voltage
Pin 2: Input 2 or diagnostic input (DESINA)
Pin 3: GND
Pin 4: Input 1
Pin 5: FE

Circuit principle of the digital input

Port wiring of Pin 3, Pin 2 and Pin 4 at DI0.0 to DI0.7:



Circuit principle of the digital input for SAI-AU M12 SB 8DI-V2

Diagnostic data SAI-AU M12 SB 8DI-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal Error	
		2	External error	
		3	Channel Error	
		4	Error	0
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Channel information available	1
		5 ... 7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 3	Reserved	0
		4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0 ... 3	Channel type 0x70	0
		4 ... 6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	8
Channel error	7	0	Error at channel 0	
		...	...	
		7	Error at channel 7	
	8 ... 10	0 ... 31	Reserved	0
Channel 0 error	11	0 ... 3	Reserved	
4		Line break (DESINA)		
...	...			
Channel 7 error	18	5	Sensor supply fault	
		6 ... 7	Reserved	
Channel 8 error				
...				
Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [μs] (32bit)	

Process data inputs SAI-AU M12 SB 8DI-V2

Byte	Bit	Name
IB0	0	DI0
	1	DI1
	2	DI2
	3	DI3
	4	DI4
	5	DI5
	6	DI6
	7	DI7

Parameters SAI-AU M12 SB 8DI-V2

Channel	Description	Options ¹⁾	Default
0, 2, 4, 6	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms
1, 3, 5, 7	Desina Function	Input (0) / Desina diagnosis (1)	Input
	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms

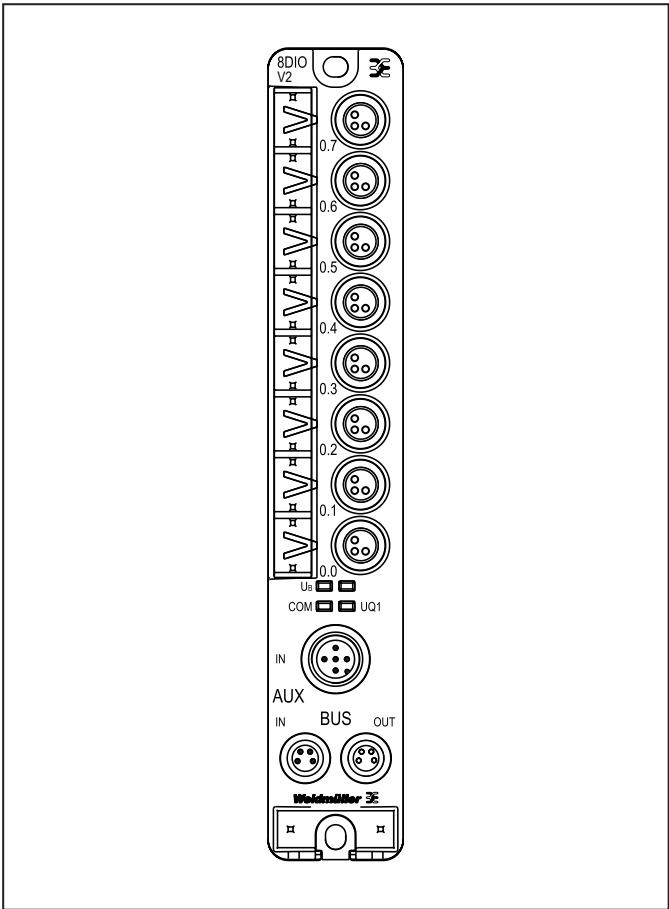
1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M12 SB 8DI-V2 (Order No. 3096470000)

Supply	
Power supply	24 V DC +20 %/-15 %
Contact load	3 A per pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Digital inputs	
Number	8
Permissible input voltage	-30 V DC ... +30 V DC
Input voltage low	< 5 V DC acc. to IEC 61131-2 Type 1
Input voltage high	> 15 V DC acc. to IEC 61131-2 Type 1
Input current low	< 15 mA acc. to IEC 61131-2 Type 1
Input current high	2 mA ... 15 mA acc. to IEC 61131-2 Type 1
Input filter	Adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Reverse polarity protection	Yes
Potential isolation to module electronics	No
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	155 x 30 x 32 mm
Weight	150 g

5.3 SAI-AU M8 SB 8DIO-V2

The SAI-AU M8 SB 8DIO-V2 is a module for the connection of 8 digital sensors via 8 M8 connections. Alternatively, up to 8 channels can be used as outputs. The outputs are designed for 0.5 A load each.



SAI-AU M8 SB 8DIO-V2 (Order No. 3096510000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
AUX IN	Power supply UQ1
0.0 to 0.7	8 digital inputs / 8 digital outputs

LED	Display
0.0 ... 0.7	Digital inputs/outputs
	Yellow Status digital input/output Pin 4
	Red Short circuit at 24 V DC Sensor voltage Pin 1 or at digital output Pin 4
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
	Red Power supply < 18 V DC
	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO
	Green flashing (approx. 10 s) Communication is being established
	Green flashing Pre-operational mode, no communication
	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted
UQ1	Power supply UQ1 for local Outputs
	Green Voltage UQ1 ≥ 18 V DC
	Red Voltage UQ1 < 18 V DC

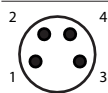
Subbus power supply



Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module. The power supply and the digital inputs/outputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

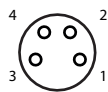
M8 Plug, 4-pole



Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

Power supply BUS OUT

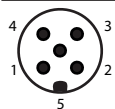
M8 Socket, 4-pole



Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

Power supply AUX IN

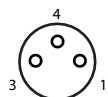
M12 Plug, 5-pole, A-coded



Pin 1: +24 V DC UQ1
Pin 2: +24 V DC UQ1
Pin 3: GND UQ1
Pin 4: GND UQ1
Pin 5: FE
Housing: shield, connected with FE connection

Digital input connection/Output

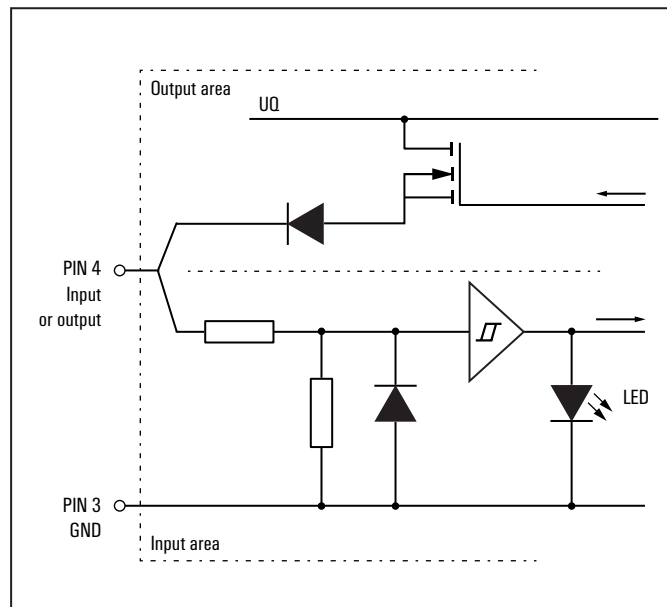
M8 Socket, 3-pole



Pin 1: + 24 V DC Sensor voltage
Pin 3: GND
Pin 4: Input/Output

Circuit principle of the digital input/output

Port wiring of Pin 3 and Pin 4 at DIO 0.0 to DIO 0.7:



Circuit principle of the digital input/output for SAI-AU M8 SB 8DIO-V2

Diagnostic data SAI-AU M8 SB 8DIO-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal Error	
		2	External error	
		3	Channel Error	
		4	Error	
		5	Power supply fault	
		6	Reserved	
		7	Parameter error	
Module type	1	0		1
		1	Module Type 0x0F	1
		2		1
		3		1
		4	Channel information available	1
		5 ... 7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0	External auxiliary supply error (UQ1)	0
		1 ... 3	Reserved	0
		4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0		0
		1		1
		2		0
		3	Channel type 0x72	0
		4		1
		5		1
		6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	8
Channel error	7	0	Error at channel 0	
		...	...	
		7	Error at channel 7	
	8 ... 10	0 ... 31	Reserved	0
Channel 0 error	11	0 ... 1	Reserved	
		2	Short circuit low	
		3	Short circuit high	
		4	Line break (DESINA)	
...	...			
Channel 7 error	18	5	Output power missing	
		6	Sensor supply fault	
		7	Reserved	
Channel 8 error				
...				
Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data inputs SAI-AU M8 SB 8DIO-V2

Byte	Bit	Name
IB0	0	DI0
	1	DI1
	2	DI2
	3	DI3
	4	DI4
	5	DI5
	6	DI6
	7	DI7

Process data outputs SAI-AU M8 SB 8DIO-V2

Byte	Bit	Name
QB0	0	D00
	1	D01
	2	D02
	3	D03
	4	D04
	5	D05
	6	D06
	7	D07

Parameters SAI-AU M8 SB 8DIO-V2

Channel	Description	Options ¹⁾	Default
0, 2, 4, 6	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms
	I/O Switch	Output (0) / Input (1)	Input
	Output behaviour on error	Hold last value (0) / Enable substitute value (1)	Enable substitute value
	Substitute value	Off (0) / On (1)	Off
1, 3, 5, 7	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms
	Desina Function	Input (0) / Desina diagnosis (1)	Input
	I/O Switch	Output (0) / Input (1)	Input
	Output behaviour on error	Hold last value (0) / Enable substitute value (1)	Enable substitute value
	Substitute value	Off (0) / On (1)	Off

