SAI Active Universal Pro - Manual

SAI-AU M12 PB GW 16DI
SAI-AU M8 PB GW 16DI
SAI-AU M8 SB 8DI
SAI-AU M12 SB 8DI
SAI-AU M8 SB 8DIO
SAI-AU M12 SB 8DIO
SAI-AU M8 SB 8DO 2A
SAI-AU M12 SB 8DO 2A
SAI-AU M12 SB 4AI
SAI-AU M12 SB 4AO
SAI-AU M12 SB 4THERMO
SAI-AU M12 SB 4PT100
SAI-AU M12 SB 2CNT

Weidmüller

Foreword

List of revisions

Version	Date	Change
1.0	04/08	First release
1.1	05/08	Technical data
1.2	07/08	Notes of safety
1.3	05/09	SAI-M8 PB 16DI, Technical Data, input and output data, parameter data, diagnostic data
1.4	09/09	Plug-in stations, additional notices

Note on the document

The content of this manual is checked to conform with the hardware and software described. Since deviations still may appear, we cannot guarantee complete conformance. The content of this manual is regularly checked and necessary corrections are considered in the next versions. We are grateful for your improvement proposals.

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Contents

1. Notes on Safety

1.1 Prescribed Use

WARNING: Danger

- Using this product beyond the specifications or disregard of using instructions and warnings may cause grave malfunctions so that personal injury and material damages occur.

- In the case of malfunction or failure of the SAI Module cannot be predicted the behaviour by other connected devices of an arrangement. Personal damages and material damages can occur. Make only settings, if you are informed exactly about all effects in the whole arrangement.

NOTE

This device is intended for use in applications as described in the operating instructions only. Any other form of usage is not permitted and can lead to accidents or destruction of the device. Any misuse will lead immediately to the expiry of all guarantee and warranty claims on the part of the operator against the manufacturer.

1.2 Qualified staff

These operating instructions have been written for trained and qualified personnel who are familiar with the valid regulations and standards applicable to the field of application.

1.3 Accuracy of the technical documentation

These operating instructions have been written with due care and attention. However, unless otherwise required by law we do not guarantee that the data, images and drawings are accurate or complete nor do we accept liability for their contents. Weidmueller's general terms and conditions of sale apply in their respective valid form.

Subject to alteration without notice.

1.4 CE label

This product fulfils the guidelines issued by the European Union (EU) and is therefore entitled to carry the CE mark.

1.5 Declaration of conformity

The product fulfils both the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

1.6 Recycling in accordance with WEEE

Disposal B2B (Business-to-Business)

Dear Weidmueller customer, by purchasing this product you have the possibility to return the device to Weidmueller at the end of its life cycle.

WEEE (EU-regulation 2002/96EG) regulates how electric devices have to be taken back and recycled. Since August 13 2005 in range of B2C (Business to Business) manufacturers of electric devices that have been sold after the mentioned date are bound to take back the devices free of charge and to recycle them. Electric devices must not be put to ordinary waste disposal.

Electric devices have to be recycled and to be disposed separately. All devices that fall under these regulations are marked with this logo.

What can we do for you?

Weidmueller offers a possibility to return your old device to us free of charge. Weidmueller will recycle your device according to current law.

What do you have to do?

When your device has reached its life cycle, just send to your Weidmueller distribution service it using the parcel service. We will assume all recycling and pollution abatements. There won't be any costs or inconveniences for you.

Disposal B2C (Business-to-Customer)

Dear Weidmueller customer, by purchasing this product you have the possibility to return the device to Weidmueller at the end of its life cycle.

WEEE (EU-regulation 2002/96EG) regulates how electric devices have to be taken back and recycled. Since August 13 2005 in range of B2C (Business to Customer) manufacturers of electric devices that have been sold after the mentioned date are bound to take back the devices free of charge and to recycle them. Electric devices must not be put to ordinary waste disposal.

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2. SAI Pro

2.1 Pro Description

The acronym **SAI** stands for **Sensor – Actuator – Interface**. It is a compact-designed distributor or collector of signal lines.

The SAI Active Universal Pro supplements compact stand-alone devices with extendable sub-bus modules.

A Pro System consists of a gateway I/O module and one or more extension I/O modules.

The gateway I/O is connected to the higher-level Fieldbus and supplied with power. The gateway I/O is also the starting point for the sub-bus. With M8 cables, up to fifteen extension I/O modules can be connected sequentially.

There is a large selection of gateway I/Os for the common Fieldbus standards. There are also many different functions within the extension I/O modules.

The maximum expandability of the sub-bus network is limited by the voltage drop over the line. A detailed explanation of this is included in the manual.

The Pro System is represented as a modular device in the hardware configuration on the SPS or IPC. The Fieldbus address and the number and type of extension I/O modules must be entered here. This can easily be done with the configuration files which are available for download from the Weidmueller homepage.

The gateway I/O consists of the following components:

- An I/O section: to connect the signal lines
- A settings section: to set the PROFIBUS-DP addresses and insert the jumpers for the different electric potentials.
- A bus / power section: to connect and loop-through the supply voltage, the Fieldbus interface, and the sub-bus connection.

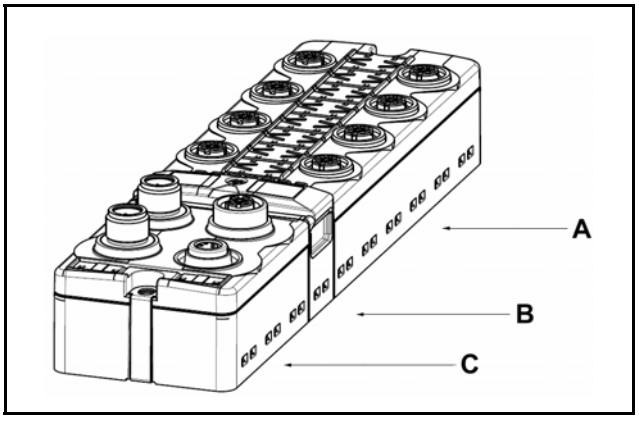


Figure 1 Basic design of the gateway I/O

A I/O section

B Settings range

C Bus / power section

Weidmueller offers the following gateway I/O versions:

- PROFIBUS-DP gateway with 16 digital inputs
- DeviceNet gateway with 16 digital inputs
- Modbus TCP with 16 digital inputs
- USB / Modbus gateway (Modbus ASCII) with 16 digital inputs and 8 digital outputs

Weidmueller offers the following extension I/O versions:

- 8 digital inputs with M12 I/O connector
- 8 digital inputs with M8 I/O connector
- 8 digital 2A outputs with M12 I/O connector
- 8 digital 2A outputs with M8 I/O connector
- 8 digital inputs or 0.5A outputs with M12 I/O connector
- 8 digital inputs or 0.5A outputs with M8 I/O connector
- 4 analogue inputs with M12 I/O connector
- 4 analogue outputs with M12 I/O connector
- 4 thermal inputs with M12 I/O connector
- 4 PT100 inputs with M12 I/O connector
- 2 counter inputs with M12 I/O connector

System structure of the Universal Pro

- Max. no. of slaves: 15
- Bus structure: Line
- Max. expansion: 10 – 50m
- Addressing: automatic

The extension I/O consists of the following components:

- An I/O section: to connect the signal lines
- A bus / power section: 2 sub-bus connections and an extra power-supply plug for the digital output modules

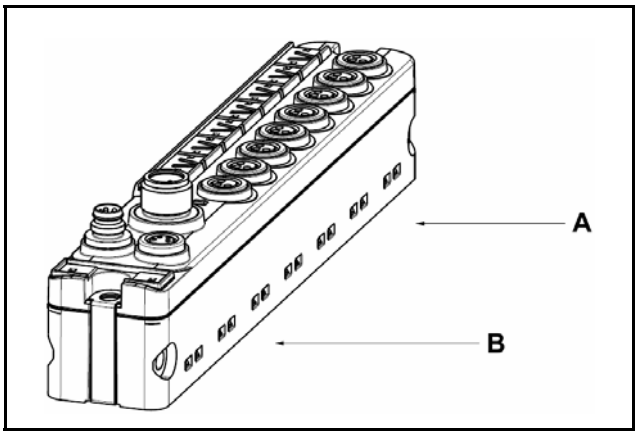


Figure 2 Basic design of the extension I/O

A I/O section

B Bus / power section

2.2 PROFIBUS-DP

PROFIBUS

PROFIBUS (PROcess Field BUS) is a part of the international standards IEC 61158 and IEC 61784. Physically, PROFIBUS is either an electrical network based on a shielded, two conductor cable or an optical network based on a fibre optics cable. PROFIBUS-DP (DP = Decentralised Periphery) is a special application for automating factory production.

System

A typical PROFIBUS-DP system is made up of

- at least one PLC or industrial PC (master) operating as a control system
- various field devices, which can be digital or analogue I/O devices, AC or DC drives, magnetic or pneumatic valves, frequency converters, starters, operating and display devices (slaves)

Data transfer

Data exchange within the system is carried out by means of cyclic polling. The master establishes communications with one slave at a time, makes data available and/or requests data. The slave being addressed responds immediately to the request for data. Once completed, this procedure is repeated with the other slave devices. This is a continuous cyclic process.

GSD files (device database files)

The GSD file is the obligatory "ID card" of each and every PROFIBUS device. It contains the characteristic data of the device, details about its communication capabilities as well as further information such as diagnostic values. All GSD files for the SAI Active Universal range of SAI distributors can be downloaded from Weidmueller's website at: http://www.weidmueller.com/54266/Downloads/Software/SAI-Active-Data/cw_index.aspx?newsid=

For more information, please refer to Chapter "Commissioning the PROFIBUS-DP".

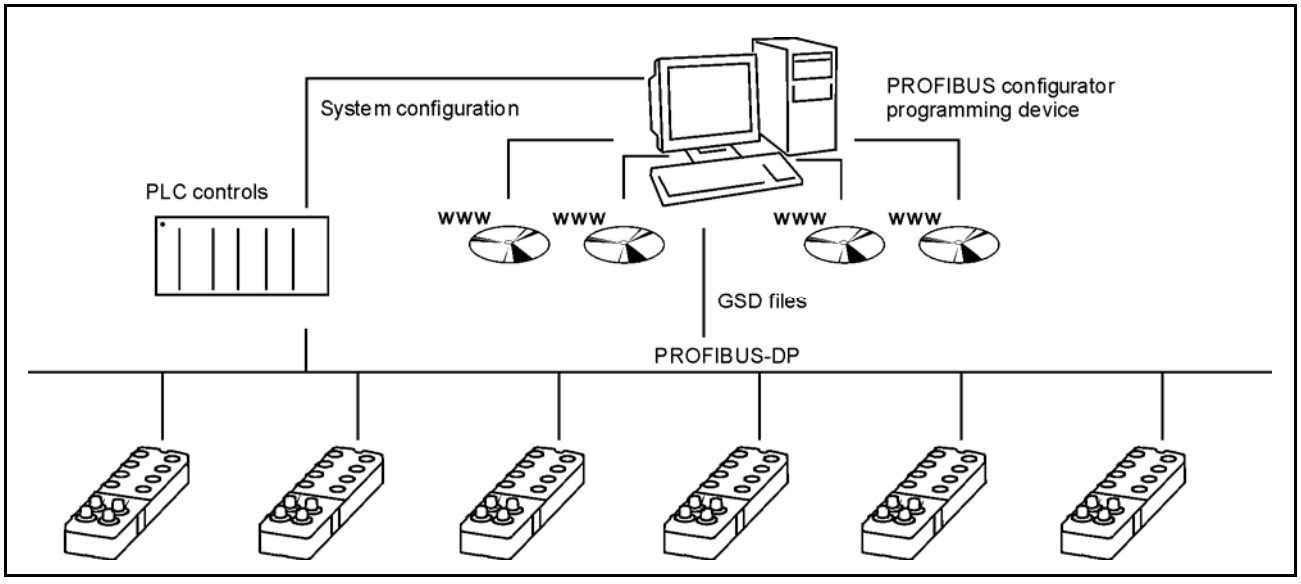


Figure 3 Basic PROFIBUS system configuration

3. Project Planning with the Universal Pro

3.1 Project planning

Planning the bus system

The following steps must be taken into consideration when designing an installation:

1 Location of the machine or facility

2 Assignment of the signals to the installation to a logical group

3 Selection of the field devices

4 Assignment of the signals to the field devices

5 Determination of where the field devices are to be installed

Criteria for determining the correct SAI distributor:	
Size of the connectors	Determine the size of the connectors to suit you application, the design of the sensors or according to your personal preferences. Weidmueller offers both M12 and M8 variants for purely digital signals.
Number of poles of the I/O connections	Please consider the sensor/actuator cable to be connected; possible options are 3 or 5 poles.
T-piece	Specifically for 5-pole M12 sensor connections, you can feed two cables to a distributor input by means of a Y-piece.
Inputs / outputs	Weidmueller has a variety of SAI distributors on offer such as a variant with 16 digital inputs, with mixed digital inputs/outputs as well as an analogue/digital version (for more information please refer to Chapter 4: (Connecting SAIs).
Shielding	Shielding by means of metal connectors is necessary for bus connections. We recommend the same approach for analogue signals to restrict the susceptibility to interference.
Signals	Please consider if you wish to transmit analogue or digital signals.

Table 1 Determining the correct SAI distributor

You can find more information about determining the correct selection of products in Appendix A: Product Overview.

3.2 Power supply

Gateway I/O

The gateway I/O modules are supplied with power by an M12 A-encoded connector. With this you can provide power to two different potentials. These voltages can be connected with the help of a jumper in the address range.

Extension I/O without outputs

These modules get their power supply from the 4-pole M8 combi-cable. The electronics and the inputs are both supplied with this UI potential.

Extension I/O with outputs

The modules with digital outputs are easy to identify with their extra M12 plug. This is where the power is fed in for the outputs. The electronics and the inputs are also supplied with the M8 combi-cable.

	**CAUTION**
	No external voltage should be applied to the outputs.

Current carrying capacity

The connector can carry up to 3 A DC per pin. This limits that total number of loads on a sub-bus system.

In order to calculate the required current, the following values must be added up:

- The power consumption of the extension I/O module
- The current requirement of each individual input

Current requirement of the extension I/O modules

1938600000	The 8DI M8 sub-bus module	50mA
1938610000	The 8DI M12 sub-bus module	50mA
1938630000	The 8DI/DO M8 sub-bus module	50mA
1938640000	The 8DI/DO M12 sub-bus module	50mA
1938660000	The 8DO M8 2A sub-bus module	50mA
1938680000	The 8DO M12 2A sub-bus module	50mA
1938690000	The AI M12 sub-bus module	50mA
1938700000	The AO M12 sub-bus module	50mA
1938710000	The PT100 M12 sub-bus module	50mA
1938720000	The Thermal M12 sub-bus module	50mA
1938730000	The Counter M12 sub-bus module	50mA

Table 2 Current requirement of the extension I/O modules

Please refer to the sensor manufacturer's data sheet, for the current requirement of the sensors. The maximum current-carrying capacity of the digital inputs in 50 mA.

	**CAUTION**
	The residual current should not be more than 3 amps higher than the max. current-carrying capacity of the connector.

Voltage drop / max. expansion

The maximum expansion of the sub-bus system depends on four factors:

- The number of stations
- The distance between stations
- The current load of each participant and there inputs
- The resistance of the wires in use

The following formula results:

Voltage drop of the line =
current consumption of module x (line resistance x line length x 2)

Total voltage drop =
voltage drop of line 1 + voltage drop of line 2 + voltage drop of line x

Voltage on last module =
Supply voltage to gateway I/O - 0.9V - total voltage drop

Result:

When voltage to last module is greater then 18V DC = Okay
When voltage to last module is less than 18V DC = Not okay

We have made available a software tool to help you calculate the residual current and voltage drop. It can be downloaded from the Weidmueller homepage at www.weidmueller.com.

3.3 An example - calculation of power supply

A sub-bus system should be set up for 45 sensors and 14 actuators. The extension distance is 30 m.

The following modules have been selected:

1 x 1938550000 Gateway IO Module 16DI M12

6 x 1938610000 Extension IO Module 8DI M12

2 x 1938640000 Extension IO Module 8DI/DO M12

1 x 1938680000 Extension I/O Module 8DO M12 2A

All sensors consume 10 mA current each.

No.	Cat. No.	Current for module	Current for sensors	Total current
1	1938610000	50 mA	6 x 10 mA = 60 mA	110 mA
2	1938680000	50 mA		50 mA
3	1938610000	50 mA	6 x 10 mA = 60 mA	110 mA
4	1938610000	50 mA	6 x 10 mA = 60 mA	110 mA
5	1938640000	50 mA	4 x 10 mA = 40 mA	90 mA
6	1938610000	50 mA	6 x 10 mA = 60 mA	110 mA
7	1938640000	50 mA	4 x 10 mA = 40 mA	90 mA
8	1938610000	50 mA	6 x 10 mA = 60 mA	110 mA
9	1938610000	50 mA	6 x 10 mA = 60 mA	110 mA

Table 3 Current consumption of the modules

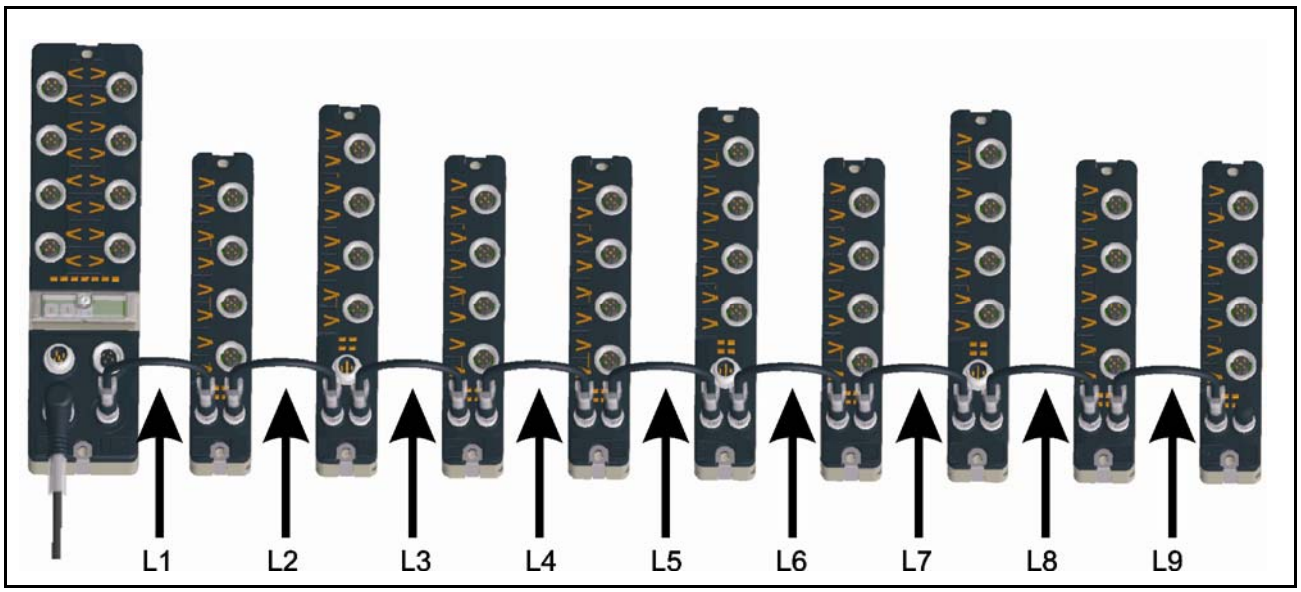


Figure 4 Example of system structure

The cable length of the sub-bus line:

between the modules

1 and 2 = 10 m = L1

2 and 3 = 5 m = L2

3 and 4 = 0.3 m = L3

4 and 5 = 0.3 m = L4

5 and 6 = 4m = L5

6 and 7 = 0.3 m = L6

7 and 8 = 0.3 m = L7

8 and 9 = 10 m = L8

9 and 10 = 1 m = L9

The max. residual current on the sub-bus line is the sum of all currents and in this example is 0.89A. Thus the max. current-carrying capacity of 3A is not reached.

Voltage drop L9 = 0.011 V
110 mA x (0.05 Ohm/m x 1 m x 2)

Voltage drop L8 = 0.22 V
(110 mA + 110 mA) x (0.05 Ohm/m x 10 m x 2)

Voltage drop L7 = 0.0093 V
(90 mA + 110 mA + 110 mA) x (0.05 Ohm/m x 0.3 m x 2)

Voltage drop L6 = 0.0126 V
(110 mA + 90 mA + 110 mA + 110 mA) x (0.05 Ohm/m x 0.3 m x 2)

Voltage drop L5 = 0.204 V
(90 mA + 110 mA + 90 mA + 110 mA + 110 mA) x (0.05 Ohm/m x 4 m x 2)

Voltage drop L4 = 0.0186 V
(110 mA + 90 mA + 110 mA + 90 mA + 110 mA + 110 mA) x (0.05 Ohm/m x 0.3 m x 2)

Voltage drop L3 = 0.0219 V
(110 mA + 110 mA + 90 mA + 110 mA + 90 mA + 110 mA + 110 mA) x (0.05 Ohm/m x 0.3 m x 2)

Voltage drop L2 = 0.39 V
(50 mA + 110 mA + 110 mA + 90 mA + 110 mA + 90 mA + 110 mA + 110 mA) x (0.05 Ohm/m x 5 m x 2)

Voltage drop L1 = 0.89 V
(110 mA + 50 mA + 110 mA + 110 mA + 90 mA + 110 mA + 90 mA + 110 mA + 110 mA) x (0.05 Ohm/m x 10 m x 2)

Total voltage drop = 1.7774 V
0.89 V + 0.39 V + 0.0219 V + 0.0186 V + 0.204 V + 0.0126 V + 0.0093 V + 0.22 V + 0.011 V

Voltage at module 9 = 21.3226 V
24 V – 0.9 V – 1.7774 V

Voltage at module 9 is greater than 18V DC → Okay

4. Mounting SAIs

4.1 Mounting position and mounting dimension

An SAI distributor can be mounted in any position. There are no restrictions placed with regard to their position when being mounted: vertical, horizontal, on their side, overhead …

However, to ensure that the LEDs can be seen, we recommend that – where possible – the modules are not mounted overhead. Our SAIs can be mounted side-by-side. Please observe that a given distance to the adjacent module may be required when using custom assembly and angled connectors.
The mounting dimensions of our gateway I/Os are 210 x 54 mm. The dimensions of the extension I/O with digital outputs are 180 x 30 mm. The version with digital inputs measures 155 x 30 mm.

You can find details for mounting dimensions in Appendix B: Drilling Templates.

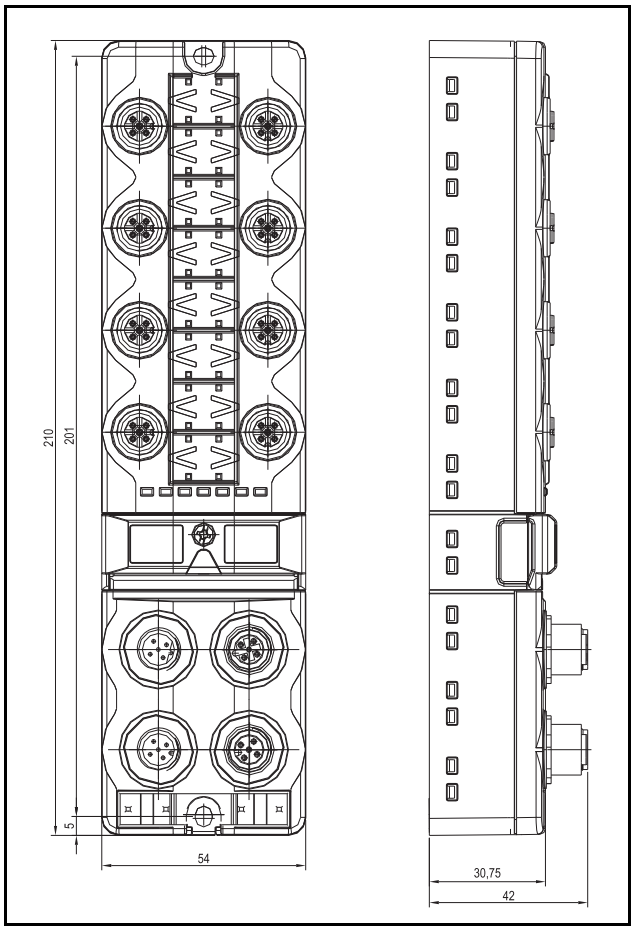


Figure 5 Dimensions of gateway I/O

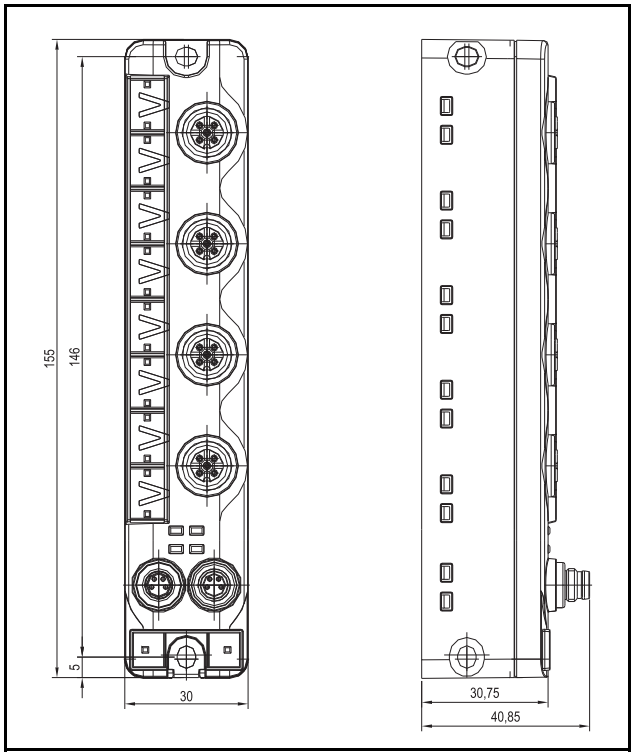


Figure 6 Dimensions of extension I/O without digital outputs

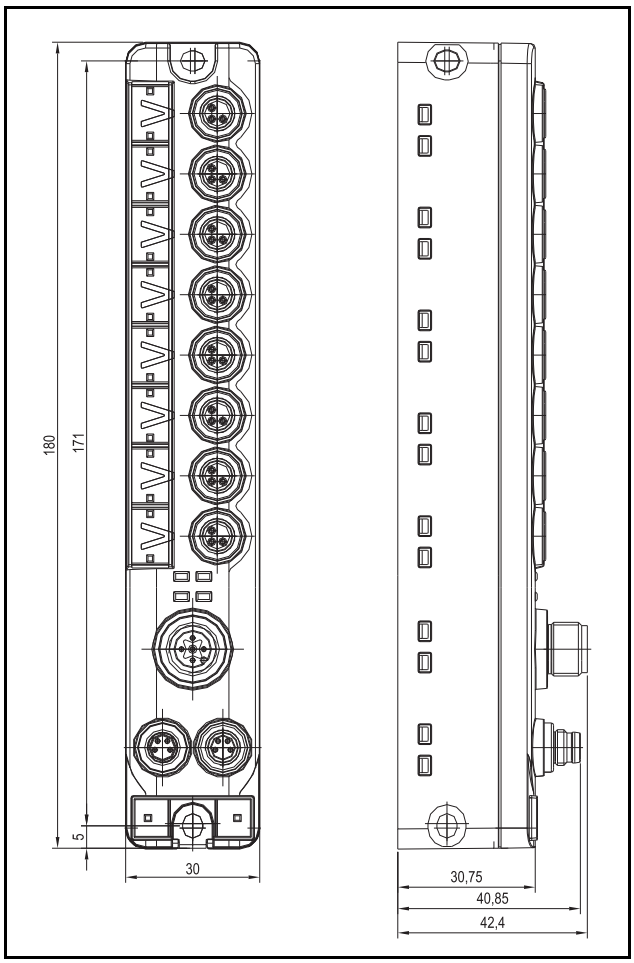


Figure 7 Dimensions of extension I/O with digital outputs

4.2 Mounting SAI distributors

Mounting

To mount the SAI distributor, select a firm and level surface. Pre-drill the bore holes. Hold the distributor above the bore holes and fix it in positions with screws. Please use a spring washer if the SAI distributor is to be used in an environment where the loads are subject to increased shock and vibration.

Please refer to Figure Mounting the gateway I/O.

PROFIBUS guidelines

Please observe the PROFIBUS guidelines: Installation Guideline for PROFIBUS-DP/FMS.

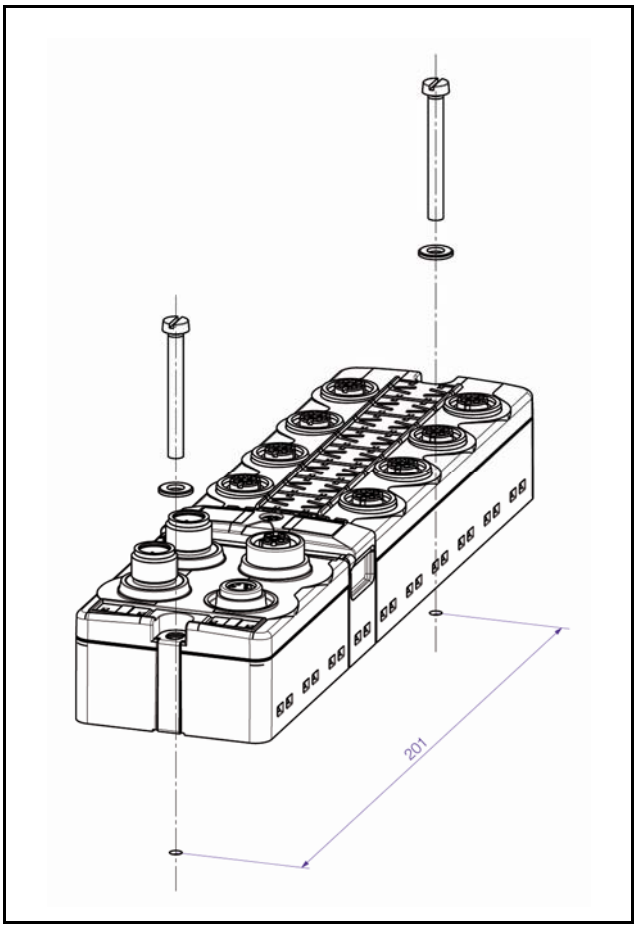


Figure 8 Mounting the gateway I/O

DANGER!

Isolate the system before connecting the power supply connector or inserting or removing jumpers.

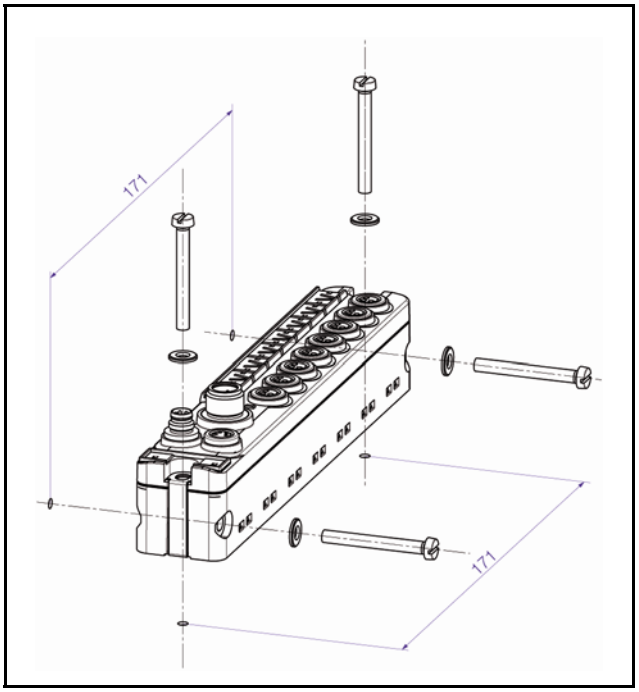


Figure 9 Mounting the extension I/O

Torques

Observe the following torques:

M8 connectors	0.6 Nm
M8 protective cap	0.4 Nm
M12 connectors	0.8 Nm
M12 protective cap	0.8 Nm
Screw for peak window	0.5 Nm

Functional earth (FE)

The functional earth is the grounding of equipment to its surroundings. Contrary to the protective earth (PE) the FE does not primarily serve to protect equipment or persons, but to discharge electrostatic charges, shield connections etc.

	CAUTION! EMC
	Electromagnetic pulses affect cabling and the distributor during operations. Flawed signals and false data can result. SAI distributors from the SAI Active Universal series are equipped with an FE connection integrated at the mounting hole in the bus/power section. Use this connection and fix the distributor directly to a conductive surface or attach a short, low impedance FE cable to the fixing screw by means of a cable lug. **Important:** Do not use a PE conductor for the FE connection.

Please refer to Figure Functional earth (FE) connection.

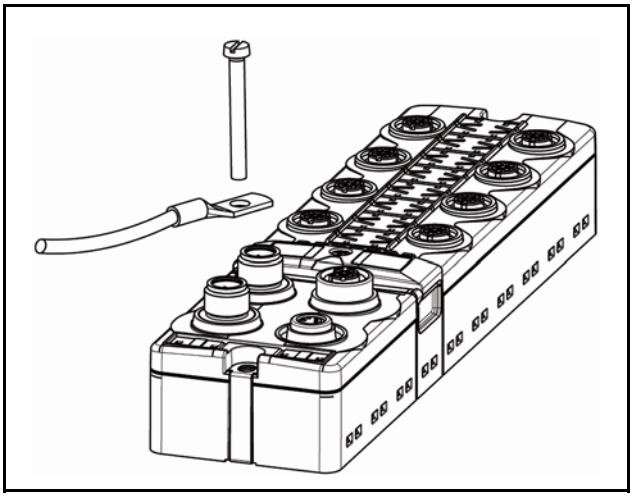


Figure 10 Functional earth (FE) connection

Required accessories / DIN components

2 socket-head cap screw M4 x 30

We recommend cylinder head studs with hexagon-socket or Torx type.

Tools

Allen key or Torx screwdriver appropriate to the screw you choose.

You can find tool recommendations in Appendix A: Product Overview.

4.3

Marking / labelling

Twenty transparent markers in a MultiCard frame are included in the range of supply of the SAI distributors. These allow you to individually mark the I/O connections as well as the distributor. For the gateway I/O, either two normal or one longer marker can be used to specifically mark the distributor.

Please refer to Figure 11 Putting the markers on the gateway I/O.

Weidmueller has various printers and plotters available to achieve professional printing results. For advice and a demonstration, please contact your Weidmueller partner.

To achieve rapid manual on-site marking results, we recommend our fibre pen STI-S.

Please also refer to Appendix A: Product Overview.

NOTE

Please note that you should not stick markers on top of one another. Nor should you use coloured markers since they can cover up the LEDs below them.