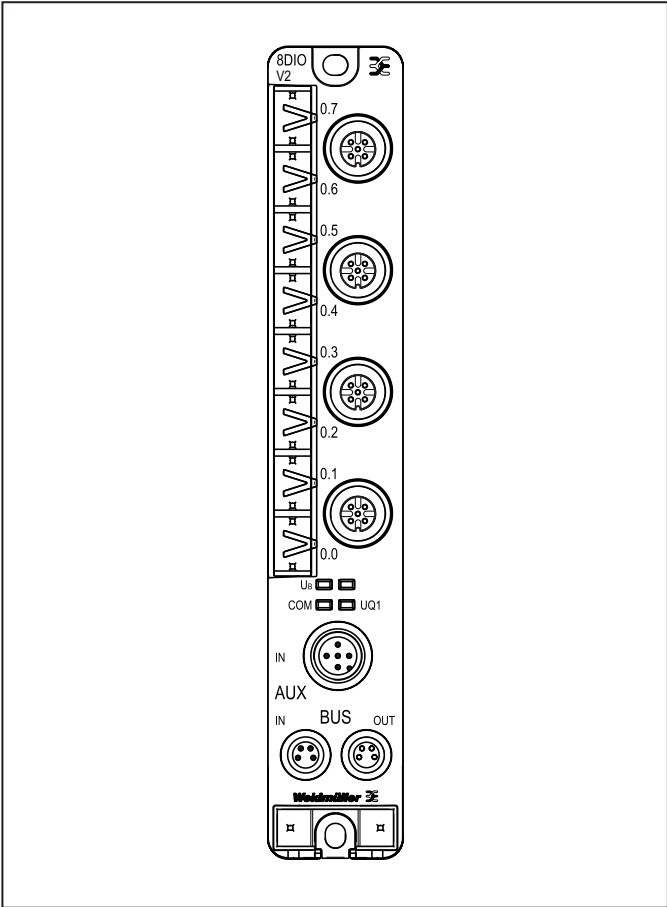
1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M8 SB 8DIO-V2 (Order No. 3096510000)

Supply	
Power supply BUS IN/ AUX IN	24 V DC + 20 %/ - 15 %
Contact load	3 A per pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Digital inputs	
Number	8
Permissible input voltage	-30 V DC ... +30 V DC
Input voltage low	< 5 V DC acc. to IEC 61131-2 Type 1
Input voltage high	> 15 V DC acc. to IEC 61131-2 Type 1
Input current low	< 15 mA acc. to IEC 61131-2 Type 1
Input current high	2 mA ... 15 mA acc. to IEC 61131-2 Type 1
Input filter	Adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Reverse polarity protection	Yes
Potential isolation to module electronics	No
Digital outputs	
Number	8
Type	P-switching
Output current	max. 0,5 A per channel, total current 4 A per module
Switching frequency ohmic load	max. 100 Hz
Switching frequency inductive load (DC-13)	max. 1 Hz
Switching frequency lamp load (12 W)	max. 8 Hz
Short circuit proof	Yes
Potential isolation to module electronics	No
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	180 x 30 x 32 mm
Weight	175 g

5.4
SAI-AU M12 SB 8DIO-V2

The SAI-AU M12 SB 8DIO-V2 is a module for the connection of 8 digital sensors via 4 M12 connections. Alternatively, up to 8 channels can be used as outputs. The outputs are designed for 0.5 A load each.



SAI-AU M12 SB 8DIO-V2 (Order No. 3096480000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
AUX IN	Power supply UQ1
0.0 to 0.7	8 digital inputs/ 8 digital outputs

LED	Display
0.0 ... 0.7	Digital inputs/outputs
	Yellow Status digital input/output Pin 2/4
	Red Short circuit at 24 V DC Sensor voltage Pin 1 or at digital output pin 2/4
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
	Red Power supply < 18 V DC
	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO
	Green flashing (approx. 10 s) Communication is being established
	Green flashing Pre-operational mode, no communication
	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted
UQ1	Power supply UQ1
	Green Voltage UQ1 ≥ 18 V DC
	Red Voltage UQ1 < 18 V DC

Subbus power supply



Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module. The power supply and the digital inputs/outputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

M8 Plug, 4-pole

	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection
--	--

Power supply BUS OUT

M8 Socket, 4-pole

	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection
--	--

Power supply AUX IN

M12 Plug, 5-pole, A-coded

	Pin 1: +24 V DC UQ1 Pin 2: +24 V DC UQ1 Pin 3: GND UQ1 Pin 4: GND UQ1 Pin 5: FE Housing: shield, connected with FE connection
--	--

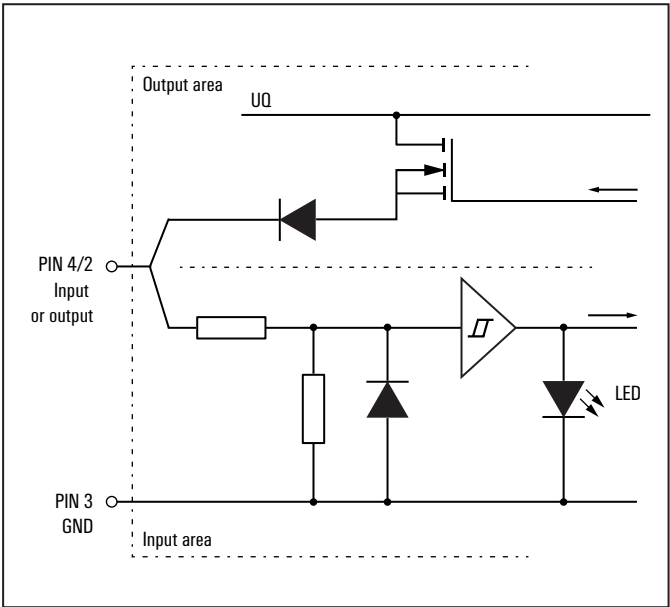
Digital input/output connection

M12 Socket, 5-pole

	Pin 1: + 24 V DC Sensor voltage Pin 2: Input/output 2 or diagnostic input (DESINA) Pin 3: GND Pin 4: Input/output 1 Pin 5: FE
--	---

Circuit principle of the digital input/output

Port wiring of Pin 3, Pin 2 and Pin 4 at DIO 0.0 to DIO 0.7:



Circuit principle of the digital input/output of SAI-AU M12 SB 8DIO-V2

Diagnostic data SAI-AU M12 SB 8DIO-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal Error	
		2	External error	
		3	Channel Error	
		4	Error	
		5	Power supply fault	
		6	Reserved	
		7	Parameter error	
Module type	1	0		1
		1	Module Type 0x0F	1
		2		1
		3		1
		4	Channel information available	1
		5 ... 7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0	External auxiliary supply error (UQ1)	0
		1 ... 3	Reserved	0
		4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0		0
		1		1
		2		0
		3	Channel type 0x72	0
		4		1
		5		1
		6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	8
Channel error	7	0	Error at channel 0	
		...	...	
		7	Error at channel 7	
Channel 0 error ... Channel 7 error	8 ... 10	0 ... 31	Reserved	0
		0 ... 1	Reserved	
		2	Short circuit low	
		3	Short circuit high	
		4	Line break (DESINA)	
		5	Output power missing	
		6	Sensor supply fault	
		7	Reserved	
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data inputs SAI-AU M12 SB 8DIO-V2

Byte	Bit	Name
IB0	0	DI0
	1	DI1
	2	DI2
	3	DI3
	4	DI4
	5	DI5
	6	DI6
	7	DI7

Process data outputs SAI-AU M12 SB 8DIO-V2

Byte	Bit	Name
QB0	0	D00
	1	D01
	2	D02
	3	D03
	4	D04
	5	D05
	6	D06
	7	D07

Parameters SAI-AU M12 SB 8DIO-V2

Channel	Description	Options ¹⁾	Default
0, 2, 4, 6	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms
	I/O Switch	Output (0) / Input (1)	Input
	Output behaviour on error	Hold last value (0) / Enable substitute value (1)	Enable substitute value
	Substitute value	Off (0) / On (1)	Off
1, 3, 5, 7	Input delay	1 ms (0) / 3 ms (1) / 5 ms (2) / 10 ms (3)	3 ms
	Desina Function	Input (0) / Desina diagnosis (1)	Input
	I/O Switch	Output (0) / Input (1)	Input
	Output behaviour on error	Hold last value (0) / Enable substitute value (1)	Enable substitute value
	Substitute value	Off (0) / On (1)	Off

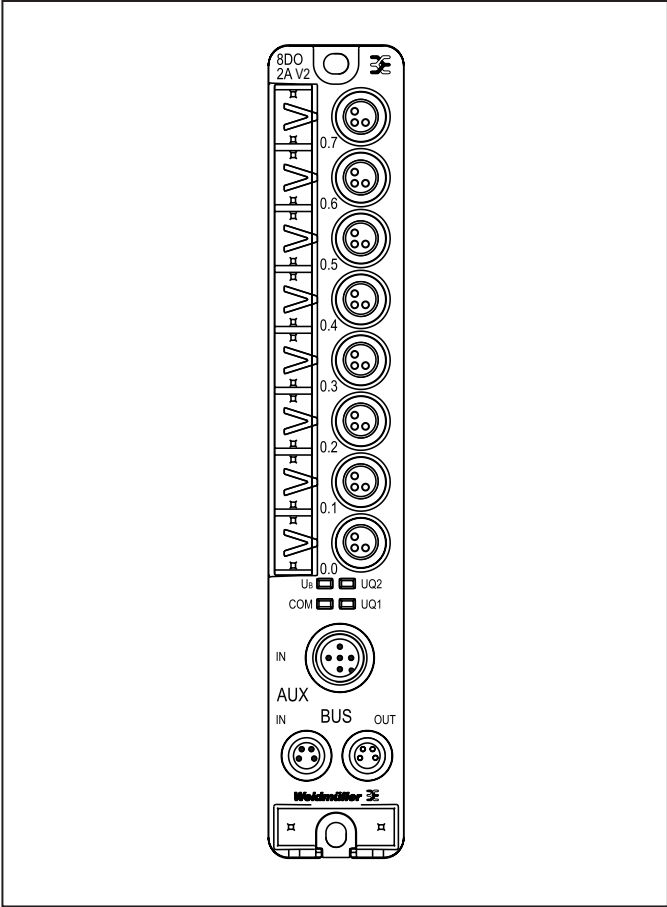
1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M12 SB 8DIO-V2 (Order No. 3096480000)

Supply	
Power supply BUS IN/ AUX IN	24 V DC + 20 %/ - 15 %
Contact load	3 A per pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Digital inputs	
Number	8
Permissible input voltage	-30 V DC ... +30 V DC
Input voltage low	< 5 V DC acc. to IEC 61131-2 Type 1
Input voltage high	> 15 V DC acc. to IEC 61131-2 Type 1
Input current low	< 15 mA acc. to IEC 61131-2 Type 1
Input current high	2 mA ... 15 mA acc. to IEC 61131-2 Type 1
Input filter	Adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Reverse polarity protection	Yes
Potential isolation to module electronics	No
Digital outputs	
Number	8
Type	P-switching
Output current	max. 0,5 A per channel, total current 4 A per module
Switching frequency ohmic load	max. 100 Hz
Switching frequency inductive load (DC-13)	max. 1 Hz
Switching frequency lamp load (12 W)	max. 8 Hz
Short circuit proof	Yes
Potential isolation to module electronics	No
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	180 x 30 x 32 mm
Weight	175 g

5.5 SAI-AU M8 SB 8DO 2A-V2

The SAI-AU M8 SB 8DO 2A-V2 is a module for the connection of 8 digital sensors via 8 M8 connections. The outputs are designed for 2 A load each.



SAI-AU M8 SB 8DO 2A-V2 (Order No. 3096630000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
AUX IN	Power supply UQ1, UQ2
0.0 to 0.7	8 digital outputs

LED	Display
0.0 ... 0.7	Digital outputs
	Yellow Status digital output Pin 4
	Red Short circuit at 24 V DC Sensor voltage Pin 1 or at digital output Pin 4
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
	Red Power supply < 18 V DC
	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO
	Green flashing (approx. 10 s) Communication is being established
	Green flashing Pre-operational mode, no communication
	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted
UQ1	Power supply UQ1
	Green Voltage UQ1 ≥ 18 V DC
	Red Voltage UQ1 < 18 V DC
UQ2	Power supply UQ2
	Green Voltage UQ2 ≥ 18 V DC
	Red Voltage UQ2 < 18 V DC

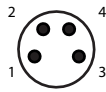
Subbus power supply



Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module. The power supply and the digital outputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

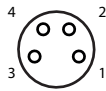
M8 Plug, 4-pole



Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

Power supply BUS OUT

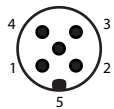
M8 Socket, 4-pole



Pin 1: +24 V DC
Pin 2: Data +
Pin 3: GND
Pin 4: Data -
Housing: shield, connected with FE connection

Power supply AUX IN

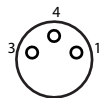
M12 Plug, 5-pole, A-coded



Pin 1: +24 V DC UQ1
Pin 2: +24 V DC UQ2
Pin 3: GND UQ1
Pin 4: GND UQ2
Pin 5: FE
Housing: shield, connected with FE connection

Digital output connection

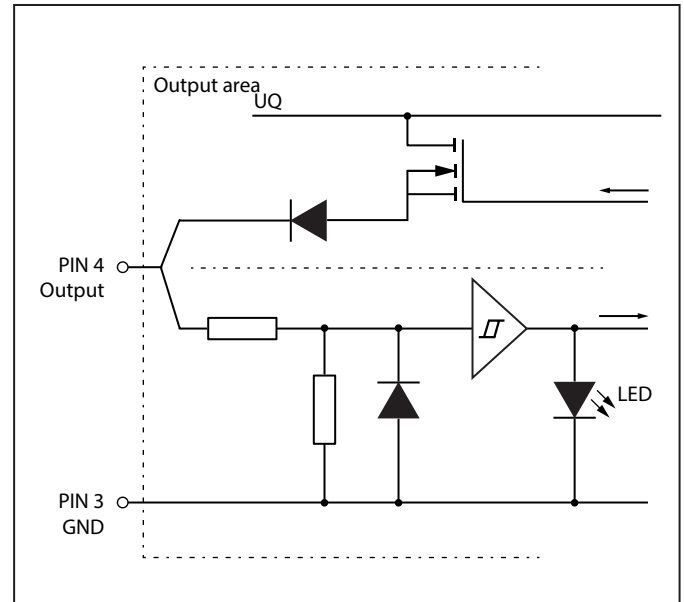
M12 Socket, 3-pole



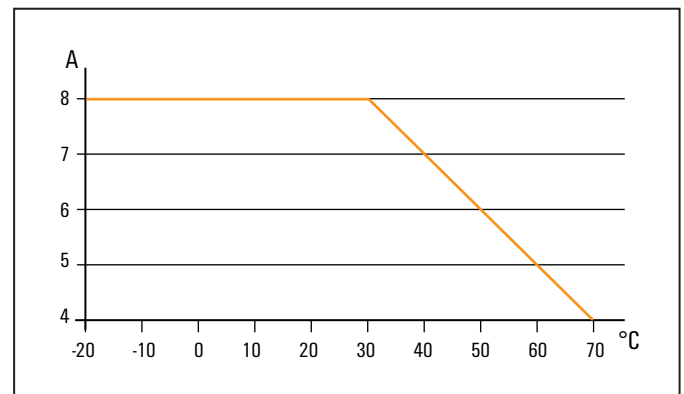
Pin 1: + 24 V DC Sensor voltage
Pin 3: GND
Pin 4: Output

Circuit principle of the digital output

Port wiring of Pin 3 and Pin 4 at DO 0.0 to DO 0.7:



Circuit principle of the digital output of SAI-AU M8 SB 8DO 2A-V2



Derating curve for the maximum total current of the outputs of SAI-AU M8 SB 8DO 2A-V2

Diagnostic data SAI-AU M8 SB 8DO 2A-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal Error	
		2	External error	
		3	Channel Error	
		4	Error	
		5	Power supply fault	
		6	Reserved	
		7	Parameter error	
Module type	1	0		1
		1		1
		2	Module Type 0x0F	1
		3		1
		4	Channel information available	1
		5 ... 7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0	External auxiliary supply error (UQ1)	0
		1	External auxiliary supply error (UQ2)	
		2 ... 3	Reserved	0
		4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0		0
		1		1
		2		0
		3	Channel type 0x72	0
		4		1
		5		1
		6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	8
Channel error	7	0	Error at channel 0	
		...	...	
		7	Error at channel 7	
		8 ... 10	0 ... 31 Reserved	0
Channel 0 error ... Channel 7 error	11	0 ... 1	Reserved	
		2	Short circuit low	
		3	Short circuit high	
		4	Reserved	
Channel 8 error ... Channel 31 error	18	5	Output power missing	
		6	Sensor supply fault	
		7	Reserved	
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data outputs SAI-AU M8 SB 8DO 2A-V2

Byte	Bit	Name
QB0	0	D00
	1	D01
	2	D02
	3	D03
	4	D04
	5	D05
	6	D06
	7	D07

Parameters SAI-AU M8 SB 8DO 2A-V2

Channel	Description	Options ¹⁾	Default
0 ... 7	Output behaviour on error	Hold last value (0) / Enable substitute value (1)	Enable substitute value
0 ... 7	Substitute value	Off (0) / On (1)	Off

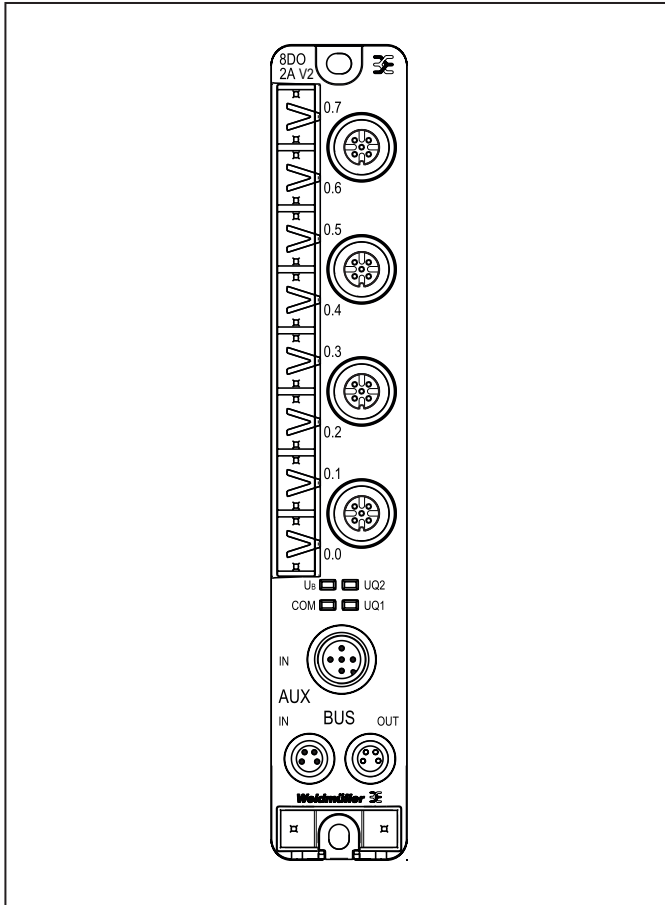
1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M8 SB 8DO 2A-V2 (Order No. 3096630000)

Supply	
Power supply BUS IN/ AUX IN	24 V DC + 20 %/ - 15 %
Contact load	3 A per pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Digital outputs	
Number	8
Type	P-switching
Output current	max. 2 A per channel, total 4 A per group of 4 channels, total 8 A per module at 30 °C
Switching frequency ohmic load	max. 100 Hz
Switching frequency inductive load (DC-13)	max. 1 Hz (with suitable free-wheeling diode)
Switching frequency lamp load (48 W)	max. 8 Hz
Short circuit proof	Yes
Potential isolation to module electronics	No
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	180 x 30 x 32 mm
Weight	175 g

5.6 SAI-AU M12 SB 8DO 2A-V2

The SAI-AU M12 SB 8DO 2A-V2 is a module for the connection of 8 digital actors via 4 M12 connections. The outputs are designed for 2 A load each.