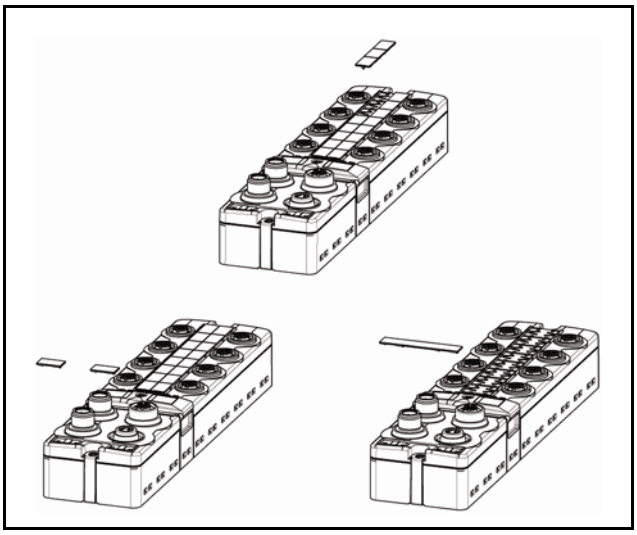


Figure 11 Putting the markers on the gateway I/O

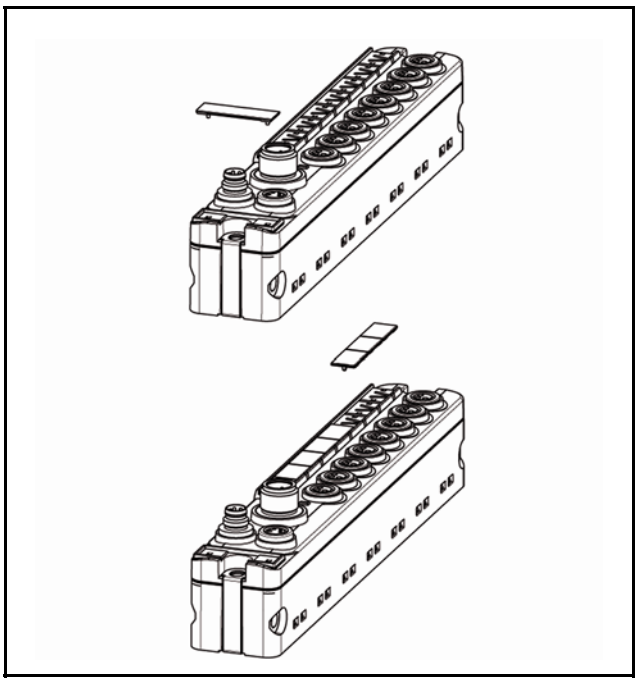


Figure 12 Putting the markers on the extension I/O

4.4 Dismounting the SAI

WARNING!

Connectors for the power supply and jumpers must not be pulled or inserted when power is applied to the system.

CAUTION!

No immediate damage will occur to the device if you dismount an SAI distributor when the system is operating. However, the disruption to PROFIBUS will place the rest of the facility in an uncontrolled state. This can lead to indirect damage. For this reason, we strongly recommend that the system be disconnected from the power supply before dismounting a distributor.

Dismounting

6 Turn off the power supply to the system.

7 Disconnect the connections to the power supply on the SAI distributor.

8 Disconnect the PROFIBUS connections on the SAI distributor.

9 Disconnect the I/O connections.

10 Dismount the distributor by undoing the fixing screws.

Tools

Allen key or Torx screwdriver appropriate to the screw you choose.

Please also refer to Appendix A: Product Overview.

5. Connecting the SAI Distributor

5.1 Gateway I/O for PROFIBUS-DP: SAI-AU M12 PB GW 16DI

PROFIBUS is an universal, open, digital communication system providing solutions for a wide spectrum of applications – first and foremost in production and process automation. As well as complex communications tasks PROFIBUS is a suitable solution for fast and time-critical applications. PROFIBUS communication is anchored in the international standards IEC 61158 and IEC 61784. The criteria for its use and planning are defined in the openly accessible guidelines available from the PROFIBUS User's Organisation (PNO).

These guidelines fulfil the demands on the part of the users for multi-vendor and open solutions. That guarantees the communication between devices of differing manufactures – without having to make prior adjustments.

For further information, please visit www.profibus.com.

Connection

The following section is based on the product series SAI Active Universal with PROFIBUS connection.

NOTE

Select the bus cable as cable type A in accordance with IEC 61158. The PROFIBUS connection is made via a 5-pole M12 male connector (Bus IN) and a 5-pole M12 female connector (Bus OUT). Both connections are B-coded. Use the "Bus In" connection to feed in signals and "Bus Out" to route these forward.

In the SAI, male and female connectors are conductively connected. That enables the PROFIBUS to be routed from SAI to SAI without the need for drop lines.

NOTE

It is possible to connect the SAI distributors by means of a drop line for low transmission rates up to 1500 kBit/s. The total length of the drop line must not exceed 6.6 meters. The drop lines should be kept as short as possible. Avoid the use of drop lines for baud rates greater than 1500 kBit/s.

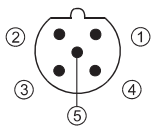
Module connection from Bus IN	
Contact system	M12 male connector, 5-pole
Coding	B
Pin assignment  	Pin 1: +5 V DC Pin 2: Data A (green strand) connect with Bus-OUT-Pin 2 Pin 3: GND Pin 4: Data B (red strand) connect with Bus-OUT-Pin 4 Pin 5: Shield

Table 4 Contact assignment for the PROFIBUS male connector

Module connection from Bus OUT	
Contact system	M12 female connector, 5-pole
Coding	B
Pin assignment	Pin 1: +5 V DC Pin 2: Data A (green strand) connected to Bus IN, pin 2 Pin 3: GND Pin 4: Data B (red strand) connected to Bus IN, pin 4 Pin 5: Shield

Table 5 Contact assignment for the PROFIBUS female connector

Bus termination

A reference voltage of 5 V DC is made applied to both bus terminals. This voltage is isolated from the internal system voltage and is applied exclusively to supply an external bus connection with power. Install the terminations at the physical beginning and end according to the PROFIBUS standard EN 50170 using the following values:

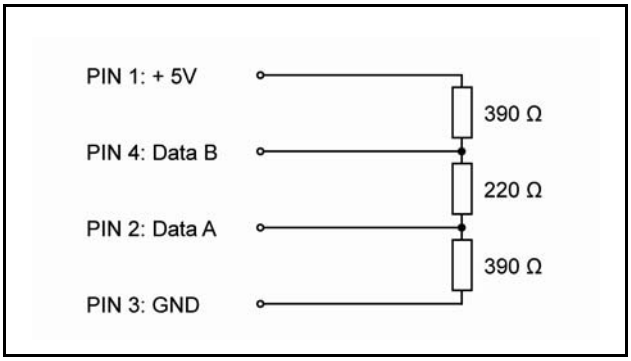


Figure 13 Bus termination wiring

Accessories

Terminating resistor connector, PROFIBUS-DP in M12 connector:

Type: SAIEND PM M12 5P B-COD VPE: 1

Order No.: 1784770000

Setting the transmission rate

The SAI recognises and adopts the transmission speed which is being used on the bus. Any change to the transmission speed on the bus will also be recognised and adopted.

SAI distributors support all conventional baud rates.

Setting the PROFIBUS address

With the PROFIBUS address, you can determine the address your SAI distributor will be identified with on the PROFIBUS-DP.

Two rotary switches in the address section of the SAI are used to make appropriate address settings. The setting is made in hexadecimal code from 00H to 7EH which corresponds to the decimal values from 0 to 126.

Please refer to Appendix C: Converting from Hexadecimal to Decimal.

Set the PROFIBUS-DP address for the SAI distributor in the settings section of the distributor. Use a flat-bladed screwdriver to adjust the rotary switch.

NOTE

It is only possible to set the bus address in the address section of the SAI. Any alterations made to the bus address during operations will be recognised and adopted following the next reset (turning off and on the power supply).

The factory-set bus address on the SAI is 03.

A table is available in the Appendix C: Converting from Hexadecimal to Decimal to aid in conversion of decimal to hexadecimal addresses.

Figure 14 Address switch

Address / hexadecimal code

Please note that PROFIBUS-DP allows a maximum of 126 possible addresses. The addresses 1 to 125 are defined.

Please observe: the address 126 is used for configuration purposes and the addresses 01 and 02 are retained for the PROFIBUS master.

The distributor address is set in hexadecimal code by means of two rotary coding switches. To do so, you will have to convert the decimal address to hexadecimal or, for the sake of simplicity, you could make use of the table in Appendix C: Converting from Hexadecimal to Decimal.

Example: To set the PROFIBUS-DP address 93, turn the left-hand rotary coding switch to position 5 and the right-hand rotary coding switch to position D.

NOTE

Each address must be allocated only once on PROFIBUS-DP. The PROFIBUS address that you set must match the PROFIBUS address for this distributor set in the project configuration software. If you alter a PROFIBUS address during operations you will have to disconnect the power supply and then restart the system to enable the master to recognise the change.

Technical data	
Fieldbus interface	PROFIBUS-DP V0 according to DIN EN 61158 certified by the PNO
Protocol	PROFIBUS IEC 61158
GSD file (Device Data Base File)	device-specific for each module
Transmission	RS485
Transmission medium	twisted pair
Separation of potentials	yes, to module electronics
Voltage withstand capacity	500 V DC
Baud rates	9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000 kBit/s set automatically
Number of nodes	max. 32 in a segment; max. 127 with repeatern
Range of bus addresses	0 to 126; recommended 2 to 125
Setting the bus address	by means of two rotary coding switches; coding: hexadecimal

Table 6 Technical data for PROFIBUS

5.2 SAI-AU M12 PB GW 16DI

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M12 PB GW 16DI is designed to connect 16 digital sensors with 8 M12 connectors.

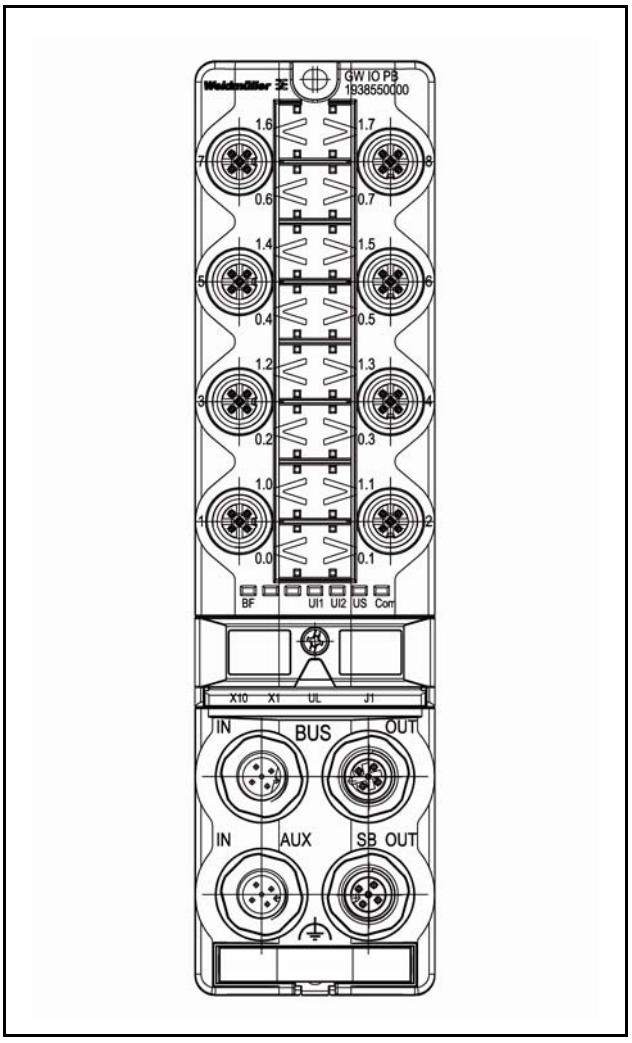


Figure 15 SAI-AU M12 PB GW 16DI

LEDs	
UI1	Supply voltage UI1 Supply for the gateway, the sub-bus US voltage and the DI1, DI3, DI5 and DI7 plug-in stations.
UI2	Supply voltage UI2 Supplies the plug-in stations DI2, DI4, DI6 and DI8
US	Supply voltage US Supply for the module and the plug-in stations 1 though 8.
Com	Communication with the extension I/O modules
0.0 – 1.7	Digital inputs
Connections	
BUS IN	PROFIBUS-DP input
BUS OUT	PROFIBUS-DP feed-through
AUX IN	Power supply
SUB OUT	Sub-bus output
1 to 8	16 inputs

Table 7 SAI-AU M12 PB GW 16DI

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

A five-pole M12 male connector is used to connect the supply voltage to the sub-bus. Use the SUB-OUT connection as a feed-through. The power supply and the digital inputs share a common earth and are not electrically isolated.

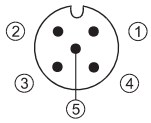
Module connection from AUX-IN	
Contact system	M12 male connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc UI1 Pin 2: + 24 Vdc UI2 Pin 3: GND Pin 4: GND Pin 5: PE

Table 8 Contact assignment for the AUX-IN male connector

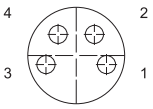
Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	A
Pin assignment 	Pin 1: +24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 9 Contact assignment for the Sub-bus female connector

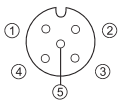
Connection for a digital input	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc sensor power supply Pin 2: Input 2 or diagnostics input Pin 3: GND Pin 4: Input 1 Pin 5: FE

Table 10 Contact assignment of the digital input

Block diagram of the digital input

Input configuration pins 2 and 4 from each M12 female connector:

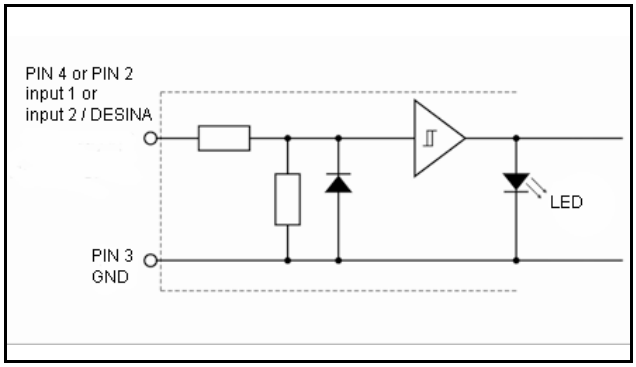


Figure 16 Block diagram of the digital input

Optical displays

The status of a digital input is shown with a yellow/ red LED.

LED IN: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7:

- Yellow: status of digital input from pin 4
- Red: short-circuit at 24 V DC
  sensor voltage pin 1

LED UI1

- Green: Voltage > 18 V DC
- Red: Voltage < 18 V DC

LED UI2

- Green: Voltage > 18 V DC
- Red: Voltage < 18 V DC

LED US

- Green: Voltage > 18 V DC
- Red: Voltage < 18 V DC,
  OFF = no extension I/O is connected

LED COM

- Green: ON = communication with Sub-bus is okay
- Red: 0.5 Hz flashing = setting up communication (max. 20 seconds)
  ON = time-out communication

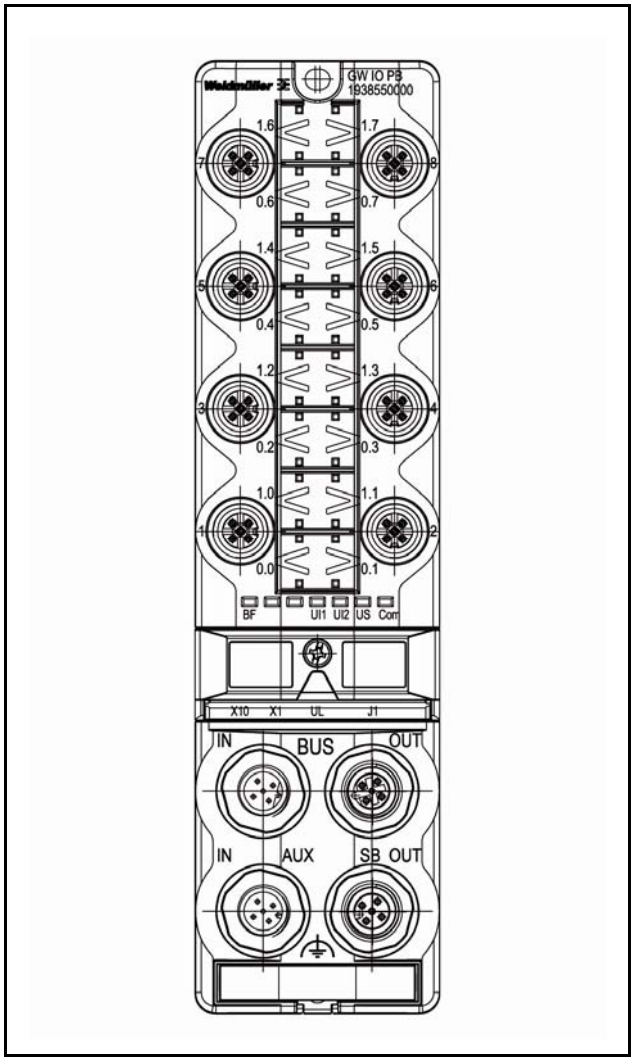


Figure 17 I/O view Gateway I/O 16DI

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load per pin	2,5 A
Reverse polarity protection	yes
Current input	module approx. 70 mA
Digital inputs	16 channels
Plug-in stations	DI1, DI2, DI3, DI4, DI5, DI6, DI7 and DI8
Grouping	two groups for each eight channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input level Low	< 5 V DC acc. to EN 61131-2 Type 1
Input level High	> 15 V DC acc. to EN 61131-2 Type 1
Input current Low	< 15 mA acc. to EN 61131-2 Type 1
Input current High	2 mA to 15 mA acc. to EN 61131-2 Type 1
Input filter	3 ms
Separation of potentials to the module electronics	none
Display elements	one yellow/red error/status LED per channel
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
GSD file (Device Data Base File)	WIAU0A74.GSD
Dimensions L x W x H	210 x 54 x 32 mm
Weight	325 g
Article order number	1938550000
Article designation	SAI-AU M12 PB GW 16DI

Table 11 Technical data for the SAI-AU M12 PB GW 16DI

5.3 SAI-AU M8 PB GW 16DI

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M8 PB GW 16DI is designed to connect 16 digital sensors with 16 M8 connectors.

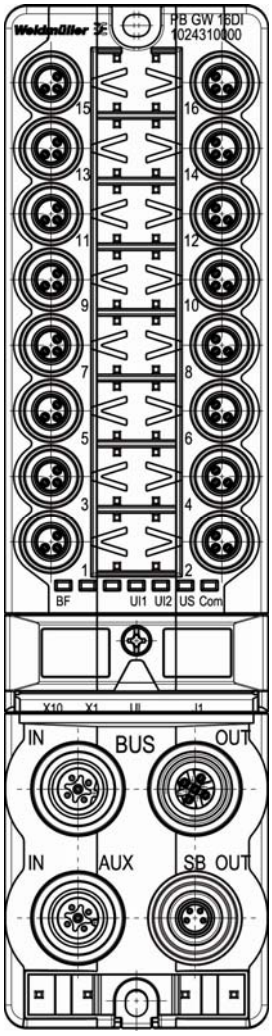


Figure 18 SAI-AU M8 PB GW 16DI

LEDs	
UI1	Supply voltage UI1 Supply for the gateway, the sub-bus US voltage and the DI1, DI3, DI5, DI7, DI9, DI11, DI13 and DI15 plug-in stations.
UI2	Supply voltage UI2 Supplies the plug-in stations DI2, DI4, DI6, DI8, DI10, DI12, DI14 and DI16
US	Supply voltage US Supply for the module and the plug-in stations 1 though 8.
Com	Communication with the extension I/O modules
1 to 16	Digital inputs
Connections	
BUS IN	PROFIBUS-DP input
BUS OUT	PROFIBUS-DP feed-through
AUX IN	Power supply
SUB OUT	Sub-bus output
1 to 8	16 inputs

Table 12 SAI-AU M8 PB GW 16DI

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

A five-pole M12 male connector is used to connect the supply voltage to the sub-bus. Use the SUB-OUT connection as a feed-through. The power supply and the digital inputs share a common earth and are not electrically isolated.

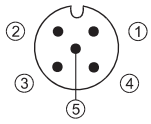
Module connection from AUX-IN	
Contact system	M12 male connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc UI1 Pin 2: + 24 Vdc UI2 Pin 3: GND Pin 4: GND Pin 5: PE

Table 13 Contact assignment for the AUX-IN male connector

Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	A
Pin assignment 	Pin 1: +24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 14 Contact assignment for the Sub-bus female connector

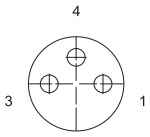
Connection for a digital input	
Contact system	M8 female connector, 3-pole
Coding	None
Pin assignment 	Pin 1: + 24 Vdc sensor power supply Pin 2: GND Pin 4: Input

Table 15 Contact assignment of the digital input

Block diagram of the digital input

Input configuration pins 2 and 4 from each M12 female connector:

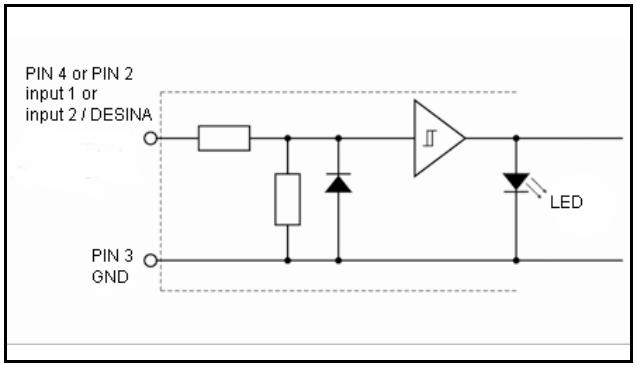


Figure 19 Block diagram of the digital input

Optical displays

The status of a digital input is shown with a yellow/ red LED.

LED IN: 1 to 16:

- Yellow: status of digital input from pin 4
- Red: short-circuit at 24 V DC
  sensor voltage pin 1

LED UI1

- Green: Voltage > 18 V DC
- Red: Voltage < 18 V DC

LED UI2

- Green: Voltage > 18 V DC
- Red: Voltage < 18 V DC

LED US

- Green: Voltage > 18 V DC
- Red: Voltage < 18 V DC,
  OFF = no extension I/O is connected

LED COM

- Green: ON = communication with Sub-bus is okay
- Red: 0.5 Hz flashing = setting up communication (max. 20 seconds)
  ON = time-out communication

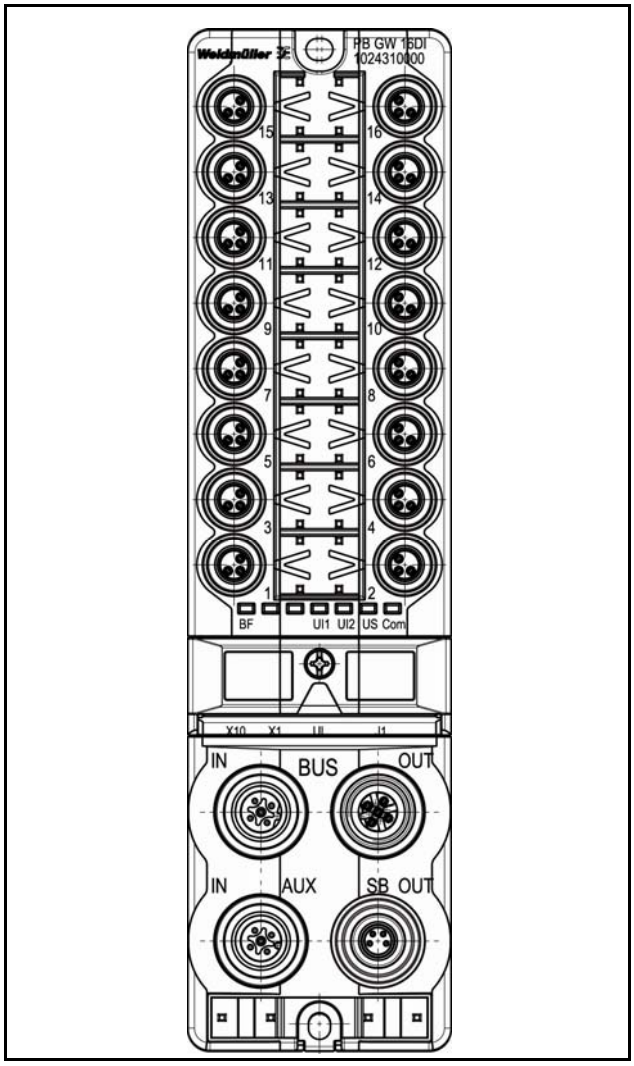


Figure 20 I/O view Gateway I/O 16DI

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load per pin	2,5 A
Reverse polarity protection	yes
Current input	module approx. 70 mA
Digital inputs	16 channels
Plug-in stations	DI1 to DI16
Grouping	two groups for each eight channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input level Low	< 5 V DC acc. to EN 61131-2 Type 1
Input level High	> 15 V DC acc. to EN 61131-2 Type 1
Input current Low	< 15 mA acc. to EN 61131-2 Type 1
Input current High	2 mA to 15 mA acc. to EN 61131-2 Type 1
Input filter	3 ms
Separation of potentials to the module electronics	none
Display elements	one yellow/red error/status LED per channel
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
GSD file (Device Data Base File)	WIAU0A74.GSD
Dimensions L x B x H	210 x 54 x 32 mm
Weight	325 g
Article order number	1024310000
Article designation	SAI-AU M8 PB GW 16DI

Table 16 Technical data for the SAI-AU M8 PB GW 16DI

5.4 SAI-AU M8 SB 8DI

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M8 SB 8DI is designed to connect 8 digital sensors with 8 M8 connectors.

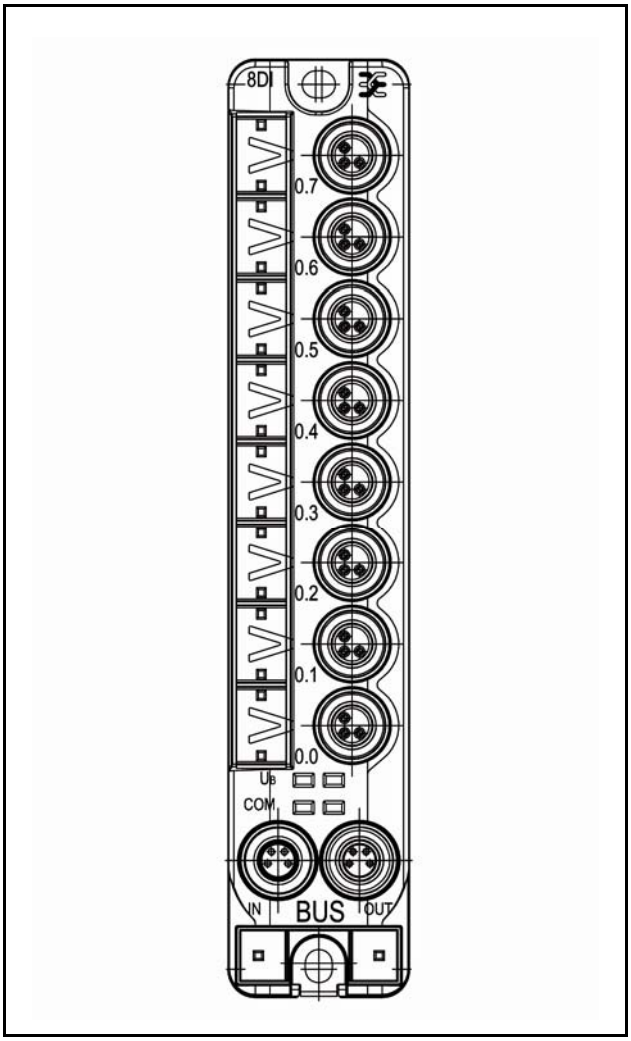


Figure 21 SAI-AU M8 SB 8DI

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB. Supply for the module and the plug-in stations 1 though 8.
Com	Communication with the gateway
DI1 to DI8	Digital inputs
Connections	
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 8	8 inputs

Table 17 SAI-AU M8 SB 8DI

Connection of the supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

A four-pole M8 male connector and a four-pole M8 female connector are used to connect the supply voltage to the sub-bus. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to feed it forward. The power supply and the digital inputs share a common earth and are not electrically isolated.

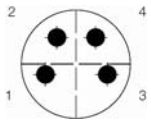
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc pin 2 Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 18 Contact assignment for the Sub-bus male connector

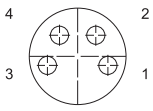
Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc pin 2 Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 19 Contact assignment for the Sub-bus female connector

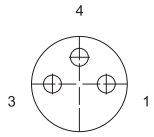
Connection for a digital input	
Contact system	M8 female connector, 3-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc sensor power supply Pin 3: GND Pin 4: Input

Table 20 Contact assignment of the digital input

Block diagram of the digital input

Input configuration pin 4 from each M8 female connector:

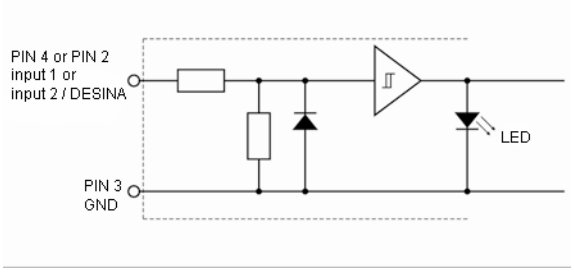


Figure 22 Block diagram of the digital input

Optical displays

The status of a digital input is shown with a yellow/ red LED.

LED IN: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7:

- Yellow: status of digital input from pin 4
- Red: short-circuit at 24 V DC
  sensor voltage pin 1

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing = < 15,
  OFF = < 12 V DC

LED COM

- Green: Communication setup with the gateway I/O
  LED flashed for max. 20 seconds green
- Red: time-out communication

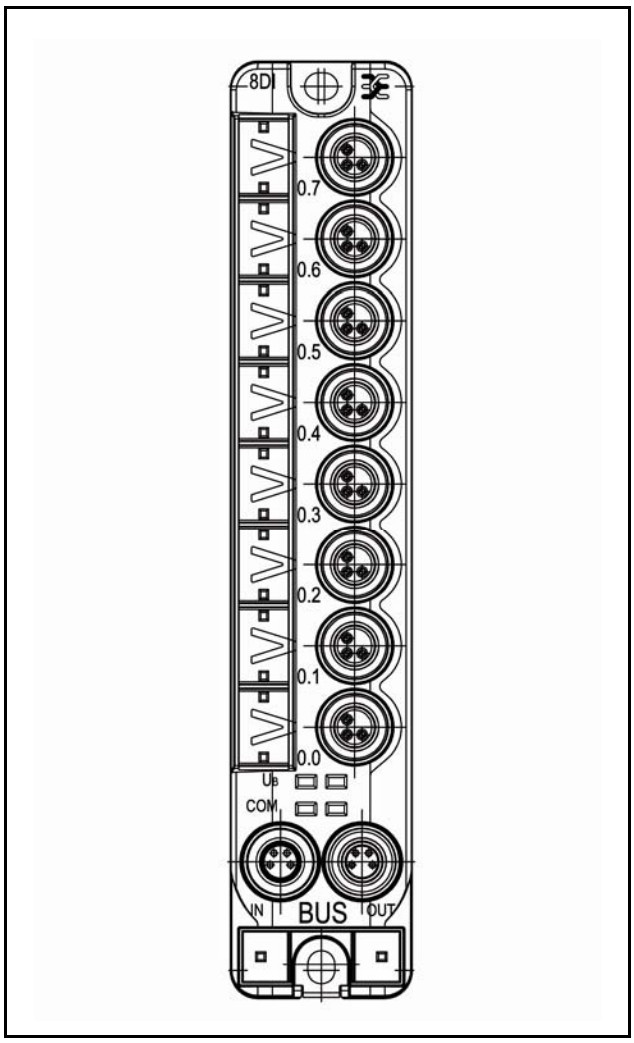


Figure 23 I/O view of M8 8DI

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Digital inputs	8 channels
Plug-in stations	DI1, DI2, DI3, DI4, DI5, DI6, DI7 and DI8
Grouping	one group for all eight channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input level Low	< 5 V DC acc. to EN 61131-2 Type 1
Input level High	> 15 V DC acc. to EN 61131-2 Type 1
Input current Low	< 15 mA acc. to EN 61131-2 Type 1
Input current High	2 mA to 15 mA acc. to EN 61131-2 Type 1
Input filter	adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Separation of potentials to the module electronics	none
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	155 x 30 x 32 mm
Weight	150 g
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Article order number	1938600000
Article designation	SAI-AU M8 SB 8DI

Table 21 Technical data for the SAI-AU M8 SB 8DI

5.5 SAI-AU M12 SB 8DI

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M12 SB 8DI is designed to connect eight digital sensors with four M12 connectors.

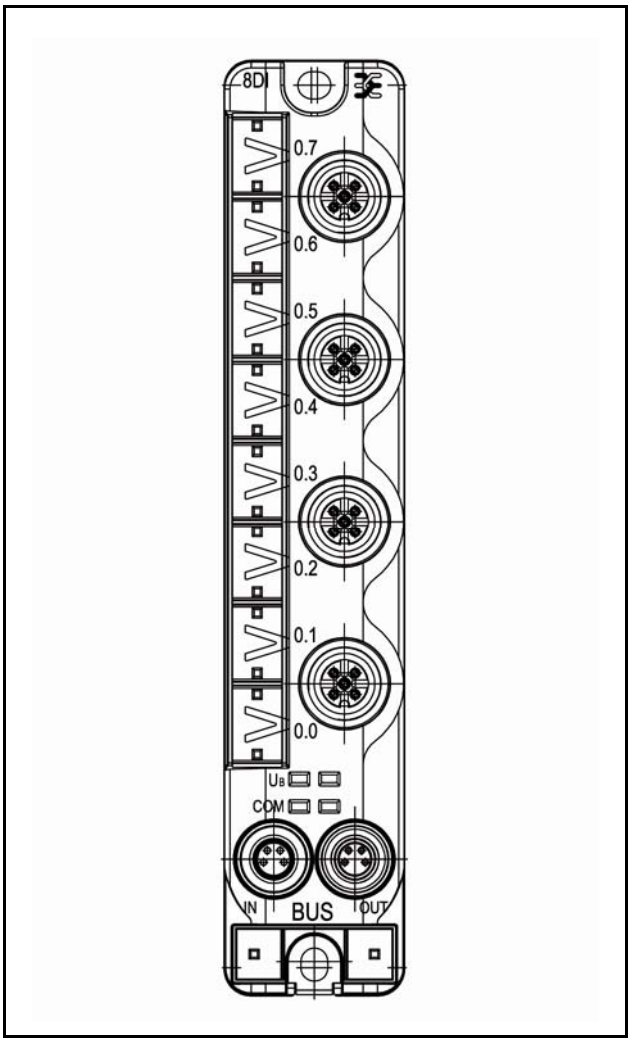


Figure 24 SAI-AU M12 SB 8DI

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB Supply for the module and the plug-in stations 1 though 4.
Com	Communication with the gateway
DI1 to DI8	Digital inputs
Connections	
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 4	8 inputs

Table 22 SAI-AU M12 SB 8DI

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

The power supply is connected to the sub-bus via a 4-pole M8 male connector and a 4-pole M8 female connector. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to feed it forward. The power supply and the digital inputs share a common earth and are not electrically isolated.