SAI-AU M12 SB 8DO 2A-V2 (Order No. 3096490000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
AUX IN	Power supply UQ1, UQ2
0.0 ... 0.7	8 digital outputs

LED	Display
0.0 ... 0.7	Digital outputs
	Yellow Status digital output Pin 2/4
	Red Short circuit at 24 V DC Sensor voltage Pin 1 or at digital output Pin 2/4
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
	Red Power supply < 18 V DC
	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO
	Green flashing (approx. 10 s) Communication is being established
	Green flashing Pre-operational mode, no communication
	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted
UQ1	Power supply UQ1
	Green Spannung UQ1 ≥ 18 V DC
	Red Spannung UQ1 < 18 V DC
UQ2	Power supply UQ2
	Green Spannung UQ2 ≥ 18 V DC
	Red Spannung UQ2 < 18 V DC

Subbus power supply



Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module.
The power supply and the digital outputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

M8 Plug, 4-pole	
	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection

Power supply BUS OUT

M8 Socket, 4-pole	
	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection

Power supply AUX IN

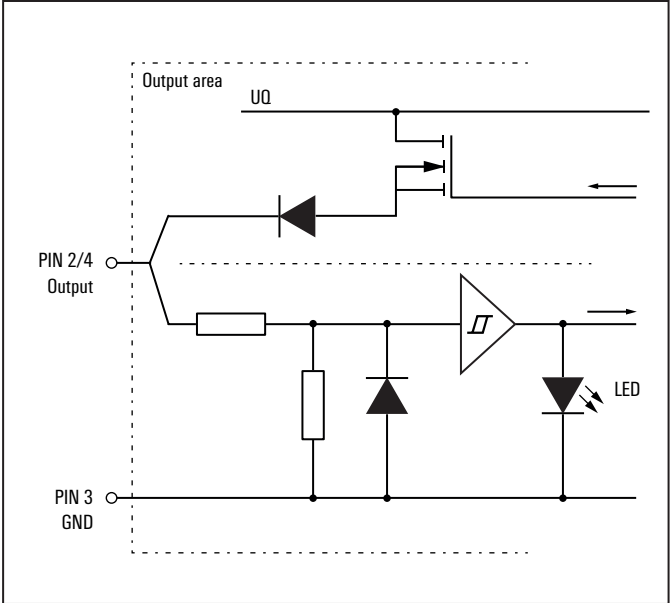
M12 Plug, 5-pole, A-coded	
	Pin 1: +24 V DC UQ1 Pin 2: +24 V DC UQ2 Pin 3: GND UQ1 Pin 4: GND UQ2 Pin 5: FE Housing: shield, connected with FE connection

Digital output connection

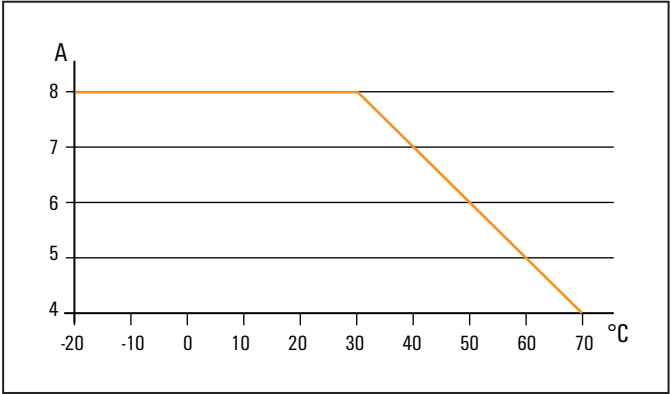
M12 Socket, 5-pole, A-coded	
	Pin 1: + 24 V DC Sensor voltage Pin 2: Output 2 Pin 3: GND Pin 4: Output 1 Pin 5: FE

Circuit principle of the digital output

Port wiring of Pin 3 and Pin 2/4 at DO 0.0 to DO 0.7:



Circuit principle of the digital output of SAI-AU M12 SB 8DO 2A-V2



Derating curve for the maximum total current of the outputs of SAI-AU M12 SB 8DO 2A-V2

Diagnostic data SAI-AU M12 SB 8DO 2A-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal Error	
		2	External error	
		3	Channel Error	
		4	Error	
		5	Power supply fault	
		6	Reserved	
		7	Parameter error	
Module type	1	0		1
		1		1
		2	Module Type 0x0F	1
		3		1
		4	Channel information available	1
		5 ... 7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0	External auxiliary supply error (UQ1)	0
		1	External auxiliary supply error (UQ2)	
		2 ... 3	Reserved	0
		4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0		0
		1		1
		2		0
		3	Channel type 0x72	0
		4		1
		5		1
		6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	8
Channel error	7	0	Error at channel 0	
		...	...	
		7	Error at channel 7	
		8 ... 10	0 ... 31 Reserved	0
Channel 0 error ...	11	0 ... 1	Reserved	
		2	Short circuit low	
		3	Short circuit high	
		4	Reserved	
Channel 7 error	18	5	Output power missing	
		6	Sensor supply fault	
		7	Reserved	
Channel 8 error ...	19 ... 42	0 ... 7	Reserved	0
Channel 31 error				
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data outputs SAI-AU M12 SB 8DO 2A-V2

Byte	Bit	Name
QB0	0	D00
	1	D01
	2	D02
	3	D03
	4	D04
	5	D05
	6	D06
	7	D07

Parameters SAI-AU M12 SB 8DO 2A-V2

Channel	Description	Options ¹⁾	Default
0 ... 7	Output behaviour on error	Hold last value (0) / Enable substitute value (1)	Enable substitute value
0 ... 7	Substitute value	Off (0) / On (1)	Off

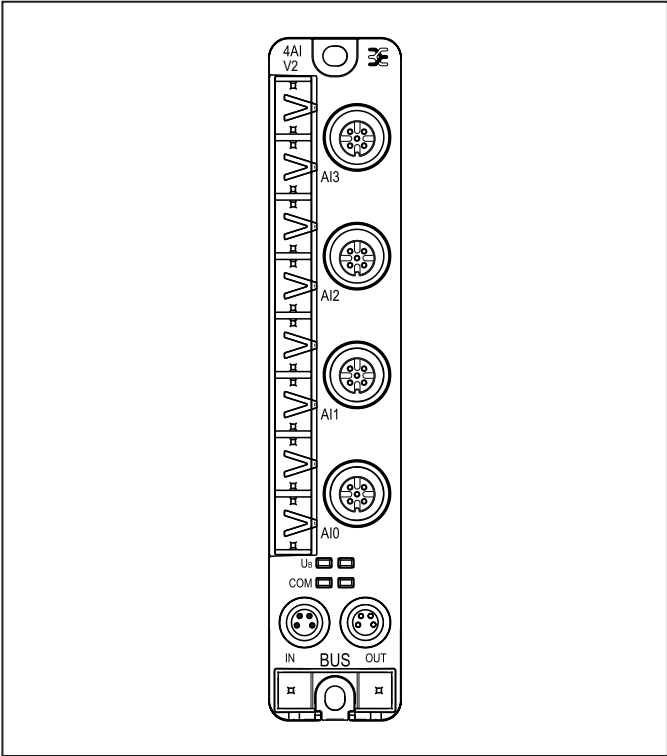
1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M12 SB 8DO 2A-V2 (Order No. 3096490000)

Supply	
Power supply BUS IN/ AUX IN	24 V DC + 20 %/ - 15 %
Contact load	3 A per pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Digital outputs	
Number	8
Type	P-switching
Output current	max. 2 A per channel, total 4 A per group of 4 channels, total 8 A per module at 30 °C
Switching frequency ohmic load	max. 100 Hz
Switching frequency inductive load (DC-13)	max. 1 Hz (with suitable free-wheeling diode)
Switching frequency lamp load (48 W)	max. 8 Hz
Short circuit proof	Yes
Potential isolation to module electronics	No
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	180 x 30 x 32 mm
Weight	175 g

5.7 SAI-AU M12 SB 4AI-V2

The SAI-AU M12 SB 4AI-V2 is a module for the connection of 4 analogue sensors via 4 M12 connections.



SAI-AU M12 SB 4AI-V2 (Order No. 3096450000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
AI0 ... AI3	4 analogue inputs

LED	Display
AI0 ... AI3	Analogue inputs
	Red Short circuit at 24 V DC Sensor voltage Pin 1 or diagnostics at analogue inputs
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
	Red Power supply < 18 V DC
	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO
	Green flashing (approx. 10 s) Communication is being established
	Green flashing Pre-operational mode, no communication
	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted

Subbus power supply



Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module.
The power supply and the analogue inputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

M8 Plug, 4-pole	
	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection

Power supply BUS OUT

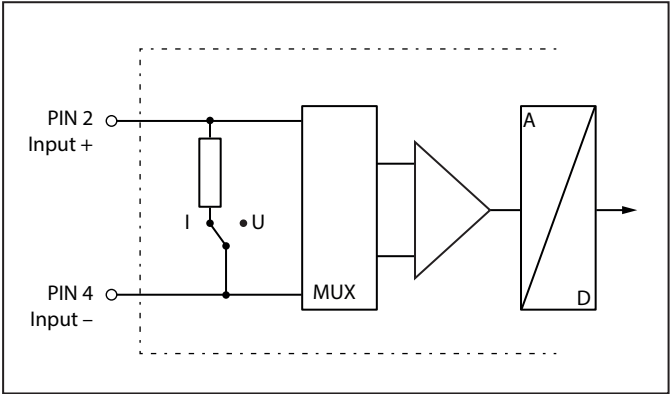
M8 Socket, 4-pole	
	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection

Analogue input connection

M12 Socket, 5-pole, A-coded	
	Pin 1: + 24 V DC Sensor voltage Pin 2: Analogue input + Pin 3: GND Pin 4: Analogue input - Pin 5: FE Housing: shield

Circuit principle of the analogue input

Port wiring of Pin 2 and Pin 4 at AI0 to AI3:



Circuit principle of the analogue input of SAI-AU M12 SB 4AI-V2

Diagnostic data SAI-AU M12 SB 4AI-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Error	0
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0		1
		1		0
		2	Module Type 0x05	1
		3		0
		4	Channel information available	1
Error byte 2	2	5 ... 7	Reserved	0
		0 ... 3	Reserved	0
Error byte 3	3	4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0 ... 1		0
		2	Channel type 0x74	1
		3		0
		4 ... 6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		...	...	
		3	Error at channel 3	
		4 ... 7	Reserved	
Channel 0 error	11	8 ... 10	Reserved	0
		0	Parameter error	
Channel 3 error	14	1	Overload	
		2	Reserved	
Channel 4 error	14	3	Sensor supply fault	
		4	Line break signal	
...	...	5	Reserved	
		6	Lower limit exceeded	
Channel 31 error	...	7	Upper limit exceeded	
		...	...	
Channel 4 error	...	...	...	
Channel 31 error	15 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data inputs SAI-AU M12 SB 4AI-V2

Byte	Format	Name
IB0	WORD	AI0
IB1		
IB2	WORD	AI1
IB3		
IB4	WORD	AI2
IB5		
IB6	WORD	AI3
IB7		

A diagnosis is indicated when a diagnosis limit value has been exceeded.

Diagnosis limit values

Measurement range	Lower limit	Upper limit
0 ... 20 mA	-	21 mA
4 ... 20 mA	3.6 mA	21 mA
0 ... 10 V	-	10.5 V
±10 V	-10.5 V	10.5 V

Parameters SAI-AU M12 SB 4AI-V2

Channel	Description	Options ¹⁾	Default
0 ... 3	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3) / 2 Hz low pass (4)	disabled
	Channel diagnosis	disabled (0) / enabled (1)	disabled
	Diag short circuit 24 V	disabled (0) / enabled (1)	disabled
	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
	Measurement range	disabled (0) / 0 ... 20 mA (1) / 4 ... 20 mA (2) / 0 V ... 10 V (3) / -10 to 10 V (4)	disabled
	Update Int	5 ... 250 ms	5 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M12 SB 4AI-V2 (Order No. 3096450000)

Supply	
Power supply	24 V DC + 20 % / - 15 %
Contact load	3 A per pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Analogue inputs	
Number	4
Permissible input voltage / current	-30 V DC ... +30 V DC / -30 mA ... +30 mA
Input type	Differential measurement between Pin 2 and Pin 4
Sampling time	5 ... 250 ms, adjustable for each input
Accuracy	0.1 % FSR max. at 25 °C
Temperature coefficient	100 ppm/K
Resolution	16 Bit
Voltage ranges	0 ... +10 V or -10 V ... +10 V
Input resistance	> 100 kΩ
Current ranges	0 ... 20 mA, 4 ... 20 mA
Input resistance	approx. 43 Ω
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	155 x 30 x 32 mm
Weight	150 g

Conversion table for measurement ranges¹⁾

Measurement range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 – 20 mA Siemens S7 format	23.52 mA	32511	0x7EFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648
	20 mA	27648	0x6C00	Nominal range	
	10 mA	13824	0x3600		
	0 mA	0	0x0000		
0 – 20 mA Siemens S5 format	23.52 mA	19268	0x4B44	Overloading	D = 16384 x I / 20 I = D x 20 / 16384
	20 mA	16384	0x4000	Nominal range	
	10 mA	8192	0x2000		
	0 mA	0	0x0000		
4 – 20 mA Siemens S7 format	22.81 mA	32511	0x7EFF	Overloading	D = 27648 x (I – 4) / 16 I= D x 16 / 27648 + 4
	20 mA	27648	0x6C00	Nominal range	
	12 mA	13824	0x3600		
	4 mA	0	0x0000		
4 – 20 mA Siemens S5 format	1.19 mA	-4864	0xED00	Underloading	D = 27648 x (I – 4) / 16 I = D x 16 / 16384 + 4
	22.82 mA	19268	0x4B44	Overloading	
	20 mA	16384	0x4000	Nominal range	
	12 mA	8192	0x2000		
0 – 10 V Siemens S7 format	4 mA	0	0x0000		Underloading
	0.8 mA	-3277	0xF333		
	11.76 V	32511	0x7EFFh	Overloading	
	10 V	27648	0x6C00	Nominal range	
0 – 10 V Siemens S5 format	5 V	13824	0x3600		
	0 V	0	0x0000		
	11.76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
5 V	8192	0x2000			
0 V	0	0x0000			
±10 V Siemens S7 format	11.76 V	32511	0x7EFF	Overloading	D = 27648 x U / 10 U = D x 10 / 27648
	10 V	27648	0x6C00	Nominal range	
	5 V	13824	0x3600		
	0 V	0	0x0000		
±10 V Siemens S7 format	-5 V	-13824	0xCA00	Underloading	
	-10 V	-27648	0x9400		
	-11.76 V	-32511	0x8100		
	±10 V Siemens S5 format	11,76 V	19268		0x4B44
10 V		16384	0x4000	Nominal range	
5 V		8192	0x2000		
0 V		0	0x0000		
±10 V Siemens S7 format	-5 V	-8192	0xE000	Underloading	
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC		



In the case of undervoltage (power supply), the input value 0x7FFF is displayed in S7 format. In S5 format, the 3 least significant bits remain the status they had before the undervoltage, so the input value is in the range from 0x7FF8 to 0x7FFF.

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000
Additional status bits are set for S5

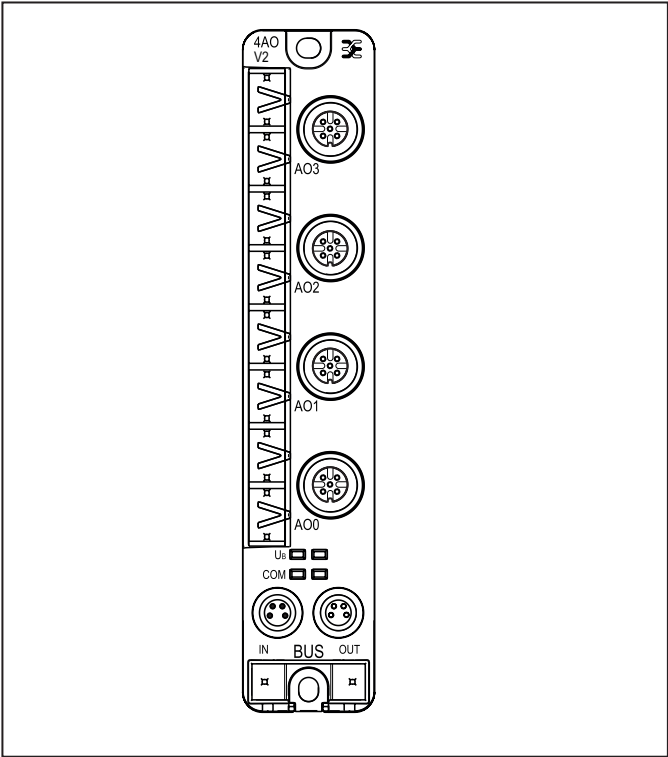
Digital measured value representation in Siemens S5 format

Data bit	7	6	5	4	3	2	1	0
Byte 0 (High Byte)	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵
Byte 1 (low byte)	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	A	F	0

A: 0 = not active / 1 = active
F: 0 = no line break / 1 = line break
0: 0 = 0 to 4095 units / 1 = ±4096 units (overflow)
Representation in two's complement, 2¹² = VZ in representation as amount and signs

5.8 SAI-AU M12 SB 4AO-V2

The SAI-AU M12 SB 4AO-V2 is a module for the connection of 4 analogue actors via 4 M12 connections. The type of output signal (current or voltage) is selected via the pin assignment. The desired measuring range for current or voltage is set in the configurator of the control unit.



SAI-AU M12 SB 4AO-V2 (Order No. 3096460000)

Connector	Function
BUS IN	Subbus input
BUS OUT	Subbus output
A00 ... A03	Analogue outputs

LED	Display
A00 ... A03	Analogue outputs
	Short circuit at 24 V DC Sensor voltage Pin 1 or diagnostics at analogue outputs
UB	Power supply for the module and the ports
	Green Power supply ≥ 18 V DC
	Red Power supply < 18 V DC
	Red flashing Power supply < 15 V DC
COM	Communication status with the UR20-1COM-SAI-PRO
	Green flashing (approx. 10 s) Communication is being established
	Green flashing Pre-operational mode, no communication
	Green Communication with UR20-1COM-SAI-PRO
	Red Communication interrupted

Subbus power supply



Always use the BUS IN connector for the feeding into the module and the BUS OUT connector for forwarding to the next module. The power supply and the analogue outputs use a common ground and they are not galvanically isolated.

Power supply BUS IN

M8 Plug, 4-pole

	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection
--	--

Power supply BUS OUT

M8 Socket, 4-pole

	Pin 1: +24 V DC Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: shield, connected with FE connection
--	--

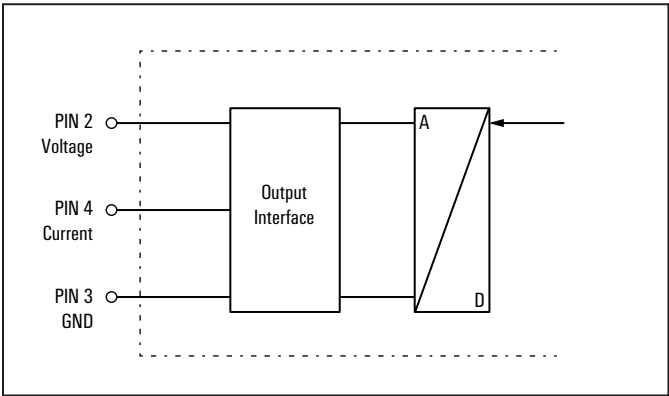
Analogue output connection

M12 Socket, 5-pole, A-coded

	Pin 1: + 24 V DC actuator voltage Pin 2: Analogue output voltage Pin 3: GND Pin 4: Analogue output current Pin 5: FE Housing: shield
--	---

Circuit principle of the analogue output

Port wiring of Pin 2 to Pin 4 at A00 to A03:



Circuit principle of the analogue output of SAI-AU M12 SB 4A0-V2

Diagnostic data SAI-AU M12 SB 4A0-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Error	0
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0		1
		1		0
		2	Module Type 0x05	1
		3		0
		4	Channel information available	1
		5 ... 7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 3	Reserved	0
		4	Communication error	
		5 ... 7	Reserved	0
Channel type	4	0 ... 1		0
		2	Channel type 0x74	1
		3		0
		4 ... 6		1
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		...	...	
		3	Error at channel 3	
		4 ... 7	Reserved	
		8 ... 10	Reserved	0
Channel 0 error	11	0	Parameter error	
		1	Overload	
		2	Reserved	
		3	Sensorsupply fault	
Channel 3 error	14	4	Reserved	
		5	Reserved	
		6	Lower limit exceeded	
Channel 4 error	...	7	Upper limit exceeded	
		...	...	
Channel 31 error	15 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data outputs SAI-AU M12 SB 4A0-V2