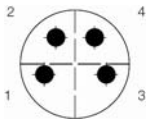
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 23 Contact assignment for the Sub-bus male connector

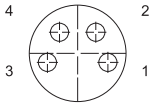
Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 24 Contact assignment for the Sub-bus female connector

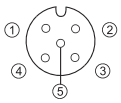
Connection for a digital input	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc sensor power supply Pin 2: Input 2 or diagnostics input Pin 3: GND Pin 4: Input 1 Pin 5: FE

Table 25 Contact assignment of the digital input

Block diagram of the digital input

Input configuration pins 4 and 2 from each M12 female connector:

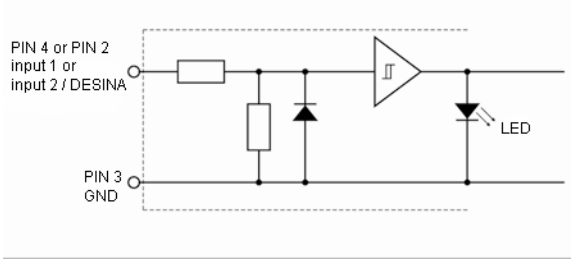


Figure 25 Block diagram of the digital input

DESINA

DESINA stands for the **DE**centralised and **S**tandard-ised **IN**st**A**llations technology for machine tools and production systems.

DESINA describes the standardised process for electrical, hydraulic and pneumatic installations for automatic machine tools and production systems.

Additional information is located at **www.desina.de**.

Optical displays

The status of a digital input is shown with a yellow/red LED.

LED IN: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7:

- Yellow: status of digital input or **DESINA** input from pin 2
- Red: short-circuit of 24 V DC sensor voltage pin 1 or error message at **DESINA** input

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing = < 15, OFF = < 12 V DC

LED COM

- Green: Communication setup with the gateway I/O LED flashed for max. 20 seconds green
- Red: time-out communication

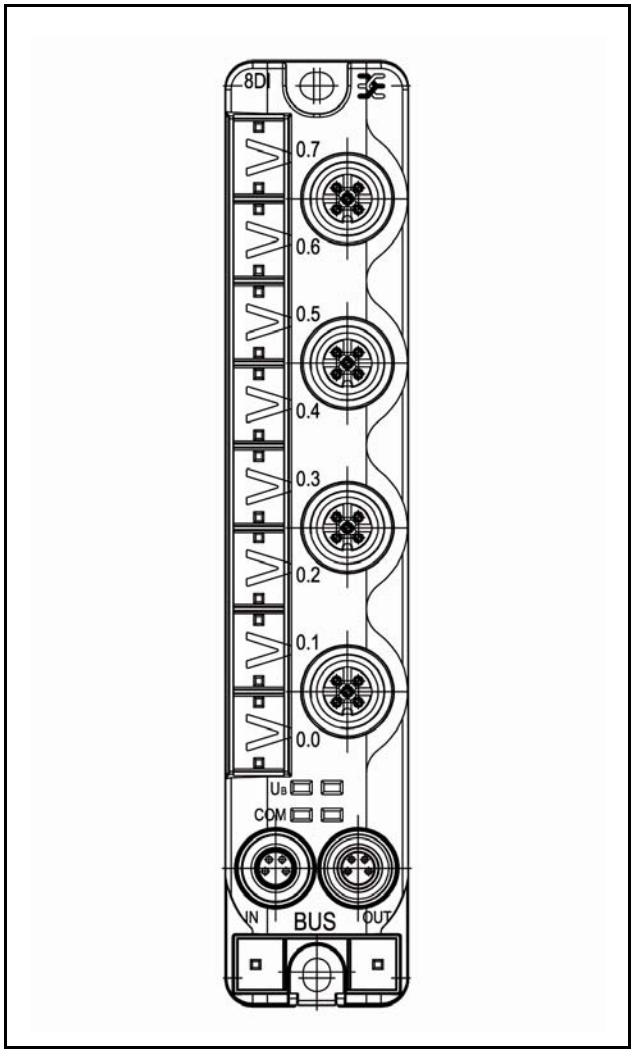


Figure 26 I/O view of M12 8DI

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Digital inputs	8 channels
Plug-in stations	DI1, DI2, DI3, DI4, DI5, DI6, DI7 and DI8
Grouping	one group for all eight channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input level Low	< 5 V DC acc. to EN 61131-2 Type 1
Input level High	> 15 V DC acc. to EN 61131-2 Type 1
Input current Low	< 15 mA acc. to EN 61131-2 Type 1
Input current High	2 m A to 15 mA acc. to EN 61131-2 Type 1
Input filter	adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Separation of potentials to the module electronics	none
Display elements	One yellow/red error/status LED per channel
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	155 x 30 x 32 mm
Weight	150 g
Article order number	1938610000
Article designation	SAI-AU M12 SB 8DI

Table 26 Technical data for the SAI-AU M12 SB 8DI

5.6 SAI-AU M8 SB 8DIO

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a Fieldbus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M8 SB 8DIO is designed to connect 8 digital sensors. Alternatively, up to eight channels can be used as outputs. The outputs are designed for a load current of 0.5 A.

The signals are connected via eight M8 male connectors.

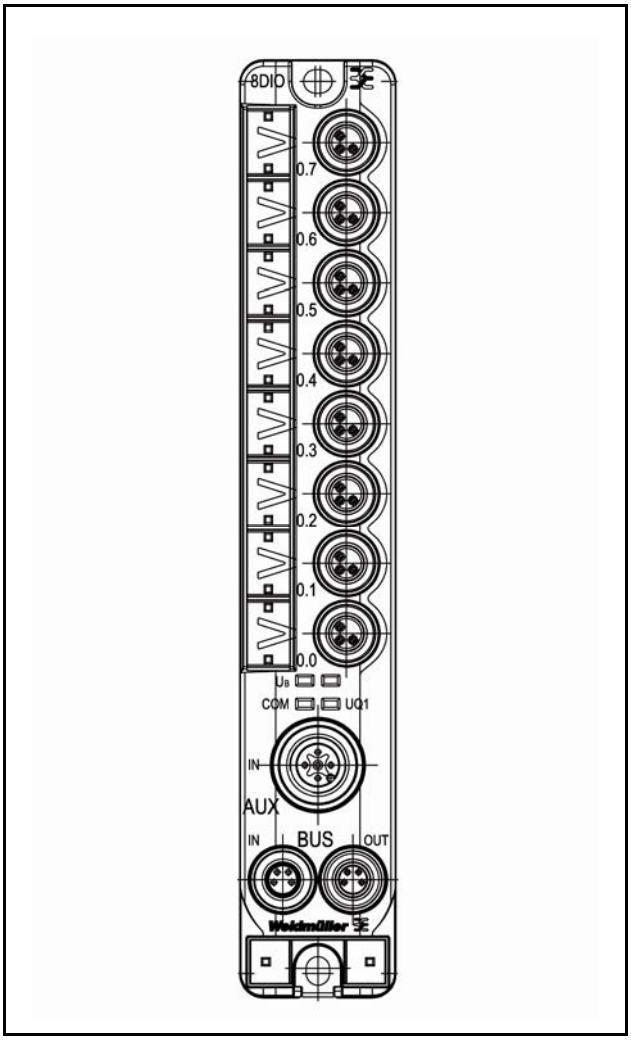


Figure 27 SAI-AU M8 SB 8DIO

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

HINWEIS

The DESINA functionality can only be used if the two relevant configurable IOs are parameterised as inputs.

LEDs	
UB	Supply voltage UB Supply for the module and the plug-in stations 1 though 8.
UQ1	Supply voltage UQ1
Com	Communication with the gateway
IO1 to IO8	Supply for the outputs O1...O8
Connections	
AUX IN	Supply voltage UQ1
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 8	8 inputs and 8 outputs

Table 27 SAI-AU M8 SB 8DIO

Connection of the supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

A four-pole M8 male connector and a four-pole M8 female connector are used to connect the supply voltage to the sub-bus. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to feed it forward. The power supply and the digital inputs share a common earth and are not electrically isolated.

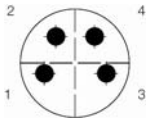
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 28 Contact assignment for the Sub-bus male connector

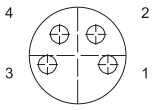
Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 29 Contact assignment for the Sub-bus female connector

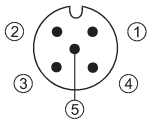
Module connection from AUX-IN	
Contact system	M12 male connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc UQ1 Pin 2: + 24 Vdc UQ1 Pin 3: GND UQ1 Pin 4: GND UQ1 Pin 5: PE Housing: Shield, connected with the FE

Table 30 Contact assignment for the power supply male connector

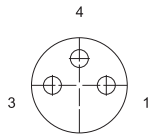
Connection of a digital input and output	
Contact system	M8 female connector, 3-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc sensor power supply Pin 3: GND Pin 4: Input / output

Table 31 Contact assignment of the digital output

Block diagram of the digital input and output

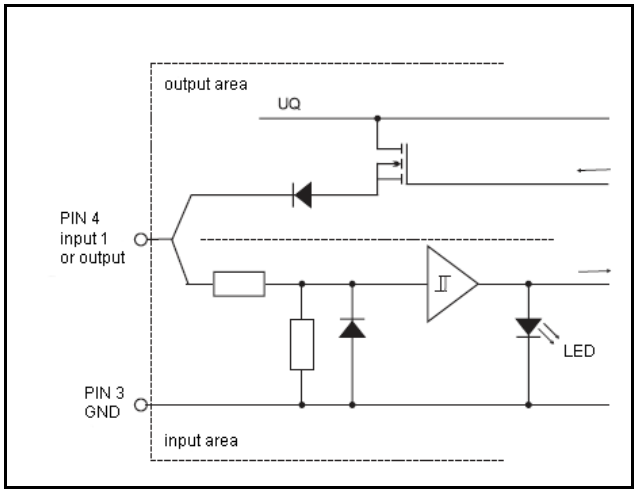


Figure 28 Block diagram of the digital input and outputs

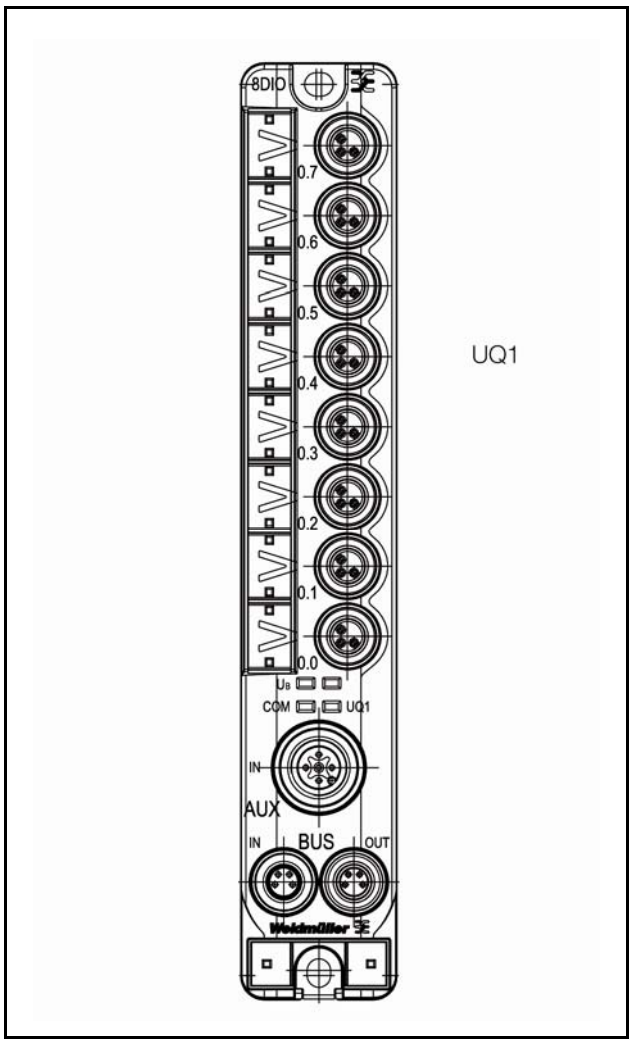


Figure 29 The assignment of outputs to the power supplies

NOTE

The power supplies to the output drives share a common earth with the power supply to the sensors; therefore, these are not electrically isolated.

Optical displays

The status of a digital I/O is shown with a yellow/red LED.

LED IO: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7:

- Yellow: status I/O from pin 4
- Red: short-circuit at 24 V DC
  sensor voltage pin 1

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing = < 15,
  OFF = < 12 V DC

LED UQ1

- Green: Voltage UQ1 > 18 V DC
- Red: Voltage UQ1 < 18 V DC

LED COM

- Green: Communication setup with the gateway I/O
  LED flashed for max. 20 seconds green
- Red: time-out communication

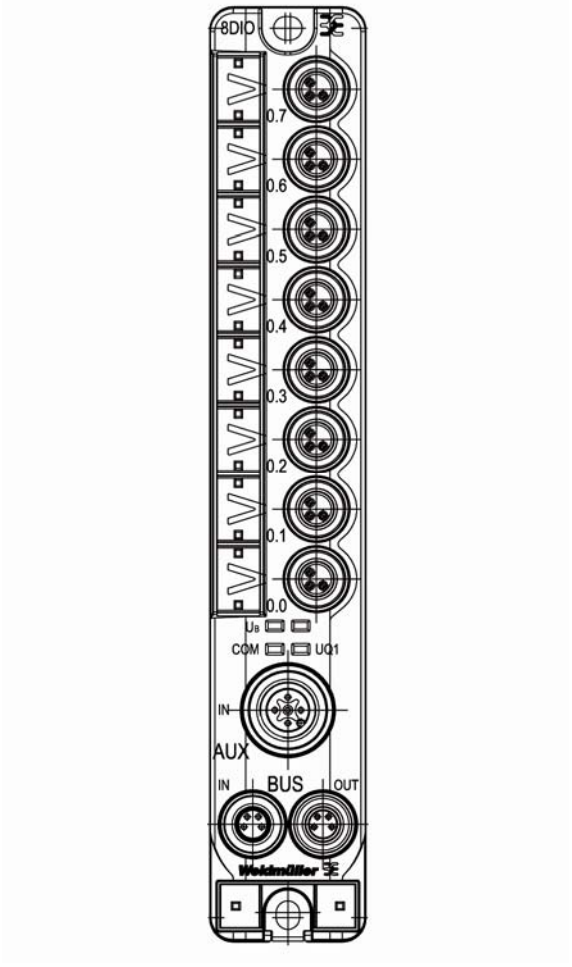


Figure 30 I/O view of M8 8DIO

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Digital inputs	8 channels
Plug-in stations	I/O1, I/O2, I/O3, I/O4, I/O5, I/O6, I/O7 and I/O8
Grouping	one group for all eight channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input level Low	< 5 V DC acc. to EN 61131-2 Type 1
Input level High	> 15 V DC acc. to EN 61131-2 Type 1
Input current Low	< 15 mA acc. to EN 61131-2 Type 1
Input current High	2 mA to 15 mA acc. to EN 61131-2 Type 1
Input filter	adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Separation of potentials to the module electronics	none
Display elements	one yellow/red error/status LED per channel
Digital outputs	8 channels
Plug-in stations	I/O1, I/O2, I/O3, I/O4, I/O5, I/O6, I/O7 and I/O8
Grouping	one group for all eight channels with a common earth
Driver type	Highside
Current per channel	0.5 A
Residual current	module 4 A
Output voltage Low	0 V
Switching capacity, resistive load	max. 100 Hz
Switching capacity, inductive load	max. 1 Hz
Switching capacity, lamp load:	max. 8 Hz
Short-circuit proof	yes, switch-off in case of short-circuit and error message
Short-circuit current	at 25 °C 1.4 A
Separation of potentials to the module electronics	none
Display elements	one yellow/red error/status LED per channel

Technical data	
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	175 x 30 x 32 mm
Weight	175 g
Article order number	1938630000
Article designation	SAI-AU M8 SB 8DIO

Table 32 Technical data for the SAI-AU M8 SB 8DIO

5.7 SAI-AU M12 SB 8DIO

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a Fieldbus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M12 SB 8DIO is designed to connect 8 digital sensors. Alternatively, up to eight channels can be used as outputs. The outputs are designed for a load current of 0.5 A.

The signals are connected via 4 M12 male connectors with 2 channels per plug-in.

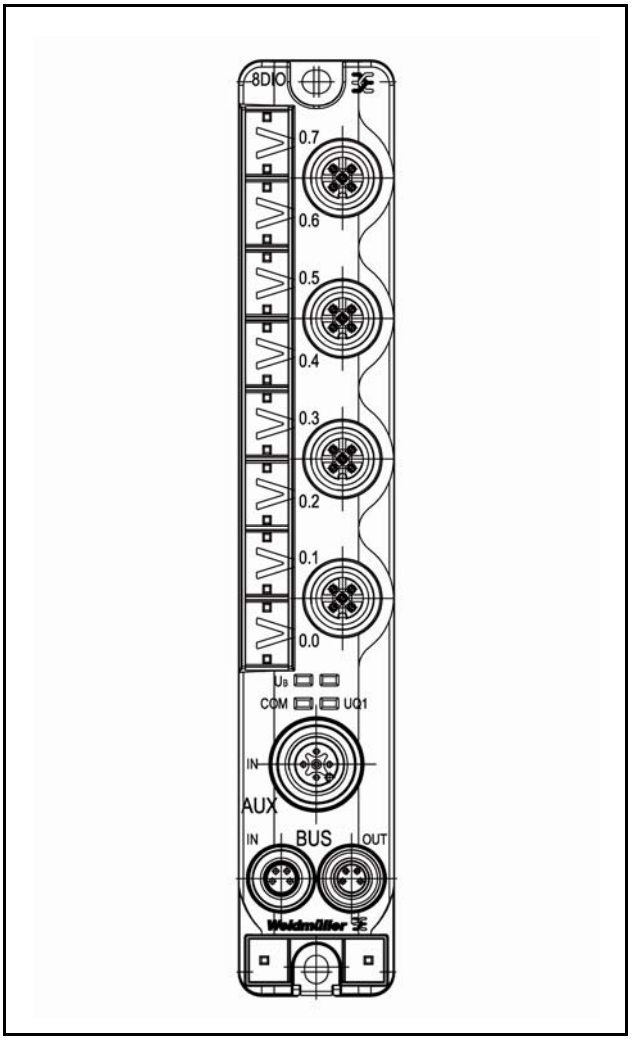


Figure 31 SAI-AU M12 SB 8DIO

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

HINWEIS

The DESINA functionality can only be used if the two relevant configurable IOs are parameterised as inputs.

LEDs	
UB	Supply voltage UB Supply for the module and the plug-in stations 1 though 4.
UQ1	Supply voltage UQ1 Supply for the outputs O1...O4
Com	Communication with the gateway
IO1 to IO8	Digital inputs and outputs
Connections	
AUX IN	Supply voltage UQ1, UQ2
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 4	Variably connected with inputs and outputs (sum 8).

Table 33 SAI-AU M12 SB 8DIO

Connection of the supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

The power supply is connected to the sub-bus via a 4-pole M8 male connector and a 4-pole M8 female connector. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to feed it forward. The power supply and the digital inputs share a common earth and are not electrically isolated.

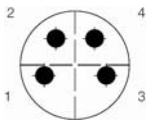
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 34 Contact assignment for the Sub-bus male connector

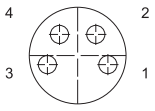
Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 35 Contact assignment for the Sub-bus female connector

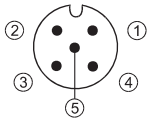
Module connection from AUX-IN	
Contact system	M12 male connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc UQ1 Pin 2: + 24 Vdc UQ1 Pin 3: GND UQ1 Pin 4: GND UQ1 Pin 5: PE housing: Shield, connected with the FE

Table 36 Contact assignment for the power supply male connector

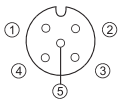
Connection of a digital input and output	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc sensor power supply Pin 2: Input 2 or diagnostics input Pin 3: GND Pin 4: Input 1/output Pin 5: FE

Table 37 Contact assignment of the digital input and output

Block diagram of the digital input and output

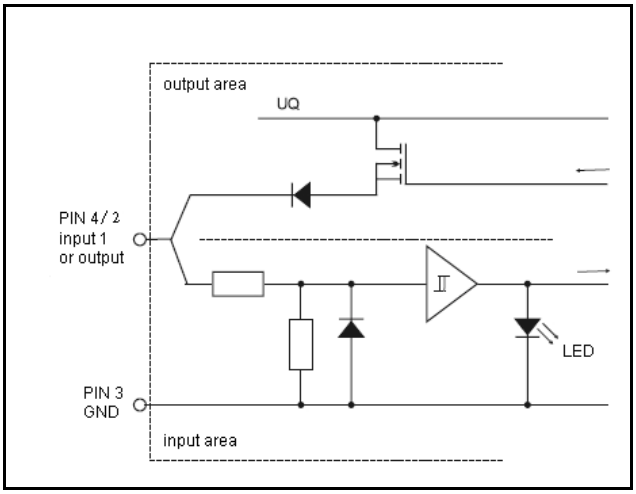


Figure 32 Block diagram of the digital input and output

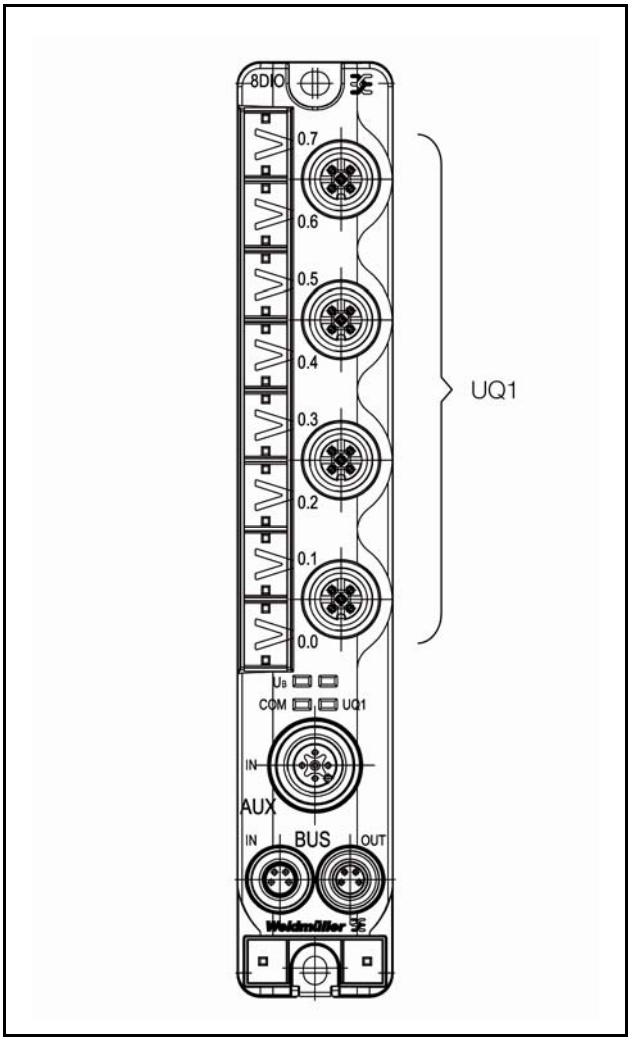


Figure 33 The assignment of outputs to the power supplies

NOTE

The power supplies to the output drives share a common earth with the power supply to the sensors; therefore, these are not electrically isolated.

Optical displays

The status of a digital I/O is shown with a yellow/red LED.

LED IO: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7:

- Yellow: status I/O from pin 4
- Red: short-circuit at 24 V DC
  sensor voltage pin 1

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing = < 15, OFF = < 12 V DC

LED UQ1

- Green: Voltage UQ1 > 18 V DC
- Red: Voltage UQ1 < 18 V DC

LED COM

- Green: Communication setup with the gateway I/O, LED flashed for max. 20 seconds green
- Red: time-out communication

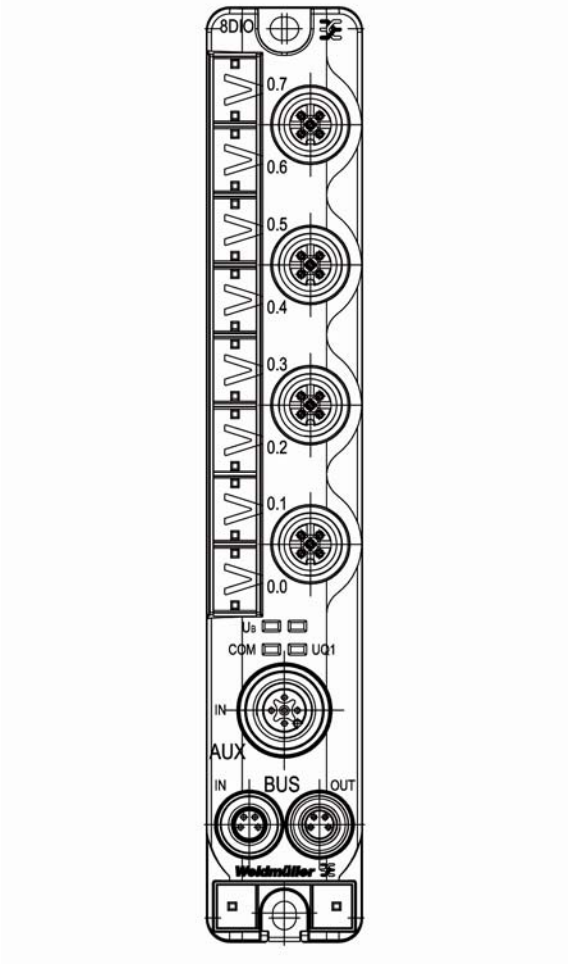


Figure 34 I/O view of M12 8DIO

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Reverse polarity protection	yes
Contact load	per pin 3 A
Current input	module approx. 50 mA
Digital inputs	8 channels
Plug-in stations	E/A1, E/A2, E/A3 and E/A4
Grouping	one group for all eight channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input level Low	< 5 V DC acc. to EN 61131-2 Type 1
Input level High	> 15 V DC acc. to EN 61131-2 Type 1
Input current Low	< 15 mA acc. to EN 61131-2 Type 1
Input current High	2 mA to 15 mA acc. to EN 61131-2 Type 1
Input filter	adjustable: 1 ms, 3 ms, 5 ms, 10 ms
Separation of potentials to the module electronics	none
Display elements	one yellow/red error/status LED per channel
Digital inputs	8 channels
Plug-in stations	E/A1, E/A2, E/A3 and E/A4
Grouping	One group for all eight channels with a common earth
Driver type	Highside
Current per channel	0.5 A
Residual current	module 4 A
Output voltage Low	0 V
Switching capacity, resistive load	max. 100 Hz
Switching capacity, inductive load	max. 1 Hz
Switching capacity, lamp load:	max. 8 Hz
Short-circuit proof	yes, switch-off in case of short-circuit and error message
Short-circuit current	at 25 °C 1.4 A
Separation of potentials to the module electronics	none
Display elements	One yellow/red error/status LED per channel

Technical data	
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	175 x 30 x 32 mm
Weight	175 g
Article order number	1938640000
Article designation	SAI-AU M12 SB 8DIO

Table 38 Technical data for the SAI-AU M12 SB 8DIO

5.8 SAI-AU M8 SB 8DO 2A

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a Fieldbus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M8 SB 8DO 2A is designed to connect 8 digital actuators. The outputs are designed for a load current of 2.0 A.

The signals are connected via eight M8 male connectors.

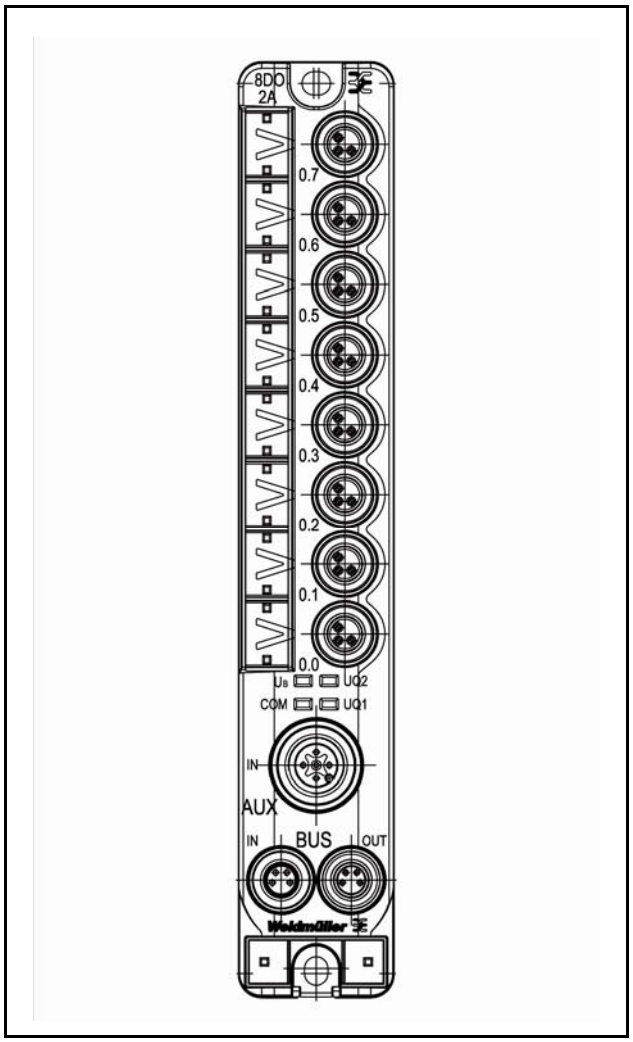


Figure 35 SAI-AU M8 SB 8DO 2A

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB Supply for the module and the plug-in stations 1 though 8.
UQ1	Supply voltage UQ1 Supply for the outputs O1...O4
UQ2	Supply voltage UQ2 Supply for the outputs O5...O8
Com	Communication with the gateway
DO1 to DO8	Digital outputs
Connections	
AUX IN	Supply voltage UQ1, UQ2
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 8	8 outputs

Table 39 SAI-AU M8 SB 8DO 2A

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

The power supply is connected to the sub-bus via a 4-pole M8 male connector and a 4-pole M8 female connector. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to feed it forward. The power supply and the digital inputs share a common earth and are not electrically isolated.

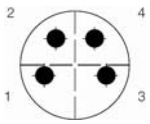
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 40 Contact assignment for the Sub-bus male connector

Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 41 Contact assignment for the Sub-bus female connector

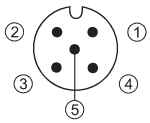
Module connection from AUX-IN	
Contact system	M12 male connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc UQ1 Pin 2: + 24 Vdc UQ2 Pin 3: GND UQ1 Pin 4: GND UQ2 Pin 5: PE housing: Shield, connected with the FE

Table 42 Contact assignment for the power supply male connector

Connection for a digital output	
Contact system	M8 female connector, 3-pole
Coding	-
Pin assignment	Pin 1: + 24 Vdc sensor power supply Pin 3: GND Pin 4: Output

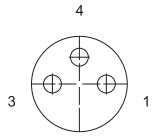


Table 43 Contact assignment of the digital output

Block diagram of digital output

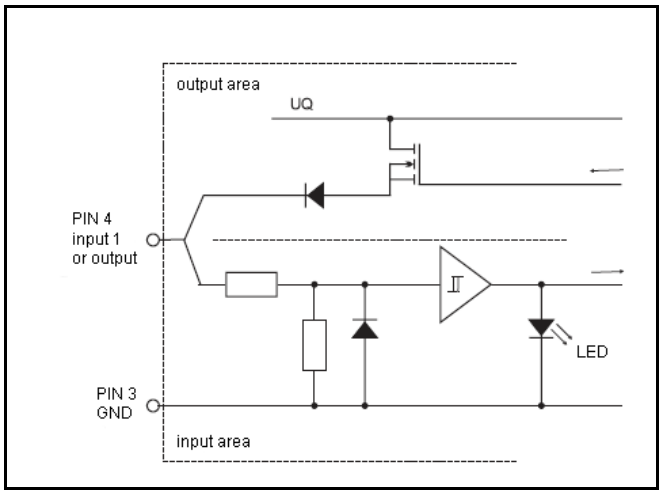


Figure 36 Block diagram of the digital output

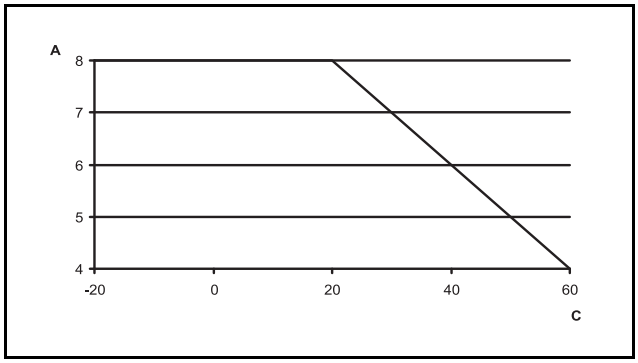


Figure 37 Derating curve for the max. residual current of the outputs

NOTE

The power supplies to the output drives share a common earth with the power supply to the sensors; therefore, these are not electrically isolated.

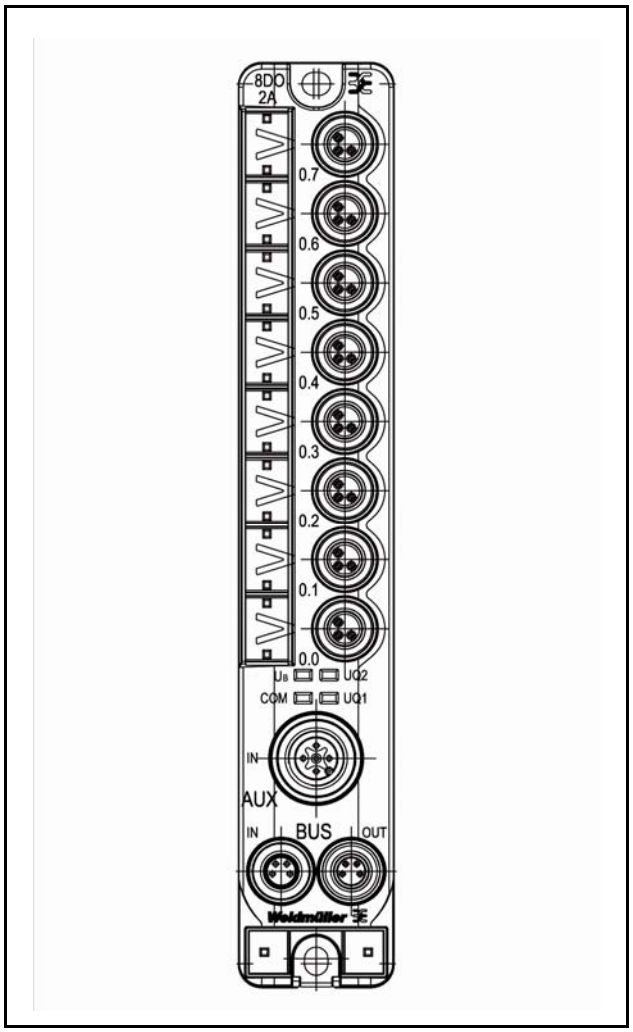


Figure 38 The assignment of outputs to the power supplies

Optical displays

The status of a digital output is shown with a yellow/ red LED.

LED OUT: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7:

- Yellow: status of digital output from pin 4
- Red: short-circuit on digital output

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing = < 15, OFF = < 12 V DC

LED UQ1

- Green: Voltage UQ1 > 18 V DC
- Red: Voltage UQ1 < 18 V DC

LED UQ2

- Green: Voltage UQ2 > 18 V DC
- Red: Voltage UQ2 > 18 V DC

LED COM

- Green: Communication setup with the gateway I/O, LED flashed for max. 20 seconds green
- Red: time-out communication

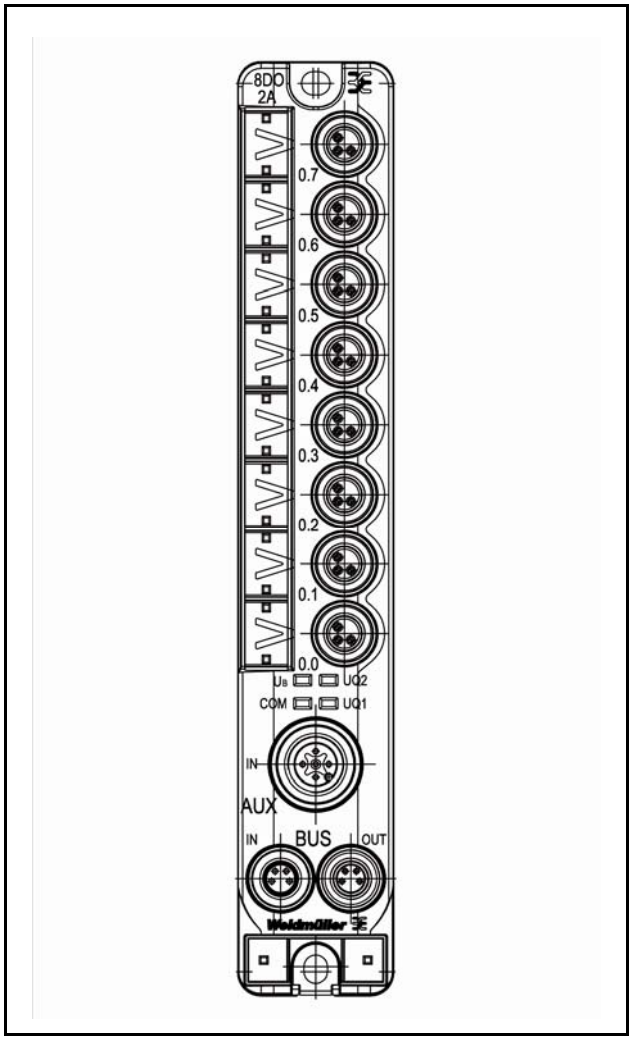


Figure 39 I/O view of M8 8 DO 2A

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Digital outputs	8 channels
Plug-in stations	O1, O2, O3, O4, O5, O6, O7 and O8
Grouping	two groups for every four channels with a common earth
Driver type	Highside
Current per channel	2 A
Residual current	module 8 A
Output voltage Low	0 V
Switching capacity, resistive load	max. 100 Hz
Switching capacity, inductive load	max. 1 Hz
Switching capacity, lamp load:	max. 8 Hz
Short-circuit proof	yes, switch-off in case of short-circuit and error message
Short-circuit current	at 25 °C 5.6 A
Separation of potentials to the module electronics	none
Display elements	one yellow/red error/status LED per channel
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	175 x 30 x 32 mm
Weight	175 g
Article order number	1938660000
Article designation	SAI-AU M8 SB 8DO 2A

Table 44 Technical data for the SAI-AU M8 SB 8DO 2A

5.9 SAI-AU M12 SB 8DO 2A

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a Fieldbus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. That enables their use in harsh environments.

The module SAI-AU M12 SB 8DO 2A is designed to connect 8 digital actuators. The outputs are designed for a load current of 2.0 A.

The signals are connected via four M12 plug-in connectors.

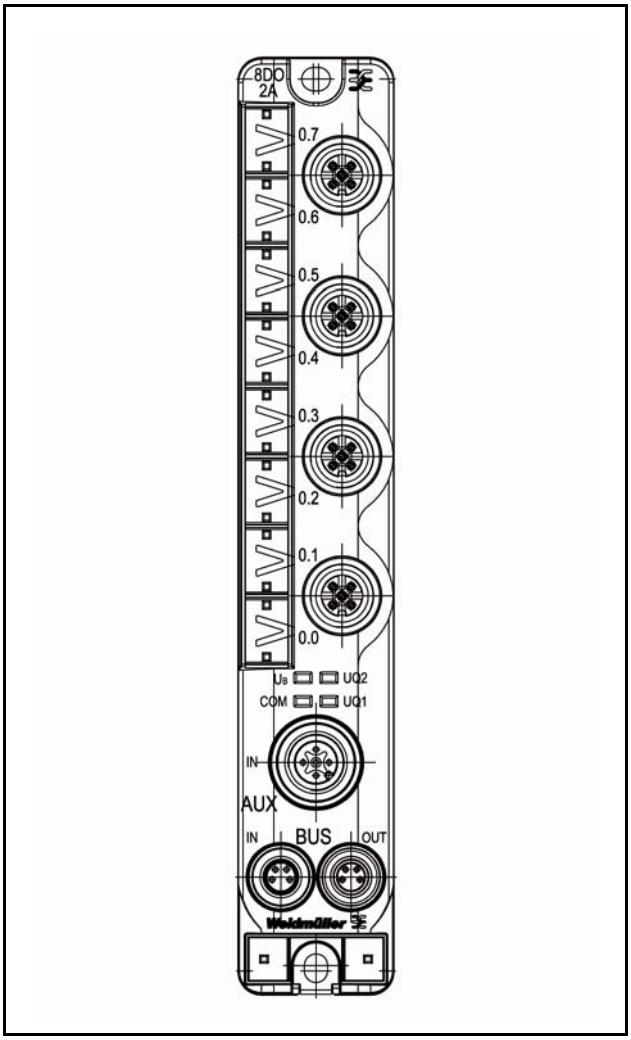


Figure 40 SAI-AU M12 SB 8DO 2A

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB Supply for the module and the plug-in stations 1 though 4.
UQ1	Supply voltage UQ1 Supply for the outputs O1...O4
UQ2	Supply voltage UQ2 Supply for the outputs O5...O8
Com	Communication with the gateway
DO1 to DO8	Digital outputs
Connections	
AUX IN	Supply voltage UQ1, UQ2
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 4	8 outputs

Table 45 SAI-AU M12 SB 8DO 2A

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

NOTE

The power supply is connected to the sub-bus via a 4-pole M8 male connector and a 4-pole M8 female connector. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to feed it forward. The power supply and the digital inputs share a common earth and are not electrically isolated.

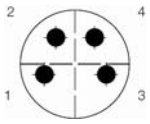
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 46 Contact assignment for the Sub-bus male connector

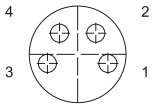
Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 47 Contact assignment for the Sub-bus female connector

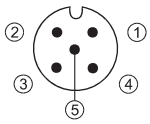
Module connection from AUX-IN	
Contact system	M12 male connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc UQ1 Pin 2: + 24 Vdc UQ2 Pin 3: GND UQ1 Pin 4: GND UQ2 Pin 5: PE housing: Shield, connected with the PE

Table 48 Contact assignment for the power supply male connector

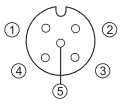
Connection for a digital output	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc sensor power supply Pin 2: Output 2 Pin 3: GND Pin 4: Output 1 Pin 5: FE

Table 49 Contact assignment of the digital output

Block diagram of digital output

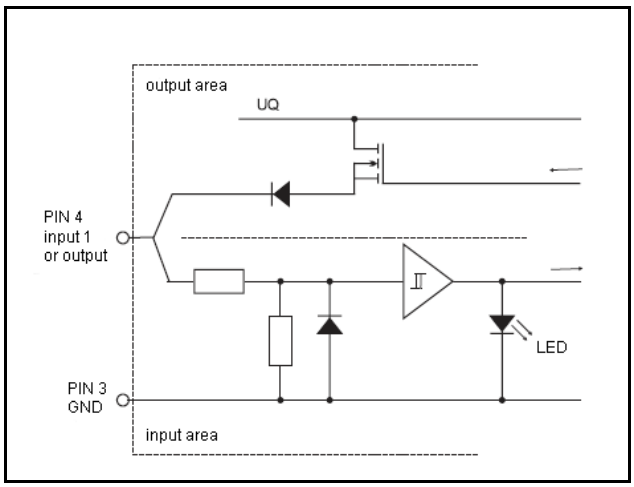


Figure 41 Block diagram of the digital output

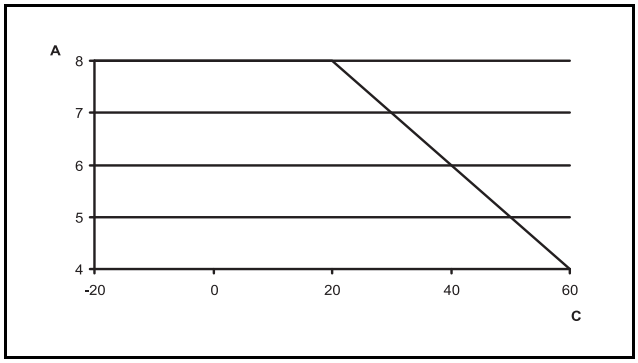


Figure 42 Derating curve for the max. residual current of the outputs

NOTE

The power supplies to the output drives share a common earth with the power supply to the sensors; therefore, these are not electrically isolated.

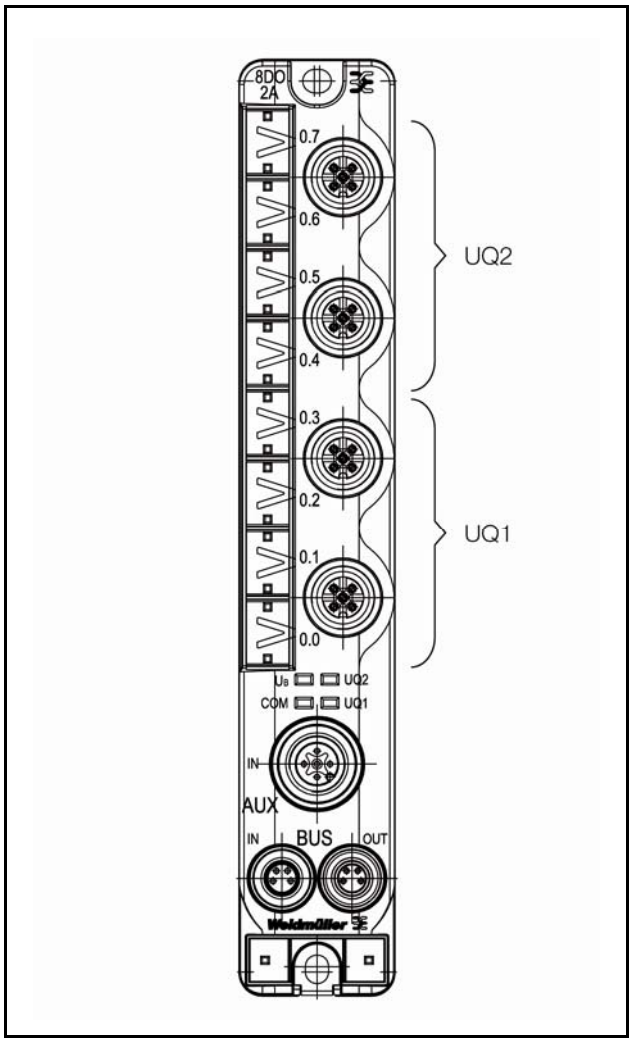


Figure 43 The assignment of outputs to the power supplies

Optical displays

The status of a digital output is shown with a yellow/ red LED.

LED OUT: 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7:

- Yellow: status of digital output from pin 4
- Red: short-circuit on digital output

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing = < 15, OFF = < 12 V DC

LED UQ1

- Green: Voltage UQ1 > 18 V DC
- Red: Voltage UQ1 < 18 V DC

LED UQ2

- Green: Voltage UQ2 > 18 V DC
- Red: Voltage UQ2 < 18 V DC

LED COM

- Green: Communication setup with the gateway I/O LED flashed for max. 20 seconds green
- Red: time-out communication

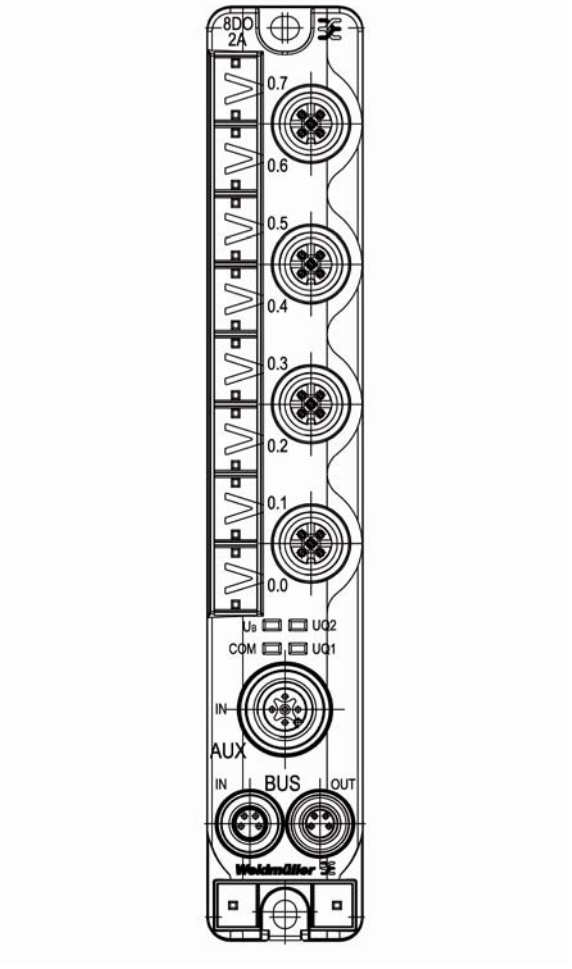


Figure 44 I/O view of M12 8DO 2A

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Digital outputs	8 channels
Plug-in stations	O1, O2, O3 and O4
Grouping	two groups for every four channels with a common earth
Driver type	Highside
Current per channel	2 A
Residual current	module 8 A
Output voltage Low	0 V
Switching capacity, resistive load	max. 100 Hz
Switching capacity, inductive load	max. 1 Hz
Switching capacity, lamp load:	max. 8 Hz
Short-circuit proof	yes, switch-off in case of short-circuit and error message
Short-circuit current	at 25 °C 5.6 A
Separation of potentials to the module electronics	none
Display elements	one yellow/red error/status LED per channel
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	175 x 30 x 32 mm
Weight	175 g
Article order number	1938680000
Article designation	SAI-AU M12 SB 8DO 2A

Table 50 Technical data for the SAI-AU M12 SB 8DO 2A

5.10 SAI-AU M12 SB 4AI

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. This enables their use in harsh environments.

The module SAI-AU M12 SB 4AI is designed to connect four analogue sensors with four M12 connectors.

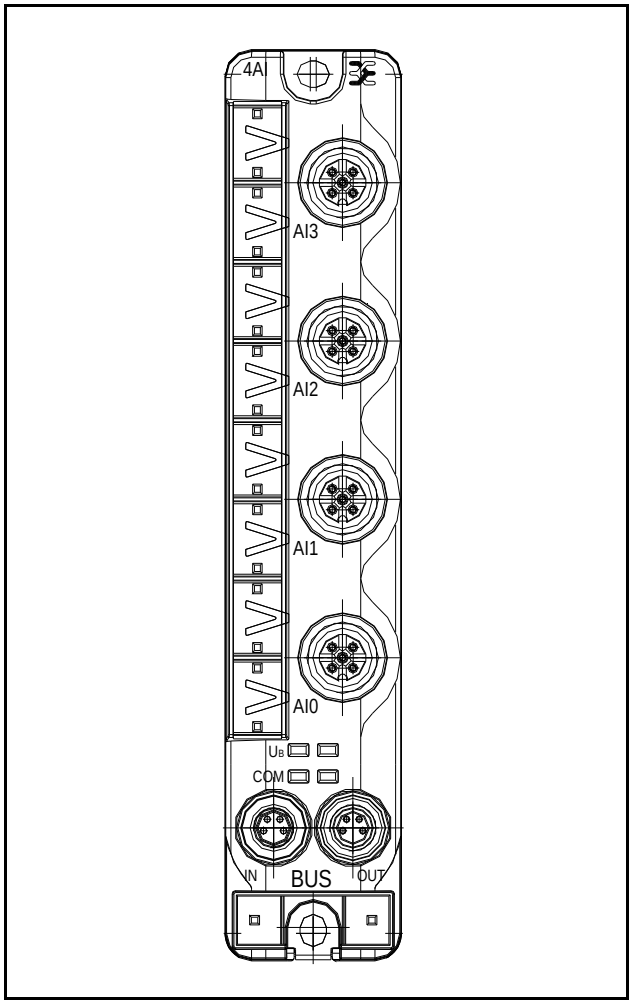


Figure 45 SAI-AU M12 SB 4AI

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB Supplies the module and the Plug-in stations 1 to 4
Com	Communication with the gateway
AI0 to AI3	Analogue inputs
Connections	
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 4	4 inputs

Table 51 SAI-AU M12 SB 4AI

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

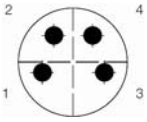


Table 52 Contact assignment for the sub-bus male connector

Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment  	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 53 Contact assignment for the sub-bus female connector

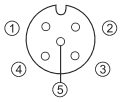
Connection for an analogue input	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment  	Pin 1: + 24 Vdc sensor power supply Pin 2: Analogue input + Pin 3: GND Pin 4: Analogue input - Pin 5: FE Housing: Shield

Table 54 Contact assignment for the analogue input

Block diagram of an analogue input

Input configuration pins 4 and 2 from each M12 female connector:

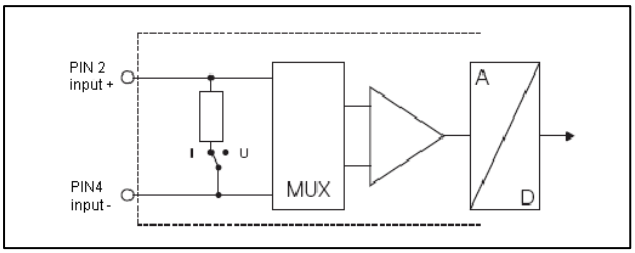


Figure 46 Block diagram of the analogue input

NOTE

A four-pole M8 male connector and a four-pole M8 female connector are used to connect the supply voltage to the sub-bus. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to forward the power further. The power supply and the analogue inputs share a common earth and are not electrically isolated.

Optical displays

The status of an analogue input is shown with a red LED.

LED IN: 0.0, 0.1, 0.2, 0.3:

- Red: short-circuit at 24 V DC
  sensor voltage pin 1

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing =< 15, OFF =< 12 V DC

LED COM

- Green: Communication setup with the gateway I/O LED flashed for max. 20 seconds green
- Red: time-out communication

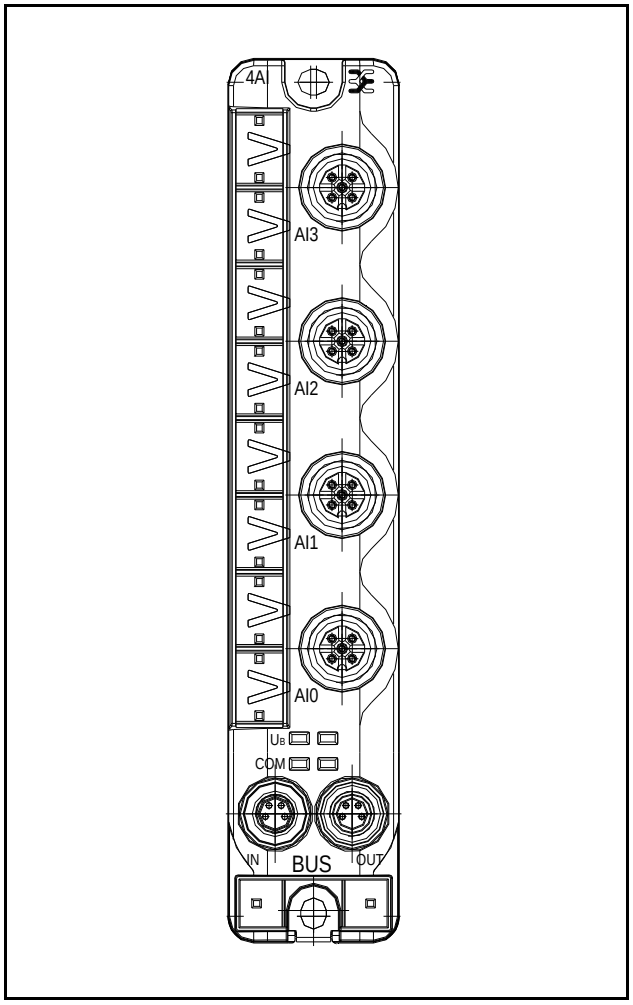


Figure 47 I/O view M12 4AI

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Analogue inputs	4 channels
Plug-in stations	AI0, AI1, AI2 and AI3
Grouping	One group for all four channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input Type	Differential measurement between pin 2 and pin 4
Sampling period	5 -250 ms adjustable per analogue input
Accuracy	< 0.2 % from the upper limit of effective range
Offset error	< 0.1 % from the upper limit of effective range
Linearity	< 0.05 %
Temperature coefficient	< 300 ppm/K of upper limit of effective range
Voltage ranges	0 to +10 V or –10 V to +10 V
Max. input voltage based on GND	± 35 V based on GND (continuous)
Input resistance	> 100 kΩ
Resolution from 0 V to +10 V	11-bit, 0 to 2047 units
Resolution from -10 V to +10 V	12-bit, 0 to 4095 units
Nominal value	2047 units and 4095 units respectively
Current ranges	0 to 20 mA or 4 to 20 mA
Max. input current, differential	-50 to +50 mA
Input resistance	< 125 Ω
Resolution 0 to 20 mA	12-bit, 0 to 4095 units
Resolution 4 to 20 mA	12-bit, 819 to 4095 units, with evaluation of diagnosis when current falls below 4 mA
Nominal value	4095 units

Technical data	
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	155 x 30 x 32 mm
Weight	150 g
Article order number	1938690000
Article designation	SAI-AU M12 SB 4AI

Table 55 Technical data, SAI-AU M12 SB 4AI

5.11 SAI-AU M12 SB 4AO

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. This enables their use in harsh environments.

The module SAI-AU M12 SB 4AO is designed to connect four analogue actuators with four M12 connectors.

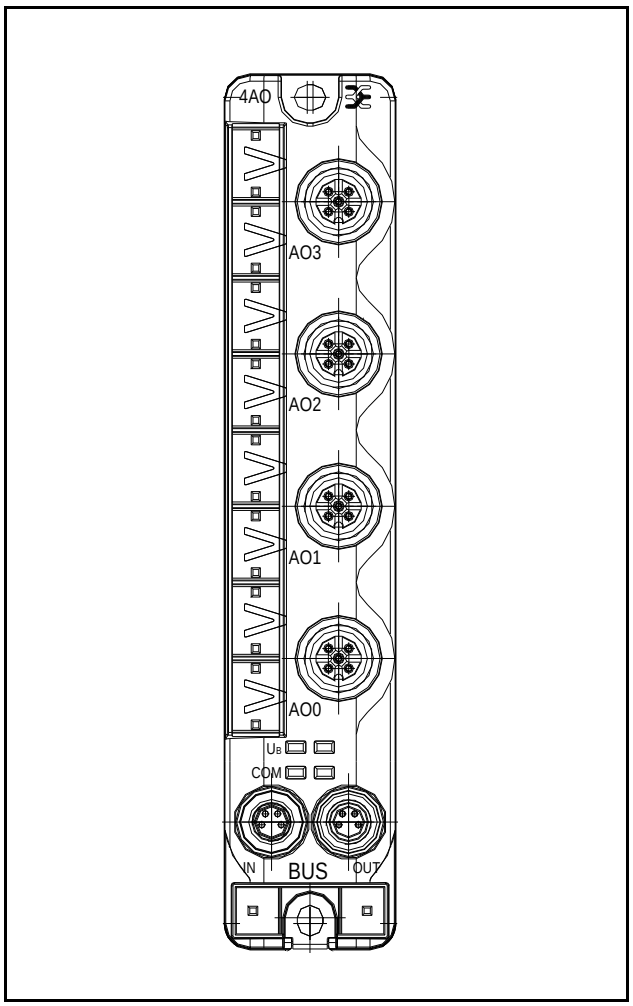


Figure 48 SAI-AU M12 SB 4AO

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB Supplies the module and the Plug-in stations 1 to 4
Com	Communication with the gateway
AO0 to AO3	Analogue outputs
Connections	
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 4	4 inputs

Table 56 SAI-AU M12 SB 4AI

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

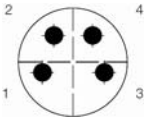
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 57 Contact assignment for the sub-bus male connector

Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 58 Contact assignment for the sub-bus female connector

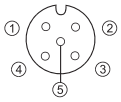
Connection for an analogue output	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc actuator voltage / 140 mA / max. at 20°C Pin 2: Analogue output voltage Pin 3: GND Pin 4: Analogue output current Pin 5: PE Housing: Shield

Table 59 Contact assignment for the analogue output

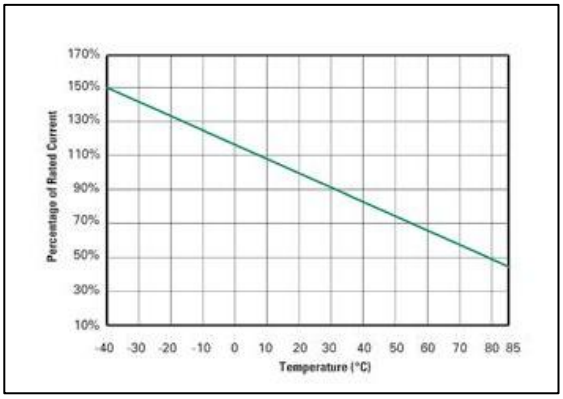


Figure 49 Temperature curve

Block diagram of an analogue output

Output wiring of pins 4 and 2 for each M12 female connector:

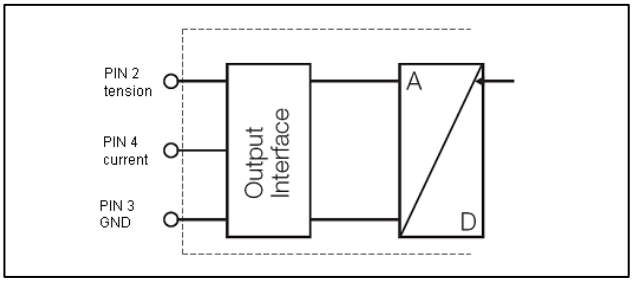


Figure 50 Block diagram of the analogue output

NOTE

A four-pole M8 male connector and a four-pole M8 female connector are used to connect the supply voltage to the sub-bus. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to forward the power further. The power supply and the analogue outputs share a common earth and are not electrically isolated.

The choice of the output signal (current or voltage) is made by selecting the pins. The current or voltage range is selected in the configurator of the manufacturer of the controls.

Optical displays

The status of an analogue output is shown with a yellow/red LED.

LED IN: 0.0, 0.1, 0.2, 0.3:

- Red: short-circuit at 24 V DC
  sensor voltage pin 1

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing =< 15, OFF =< 12 V DC

LED COM

- Green: Communication setup with the gateway I/O LED flashed for max. 20 seconds green
- Red: time-out communication

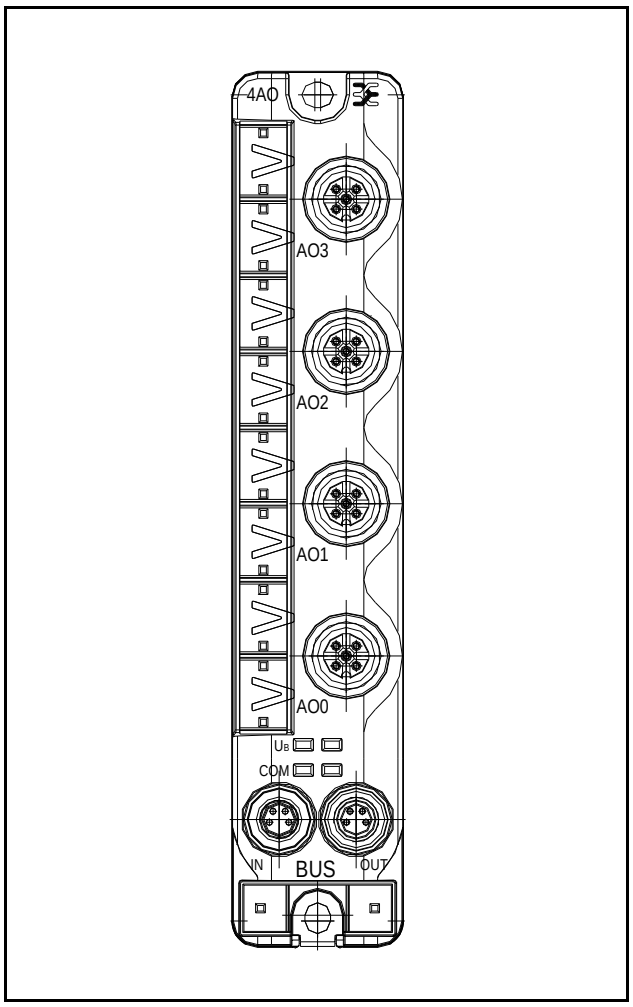


Figure 51 I/O view M12 4AO

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Analogue outputs	4 channels
Plug-in stations	AO0, AO1, AO2 and AO3
Output interval	5-250 ms adjustable per analogue output
Accuracy	< 0.2 % from the upper limit of effective range
Offset error	< 0.1 % from the upper limit of effective range
Linearity	< 0.05 %
Temperature coefficient	< 300 ppm/K of upper limit of effective range
Voltage ranges	0 to +10 V or –10 V to +10 V
Load resistance	1 kΩ
Resolution from 0 V to +10 V	11-bit, 0 to 2047 units
Resolution from -10 V to +10 V	12-bit, 0 to 4095 units
Output	asymmetric (pin 2)
Current ranges	0 to 20 mA or 4 to 20 mA
Load resistance	< 600 Ω
Resolution 0 to 20 mA	11-bit, 0 to 2047 units
Resolution 4 to 20 mA	12-bit, 819 to 4095 units
Output	asymmetric (pin 4)
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	155 x 30 x 32 mm
Weight	150 g
Article order number	1938700000
Article designation	SAI-AU M12 SB 4AO

Table 60 Technical data, SAI-AU M12 SB 4AO

5.12 SAI-AU M12 SB 4THERMO

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. This enables their use in harsh environments.

The module SAI-AU M12 SB 4THERMO is designed to connect four thermocouples with four M12 connectors.

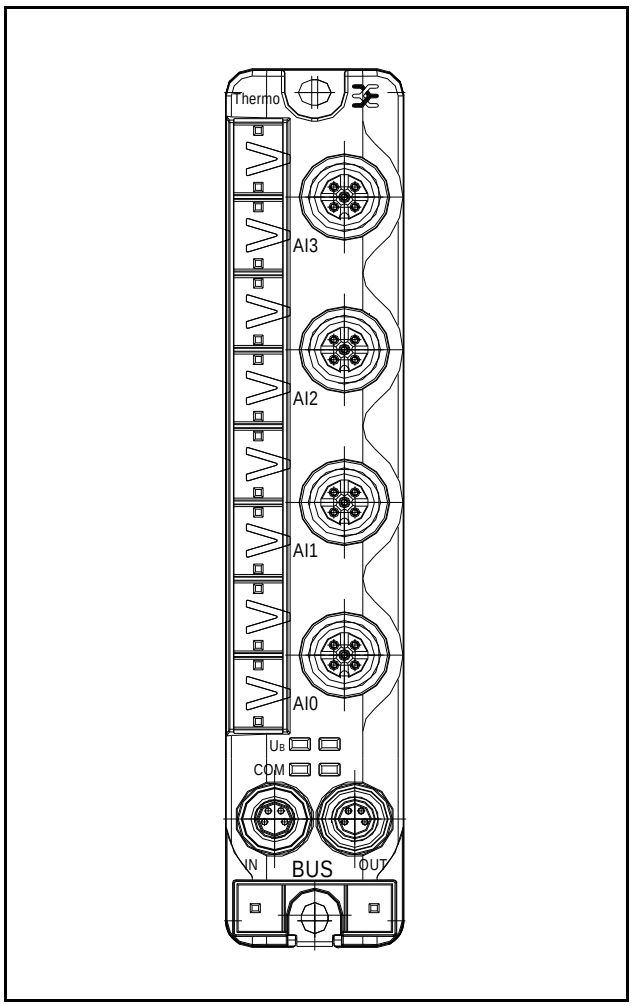


Figure 52 SAI-AU M12 SB 4THERMO

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB Supplies the module and the Plug-in stations 1 to 4
Com	Communication with the gateway
AI0 to AI3	Analogue inputs
Connections	
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 4	4 inputs

Table 61 SAI-AU M12 SB 4THERMO

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

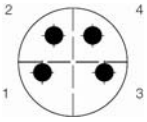
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 62 Contact assignment for the sub-bus male connector

Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment  	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 63 Contact assignment for the sub-bus female connector

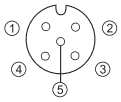
Connection for an analogue input	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment  	Pin 1: Compensation + Pin 2: Analogue input + Pin 3: Compensation - Pin 4: Analogue input - Pin 5: FE Housing: Shield

Table 64 Contact assignment for the analogue input

Block diagram of an analogue input

Input configuration pins 4 and 2 from each M12 female connector:

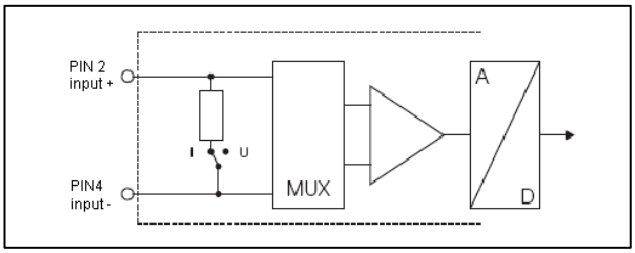


Figure 53 Block diagram of the analogue input

NOTE

A four-pole M8 male connector and a four-pole M8 female connector are used to connect the supply voltage to the sub-bus. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to forward the power further. The power supply and the thermo inputs are electrically isolated.

Optical displays

The status of a thermo input is shown with a red LED.