Byte	Format	Name
QB0	WORD	A00
QB1		
QB2	WORD	A01
QB3		
QB4	WORD	A02
QB5		
QB6	WORD	A03
QB7		

Diagnosis limit values

Measurement range	Lower limit	Upper limit
0 ... 20 mA	-	21 mA
4 ... 20 mA	3.6 mA	21 mA
0 ... 10 V	-	10.5 V
±10 V	-10.5 V	10.5 V

Parameters SAI-AU M12 SB 4A0-V2

Channel	Description	Options ¹⁾	Default
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
	Output range	disabled (0) / 0 ... 20 mA (1) / 4 ... 20 mA (2) / 0 V ... 10 V (3) / -10 ... 10 V (4)	disabled
	Substitute value	-32768 ... 32768	0
	Diagnostic alarm	disabled (0) / enabled (1)	disabled
	Diag short circuit 24 V	disabled (0) / enabled (1)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher), CANopen, EtherCAT and EtherNet/IP via module parameter class

Technical data SAI-AU M12 SB 4A0-V2 (Order No. 3096460000)

Supply	
Power supply	24 V DC + 20 % / - 15 %
Contact load	3 A per pin
Reverse polarity protection	Yes
Current consumption module	approx. 50 mA
Analoge Ausgänge	
Number	4
Output interval	5 ... 250 ms, adjustable for each output
Accuracy	0.1 % FSR max at 25 °C
Temperature coefficient	100 ppm/K
Resolution	16 Bit
Voltage ranges	0 ... +10 V or -10 V ... +10 V
Load resistance	≥ 1 kΩ
Current ranges	0 ... 20 mA or 4 ... 20 mA
Load resistance	≤ 600 Ω (up to 20 mA)
General technical data	
Ambient temperature operational	-40 ... +70 °C acc. to IEC 61131-2
Ambient temperature storage	-40 ... +85 °C acc. to IEC 61131-2
Humidity	max. 95% non condensing
Pollution degree	2
Overvoltage category	II
Use	Dry, indoor use only
Operating altitude, max.	2000 m
Degree of protection	IP65/IP67
Dimensions L x B x H	155 x 30 x 32 mm
Weight	150 g

Conversion table for output ranges¹⁾

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion	
0 – 20 mA Siemens S7 format	23.52 mA	32511	0x7EFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648	
	20 mA	27648	0x6C00	Nominal range		
	10 mA	13824	0x3600			
	0 mA	0	0x0000			
0 – 20 mA Siemens S5 format	23.52 mA	19268	0x4B44	Overloading	D = 16384 x I / 20 I = D x 20 / 16384	
	20 mA	16384	0x4000	Nominal range		
	10 mA	8192	0x2000			
	0 mA	0	0x0000			
4 – 20 mA Siemens S7 format	22.81 mA	32511	0x7EFF	Overloading	D = 27648 x (I – 4) / 16 I= D x 16 / 27648 + 4	
	20 mA	27648	0x6C00	Nominal range		
	12 mA	13824	0x3600			
	4 mA	0	0x0000			
4 – 20 mA Siemens S5 format	1.19 mA	-4864	0xED00	Underloading	D = 27648 x (I – 4) / 16 I = D x 16 / 16384 + 4	
	22.82 mA	19268	0x4B44	Overloading		
	20 mA	16384	0x4000	Nominal range		
	12 mA	8192	0x2000			
	4 mA	0	0x0000			
0 – 10 V Siemens S7 format	0.8 mA	-3277	0xF333	Underloading	D = 27648 x U/10 U = D x 10 / 27648	
	11.76 V	32511	0x7EFF	Overloading		
	10 V	27648	0x6C00	Nominal range		
	5 V	13824	0x3600			
0 – 10 V Siemens S5 format	0 V	0	0x0000	D = 16384 x U / 10 U = D x 10 / 16384		
	11.76 V	19268	0x4B44		Overloading	
	10 V	16384	0x4000		Nominal range	
	5 V	8192	0x2000			
±10 V Siemens S7 format	0 V	0	0x0000	Nominal range	D = 27648 x U / 10 U = D x 10 / 27648	
	-5 V	-13824	0xCA00			
	-10 V	-27648	0x9400			
	-11.76 V	-32511	0x8100			Underloading
	±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
		10 V	16384	0x4000	Nominal range	
		5 V	8192	0x2000		
0 V		0	0x0000			
-5 V		-8192	0xE000			
-10 V		-16384	0xC000			
-11,76 V		-19268	0xB4BC	Underloading		

1) If the process value is beyond the valid output range, the corresponding channel releases 0 V and 0 mA respectively.

6 Installation

6.1 Mounting direction and dimensions

The SAI modules can be mounted in any position, but the LEDs should be easily visible.



Observe the required distances to neighbouring modules when using freely assembled and angled connectors.

Mounting dimensions

SAI modules without digital outputs	SAI modules with digital outputs
155 mm x 30 mm	180 mm x 30 mm
SAI-AU M8 SB 8DI-V2	SAI-AU M8 SB 8DIO-V2
SAI-AU M12 SB 8DI-V2	SAI-AU M12 SB 8DIO-V2
SAI-AU M12 SB 4AI-V2	SAI-AU M8 SB 8DO 2A-V2
SAI-AU M12 SB 4AO-V2	SAI-AU M12 SB 8DO 2A-V2

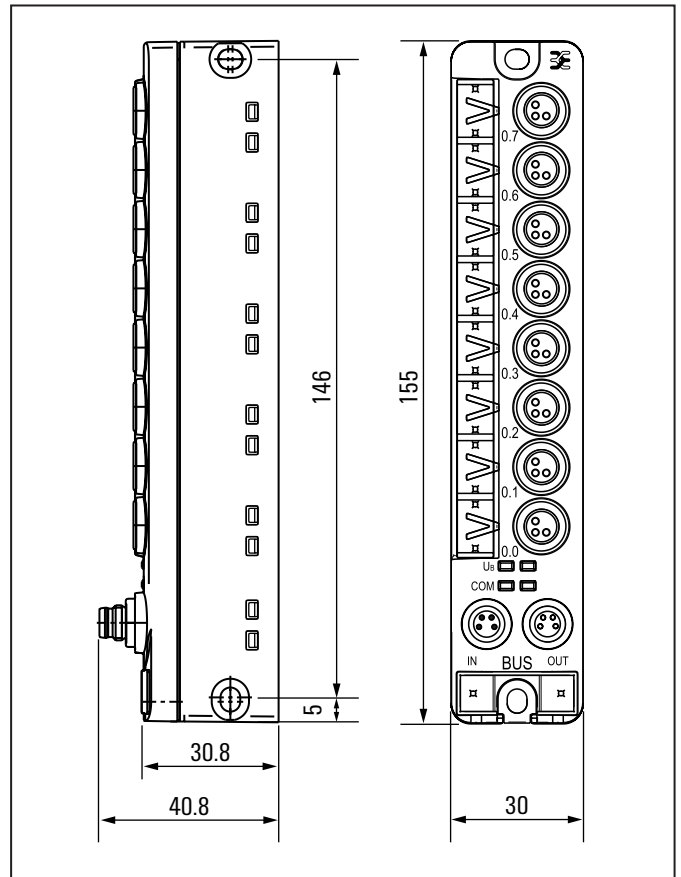


You can find drilling templates in the attachment.

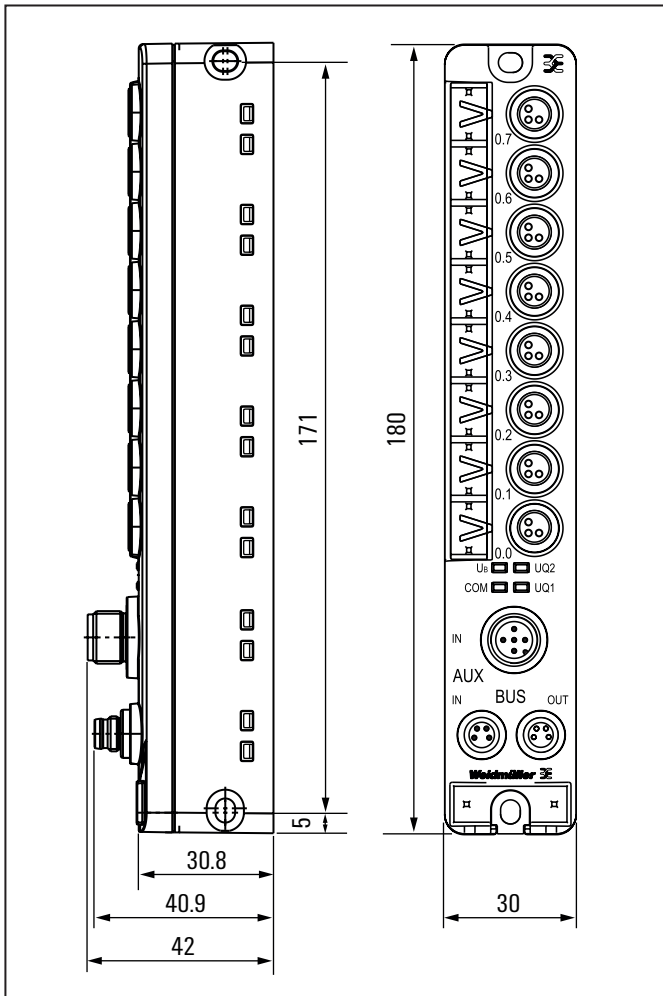
Mounting accessories (not included in scope of delivery)

- 2 cylinder head screws M4 x 30 for each SAI module, cylinder head screws with hexagon socket or Torx screws are recommended
- Fitting allen key or Torx screwdriver

You can find an overview of available plug-in connectors and cables in the attachment.