LED IN: 0.0, 0.1, 0.2 and 0.3:

- Red: Exceeding the measurement range / Wire breakage

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing =< 15, OFF =< 12 V DC

LED COM

- Green: Communication setup with the gateway I/O LED flashed for max. 20 seconds green
- Red: time-out communication

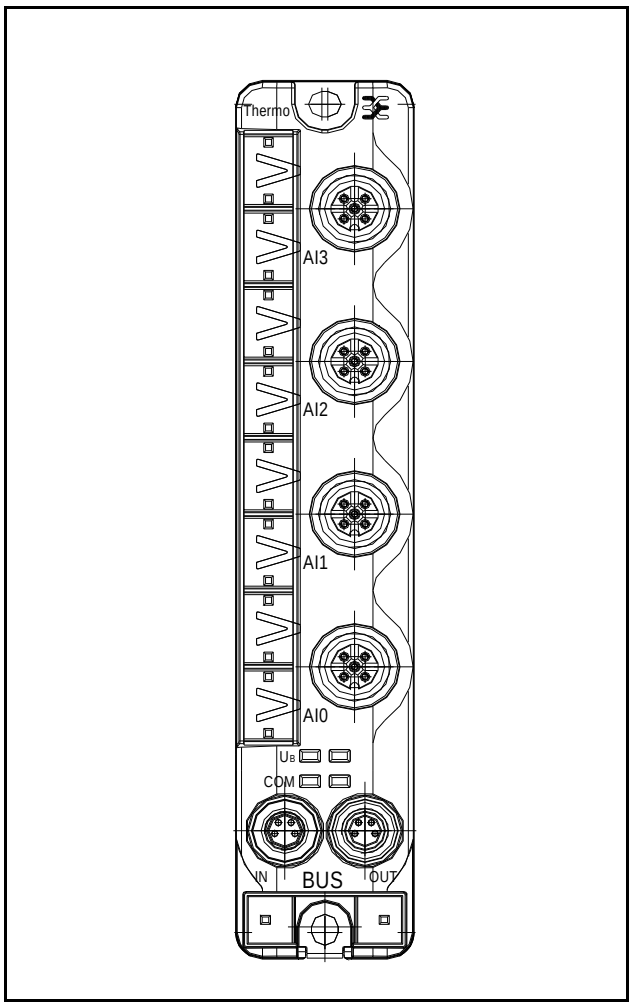


Figure 54 I/O view M12 4ATHERMO

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Analogue inputs	4 channels
Plug-in stations	AI0, AI1, AI2 and AI3
Grouping	one group for four channels
Permissable common-mode voltage	+/- 50V
Permissible input voltage	-3 V DC to +3 V DC (protected against polarity reversal)
Sensor types	types J, K, L, B, E, N, R, S, T, U, +/-15mV…+/-250mV
Sampling period	54-620 ms adjustable per analogue input
Accuracy	< 0.5 % from the upper limit of effective range
Temperature coefficient	< 300 ppm/K of upper limit of effective range
Cold-junction compensation	external PT1000 connection on pin 1 and pin 3
Sensor current for PT1000	0.2mA
Resolution of thermocouple	0.1 °C
Resolution -mV-range	depending on range, 0.5 - 8uV
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	155 x 30 x 32 mm
Weight	150 g
Article order number	1938720000
Article designation	SAI-AU M12 SB 4THERMO

Table 65 Technical data, SAI-AU M12 SB 4THERMO

5.13 SAI-AU M12 SB 4PT100

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. This enables their use in harsh environments.

The module SAI-AU M12 SB 4PT100 is designed to connect four thermocouples with four M12 connectors.

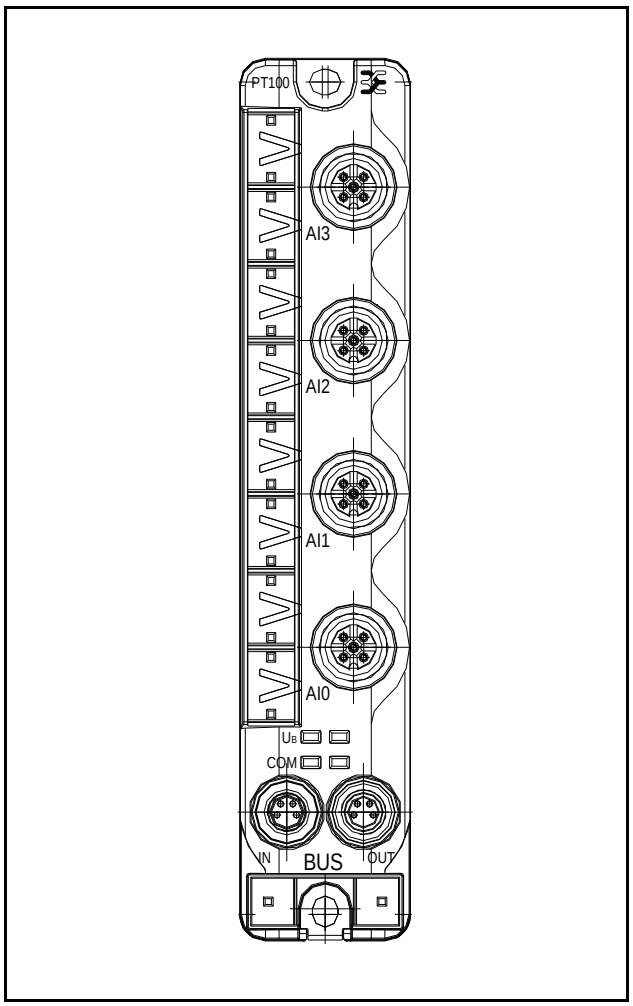


Figure 55 SAI-AU M12 SB 4PT100

HINWEIS

After a change of the Subbus modules is in many situations a new start of the gateway necessary.

LEDs	
UB	Supply voltage UB Supplies the module and the Plug-in stations 1 to 4
Com	Communication with the gateway
AI0 to AI3	PT100 inputs
Connections	
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
1 to 4	4 inputs

Table 66 SAI-AU M12 SB 4PT100

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

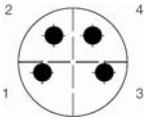
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment	 Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 67 Contact assignment for the sub-bus male connector

Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 68 Contact assignment for the sub-bus female connector

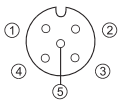
Connection for an analogue input	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment 	Pin 1: +24 V DC Pin 2: Input + Pin 3: GND Pin 4: Input – Pin 5: Shield

Table 69 Contact assignment for the analogue input

Block diagram of an analogue input

Input configuration pins 4 and 2 from each M12 female connector:

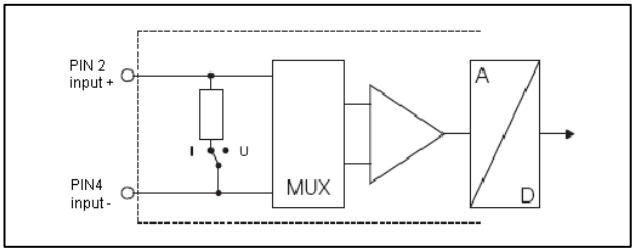


Figure 56 Block diagram of the analogue input

NOTE

A four-pole M8 male connector and a four-pole M8 female connector are used to connect the supply voltage to the sub-bus. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to forward the power further. The power supply and the PT100 inputs are electrically isolated.

Optical displays

The status of an analogue input is shown with a yellow/red LED.

LED IN: 0.0, 0.1, 0.2, 0.3:

- Red: Exceeding the measurement range / Wire breakage

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing =< 15, OFF =< 12 V DC

LED COM

- Green: Communication setup with the gateway I/O LED flashed for max. 20 seconds green
- Red: time-out communication

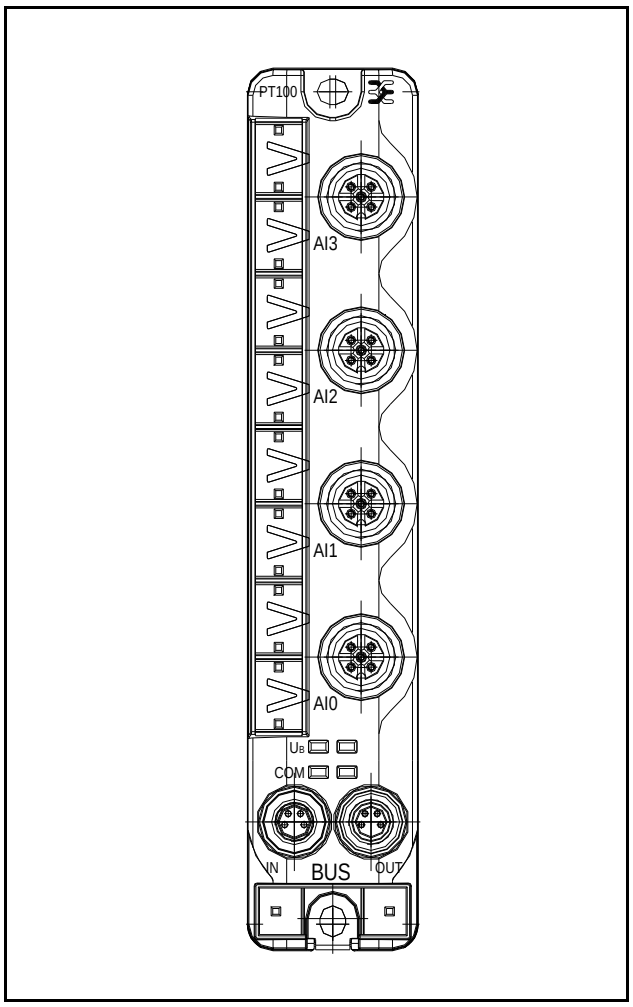


Figure 57 I/O view M12 4PT100

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	yes
Current input	module approx. 50 mA
Analogue inputs	4 channels
Plug-in stations	AI0, AI1, AI2 and AI3
Grouping	One group for four channels
Permissable common-mode voltage	+/- 50V
Permissible input voltage	-3 V DC to +3 V DC
Input Type	PT100, PT200, PT500, PT1000, NI100, NI120, NI1000, 500Ω, 5kΩ, Potentiometer 100-500Ω, Poti 500-5kΩ, Poti > 5kΩ, No Sensor
Sampling period	54-620 ms adjustable per analogue input
Accuracy	< 0.5 % from the upper limit of effective range
Temperature coefficient	< 300 ppm/K of upper limit of effective range
Sensor current	depending on input type, 0.2mA or 0.5mA
Resolution of temperature sensors	0.1 °C
Resolution of resistant measurement range	500 Ω: 0.01 Ω 5kΩ: 0.1Ω
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions L x W x H	155 x 30 x 32 mm
Weight	150 g
Article order number	1938710000
Article designation	SAI-AU M12 SB 4PT100

Table 70 Technical data, SAI-AU M12 SB 4PT100

5.14 SAI-AU M12 SB 2CNT

The SAI distributor Active Universal is equipped with the functions of a decentralised I/O system. Each distributor is equipped with module-specific actuator/sensor functions and a sub-bus interface. The modules combine the complete electronics in a water- and dust-proof protected housing. This enables their use in harsh environments. The module SAU-AU M12 SB 2CNT is designed to connect two digital signals for counting purpose with four M12 connectors.

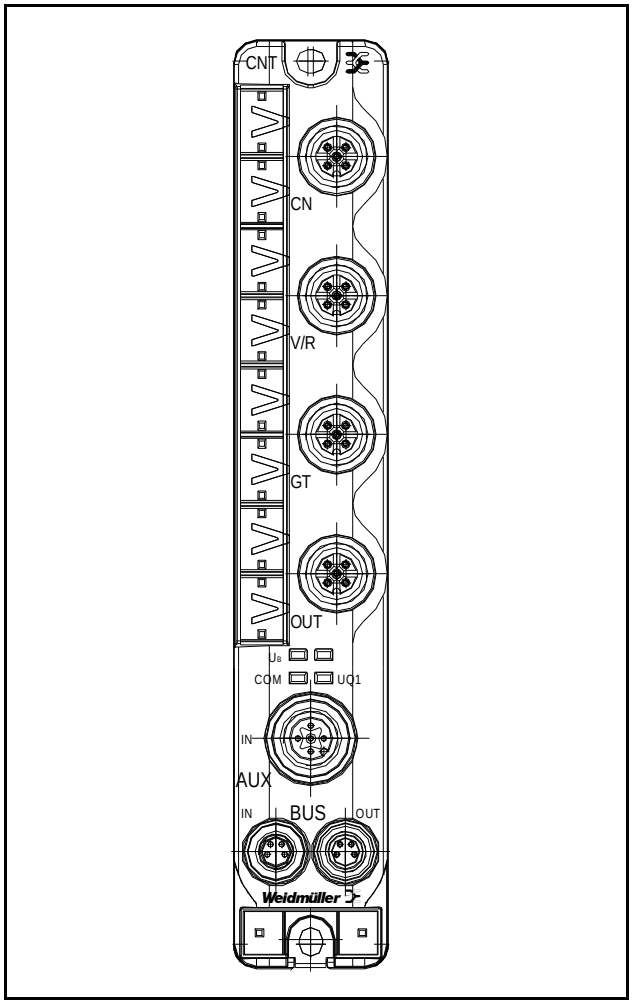


Figure 58 SAI-AU M12 SB 2CNT

HINWEIS

After a fallout, mistake or restart, the ouptput bytes must be reset over the software. The counter clearance of the gateways is to be made with the corresponding bits in the counter channel (chapter 6.6.9). If the output data be changed, the bit 7 in the counter channel needs to be changed from 1 into 0.

LEDs	
UB	Supply voltage UB Supplies the module and the Plug-in stations 1 to 4
Com	Communication with the gateway
CN	Status of counter channels
V/R	Direction of counter channels
GT	Gate status of channels
OUT	Status of digital outputs
Connections	
SUB IN	Sub-bus input
SUB OUT	Sub-bus output
AUX	Auxiliary supply for digital outputs
1	2 digital outputs of both channels
2	Gate input for both channels
3	Direction input for both channels
4	Counter input for both channels

Table 71 SAI-AU M12 SB 2CNT

Connection of supply voltage

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The dis-tributor is designed to offer protection against polarity reversal.

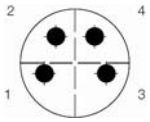
Module connection from SUB-IN	
Contact system	M8 male connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 72 Contact assignment for the sub-bus male connector

Module connection from SUB-OUT	
Contact system	M8 female connector, 4-pole
Coding	-
Pin assignment 	Pin 1: + 24 Vdc Pin 2: Data + Pin 3: GND Pin 4: Data - Housing: Shield, connected with the FE

Table 73 Contact assignment for the sub-bus female connector

Connection of auxiliary supply for outputs

The power supply is 24 V DC in accordance with EN 61131-2; the permissible range is 18 to 30 V DC. The distributor is designed to offer protection against polarity reversal.

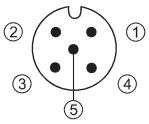
Module connection of AUX-IN	
Contact system	M12 male connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 Vdc UQ1 Pin 2: + 24Vdc UQ1 Pin 3: GND UQ1 Pin 4: GND UQ1 Pin 5: PE Housing: ground, connected with the FE

Table 74 Contact assignment for auxiliary supply

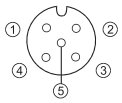
Connection for OUT connector	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment 	Pin 1: + 24 V Pin 2: DO2 Pin 3: GND Pin 4: DO1 Pin 5: Shield Housing: ground, connected with the FE

Table 75 Contact assignment for the OUT connector

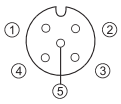
Connection for GT connector	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment  	Pin 1: + 24 V Pin 2: GT2 Pin 3: GND Pin 4: GT1 Pin 5: Shield Housing: ground, connected with the FE

Table 76 Contact assignment for the GT connector

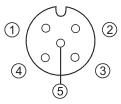
Connection for V/R connector	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment  	Pin 1: + 24 V Pin 2: V/R2 Pin 3: GND Pin 4: V/R1 Pin 5: Shield Housing: ground, connected with the FE

Table 77 Contact assignment for the V/R connector

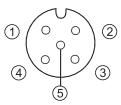
Connection for CN connector	
Contact system	M12 female connector, 5-pole
Coding	A
Pin assignment  	Pin 1: + 24 V Pin 2: CLK2 Pin 3: GND Pin 4: CLK1 Pin 5: Shield Housing: ground, connected with the FE

Table 78 Contact assignment for the CN connector

Block diagram of the counter

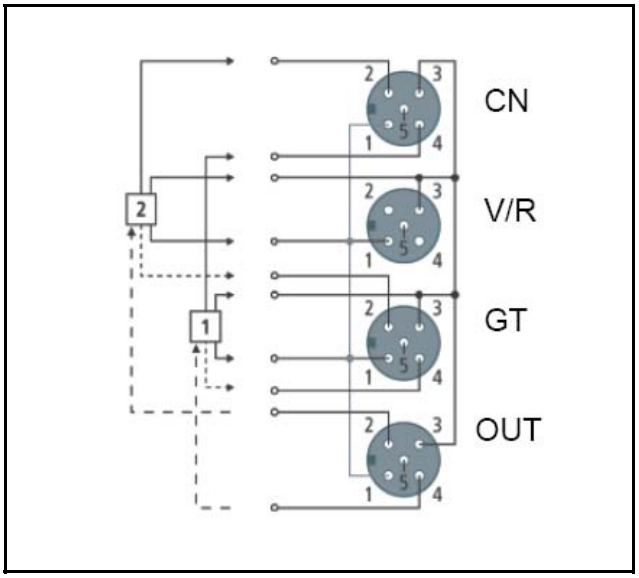


Figure 59 Block diagram of the counter

NOTE

A four-pole M8 male connector and a four-pole M8 female connector are used to connect the supply voltage to the sub-bus. Use the SUB-IN connection to feed in the power supply and the SUB-OUT connection to forward the power further.

Optical displays

The status of the OUT connector is shown with a yellow/red LED. The status of the GT, V/R and CN connectors is shown with a yellow/green LED.

LED OUT: Out 1, Out 2

- Red: Output failure with associated output, in case of a sensor supply overload on any of the 4 connectors both LEDs are red
- Yellow: Output is enabled

LED GT: GT1, GT2

- Green: Counter channel is clear for counting
- Yellow: Counter channel not released

LED V/R: V/R1, V/R2

- Green: Positive counting direction
- Yellow: Negative counting direction

LED CN: CN1, CN2

- Blinks green: Counting input is active (24 voltage level)
- Blinks yellow: Counting input is active (when quadrature counting is enabled)

LED UB

- Green: Voltage > 18 V DC
- Red: Voltage < 18, 0.5 Hz flashing =< 15, OFF =< 12 V DC

LED COM

- Green: Communication setup with the gateway I/O LED flashed for max. 20 seconds green
- Red: time-out communication

Technical data	
Supply voltage	24 V DC
Limit values	18 V DC to 30 V DC
Contact load	per pin 3 A
Reverse polarity protection	Yes
Current input	module approx. 50 mA
Digital inputs	6 channels
Plug-in stations	GT1, GT2, V/R1, V/R2, CN1, CN2
Grouping	one group for all six channels with a common earth
Permissible input voltage	-30 V DC to +30 V DC (protected against polarity reversal)
Input level Low	< 5 V DC acc. to EN 61131-2 Type 1
Input level High	> 15 V DC acc. to EN 61131-2 Type 1
Input current Low	< 15 mA acc. to EN 61131-2 Type 1
Input current High	2 mA to 15 mA acc. to EN 61131-2 Type 1
Max. input frequency	100 kHz
Separation of potentials to the module electronics	None
Display elements	one yellow/green error/status LED per channel
Counter Channels	2 channels
Counter Width	32 bit
Switching frequency	Max. 100kHz, 2kHz when direction changes
Supported counter modes	Normal operation, quadrature counting mode
Current ranges	2 outputs (one per channel)
Plug-in stations	OUT1, OUT2
Grouping	one group for all 2 output channels with a common earth
Driver type	Highside
Current per channel	0.5 A
Residual current	module 4 A
Output voltage Low	0 V
Switching capacity, resistive load	max. 100 Hz
Switching capacity, inductive load	max. 1 Hz
Switching capacity, lamp load:	max. 8 Hz

Technical data	
Short-circuit proof	yes, switch-off in case of short-circuit and error message
Short-circuit current	at 25 °C 1.4 A
Separation of potentials to the module electronics	None
Display elements	one yellow/red error/status LED per channel
General technical data:	
Ambient temperature during operation	0 to +60 °C acc. to EN 61131-2
Ambient temperature during storage	-25 to +85 °C acc. to EN 61131-2
Protection class	IP65 / IP67
Dimensions	L x W x H, 155 x 30 x 32 mm
Weight	175 g
Article order number	1938730000
Article designation	SAI-AU M8 SB 2CNT

Table 79 Technical data, SAI-AU M12 SB 2CNT

6. Commissioning the PROFIBUS-DP

6.1 The device database file (GSD) and bitmap files

GSD files (device database files)

GSD files are the electronic data sheets of a device that provide a PROFIBUS master with straightforward information about the characteristics of the PROFIBUS DP field device.

Including other information, these files describe:

- The supported transmission rates
- The length of the input and output data to be exchanged
- The meaning of the diagnostics parameters and the application parameters
- The field device type
- The supported services

The files are made available with the file extension gsd.

The following data is valid for the SAI-AU M12 PB GW 16DI PROFIBUS gateway:

ID number: 0A74

Bitmap files

Symbols are made available for display in the hardware configurator. The name of the bitmap file for normal operations is WIAUPRON.DIB. The name of the bitmap file for diagnostics is WI-AUPROS.DIB.

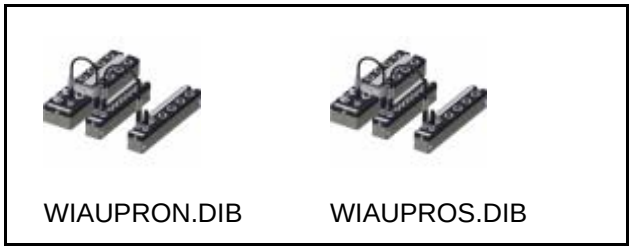


Figure 60 Bitmaps for hardware configurator

NOTE

How the GSD and bitmap files are used and their memory location depends on the configuration tool being used.

Hardware configuration is explained below, based on an example using the programming software Simatic® Step7.

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6.2 Copy the GSD files to the local directory

The GSD files are available for downloading free of charge from Weidmueller's homepage, http://www.weidmueller.com/54266/Downloads/Software/SAI-Active-Data/cw_index.aspx?newsid=

The memory location of the GSD files is determined by the installation routine of the Step7 programme. Usually, this is below the installation directory \Step7\S7DATA\GSD.

The necessary bitmap files are copied into the \Step7\S7DATA\NSBMP directory.

6.3 Install the GSD files in Step7

1 Open the respective project in the programme Step7 and select the hardware configuration.

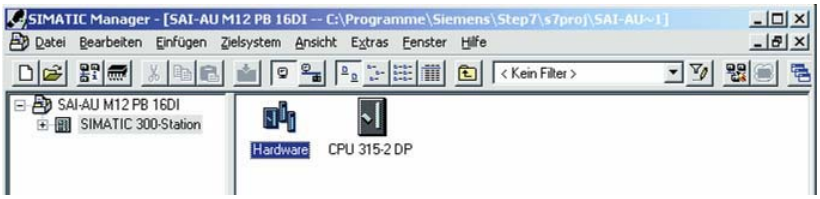

Figure 61 Installing the GSD file: step 1

	NOTE
	Close all Step7 applications before continuing with the following commands.

2 Select the command Extras > Refresh Catalogue to update the contents of the catalogue in the hardware configurator.

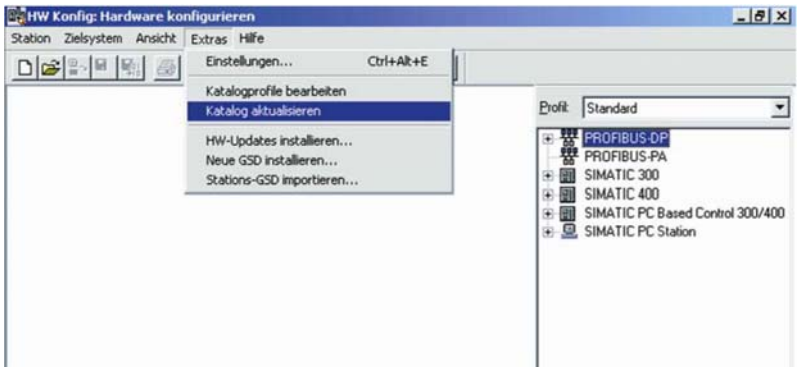

Figure 62 Installing the GSD file: step 2

When selecting the PROFIBUS-DB device, look under

PROFIBUS-DP => Additional field devices => WIN SAI-AU for the Weidmueller SAI modules.

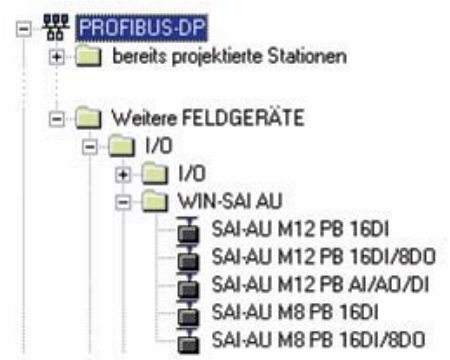

Figure 63 The Weidmueller SAI module

6.4 Adding an SAI module in the hardware configurator

The hardware configuration with a PROFIBUS DP enabled central processing unit (CPU 315-2 DP) has been launched and a PROFIBUS DP master system has been defined for this CPU.

You can now add individual devices to the PROFIBUS DP master system.

1 Drag the gateway from the slide (right column) in the middle of the window.

The gateway can be found as SAI-AU Mx PB GW 16DI.

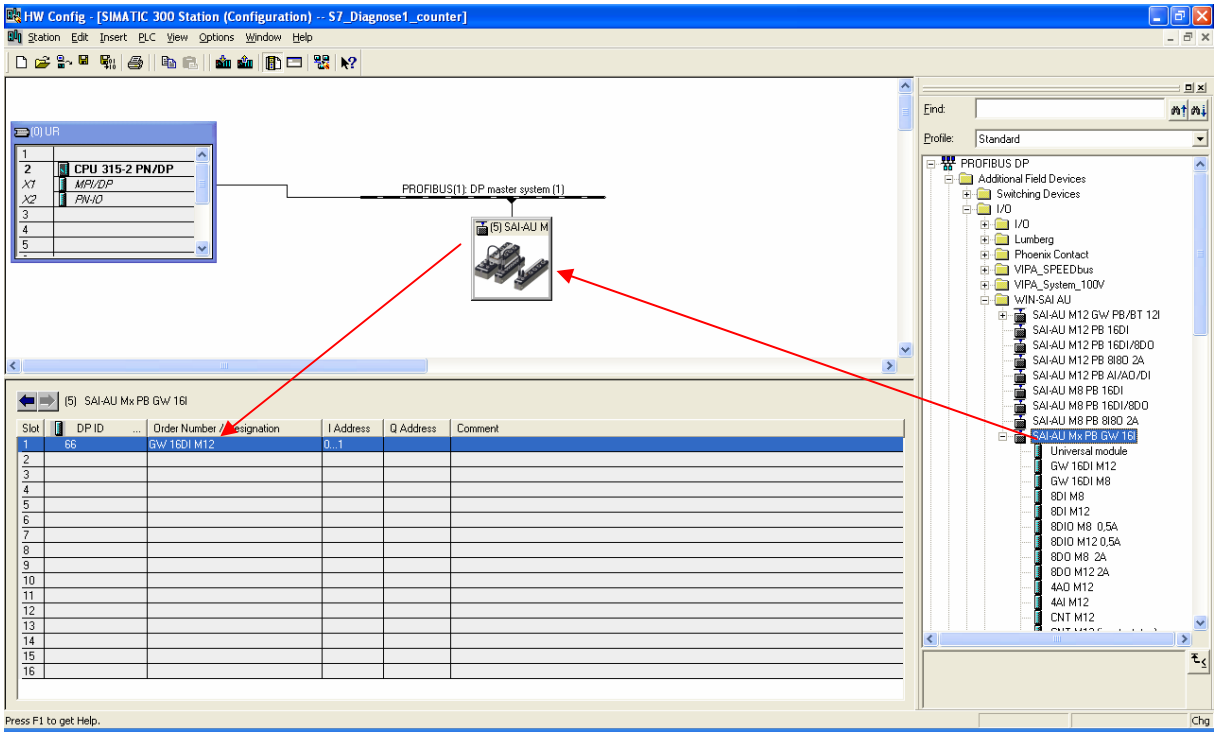

Figure 64 Hardware configurator

2 A pop-up window opens in which the PROFIBUS address can be assigned.

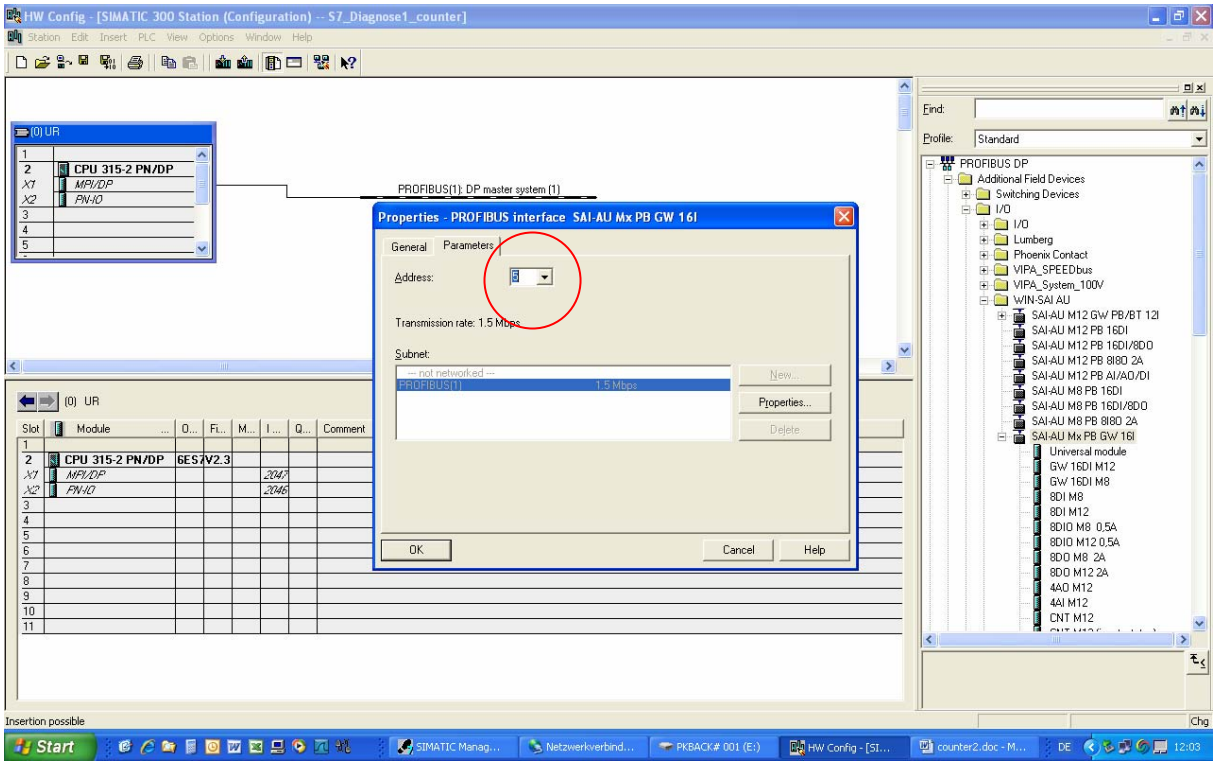

Figure 65 setting PROFIBUS address

	NOTICE
	Assign each PROFIBUS address only once. The sub-bus modules must be added in the same order that they are physically associated with the gateway.

3 You can add the individual sub-bus devices under the SAI-AU M12 GW 16DI folder.

6.4.1 Adding an Subbus module

Example SAI-AU M12 SB M12 CNT

The hardware configuration with a PROFIBUS DP enabled central processing unit (CPU 315-2 DP) has been launched and a PROFIBUS DP master system has been defined for this CPU.

1 Select by double click the CNT M12 module to paste it in the professional PROFIBUS DP master system.

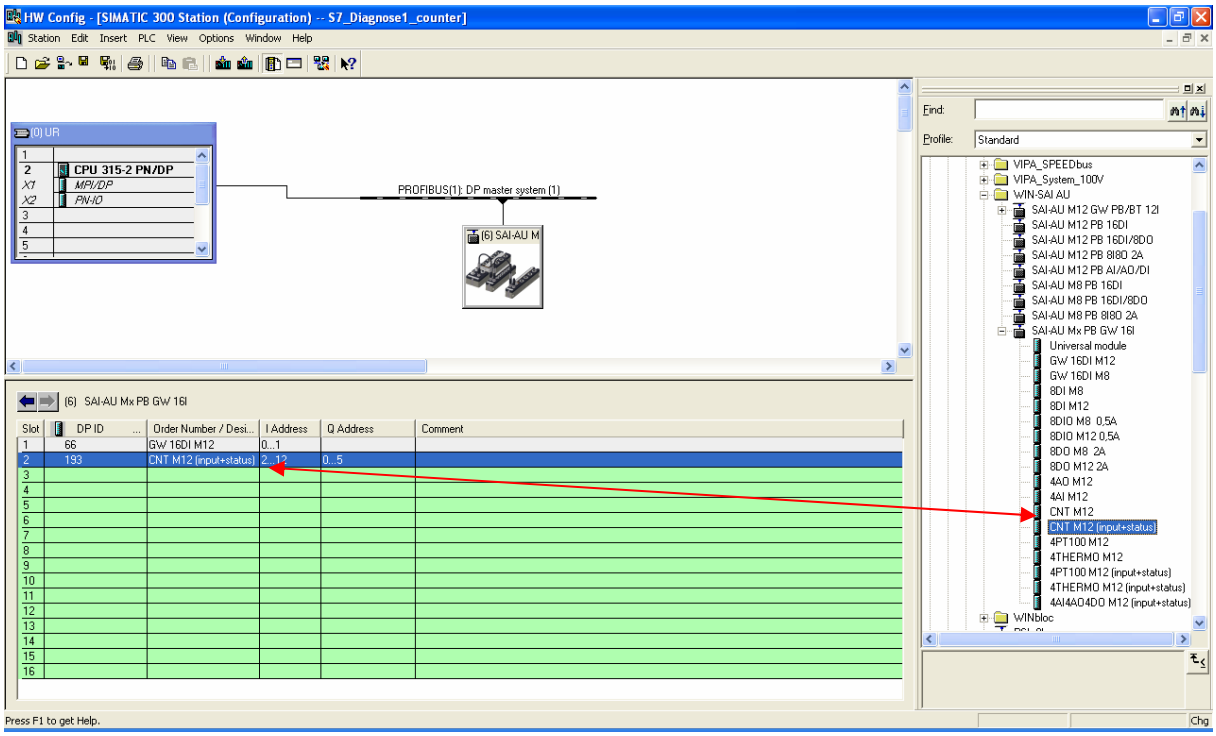

Figure 66 Configuration

2 Select by double click the slave in the table to set the assembly properties (e.g., the parametres).

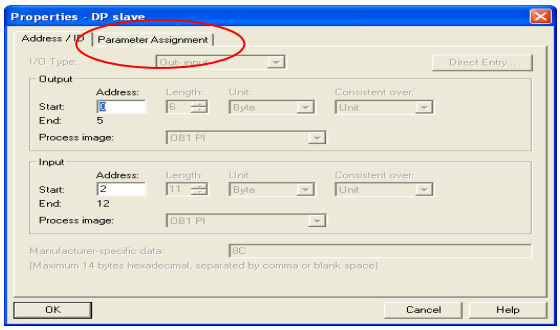

Figure 67 window address / ID

3 Select the slide „Device-specific parameters“.

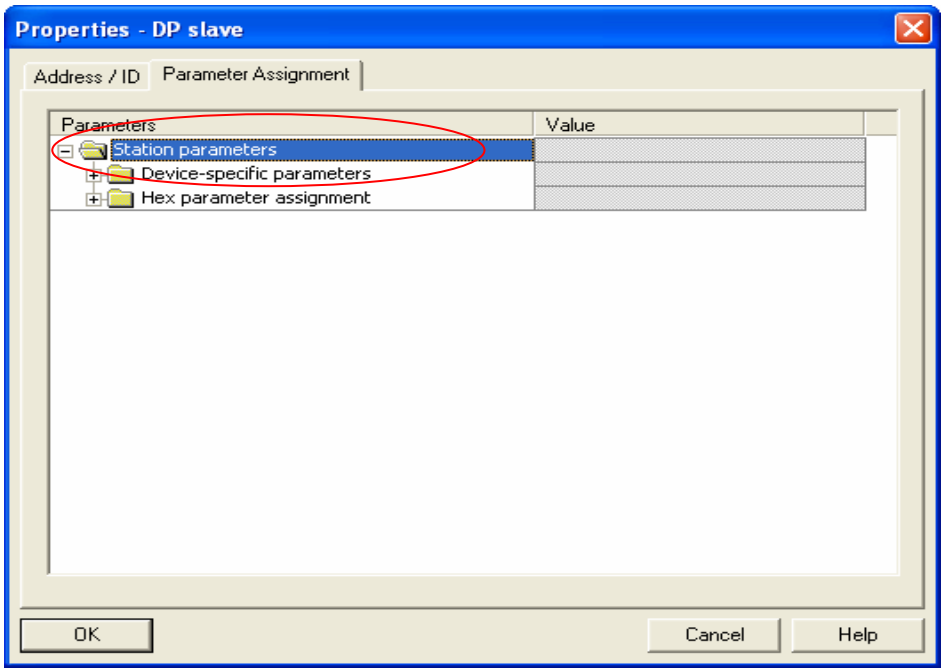

Figure 68 slide „Device-specific parameters“

4 Set the invert direction ON (ON = forward / OFF = backward)

The LED flashes green (See page 90 LED V/R.