Mounting dimensions of an SAI module without digital outputs



Mounting dimensions of an SAI module with digital outputs

6.2 Mounting an SAI module



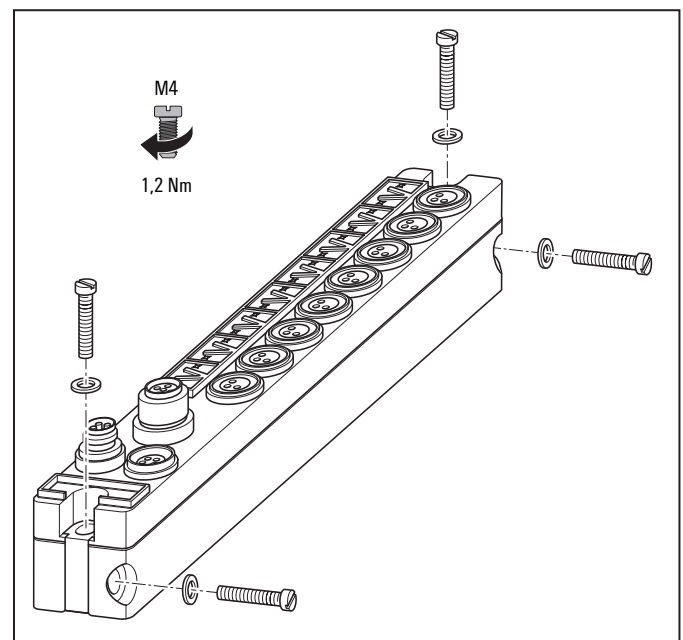
CAUTION

Risk of injury!

During operation, electromagnetic pulses act on the cables and the modules. This can result in faulty signals and incorrect data.

- Ensure that each SAI module is connected to functional earth.

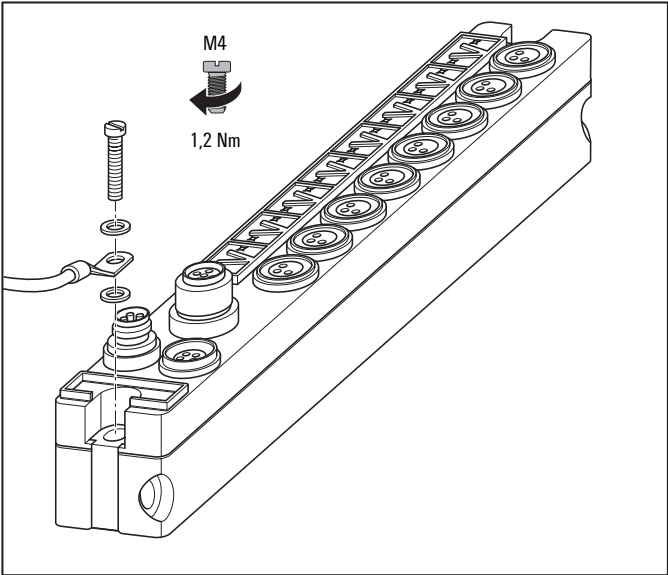
- Select a firm and level surface for mounting the SAI modules.
- Prepare the mounting holes.
- If there is an increased load due to shock or vibration, use additional spring washers.
- Fasten the SAI module with 2 screws.



Mounting an SAI module

6.3 Connecting functional earth (FE)

The SAI modules have an FE connection on the mounting hole, which is located next to the connections for the field-bus and power supply, see figure.



Connecting functional earth (FE)

Depending on the mounting position, you can establish the FE connection in different ways:

- If you use the hole with the FE connection for fastening, also attach a low-resistance and short FE conductor to the fastening screw using a cable lug.
- If you attach the module to the other holes, also attach a low-resistance and short FE conductor to the FE connection using a cable lug.

➔ Important: Do not use a PE protective earth conductor to connect the functional earth (FE).

6.4 Connecting cables and devices

Use cables with at least 80 °C rating. For ambient temperature above 65 °C, use cables with at least 90 °C. You can find the connector pin assignment of the plug-in connectors for each SAI module in the respective module description, see Chapter 5. Regard the tightening torques for the plug-in connectors.

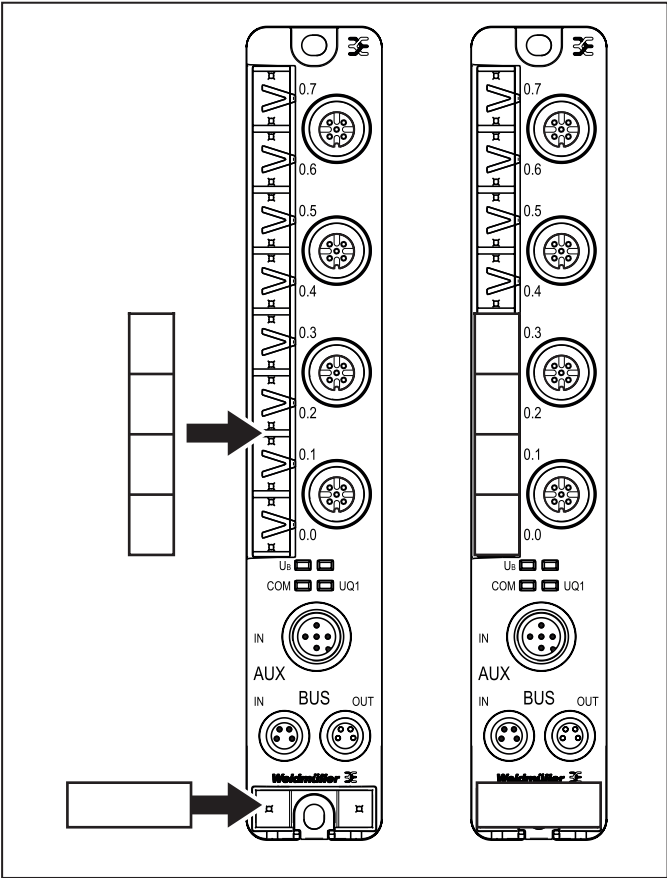
M8	Torque	M12	Torque
Connector	0.6 Nm	Connector	0.8 Nm
Protection cap	0.4 Nm	Protection cap	0.8 Nm

6.5 Marking the modules

The scope of delivery of an SAI module includes 20 transparent markers in a MultiCard frame. This allows you to mark the SAI module and the individual I/O connections.

Weidmüller offers different marking systems for the professional printing of the markers, please refer to the Weidmüller Service. For quick marking on site, we recommend our STI-S fibre pen, see accessories in the attachment.

➔ Use transparent markers only, see accessories in the attachment. Coloured marker would cover the LEDs.
Do not cover the markers with stickers.



Applying markers

7 Disassembling and disposing SAI modules

	CAUTION
	Risk of injury! Removing an SAI module while the system is in operation will not cause any immediate damage to the device. However, the interruption will put the rest of the system in an uncontrolled state. This can lead to indirect damage. ► Switch off the power supply to the system before removing a SAI module.

Tools required

Allen key or Torx screwdriver according to the mounting screws used.

7.1 Disassembling

- De-energies the system
- Disconnect the power supply connections from the SAI module.
- Disconnect the I/O connections.
- Disassemble the SAI module by removing the mounting screws.

7.2 Disposal



The products contain substances that may be harmful to the environment and human health. In addition, it also contains substances that can be reused through targeted recycling. Observe the notes for proper disposal of the product. You can find the notes here: www.weidmueller.com/disposal