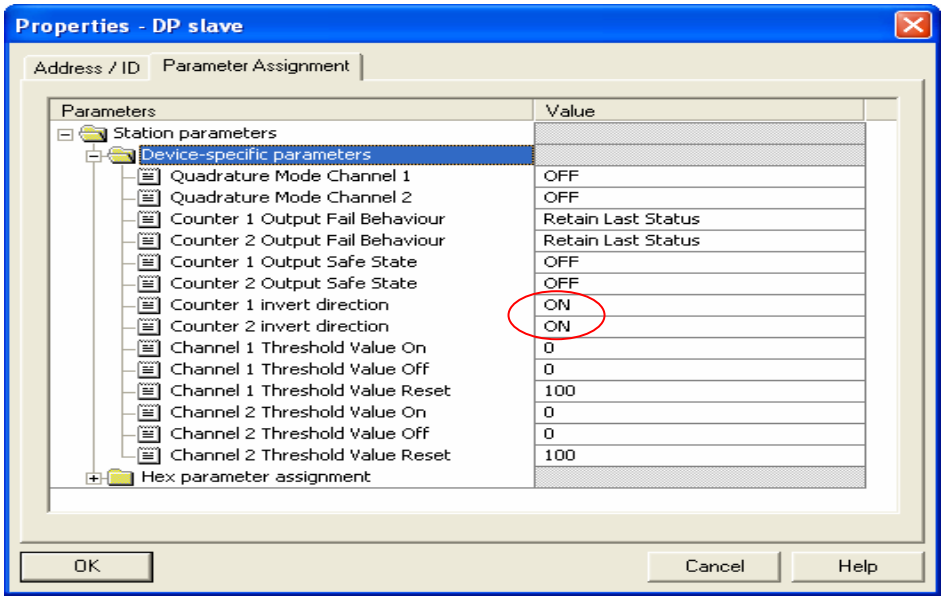

Figure 69 invert direction

5 Set the counter 1+2 endpoint - 100. The counter is counting to 100 and then the counter is setting to 0.

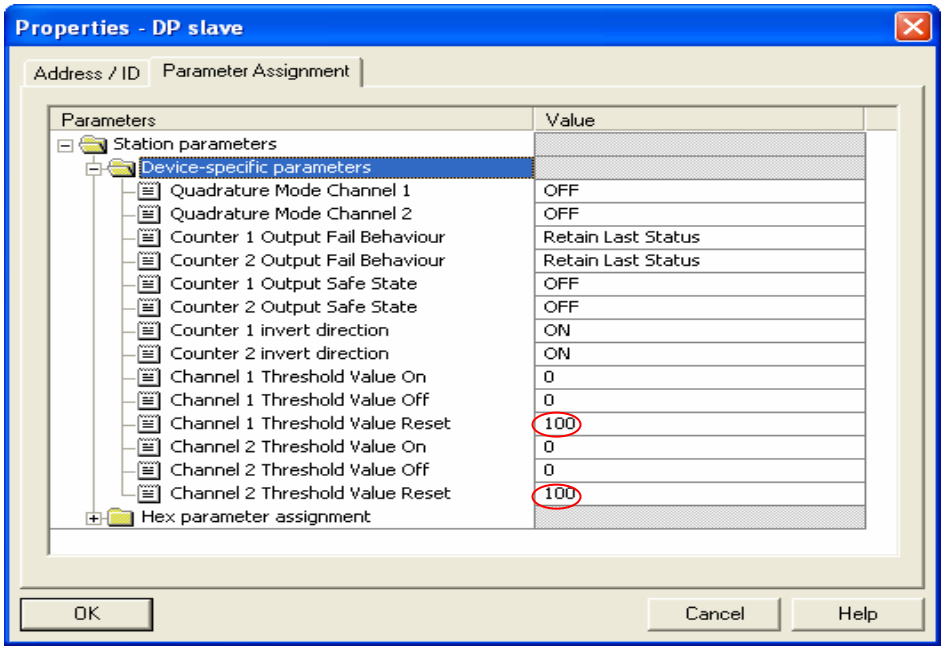

Figure 70 device-specific parameters

6 Go online to the PLC to compare data.

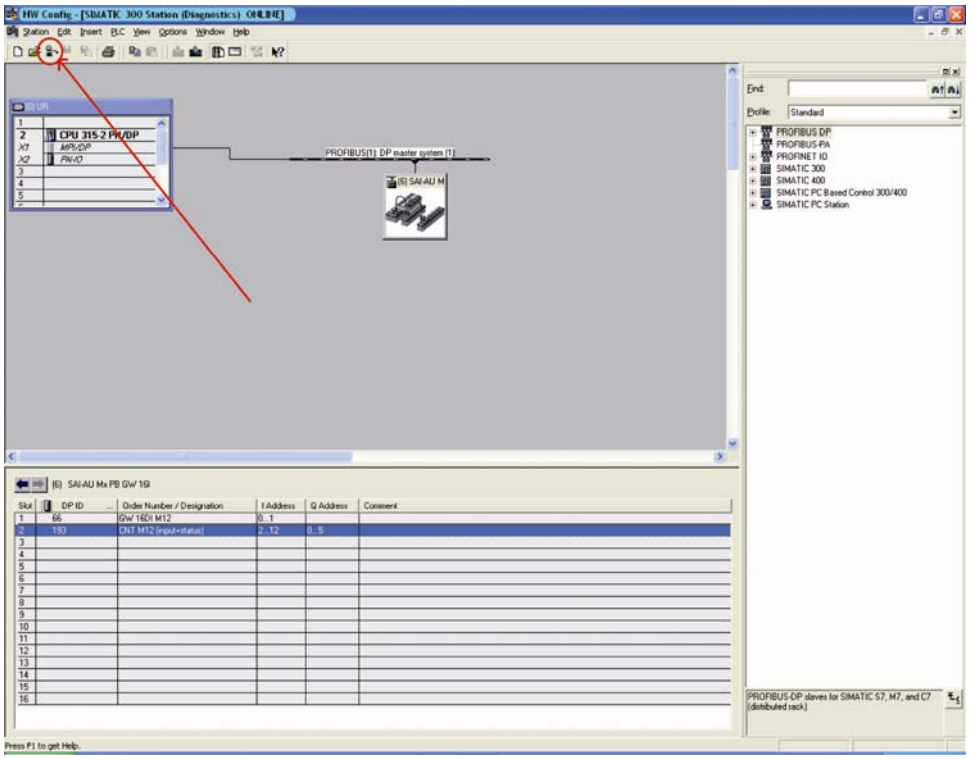

Figure 71 connection with PLC

7 Click with the right mouse button to the counter to compare the counter values.

It open the Monitor/Modify window.

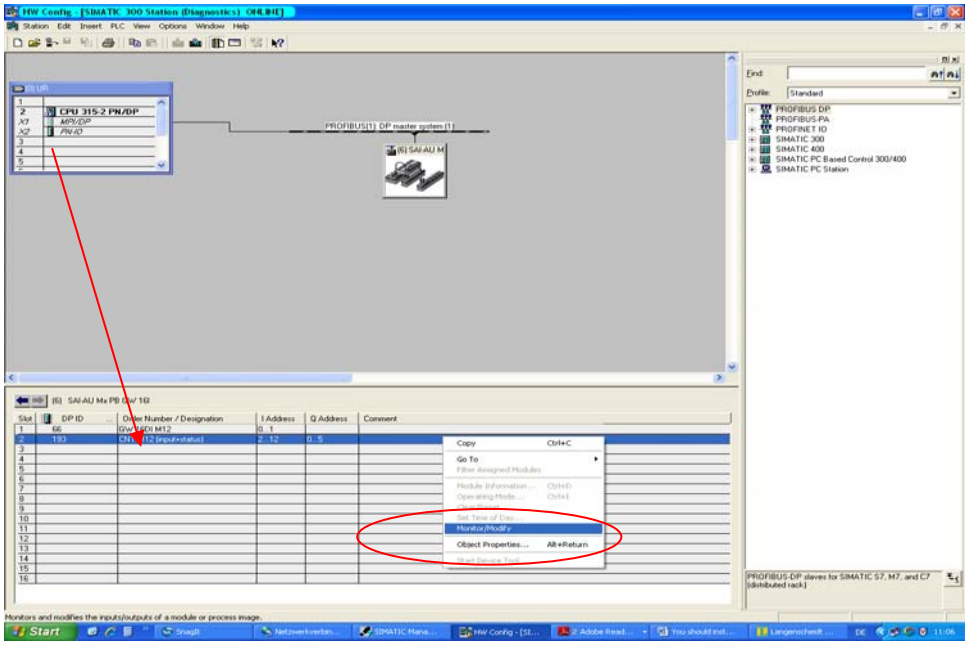

Figure 72 counter activate

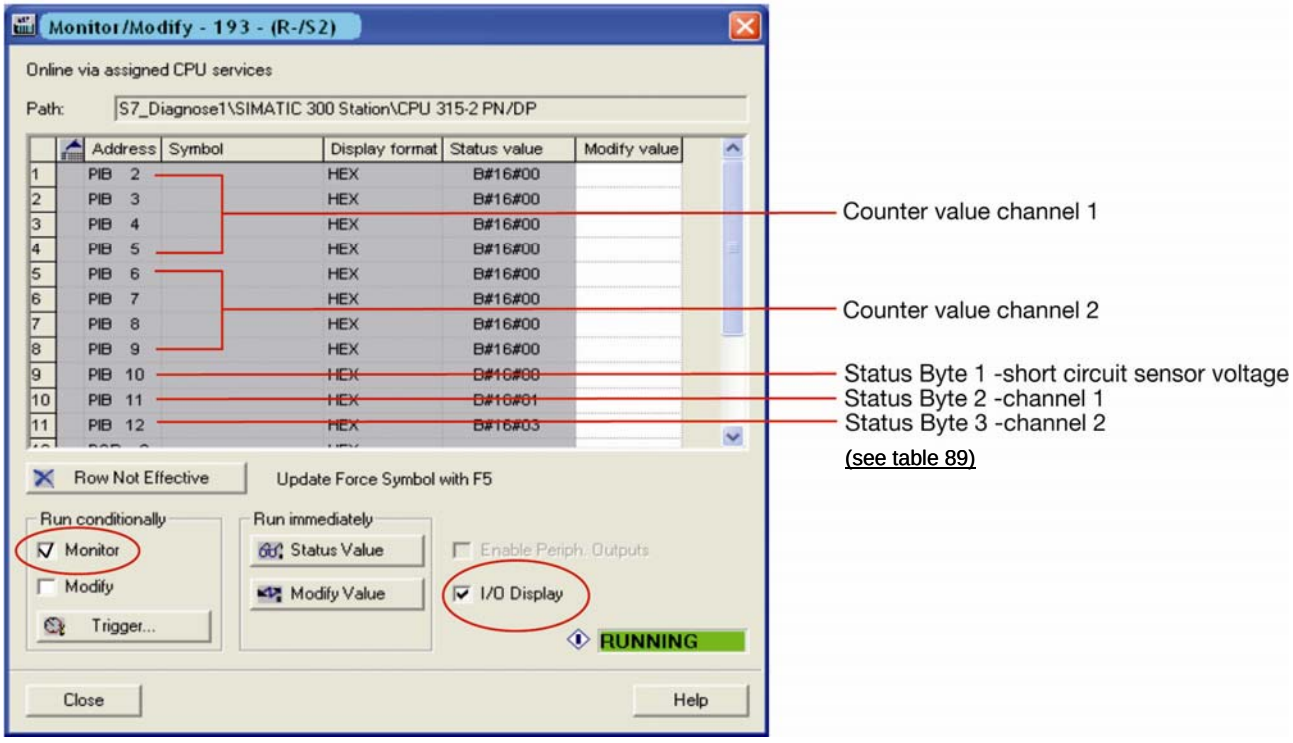

Figure 73 configuration input data

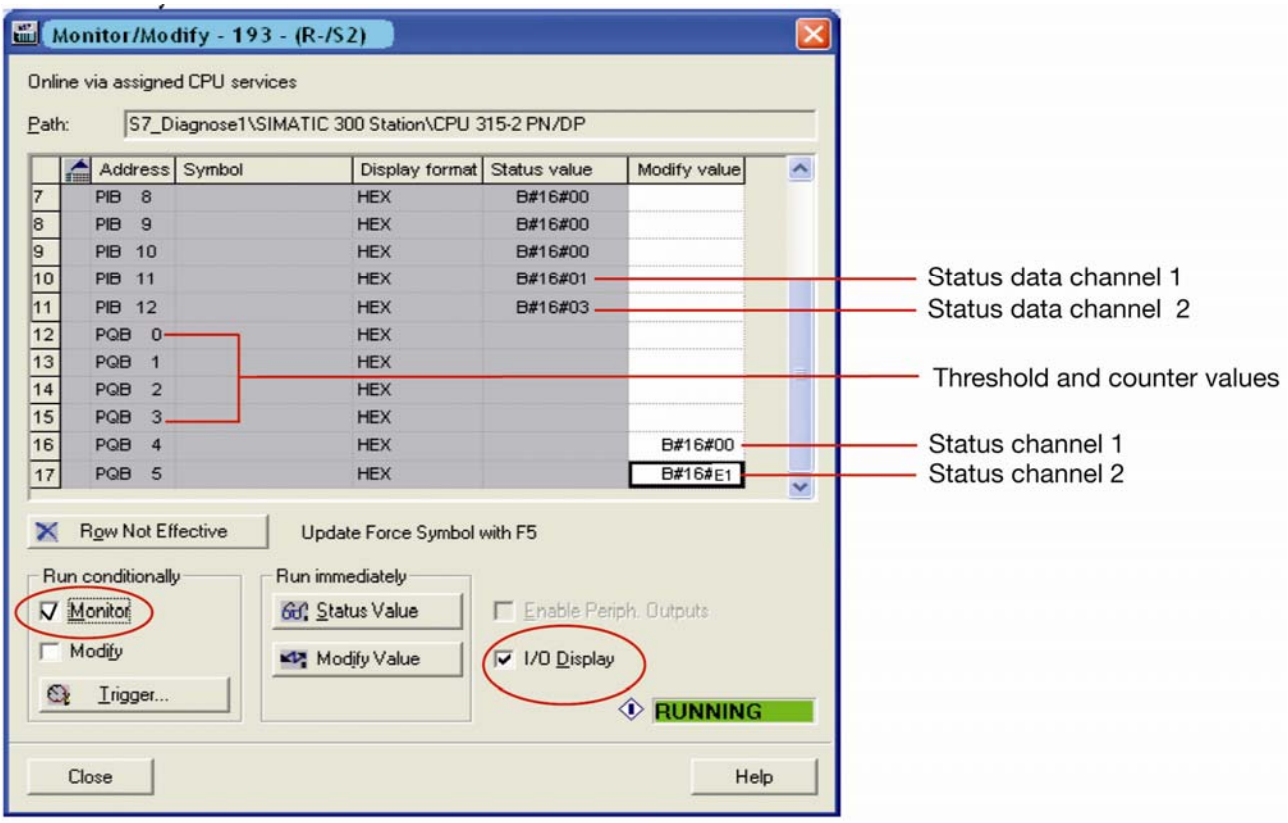

Figure 74 configuration output data

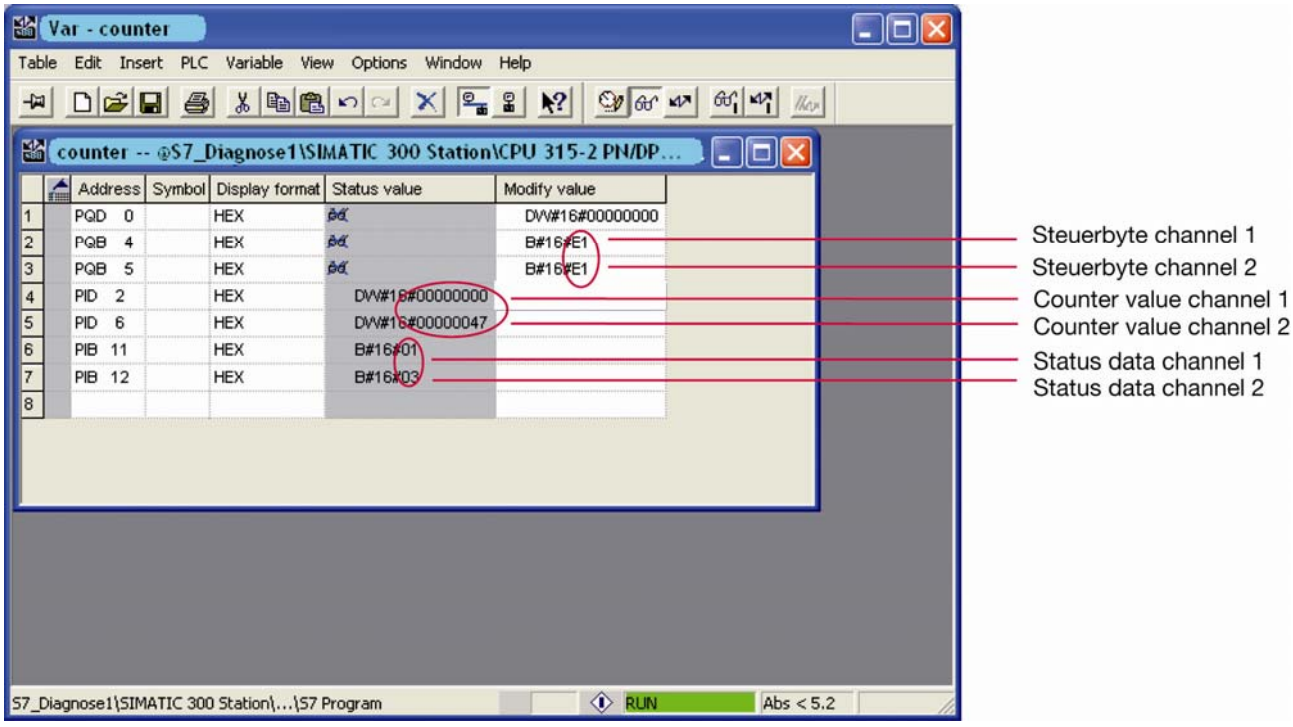

Figure 75 variable table for counter is started

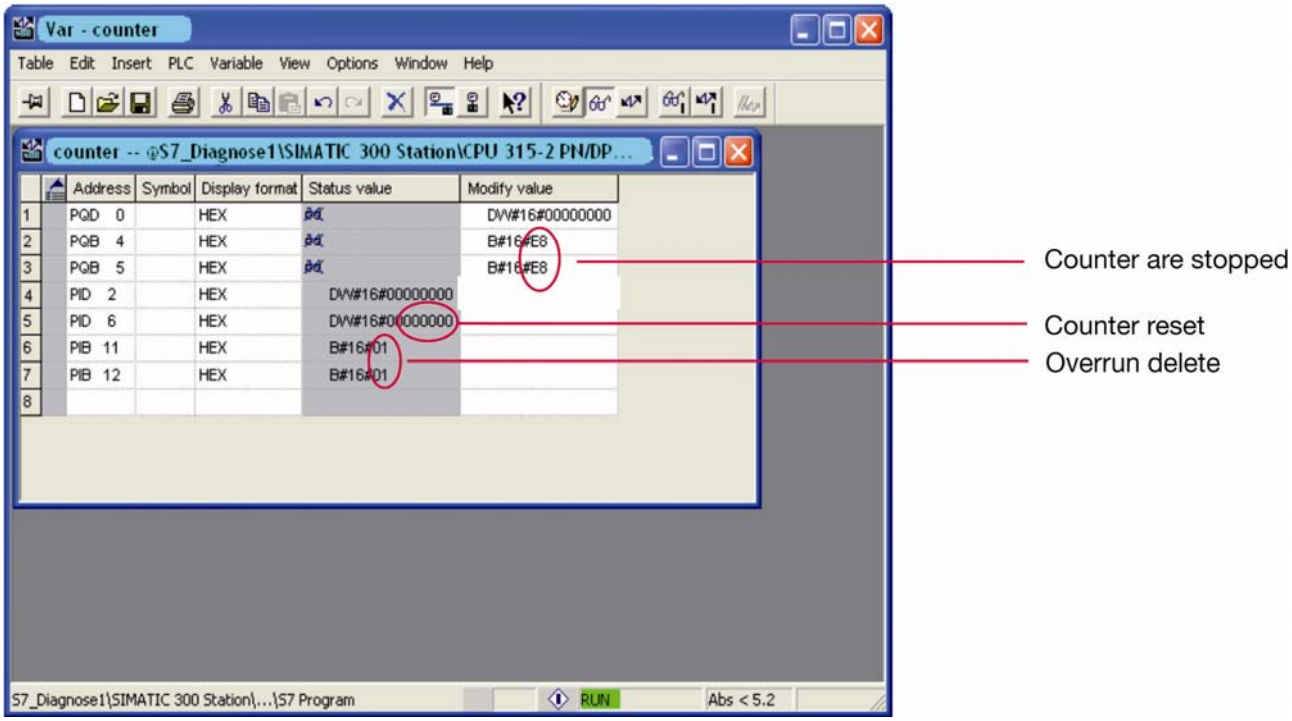

Figure 76 variable table - counter value – counter stop

6.5 Assign the input and output addresses

Each PROFIBUS DP device is already automatically assigned an address, via which data is exchanged with the PLC programme.

You can accept or alter these addresses. The quickest method is to double-click the address bar of the selected device. Then it is possible to select the original address.

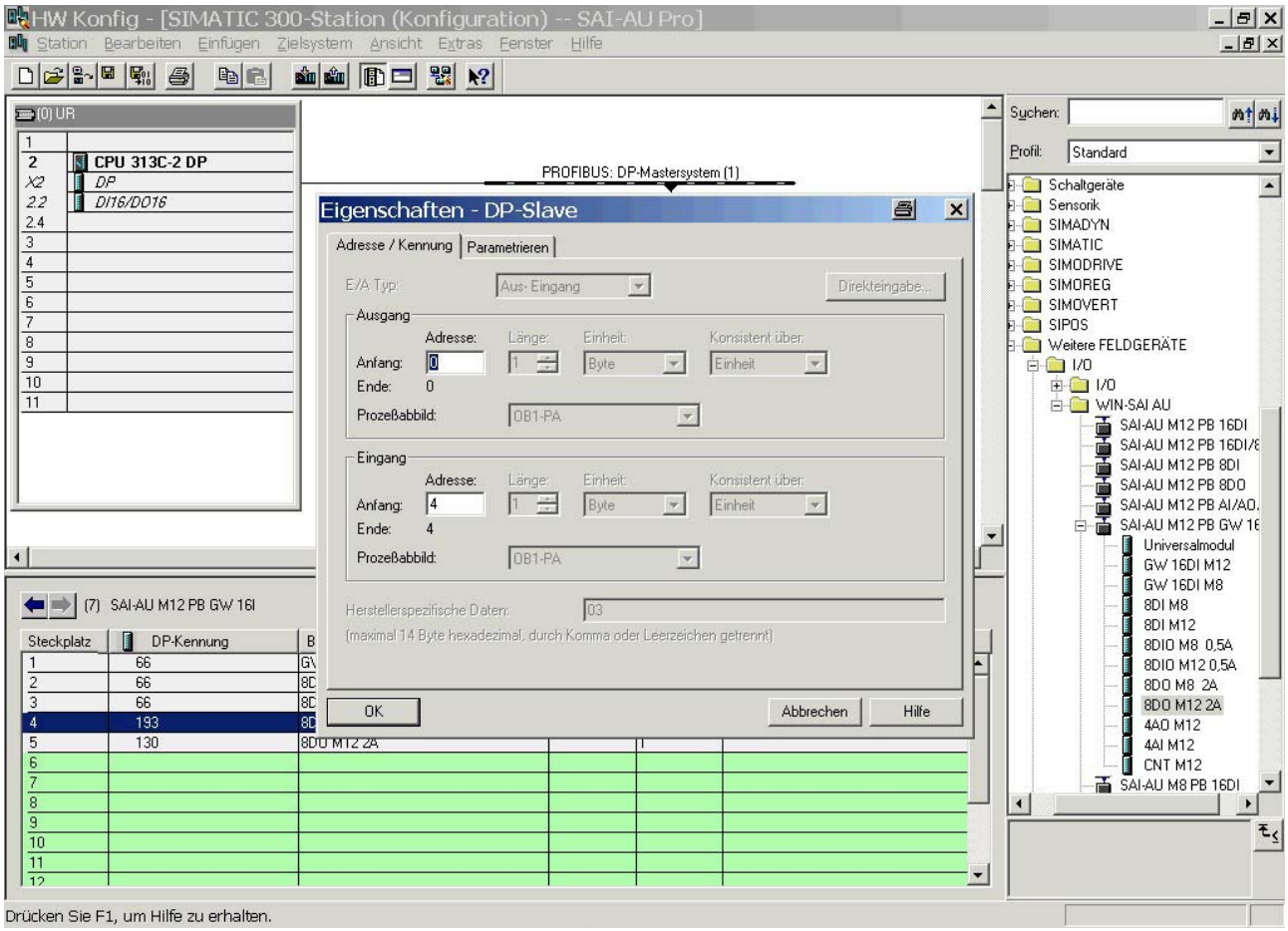

Figure 77 Assigning input / output addresses

6.6 Description of input and output data

6.6.1 SAI-AU Mx PB GW 16DI

Data	Describtion	
input	16 DI	16 digital inputs
output	none	

6.6.2 SAI-AU Mx SB 8DI

Data	Describtion	
input	8DI	8 digital inputs
output	none	

6.6.3 SAI-AU Mx SB 8DIO

Data	Describtion	
input	8DI	8 digital inputs
output	8DO	8 digital outputs

6.6.4 SAI-AU Mx SB 8DO 2A

Data	Describtion	
input	none	
output	8DO	8 digital outputs

6.6.5 SAI-AU M12 SB 4AI

Data	Describtion	
input	4AI	4 analog inputs 4 16 bit wide words (only lower 11 or 12 bits are used) depending on range these values will occur: 0..10 V : 0.. 2047 -10..+10 V 0 .. 4095 (where 2047 equals 0 V) 0..20 mA : 0 .. 4095 4..20 mA : 819
output	None	

6.6.6 SAI-AU M12 SB 4AO

Data	Describtion	
input	None	
output	4AO	4 analog outputs 4 16bit wide words (only lower 11 or 12 bits are used) depending on range these values must be written: 0..10 V : 0.. 2047 -10..10 V 0 .. 4095 (where 2047 equals 0 V) 0..20 mA : 0 .. 4095 4..20 mA : 819 .. 4095

6.6.7 SAI-AU M12 SB 4PT100

Data	Describtion	
input	4PT100	4 PT100 inputs 4 16bit wide words temeratures: 16 bit two complement value : 1 Bit (digit) = 1/10 Kelvin resistor values: range up to 500 Ohm : 1 Bit (digit) = 0,01 Ohm range up to 5k Ohm 1 Bit (digit) = 0,1 Ohm
output	None	

NOTE

It is possible to use the status data of the PT100 module as input data. Then the user must chose the module named "`"4PT100 M12 (input+status)"`.Then the input data are formed of the two counters and the status data (as seen in the Chapter diagnostic data).

6.6.8 SAI-AU M12 SB 4THERMO

Data	Describtion	
input	4THERMO	4 THERMO inputs 4 16bit wide words temeratures: 16 bit two complement value : 1 Bit (digit) = 1/10 Kelvin voltages : -250 to 250 mV : 1 Bit (digit) = 8µV -120 to 120 mV : 1 Bit (digit) = 4µV -60 to 60 mV : 1 Bit (digit) = 2µV -30 to 30 mV : 1 Bit (digit) = 1µV -15 to 15 mV : 1 Bit (digit) = 0,5µV range up to 5k Ohm 1 Bit (digit) = 0,1 Ohm
output	None	

NOTE

It is possible to use the status data of the THERMO module as input data. Then the user must chose the module named `""4THERMO M12 (input+status)".` Then the input data are formed of the two counters and the status data (as seen in the Chapter diagnostic data).

6.6.9 SAI-AU M12 SB CNT

Input data	Description
CNT1	32 bit counter value Channel 0
CNT2	32 bit counter value Channel 1
Output data	**Description**
CNTVAL	32 bit value for writing threshold and counter values
CNTCTRL0	Counter Channel 0 control byte Bit 0 : counter clearance (must be 1 for the counter to operate) Bit 1 : Control of the digital output associated with the counter : 0 = output is set manually 1 = output is controlled by the counter value Bit 2 : state of the digital output when setting manually 0 = clear digital output 1 = set digital output Bit 3 : Clear fault/status information of the Counter channels Bit 4 : reserved Bit 6 to 5 : addressing of register to write CNTVAL to 00 write threshold value for setting output to 1 01 write threshold value for clearing digital output 10 write threshold value for resetting the counter value to zero 11 write actual counter value Bit 7: write initiate
CNTCTRL1	Counter Channel 1 control byte Bit 0 : counter clearance (must be 1 for the counter to operate) Bit 1 : Control of the digital output associated with the counter : 0 = output is set manually 1 = output is controlled by the counter value Bit 2 : state of the digital output when setting manually 0 = clear digital output 1 = set digital output Bit 3 : Clear fault/status information of the Counter channels Bit 4 : reserved Bit 6 to 5 : addressing of register to write CNTVAL to 00 write threshold value for setting output to 1 01 write threshold value for clearing digital output 10 write threshold value for resetting the counter value to zero 11 write actual counter value Bit 7: write initiate

NOTE

It is possible to use the status data / diagnostic data of the counter module as input data. Then the user must chose the module named “"CNT M12 (input+status)".Then the input data are formed of the two counters and the status data (as seen in the Chapter diagnostic data).

6.7 Configuration and setting parameters

The functionality for all modules is defined via one or several configuration bytes in the configuration menu. To access this menu click Edit => Object properties => Parameter properties.

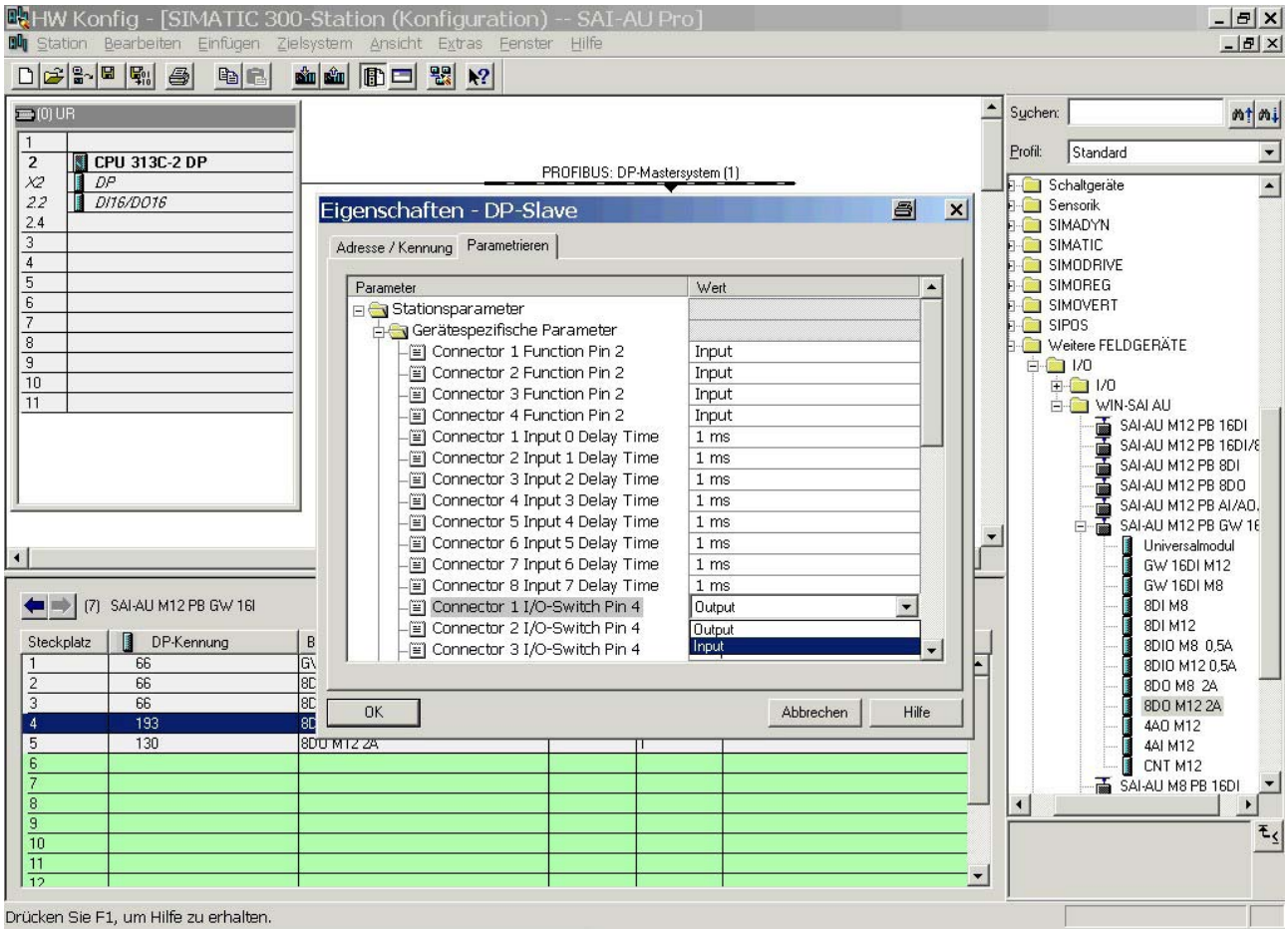

Figure 78 Parameters

Please refer to the following subsection for more information about parameter settings options for each module.

An overview of the diagnostics of the SAIs the meaning of the diagnostics bytes is available in the Diagnostic telegrams Telegram section.

6.8 SAI parameter data

Each SAI module is associated with specific parameters in the GSD file. The operator may alter these parameters.

SAI-AU M12 PB GW 16DI

With the digital inputs, the operator may activate the DESINA configuration for each digital input. The filter for each input may also be individually set (1 ms, 3 ms, 5 ms or 10 ms).

More on the DESINA configuration can be found under [2].

Number of parameter bytes:	6
1. byte:	Activation of the channel-specific diagnosis.
2. byte:	Activates the DESINA function
3. byte:	Filter input 0 ... 3
4. byte:	Filter input 4 ... 7
5. byte:	Filter input 8 ... 11
6. byte:	Filter input 12 ... 15

SAI-AU M8 SB 8DI
SAI-AU M12 SB 8DI

See SAI-AU M12 PB GW 16DI

Number of parameter bytes:	3
1. byte:	Activates the DESINA function
2. byte:	Filter input 0 ... 3
3. byte:	Filter input 4 ... 7

SAI-AU M8 SB 8DIO
SAI-AU M12 SB 8DIO

With the digital input and output modules, the operator can also set the channel type (output or input). A safe status for each output can also be declared.

Number of parameter bytes:	6
1. byte:	Activates the DESINA function.
2. byte:	Filter input 0 ... 3
3. byte:	Filter input 4 ... 7
4. byte:	Defines the function of the connection points as input or output.
5. byte:	Defines how the outputs react when there is a bus malfunction.
6. byte:	Defines the safe status of outputs.

SAI-AU M8 SB 8DO 2A
SAI-AU M12 SB 8DO 2A

See SAI-AU SB 8DO

Number of parameter bytes:	3
1. byte:	Defines the function of the connection points as input or output.
2. byte:	Defines how the outputs react when there is a bus malfunction.
3. byte:	Defines the safe status of outputs.

SAI-AU M12 SB 4AI

Number of parameter bytes:	5
1. byte:	Measurement Range for Channel 1 .. 4
2. byte:	Sampling time Channel 0
3. byte:	Sampling time Channel 1
4. byte:	Sampling time Channel 2
5. byte:	Sampling time Channel 3

SAI-AU M12 SB 4AO

Number of parameter bytes:	10
1. byte:	Output Range for Channel 1 .. 3
2. byte:	Behaviour of the analogue output when failure occurs
3./4. byte:	Defines the safe state of the output 1
5./6. byte:	Defines the safe state of the output 2
7./8. byte:	Defines the safe state of the output 3
9./10 byte:	Defines the safe state of the output 4

SAI-AU M12 SB 4PT100

Number of parameter bytes:	25
1. byte:	- Temperature format - Signess of values - Hystersis value
2. byte:	- Sensor configuration Channel 1 - Cycle time Channel 1
3. byte:	- Sensor configuration Channel 2 - Cycle time Channel 2
4. byte:	- Sensor configuration Channel 3 - Cycle time Channel 3
5. byte:	- Sensor configuration Channel 4 - Cycle time Channel 4
6. byte:	- Connection type configuration Channel 1 - Threshold alarm configuration Channel 1
7. byte:	- Connection type configuration Channel 2 - Threshold alarm configuration Channel 2
8. byte:	- Connection type configuration Channel 3 - Threshold alarm configuration Channel 3
9. byte:	- Connection type configuration Channel 4 - Threshold alarm configuration Channel 4
10./11. byte:	Threshold value 1 Channel 1
12./13. byte:	Threshold value 1 Channel 2
14./15. byte:	Threshold value 1 Channel 3
16./17. byte:	Threshold value 1 Channel 4
18./19. byte:	Threshold value 2 Channel 1
20./21. byte:	Threshold value 2 Channel 2
22./23. byte:	Threshold value 2 Channel 3
24./25. byte	Threshold value 2 Channel 4

SAI-AU M12 SB 4THERMO

Number of parameter bytes:	25
1. byte:	- Temperature format - Signess of values - Hystersis value
2. byte:	- Sensor configuration Channel 1 - Cycle time Channel 1
3. byte:	- Sensor configuration Channel 2 - Cycle time Channel 2
4. byte:	- Sensor configuration Channel 3 - Cycle time Channel 3
5. byte:	- Sensor configuration Channel 4 - Cycle time Channel 4
6. byte:	- Cold junction compensation configuration Channel 1 - Threshold alarm configuration Channel 1
7. byte:	- Cold junction compensation configuration Channel 2 - Threshold alarm configuration Channel 2
8. byte:	- Cold junction compensation configuration Channel 3 - Threshold alarm configuration Channel 3
9. byte:	- Cold junction compensation configuration Channel 4 - Threshold alarm configuration Channel 4
10./11. byte:	Threshold value 1 Channel 1
12./13. byte:	Threshold value 1 Channel 2
14./15. byte:	Threshold value 1 Channel 3
16./17. byte:	Threshold value 1 Channel 4
18./19. byte:	Threshold value 2 Channel 1
20./21. byte:	Threshold value 2 Channel 2
22./23. byte:	Threshold value 2 Channel 3
24./25 byte	Threshold value 2 Channel 4

SAI-AU M12 SB 2CNT

Number of parameter bytes:	25
1. byte:	- Configuration of behaviour of digital output in failure - Definition of safe state for outputs - Configuration of quadrature modes
2. byte:	Inversion of counting direction for Channel 1 / Channel 2
3./4./5./6. byte:	Threshold for output 1 ON
7./8./9./10. byte:	Threshold for output 1 OFF
11./12./13./14. byte:	Threshold for counter 1 RESET
15./16./17./18. byte:	Threshold for output 2 ON
19./20./21./22. byte:	Threshold for output 2 OFF
23./24./25./26. byte:	Threshold for counter 2 RESET

Activates the channel diagnostics

Bit 0 set the channel diagnostic.

Bit 0	1 = activate channel-specific diagnostics If this bit is set, after the device-related diagnosis the channel-referred diagnosis is inserted.
Bit 0	0 = deactivate channel-specific diagnostics Instead of the channel-referred diagnosis the status of the safety devices and the DESINA status is also contained in the device-related diagnosis (2 byte).

Activates the DESINA function

Bits 0 to 7 set the DESINA diagnostics of the connections 1 to 8. The DESINA diagnostics functionality is activated if the corresponding bit is set to 1.

If the DESINA diagnostic functionality is activated, the connection at pin 4 acts as a DESINA diagnostics input. The connection at pin 2 is then the switch input to be monitored.

Bits 0 to 7	1 = DESINA functionality OFF
Bits 0 to 7	0 = DESINA functionality ON

Determines the function of the connection points as input or output

By setting bits 0 to 7, the functionality of the eight connections can be defined as either inputs or outputs.

Setting this bit to 0 activates the output.

Set to this status, short-circuits to earth and +24 V DC will be recognised and reported in the diagnostics.

Bits 0 to 7	1 = connection pin 2 is INPUT
Bits 0 to 7	0 = connection pin 2 is OUTPUT

Defines how the outputs react when there is a bus malfunction

The entries for Bit 0 to Bit 7 determine for each output if it enters a safe status or if it retains the last status. If this bit is set to 0, the output retains the last status that prevailed before the bus error occurred. The safe status is defined with the following byte (defining the behaviour of the outputs in event of a bus malfunction).

Bits 0 to 7	1 = OUTPUT goes into safe status
Bits 0 to 7	0 = OUTPUT retains most recent status

Definition of measurement range/output range for analogue inputs/outputs

Two bits per configuration byte are associated with one channel. Following table shows the valid ranges:

Bits 1 to 0	00 = 0 to 10 Volt
Bits 3 to 2	01 = 0 to 20 mA
Bits 5 to 4	10 = -10 to 10 Volt
Bits 7 to 6	11 = 4 to 20 mA

Definition of sampling time for analogue inputs

Each byte defines the sampling time in milliseconds for each of the 4 channels. Valid values are in the range of 5 to 250 ms. Values are automatically rounded to a multiple of 5.

Definition of safe state for analogue outputs

There is one byte witch determines, if the analogue output goes to safe state or keeps the current value, when an error occurs. The first 4 bits are associated to one of the 4 output channels each. The safe state is set with the second parameter, which is a word value. If safe state is enabled for one output, this 16 bit (although only the lower 12 bits are used, both upper bits must be zero) value is written to the analogue output.

Temperature format configuration PT100/THERMO

If using these modules for temperature measurement, this parameter determines if the values are given in degrees Celsius or in Fahrenheit.

Bit 0	0 = degree Celsius 1 = Fahrenheit

Configuration of signess of values

This bit determines, if the values are given as two-complement values or, with an offset of 0x7fff (32767) as values with no sign.

Bit 1	0 = signed 1 = unsigned

Sensor configuration for PT100/THERMO

The second to fifth parameter byte determines the sensor type of the modules.

Bit 4 to 0	Sensor type of channel
Bit 7 to 5	Cycle time of channel

Follow tables show the values for Sensor Type/ Cycle time:

Value (Cycle time)	Description
0	50+60 Hz supress, slow (620 ms)
1	50 Hz supress, slow (140 ms)
2	60 Hz supress, slow (120 ms)
3	50+60 Hz supress, fast (220 ms)
4	50 Hz supress, fast (60 ms)
5	60 Hz supress, fast (54 ms)

Configuration of the hysteresis value for threshold alarm modes PT100/THERMO module

These bits determine the hysteresis value, which is used for threshold alarm modes.

Bit 7-3	0 = 0 1 = 5 2 = 10 3 = 20 4 = 30 5 = 40 6 = 50 7 = 60 8 = 70 9 = 80 10 = 90 11 = 100 12 = 120 13 = 140 14 = 160 15 = 180 16 = 200 17 = 300 18 = 400 19 = 500 20 = 600 21 = 700 22 = 800 23 = 900 24 = 1000 25 = 1250 26 = 1500 27 = 1750 28 = 2000 29 = 3000 30 = 4000 31 = 5000

Value (Sensor Type PT100)	Description
0	PT100
1	PT200
2	PT500
3	PT1000
4	Ni100
5	Ni120
6	Ni1000
7	Resistor 500Ohm
8	Resistor 5 kOhm
9	Poti 100-500 Ohm
10	Poti 500-5k Ohm
11	Poti > 5 kOhm
16	No Sensor

Value (Sensor Type THERMO)	Description
0	K
1	J
2	T
3	E
4	N
5	R
6	S
7	B
8	L
9	U
10	-15 .. 15 mV
11	-30 .. 30 mV
12	-60 .. 60 mV
13	-120 .. 120 mV
14	-250 .. 250 mV
16	No Sensor

The Sixth to Ninth byte determine the alarm mode configuration and the connection configuration for PT100 and the cold junction configuration for THERMO modules for each channel respectively

Alarm mode configuration is configured with the following values. By default the alarm modes are disabled. Each channel has 2 alarms. Each alarm one threshold value is associated. The alarm (which is one bit in the diagnostic status data of the module) is active, if the input value of the associated channel is above/below (dependent if it is a high or low alarm) the threshold value. The configured hysteresis value is taken into account for the alarm recognition. The hysteresis value is that distance that must be reached, before the alarm is cleared again.

Bit 3 to 2	00 = alarm 1 off 01 = low alarm 10 = high alarm
Bit 4 to 5	00 = alarm 2 off 01 = low alarm 10 =high alarm

The connection configuration for PT100 modules can be configured with the lower two bits of these configuration bytes for each channel separately. Following table shows the values:

Bit 1 to 0	00 = 4 wire connection 01 = 3 wire connection 10 = 2 wire connection

For the THERMO module, these bits determine the cold junction compensation mode.

Bit 1 to 0	00 = external PT1000 01 = manual compensation with value from first connector 10 = internal compensation (which has an error of typically 2%)

Configuration of alarm mode threshold values

The remaining bytes in the parameters of PT100 and THERMO module determine the threshold values for the alarm detection mode. For each channel two threshold values (16 bit wide) can be configured as each channel can detect two thresholds and signal this as a status information in the diagnostic data. The format of this value is as the measurement value.

Configuration of the counter

The first parameter byte of the counter determines the behaviour of the digital outputs and the configuration of the quadrature counting mode.

Bit 0	0 = digital output 0 keeps state if failure occurs 1 = digital output 0 enters safe state if failure occurs
Bit 1	0 = digital output 1 keeps state if failure occurs 1 = digital output 1 enters safe state if failure occurs
Bit 2	Determines the safe state of Output 0
Bit 3	Determines the safe state if Output 1
Bit 5 to 4	00 = normal counting mode Channel 0 01 = quadrature counting mode Channel 0
Bit 7 to 6	00 = normal counting mode Channel 1 01 = quadrature counting mode Channel 1

Configuration of the counting direction

The counting direction can be inverted by parameter.

Bit 0	0 = normal counting direction Channel 0 1 = invert counting direction Channel 0
Bit 1	0 = normal counting direction Channel 1 1 = invert counting direction Channel 1

Configuration of threshold values for the counter module

Each channel has 3 different threshold values, which must be determined by the user. The first value determines the counter value, which enables the associated digital output of the channel. The second value determines the counter value that disables the digital output associated with the counter channel. The third value determines the reset value of the associated counter channel. Note that this value must be different from zero to enable the counter functionality. The values are 32bit wide as the counter value is.

6.9 Diagnostic telegrams

Generally between diagnosis with and without channel-referred diagnosis one differentiates. Which diagnosis is used, in the byte 1 the user parameter see 6.7 configured.

6.9.1 Diagnostics without channel referred information

Parameter “Extended Diagnosis” Disable
This diagnosis consists of three parts:

1. Six bytes of standard diagnostics
2. 37 bytes of extended diagnostics
3. n bytes of IO-module diagnostics

Standard diagnostics

Byte 0, station status 1		
Bit 0	station_non_exist	1 = station can not be reached; always "0"
Bit 1	station_not_ready	1 = station is not ready for data exchange
Bit 2	cfg_fault	1 = configuration error with the master
Bit 3	ext_diag	1 = extended diagnostics data is available
Bit 4	not_supported	1 = a requested function is not supported
Bit 5	invalid_slave_response	1 = the slave response was not valid
Bit 6	prm_fault	1 = false or incomplete parameter data
Bit 7	master_lock	1 = parameters are from another master set - access is locked
Byte 1, station status 2		
Bit 0	Prm_req	1 = parameter must be transmitted again
Bit 1	Stat_diag	1 = diagnostic data is present
Bit 2	“1”	Slave always sets "1"
Bit 3	WD_ON	1 = The slave has activated the watchdog
Bit 4	freeze_mode	1 = The slave has received the "freeze" control command
Bit 5	sync_mode	1 = The slave has received the "sync" control command
Bit 6	reserved	Slave always sets "0"
Bit 7	deactivated	1 = set from master, slave is inactive, slave always sets "0"

Byte 2, station status 3		
Bit 0	reserved	Slave always sets "0"
Bit 1	reserved	Slave always sets "0"
Bit 2	reserved	Slave always sets "0"
Bit 3	reserved	Slave always sets "0"
Bit 4	reserved	Slave always sets "0"
Bit 5	reserved	Slave always sets "0"
Bit 6	reserved	Slave always sets "0"
Bit 7	ext_overflow	1 = Diagnostic data overflow
Byte 3, Diag. master address		
FFH	PB address of master	FF = Parameter has still not been received from master
02H		or the address of the master, which the parameter has set
Byte 4, Ident number (high byte)		
0AH	High byte of the ident number	The ID number of the PROFIBUS device high byte
Byte 5, Ident number (low byte)		
74H	Low byte of the ident number	The ID number of the PROFIBUS device low byte
Byte 9…10 module status module 0 (Gateway)		
Byte 11…12 module status module 1		
Byte 13…14 module status module 2		
Byte 15…16 module status module 3		
Byte 17…18 module status module 4		
Byte 19…20 module status module 5		
Byte 21…22 module status module 6		
Byte 23…24 module status module 7		
Byte 25…26 module status module 8		

Byte 27…28 module status module 9
Byte 29…30 module status module 10
Byte 31…32 module status module 11
Byte 33…34 module status module 12
Byte 35…36 module status module 13
Byte 37…38 module status module 14
Byte 39…40 module status module 15
Byte 41 fuse Gateway
Status of the fuses
Byte 42 DESINA Gateway
DESINA status
Byte 43 … Device-related diagnostic data IO of modules
Depending configuration

Table 80 Extended device-related diagnostic data without channel-referred information

Module status

The module status is the same for every module.

Module status			Binary
Byte 1	Bit 0	sensor supply overload	0
Byte 1	Bit 1	output shortcircuit	0
Byte 1	Bit 2	external voltage at output	0
Byte 1	Bit 3	supply for output UQ1 low	0
Byte 1	Bit 4	supply for output UQ1 high	0
Byte 1	Bit 5	supply for output UQ2 low	0
Byte 1	Bit 6	supply for output UQ2 high	0
Byte 1	Bit 7	supply voltage low	0
Byte 2	Bit 0	supply voltage high	1
Byte 2	Bit 1	output bus power failure	0
Byte 2	Bit 2	input/output values underrun	0
Byte 2	Bit 3	input/output values overrun	0
Byte 2	Bit 4	connection to module lost	1
Byte 2	Bit 5	broken wire	1
Byte 2	Bit 6	cold-junction-compensation missing	1
Byte 2	Bit 7	reserved	1

Table 81 Module status

Device-related diagnostic data IO of modules

The device-related diagnosis is extended by the attached Subbus modules. Per attached Subbus module are added 2 - 4 byte device-related diagnostic data.

SAI SB 8DI M8/M12	
Byte 1	Short circuit to +24V DC sensor supply
Byte 2	DESINA-Status

Table 82 Device-related diagnostic data IO of modules 8DI

SAI SB 8DIO M8/M12	
Byte 1	Short circuit to +24V DC sensor supply
Byte 2	DESINA-Status
Byte 3	Status power supply UQ1
Byte 4	Short circuit to ground at the output
Byte 5	External voltage at the output

Table 83 Device-related diagnostic data IO of modules 8DIO

SAI SB 8DO M8/M12	
Byte 1	Short circuit to +24V DC sensor supply
Byte 2	Status power supply UQ1 and UQ2
Byte 3	Short circuit to ground at the output
Byte 4	External voltage at the output

Table 84 Device-related diagnostic data IO of modules 8DO

SAI SB 4AI	
Byte 1	Short circuit to +24V DC sensor supply
Byte 2	Status for value lower deviation for range 4 to 20 mA Bit 0 : Channel 1 value underrun Bit 1 : Channel 2 value underrun Bit 2 : Channel 3 value underrun Bit 3 : Channel 4 value underrun

Table 85 Device-related diagnostic data IO of modules 4AI

SAI SB 4AO	
Byte 1	Short circuit to +24V DC sensor supply
Byte 2	Range error indication Bit 0 : Channel 1 value underrun Bit 1 : Channel 2 value underrun Bit 2 : Channel 3 value underrun Bit 3 : Channel 4 value underrun

Table 86 Device-related diagnostic data IO of modules 4AO

SAI SB PT100	
Byte 1	Range error indication Bit 0 : Channel 1 range error Bit 1 : Channel 2 range error Bit 2 : Channel 3 range error Bit 3 : Channel 4 range error
Byte 2	Broken wire status Bit 0 : Channel 1 broken wire Bit 1 : Channel 2 broken wire Bit 2 : Channel 3 broken wire Bit 3 : Channel 4 broken wire
Byte 3	Alarm threshold status Bit 0 : Channel 1 Threshold alarm 1 active Bit 1 : Channel 2 Threshold alarm 1 active Bit 2 : Channel 3 Threshold alarm 1 active Bit 3 : Channel 4 Threshold alarm 1 active Bit 4 : Channel 1 Threshold alarm 2 active Bit 5 : Channel 2 Threshold alarm 2 active Bit 6 : Channel 3 Threshold alarm 2 active Bit 7 : Channel 4 Threshold alarm 2 active

Table 87 Device-related diagnostic data IO of modules 4PT100

SAI SB THERMO	
Byte 1	Cold junction compensation error Bit 0 : Channel 1 compensation error Bit 1 : Channel 2 compensation error Bit 2 : Channel 3 compensation error Bit 3 : Channel 4 compensation error
Byte 2	Broken wire status Bit 0 : Channel 1 broken wire Bit 1 : Channel 2 broken wire Bit 2 : Channel 3 broken wire Bit 3 : Channel 4 broken wire
Byte 3	Alarm threshold status Bit 0 : Channel 1 Threshold alarm 1 active Bit 1 : Channel 2 Threshold alarm 1 active Bit 2 : Channel 3 Threshold alarm 1 active Bit 3 : Channel 4 Threshold alarm 1 active Bit 4 : Channel 1 Threshold alarm 2 active Bit 5 : Channel 2 Threshold alarm 2 active Bit 6 : Channel 3 Threshold alarm 2 active Bit 7 : Channel 4 Threshold alarm 2 active

Table 88 Device-related diagnostic data IO of modules 4THERMO

SAI SB CNT	
Byte 1	Short circuit to +24V DC sensor supply
Byte 2	Channel 0 status information Bit 0 : Signalisation of counting direction Bit 1 : indication of counting direction Bit 2 : value overrun indication Bit 3 : value underrun indication Bit 4 : state of the associated digital output Bit 5 : output fault indication Bit 6 : reserved Bit 7 : acknowledgment for writing counter value / threshold values via output data
Byte 3	Channel 1 status information Bit 0 : Signalisation of counting direction Bit 1 : indication of counting direction Bit 2 : value overrun indication Bit 3 : value underrun indication Bit 4 : state of the associated digital output Bit 5 : output fault indication Bit 6 : reserved Bit 7 : acknowledgment for writing counter value / threshold values via output data

Table 89 Device-related diagnostic data IO of modules 2CNT

6.9.2 Diagnostics with channel referred information

Parameter: „Extended Diagnostic“ Enable

This diagnosis consists of four parts:

1. Six bytes of standard diagnostics
2. 35 bytes Device-related diagnosis
3. 2-3 bytes of identification-referred diagnosis (Number depends on number of attached Extension IO modules <= 7 = 2 bytes, >7 = 3 bytes)
4. n bytes channel-referred diagnosis (The channel-referred diagnosis is as largely as the number of arising errors times three bytes)

Standard diagnostics

Byte 0, station status 1		
Bit 0	station_non_exist	1 = station can not be reached; always "0"
Bit 1	station_not_ready	1 = station is not ready for data exchange
Bit 2	cfg_fault	1 = configuration error with the master
Bit 3	ext_diag	1 = extended diagnostics data is available
Bit 4	not_supported	1 = a requested function is not supported
Bit 5	invalid_slave_response	1 = the slave response was not valid
Bit 6	prm_fault	1 = false or incomplete parameter data
Bit 7	master_lock	1 = parameters are from another master set - access is locked
Byte 1, station status 2		
Bit 0	Prm_req	1 = parameter must be transmitted again
Bit 1	Stat_diag	1 = diagnostic data is present
Bit 2	“1”	Slave always sets "1"
Bit 3	WD_ON	1 = The slave has activated the watchdog
Bit 4	freeze_mode	1 = The slave has received the "freeze" control command
Bit 5	sync_mode	1 = The slave has received the "sync" control command
Bit 6	reserved	Slave always sets "0"
Bit 7	deactivated	1 = set from master, slave is inactive, slave always sets "0"

Byte 2, station status 3		
Bit 0	reserved	Slave always sets "0"
Bit 1	reserved	Slave always sets "0"
Bit 2	reserved	Slave always sets "0"
Bit 3	reserved	Slave always sets "0"
Bit 4	reserved	Slave always sets "0"
Bit 5	reserved	Slave always sets "0"
Bit 6	reserved	Slave always sets "0"
Bit 7	ext_overflow	1 = Diagnostic data overflow
Byte 3, Diag. master address		
FFH	PB address of master	FF = Parameter has still not been received from master
02H		or the address of the master, which the parameter has set
Byte 4, Ident number (high byte)		
0AH	High byte of the ident number	The ID number of the PROFIBUS device high byte
Byte 5, Ident number (low byte)		
74H	Low byte of the ident number	The ID number of the PROFIBUS device low byte

Table 90 Standard diagnosis

6.9.3 Device-related diagnostic data

The device-related diagnosis contains the software-Version, as well as the status of the individual IO of modules gateway of the IOs.

Byte 6 Extended diagnosis data: Header

Number of bytes of the manufacturer diagnosis including this bytes

Byte 7, Software version (high byte) MSB

Byte 8, Software version (low byte) LSB

Byte 9…10 module status module 0 (Gateway)

Byte 11…12 module status module 1

Byte 13…14 module status module 2

Byte 15…16 module status module 3

Byte 17…18 module status module 4

Byte 19…20 module status module 5

Byte 21…22 module status module 6

Byte 23…24 module status module 7

Byte 25…26 module status module 8

Byte 27…28 module status module 9

Byte 29…30 module status module 10

Byte 31…32 module status module 11

Byte 33…34 Module status Module 12

Byte 35…36 module status module 13
Byte 37…38 module status module 14
Byte 39…40 module status module 15

Table 91 Extended device-related diagnostic data

6.9.4 Identification-specific diagnostic data

The identification-specific diagnostics indicates where (in which module) the error occurred.

Byte 41, identification-specific diagnostic header	
Bit 0	The length in bytes of the identification-specific diagnostics
Bit 1	The length in bytes of the identification-specific diagnostics
Bit 2	The length in bytes of the identification-specific diagnostics
Bit 3	The length in bytes of the identification-specific diagnostics
Bit 4	The length in bytes of the identification-specific diagnostics
Bit 5	The length in bytes of the identification-specific diagnostics
Bit 6	The code for identification-specific diagnostics is always equal to 0.
Bit 7	The code for identification-specific diagnostics is always equal to 1.
Byte 42, details of the module where the errors occurred, modules 1-8 (including gateway I/O)	
Bit 0	1 = error in gateway I/O
Bit 1	1 = error in extension I/O at position 1
Bit 2	1 = error in extension I/O at position 2
Bit 3	1 = error in extension I/O at position 3
Bit 4	1 = error in extension I/O at position 4
Bit 5	1 = error in extension I/O at position 5
Bit 6	1 = error in extension I/O at position 6
Bit 7	1 = error in extension I/O at position 7
Byte 43, details of the module where the errors occurred, modules 9-16	
Bit 0	8 = error in extension I/O at position 8
Bit 1	9 = error in extension I/O at position 9
Bit 2	10 = error in extension I/O at position 10
Bit 3	11 = error in extension I/O at position 11
Bit 4	12 = error in extension I/O at position 12
Bit 5	13 = error in extension I/O at position 13
Bit 6	14 = error in extension I/O at position 14
Bit 7	15 = error in extension I/O at position 15

Table 92 Identification-specific diagnostic data

6.9.5 Channel-referred diagnostic data

The quantity of module-specific diagnostic information is dependent on the number of modules which contain errors. Three bytes are needed for each error. The first byte describes the plug-in station number of the module. The second byte indicates which channel had the error. The third byte describes the type of error.

Byte n, module-specific diagnostic header	
Bit 0	Plug-in station number of the module, including gateway I/O
Bit 1	Plug-in station number of the module, including gateway I/O
Bit 2	Plug-in station number of the module, including gateway I/O
Bit 3	Plug-in station number of the module, including gateway I/O
Bit 4	Plug-in station number of the module, including gateway I/O
Bit 5	Plug-in station number of the module, including gateway I/O
Bit 6	The code for channel-specific diagnostics is always equal to 0.
Bit 7	The code for channel-specific diagnostics is always equal to 1.
Byte n+1, gives details on which channel type and which location in the module	
Bit 0	Channel number
Bit 1	Channel number
Bit 2	Channel number
Bit 3	Channel number
Bit 4	Channel number
Bit 5	Channel number
Bit 6	Channel type
Bit 7	Channel type
Byte n+2, gives detail about which error has occurred	
Bit 0	Error code
Bit 1	Error code
Bit 2	Error code
Bit 3	Error code
Bit 4	Error code
Bit 5	Data format
Bit 6	Data format
Bit 7	Data format

Table 93 Channel-referred diagnostic data

Channel type	
00	Not defined
01	Digital Input
10	Analogue outputs
11	Input and output modules

Table 94 Channel type diagnostics

Error codes for the channel-specific diagnosis.									
Bit 7 to 5			Bits 4 to 0 binary					hex	
0	0	1	X	X	X	X	X		Data format 1 bit
0	1	0	X	X	X	X	X		Data format 2 bit
0	1	1	X	X	X	X	X		Data format 4 bit
1	0	0	X	X	X	X	X		Data format 1 byte (8 bits)
1	0	1	X	X	X	X	X		Data format 1 word (16 bits)
1	1	0	X	X	X	X	X		Data format 2 words (32 bits)
X	X	X	0	0	0	0	1	21	Short-circuit
X	X	X	0	0	0	1	0	22	Overvoltage on sub-bus
X	X	X	0	0	0	1	1	23	Undervoltage on sub-bus
X	X	X	0	0	1	0	0	24	Overload
X	X	X	0	0	1	0	1	25	Excess temperature
X	X	X	0	0	1	1	0	26	Wire breakage
X	X	X	0	0	1	1	1	A7	Analogue input values have been exceeded
X	X	X	0	1	0	0	0	A8	Analogue input values have not been reached
X	X	X	0	1	0	0	1	29	Error
X	X	X	0	1	0	1	0	2A	Reserved
X	X	X	0	1	0	1	1	2B	Reserved
X	X	X	0	1	1	0	0	2C	Reserved
X	X	X	0	1	1	0	1	2D	Reserved
X	X	X	0	1	1	1	0	2E	Reserved
X	X	X	0	1	1	1	1	2F	Reserved
X	X	X	1	0	0	0	0	30	Lost connection to module
X	X	X	1	0	0	0	1	31	Forwarded sub-bus voltage is not present
X	X	X	1	0	0	1	0	32	Pin 1 sensor supply, short circuit / overload
X	X	X	1	0	0	1	1	33	Output short-circuit / overload
X	X	X	1	0	1	0	0	34	External voltage at output
X	X	X	1	0	1	0	1	35	Undervoltage at UQ1 voltage
X	X	X	1	0	1	1	0	36	Overvoltage at UQ1 voltage
X	X	X	1	0	1	1	1	37	Undervoltage at UQ2 voltage
X	X	X	1	1	0	0	0	38	Overvoltage at UQ2 voltage
X	X	X	1	1	0	0	1	39	Cold-junction compensation is missing

Table 95 Error code diagnostics

6.10 Evaluating diagnostic data in Step7

Whereas the data for inputs and outputs can be exchanged and processed directly in Step7 with PROFIBUS via the input and output image, diagnostic data must be read into the application program with an SFC.

Diagnostics data (slave diagnostics) of a DP slave is read with the SFC 13 "DPNRM_DG".

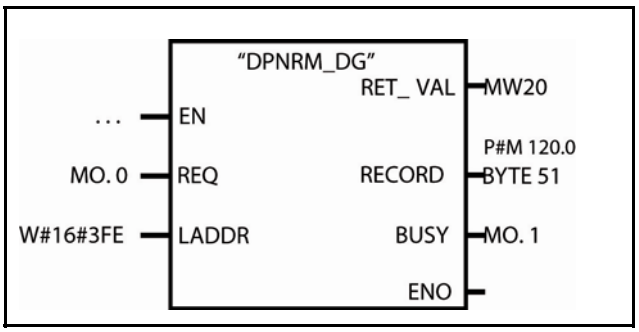

Figure 79 Diagnostics function block

Input variables:	
REQ = 1:	Request to read
LADDR:	Planned diagnostics address of the DP slave; this can be read in the hardware configurator. Note: The address must be entered in hexadecimal, for example, the diagnostic address 1022 (3FEH) means: LADDR: = W#16#3FE.
Output variables:	
RET_VAL	RET_VAL contains the length of the actual transmitted data. If an error occurs when the function is being processed, the return value contains an error code.
RECORD	Target range for the read diagnostic data. The minimum length of the data record to be read or the target range is 51.
BUSY = 1	The read operation has not been completed.

Table 96 Diagnostics function block

The maximum in Byts amounts to 244 which must be read.

In the example above, 51 bytes following the flag byte M 120.0 are reserved as target range of the diagnostics data for an SAI-AU M12 PB 16D. These are divided up as follows:

Standard diagnostics information		
MB 120	Byte 0	Station status 1
MB 121	Byte 1	Station status 2
MB 122	Byte 2	Station status 3
MB 123	Byte 3	Diag. master address
MB 124	Byte 4	Ident number (high byte)
MB 125	Byte 5	Ident number (low byte)
Standard diagnostics information		
MB 126	Byte 6	The number of bytes of the manufacturer's diagnostics, including this byte.
MB 127	Byte 7	MSB software version (high byte)
MB 128	Byte 8	LSB software version (low byte)
MB 129	Byte 9	short-circuit at +24 V DC sensor voltage
MB 130	Byte 10	Error message for DESINA diagnostics

Table 97 Diagnostics information

Please refer to the Siemens Step7 programming manual as well as the Online Help file for further information.