ANNEX

Accessories	51
Mounting dimensions	52
Service	54

Accessories

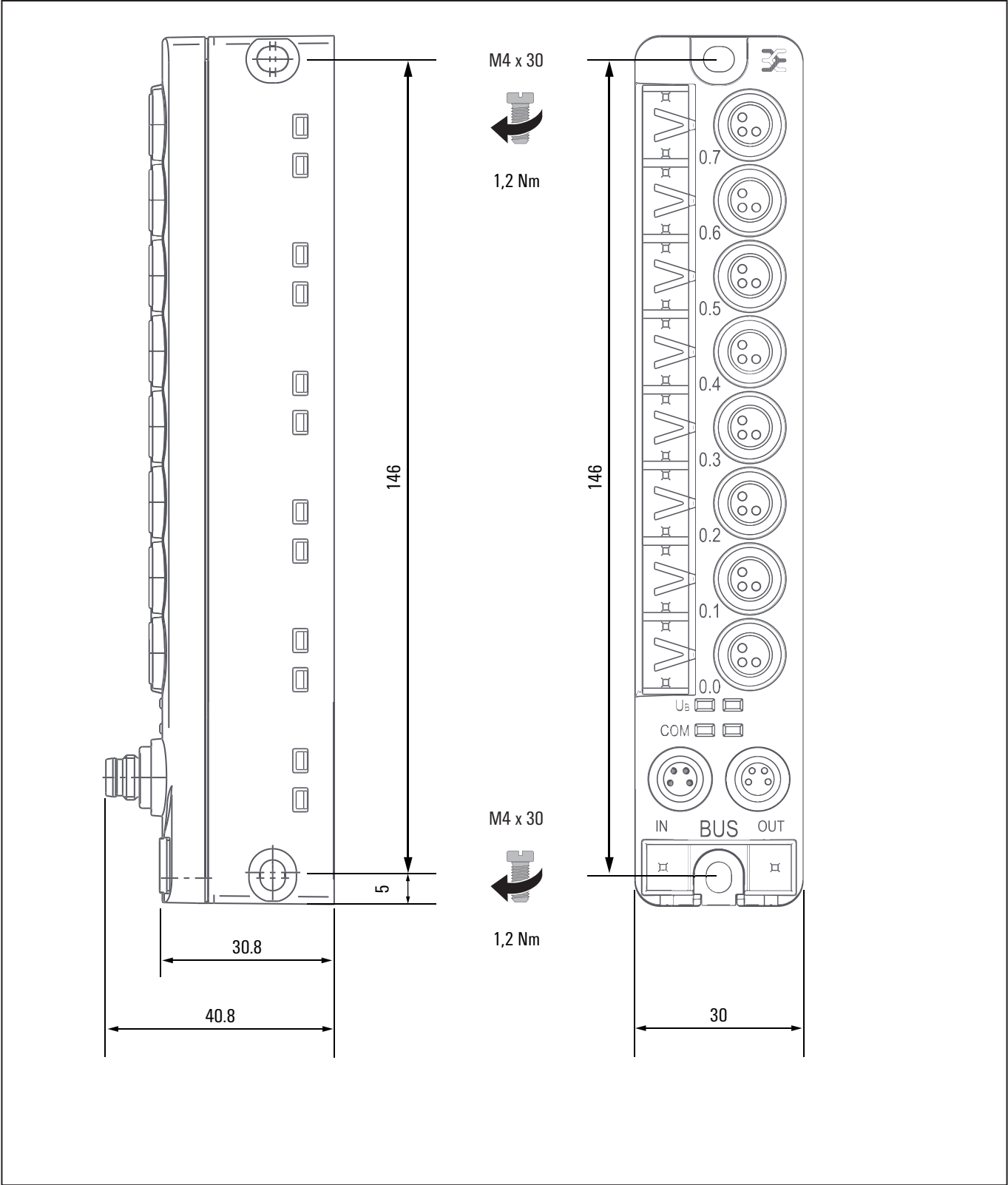
Type	Description	Order No.
SAI-AU Universal Pro		
M8/M8 4-pole shielded, Subbus connection SUB-IN / SUB-Out		
SAIL-M8GM8G-4S-0.3U	Bus line, Connecting line, M8 / M8, Number of poles: 4, 0.3 m, pin, straight - socket, straight	1981900030
SAIL-M8GM8G-4S-0.50U	Bus line, Connecting line, M8 / M8, Number of poles: 4, 0.5 m, pin, straight - socket, straight	1981900050
SAIL-M8GM8G-4S-1.0U	Bus line, Connecting line, M8 / M8, Number of poles: 4, 1 m, pin, straight - socket, straight	1981900100
SAIL-M8GM8G-4S-1.5U	Bus line, Connecting line, M8 / M8, Number of poles: 4, 1.5 m, pin, straight - socket, straight	1981900150
SAIL-M8GM8G-4S-3.0U	Bus line, Connecting line, M8 / M8, Number of poles: 4, 3 m, pin, straight - socket, straight	1981900300
SAIL-M8GM8G-4S-5.0U	Bus line, Connecting line, M8 / M8, Number of poles: 4, 5 m, pin, straight - socket, straight	1981900500
SAIL-M8GM8G-4S-10U	Bus line, Connecting line, M8 / M8, Number of poles: 4, 10 m, pin, straight - socket, straight	1981901000
SAI-AU Universal Pro M8		
M8/M8 Socket 3-pole not shielded, I/O connections		
SAIL-M8GM8G-3-1.5U	Sensor/actuator line, Connecting line, M8 / M8, Number of poles : 3, 1.5 m, pin, straight - socket, straight	1824570150
SAIL-M8GM8G-3-3.0U	Sensor/actuator line, Connecting line, M8 / M8, Number of poles : 3, 3 m, pin, straight - socket, straight	1824570300
SAIL-M8GM8G-3-5.0U	Sensor/actuator line, Connecting line, M8 / M8, Number of poles : 3, 5 m, pin, straight - socket, straight	1824570500
SAIL-M8GM8G-3-10U	Sensor/actuator line, Connecting line, M8 / M8, Number of poles : 3, 10 m, pin, straight - socket, straight	1824571000
M8 Socket 3-pole not shielded, I/O connections		
SAIL-M8BG-3-1.5U	Sensor/actuator line, One end without connector, M8, Number of poles : 3, 1.5 m, socket, straight	9457450150
SAIL-M8BG-3-3.0U	Sensor/actuator line, One end without connector, M8, Number of poles : 3, 3 m, socket, straight	9457450300
SAIL-M8BG-3-5.0U	Sensor/actuator line, One end without connector, M8, Number of poles : 3, 5 m, socket, straight	9457450500
SAIL-M8BG-3-10U	Sensor/actuator line, One end without connector, M8, Number of poles : 3, 10 m, socket, straight	9457451000
M8 Pin 3-pole field attachable, I/O connections		
SAISGP-P-3A-3.5/5.5-M8	Field attachable connector, M8	3103320000
M8 Subbus terminating resistor		
SAIEND CAN M8 4P	M8 Terminating resistor	1955340000
SAI-AU Universal Pro M12		
M12/M12 5-pole not shielded, I/O connections & supply voltage (AUX-IN)		
SAIL-M12GM12G-5-1.5U	Sensor/actuator line, Connecting line, M12 / M12, Number of poles : 5, 1.5 m, pin, straight - socket, straight	9457340150
SAIL-M12GM12G-5-3.0U	Sensor/actuator line, Connecting line, M12 / M12, Number of poles : 5, 3 m, pin, straight - socket, straight	9457340300
SAIL-M12GM12G-5-5.0U	Sensor/actuator line, Connecting line, M12 / M12, Number of poles : 5, 5 m, pin, straight - socket, straight	9457340500
SAIL-M12GM12G-5-10U	Sensor/actuator line, Connecting line, M12 / M12, Number of poles : 5, 10 m, pin, straight - socket, straight	9457341000
M12 Socket 5-pole not shielded, I/O connections & supply voltage (AUX-IN)		
SAIL-M12BG-4-1.5U	Sensor/actuator line, One end without connector, M12, Number of poles : 4, 1.5 m, socket, straight	9457730150
SAIL-M12BG-4-3.0U	Sensor/actuator line, One end without connector, M12, Number of poles : 4, 3 m, socket, straight	9457730300
SAIL-M12BG-4-5.0U	Sensor/actuator line, One end without connector, M12, Number of poles : 4, 5 m, socket, straight	9457730500
SAIL-M12BG-4-10U	Sensor/actuator line, One end without connector, M12, Number of poles : 4, 10 m, socket, straight	9457731000
M12 Pin 5-pole field attachable, I/O connections & supply voltage (AUX-IN)		
SAISP-5A-4/8-M12	Field attachable connector, M12	2681560000



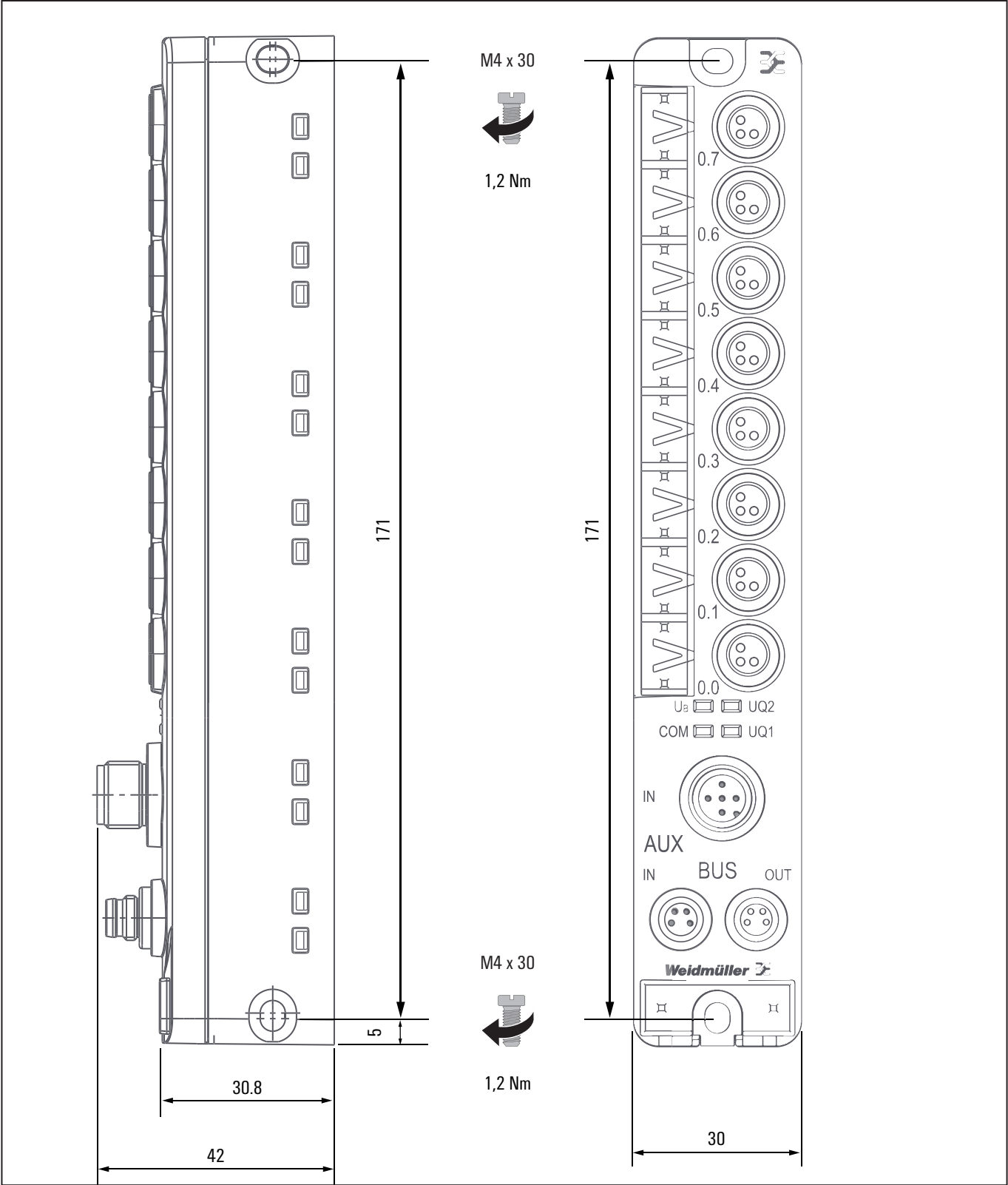
Further accessories, e.g. shielded cables, can be found in the [Weidmüller eShop](#).

Mounting dimensions

Size 155 mm modules (dimensions in mm)



Size 180 mm modules (dimensions in mm)



Service

If you have any questions about our products, please contact your responsible country representatives.



Let's connect.

You can find all Weidmüller addresses and your local contact on the internet at: www.weidmueller.com/countries

All orders are based on our general terms of delivery, which can be reviewed on the websites of our group companies where you place your order. On demand we can also send the general terms of delivery to you.