7. LED Displays

7.1 Gateway I/O

PROFIBUS-DP

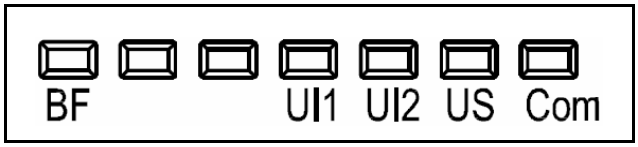

Figure 80 LEDS on the gateway I/O

LED	Colour	Function
BF	Green	ON = slave exchanging data flashing = transition after SAI is turned on
	red	ON = error, no data is being exchanged
UI1	Green	ON = > 18 V DC OFF = < 18 V DC
	red	ON = < 18 V DC OFF = > 18 V DC
UI2	Green	ON = > 18 V DC OFF = < 18 V DC
	red	ON = < 18 V DC OFF = > 18 V DC
US	Green	ON = > 18 V DC OFF = < 18 V DC
	red	ON = < 18 V DC OFF = no extension I/O is connected
Com	Green	ON = communication with Sub-bus is okay
	red	0.5 Hz flashing = setting up communication (max. 20 seconds) ON = time-out communication

Table 98 LED displays on the gateway I/O PROFIBUS-DP

7.2

Extension I/O

8DI, 4AI, 4AO, Thermal and PT100

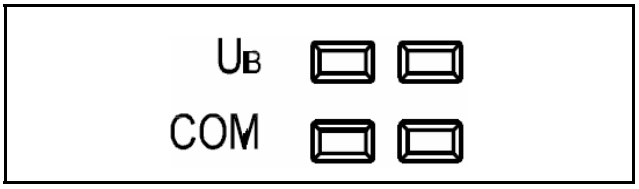

Figure 81 LEDs for 8DI, 4AI, 4AO, Thermal and PT100

8DIO

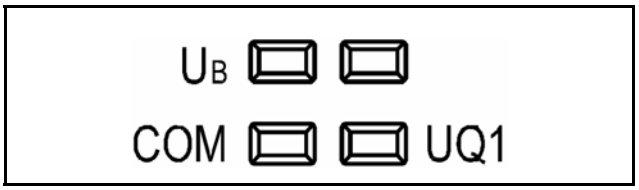

Figure 82 LEDs for the 8DIO

8DO 2 and counter

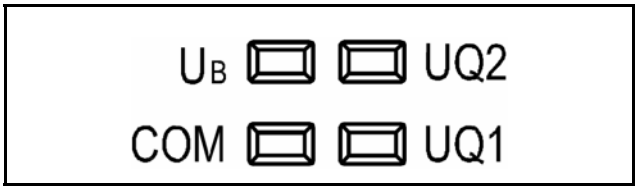

Figure 83 8DO 2 and counter

LED	Colour	Function
UB	Green	ON = slave exchanging data flashing = transition after the extension I/O is turned on
	red	ON = < 18 & > 15 V DC 0.5 Hz flashing = < 15 & > 12 V DC OFF = < 12 V DC
Com	Green	ON = communication with Sub-bus is okay
	red	0.5 Hz flashing = setting up communication (max. 20 seconds) ON = time-out communication
UQ1	Green	ON = > 18 V DC OFF = < 18 V DC
	red	ON = < 18 V DC OFF = > 18 V DC
UQ2	Green	ON = > 18 V DC OFF = < 18 V DC
	red	ON = < 18 V DC OFF = > 18 V DC

Table 99 LED displays on the extension I/Os

7.3 Layout of LEDs on the gateway I/O PROFIBUS-DP M12

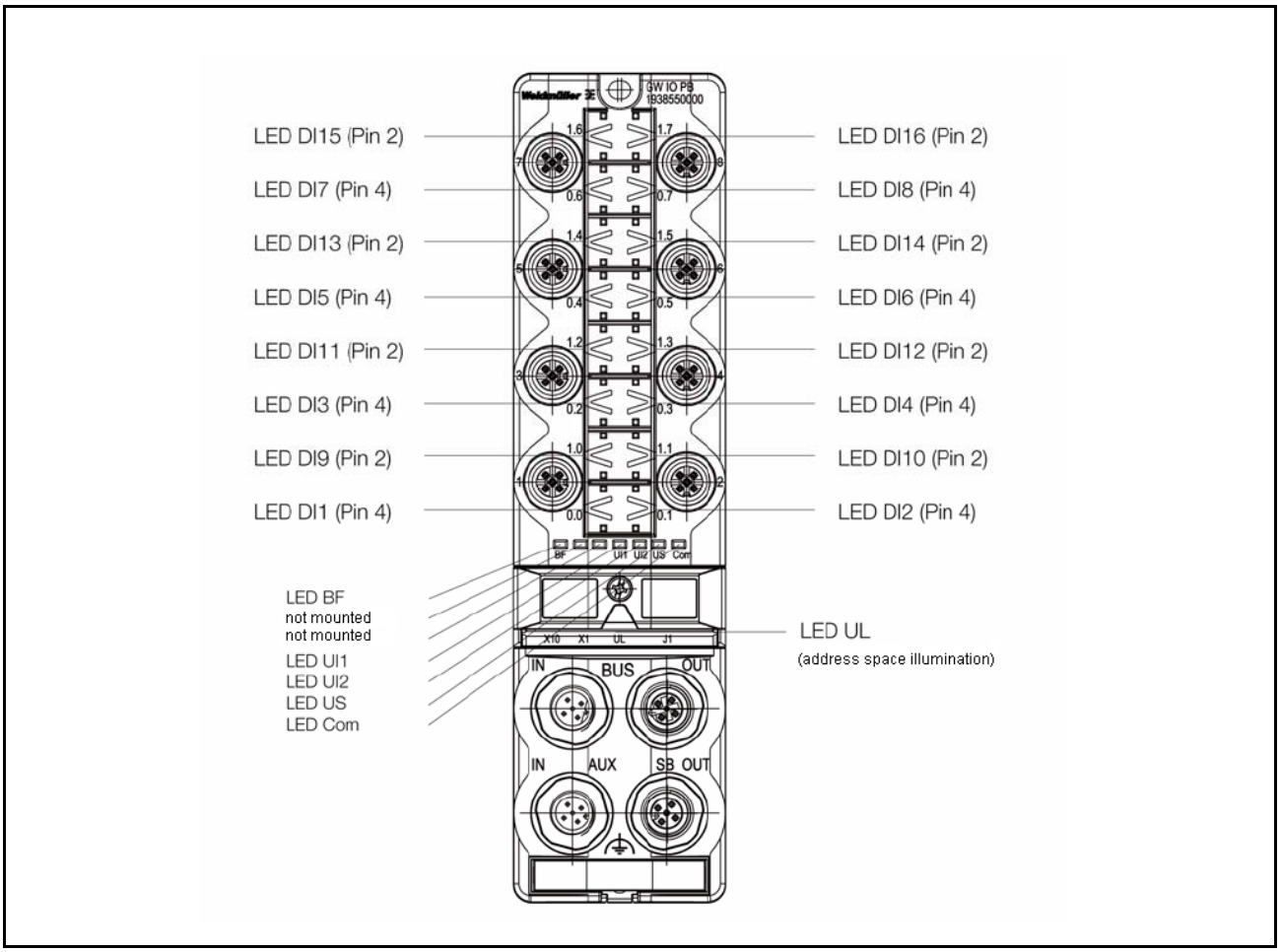

Figure 84 Layout of LEDs on the SAI-AU M12 GW PB 16DI

LED	Input	Display	Comment
DI1 to DI8	Digital input 1	yellow	Status of the digital input ON OFF
	DESINA diagnostic	red	Short-circuit at pin 1, sensor voltage (together with LED pin 2) Error message for DESINA diagnostics input
DI9 to DI16	Digital input 2	yellow	Status of digital input or DESINA diagnostics input ON OFF
	DESINA Diagnose	red	Short-circuit at pin 1, sensor voltage (together with LED pin 4)

Table 100 LED displays of the digital inputs

7.4 Layout of LEDs on the gateway I/O PROFIBUS-DP M8

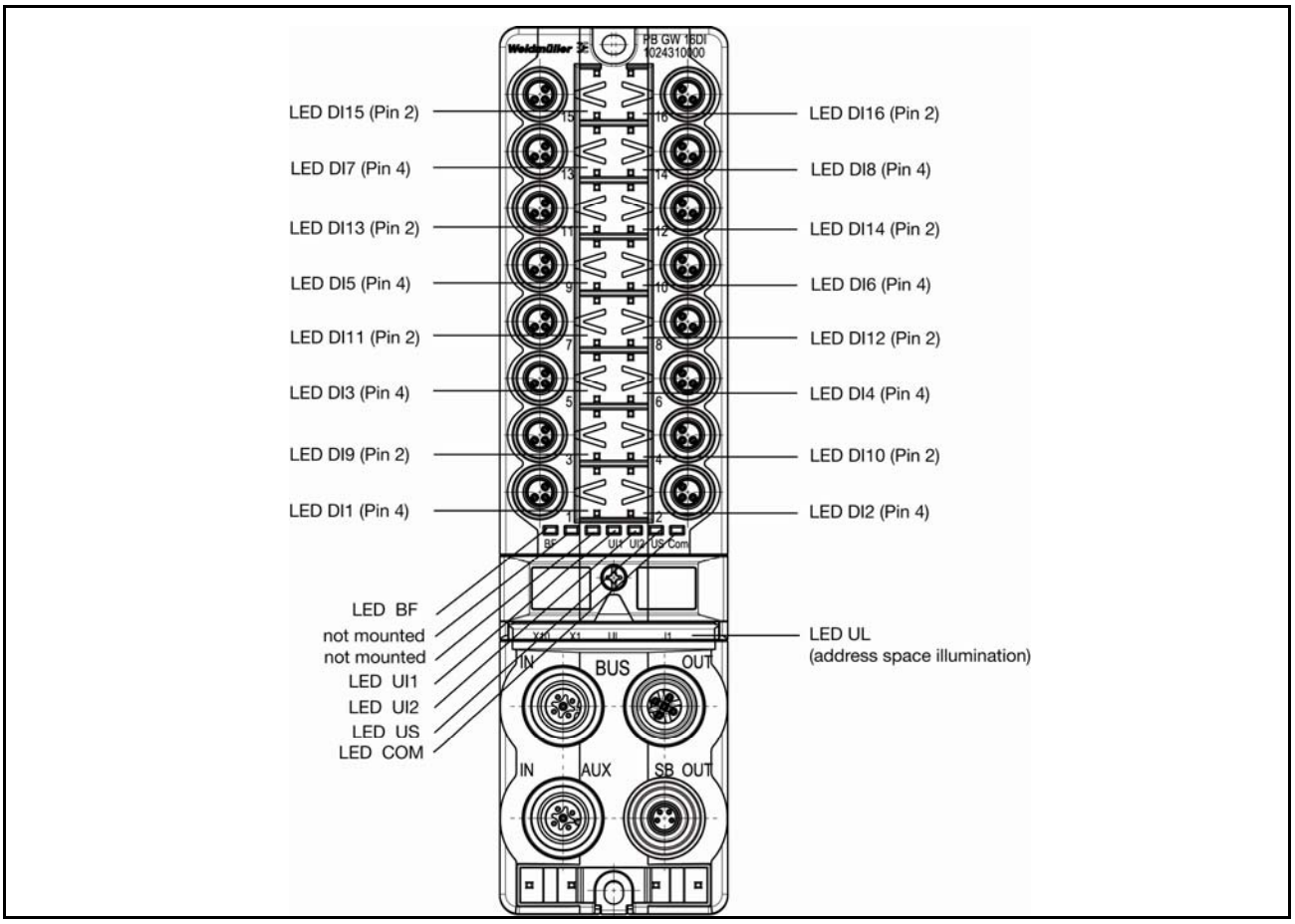

Figure 85 Layout of LEDs on the SAI-AU M8 GW PB 16DI

LED	Input	Display	Comment
DI1 to DI8	Digital input 1	yellow	Status of the digital input ON OFF
	DESINA diagnostic	red	Short-circuit at pin 1, sensor voltage (together with LED pin 2) Error message for DESINA diagnostics input
DI9 to DI16	Digital input 2	yellow	Status of digital input or DESINA diagnostics input ON OFF
	DESINA diagnostic	red	Short-circuit at pin 1, sensor voltage (together with LED pin 4)

Table 101 LED displays of the digital inputs

7.5 Layout of the LEDs on the extension I/O 8DI

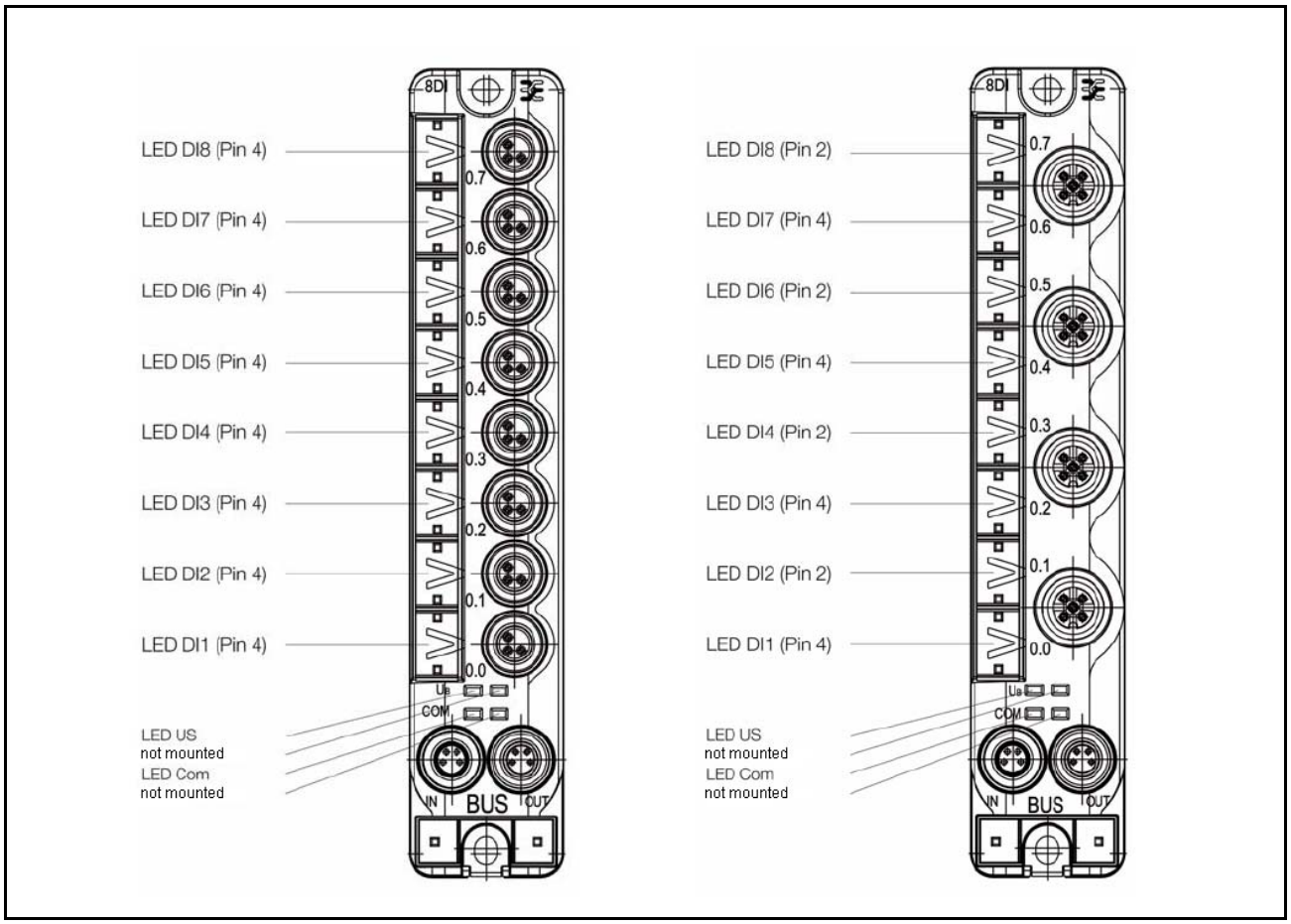

Figure 86 Layout of the LEDs on the SAI-AU M8 SB 8DI and SAI-AU M12 SB 8DI

SAI-AU M8 SB 8DI

LED	Input	Dispaly	Comments
DI1 to DI8	Digital input 1	yellow	Status of the digital input ON OFF
	DESINA diagnostic	Rot	Short-circuit at pin 1, sensor voltage (together with LED pin 2)
			Error message for DESINA diagnostics input

Table 102 LED displays of digital inputs SAI-AU M8 SB 8DI

SAI-AU M12 SB 8DI

LED	Input	Dispaly	Comments
DI1, DI3, DI5, DI7	Digital input 1	yellow	Status of the digital input ON OFF
	DESINA diagnostic	Rot	Short-circuit at pin 1, sensor voltage (together with LED pin 2) Error message for DESINA diagnostics input
DI2, DI4, DI6, DI8	Digital input 2	Gelb	Status of digital input or DESINA diagnostics input ON OFF
		Rot	Short-circuit at pin 1, sensor voltage (together with LED pin 4)

Table 103 LED displays of digital inputs SAI-AU M12 SB 8DI

7.6 Layout of the LEDs on the extension I/O 8DIO

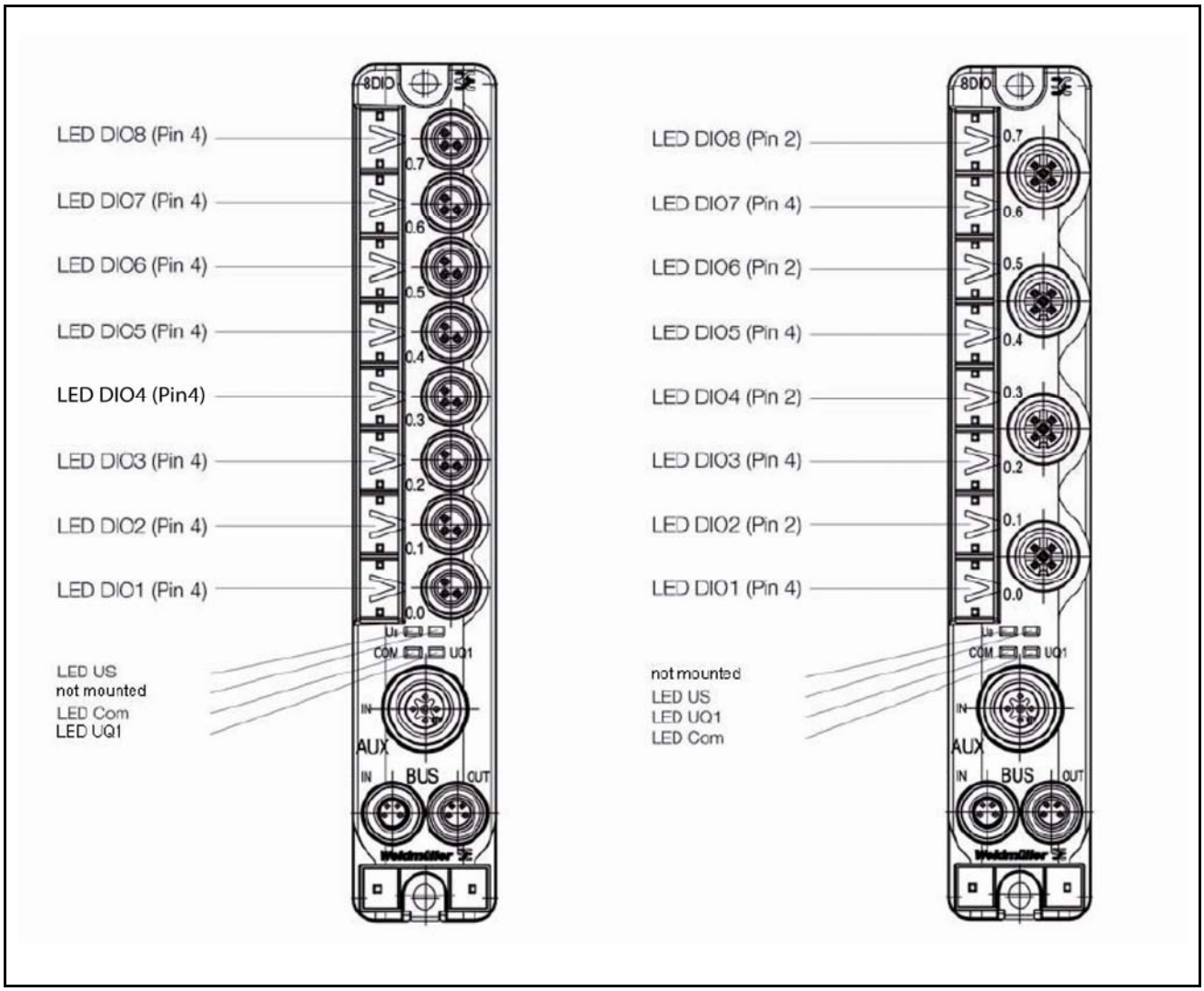

Figure 87 Layout of the LEDs on the SAI-AU M8 SB 8DIO and SAI-AU M12 SB 8DIO

SAI-AU M8 SB 8DIO

LED	E / A	Display	Comments
DIO1 to DIO8	Digital input 1	yellow	Status of the digital input ON OFF
	DESINA diagnostic	red	Short-circuit at pin 1, sensor voltage (together with LED pin 2) Error message for DESINA diagnostics input
	Digital input 1	yellow	Status of the digital input ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 2) Short-circuit at pin 4, with the earth

Table 104 LED displays of digital inputs and outputs SAI-AU M8 SB 8DIO

SAI-AU M12 SB 8DIO

LED	E / A	Display	Comments
DIO1, DIO3, DIO5, DIO7	Digital input 1	yellow	Status of the digital input ON OFF
	DESINA diagnostic	red	Short-circuit at pin 1, sensor voltage (together with LED pin 2) Error message for DESINA diagnostics input
	Digital input 1	yellow	Status of the digital input ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 2) Short-circuit at pin 4, with the earth
DIO2, DIO4, DIO6, DIO8	Digital input 2	yellow	Status of digital input or DESINA diagnostics input ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 4)
	Digital output 2	yellow	Status of the digital input ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 4) Short-circuit at pin 2, with the earth

Table 105 LED displays of digital inputs and outputs SAI-AU M12 SB 8DIO

7.7 Layout of the LEDs on the extension I/O 8DO 2 amp

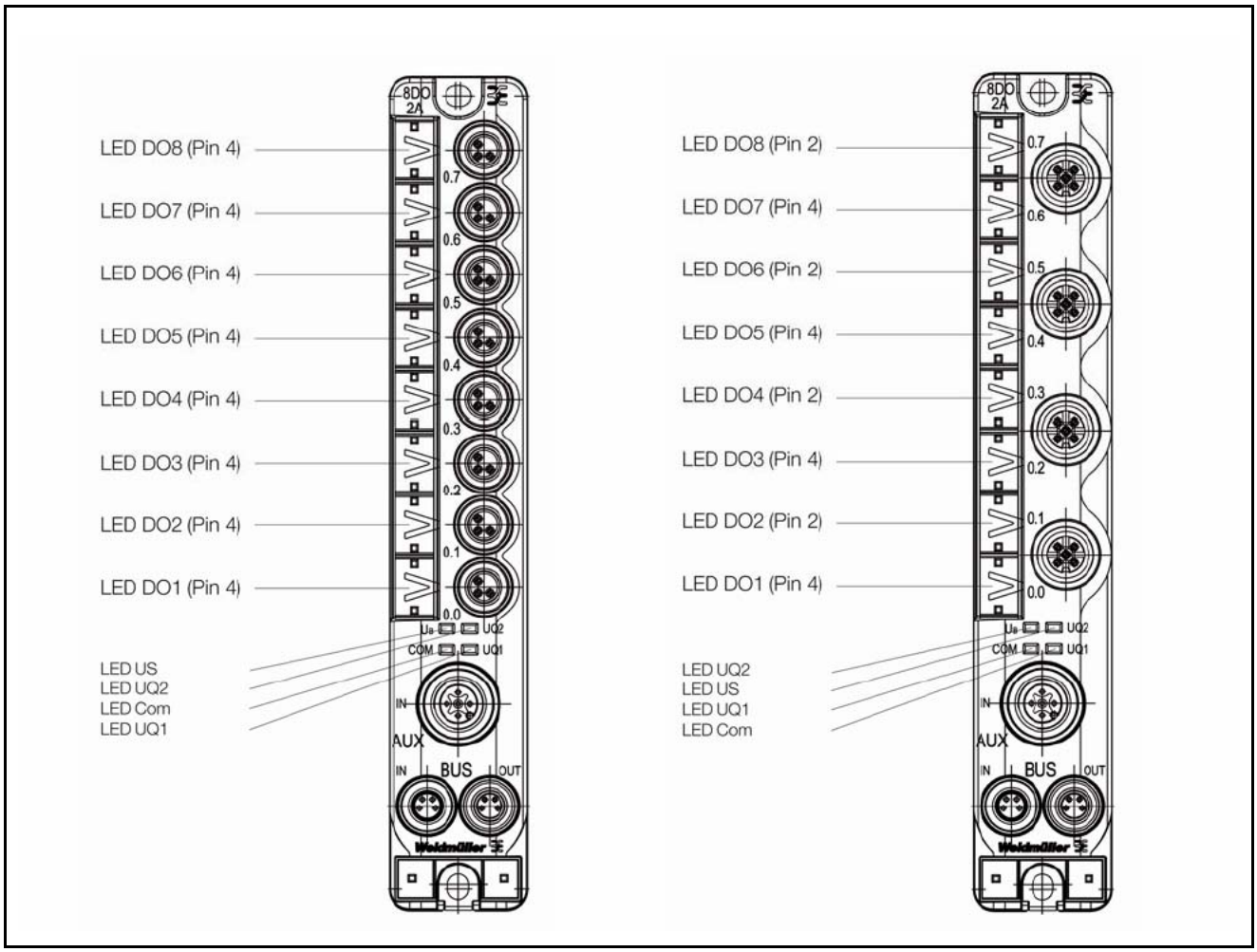

Figure 88 Layout of the LEDs on SAI-AU M8 SB 8DO 2A and SAI-AU M12 SB 8DO 2A

SAI-AU M8 SB 8DO 2A

LED	Output	Display	Comments
DO1 to DO8	Digital output 1	yellow	Status of the digital output ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 2)
			Short-circuit at pin 4, with the earth

Table 106 LED displays of the digital outputs SAI-AU M8 SB 8DO 2A

SAI-AU M12 SB 8DO 2A

LED	Output	Display	Comments
DO1, DO3, DO 5, DO7	Digital output 1	yellow	Status of the digital output ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 2)
			Short-circuit at pin 4, with the earth
DO2, DO4, DO6, DO8	Digital output 2	yellow	Status of the digital output ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 4)
			Short-circuit at pin 2, with the earth

Table 107 LED displays of the digital outputs SAI-AU M12 SB 8DO 2A

7.8 Layout of the LEDs on the extension I/O 4AI

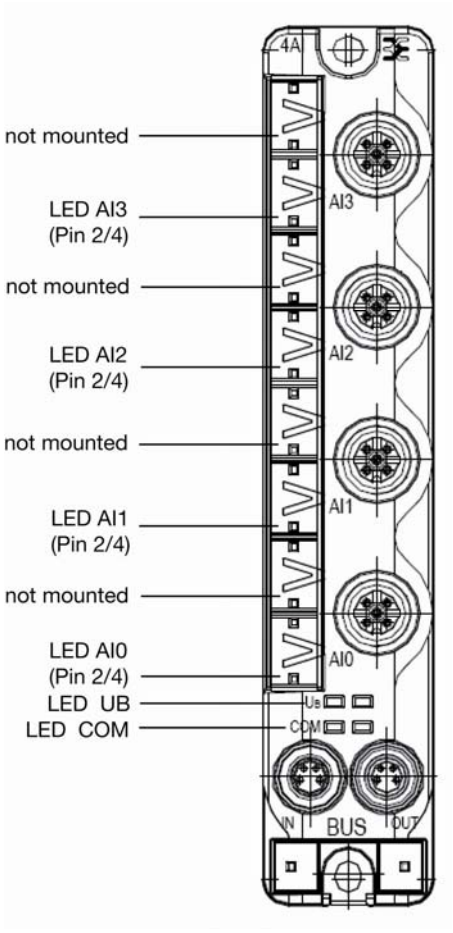

Figure 89 Layout of LEDs on the SAI-AU M12 SB 4AI

LED	Input	Dis-play	Comments
AI0 to AI3	Analogue input	red	Values out of parameter range Short-circuit at pin 1, with the Pin3

Table 108 LED displays of the analogue input

7.9 Layout of the LEDs on the extension I/O 4AO

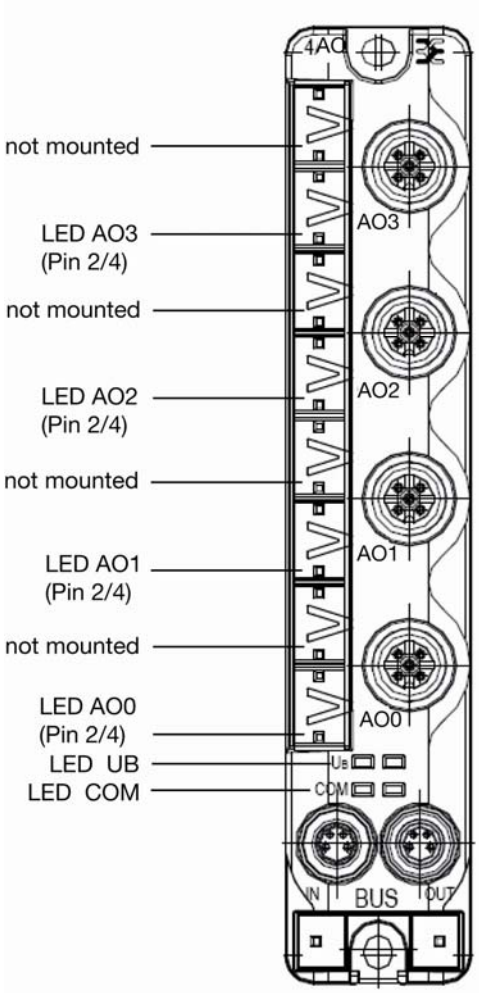

Figure 90 Layout of LEDs on the SAI-AU M12 SB 4AO

LED	Output	Display	Comments
AO0 to AO3	Analogue output	red	Short-circuit at pin 1, with the Pin3

Table 109 LED displays of the analogue output

7.10 Layout of the LEDs on the extension I/O 4PT100

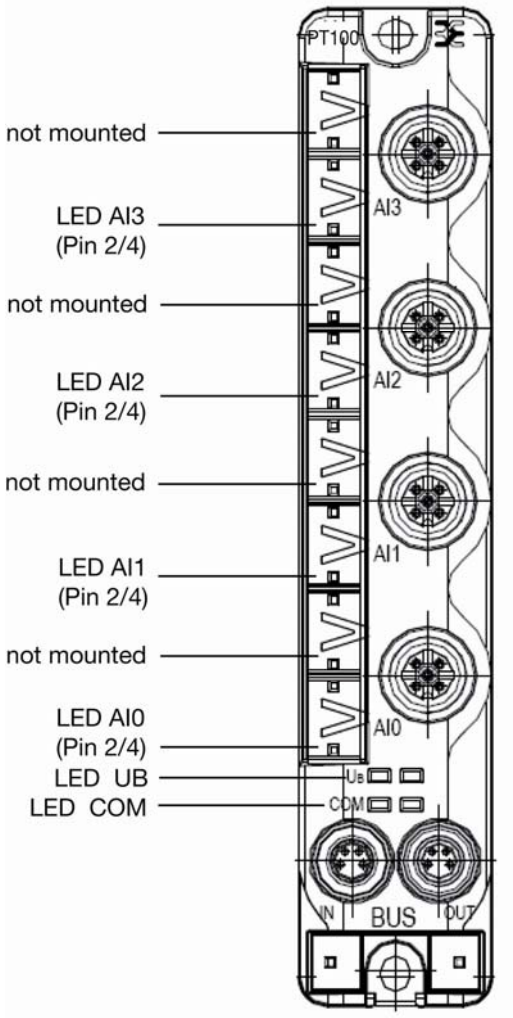

Figure 91 Layout of LEDs on the SAI-AU M12 SB 4PT100

LED	Input	Display	Comments
AO0 to AO3	Analogue input	red	Sensor error indication

Table 110 LED displays of the analogue input

7.11 Layout of the LEDs on the extension I/O 4THERMO

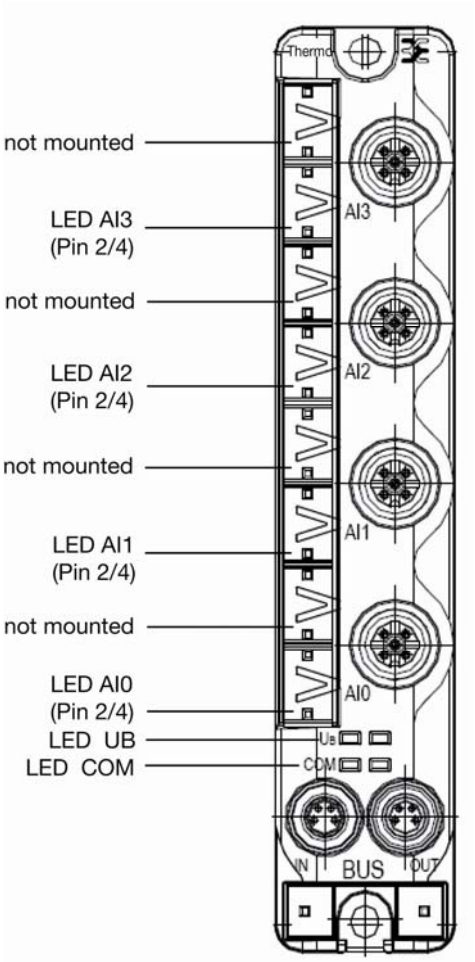

Figure 92 Layout of LEDs on the SAI-AU M12 SB 4THERMO

LED	E / A	Anzeige	Bedeutung
AO0 to AO3	Analogue input	red	Sensor error indication

Table 111 LED displays of the analogue input

7.12 Layout of the LEDs on the extension I/O 2CNT

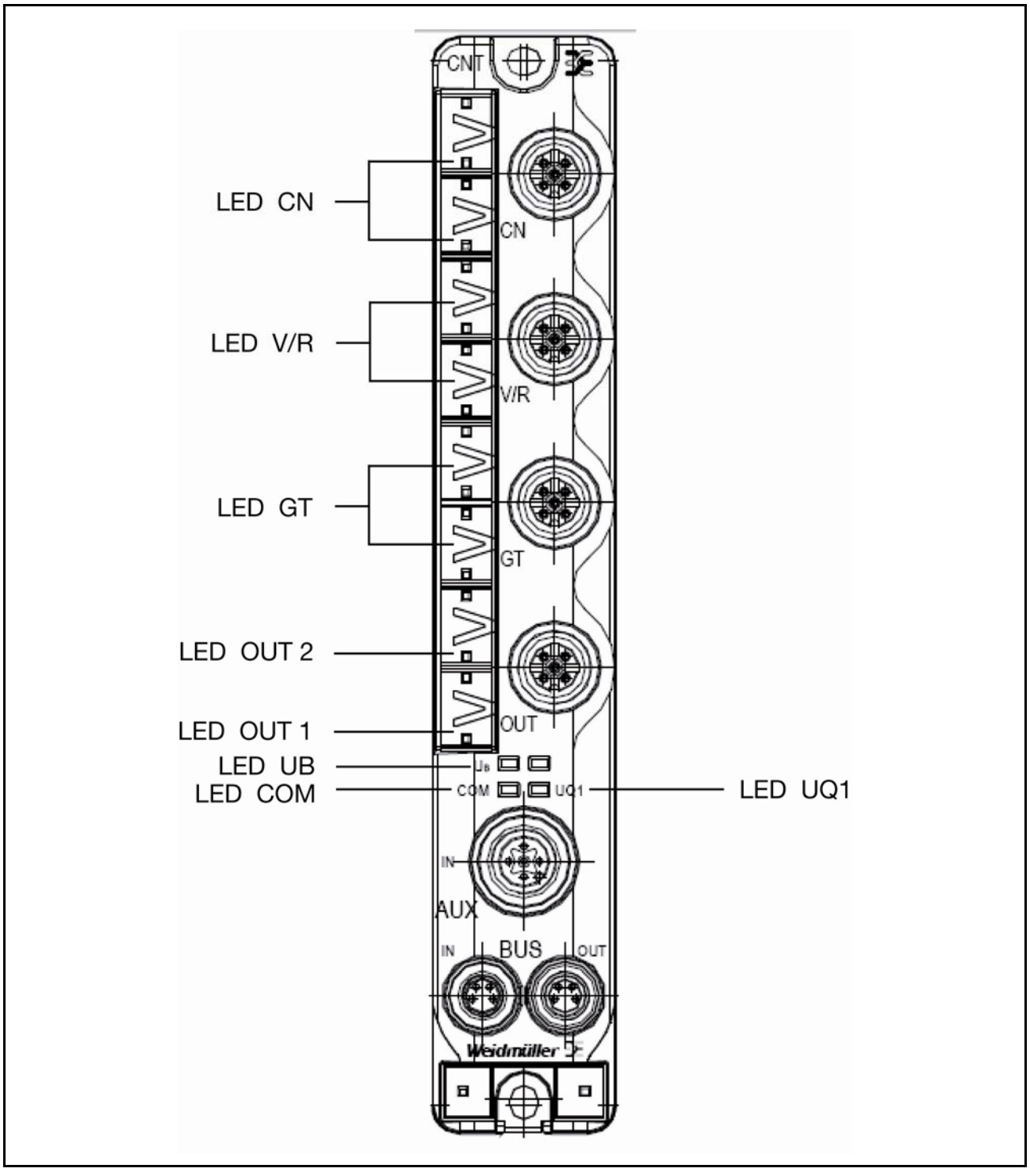

Figure 93 Layout of LEDs on the SAI-AUM12 SB 2CNT

LED	E / A	Display	Comments
OUT1	Digital output 1	yellow	Status of the digital output ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 2)
			Short-circuit at pin 4, with the earth
OUT2	Digital output 2	yellow	Status of the digital output ON OFF
		red	Short-circuit at pin 1, sensor voltage (together with LED pin 4)
			Short-circuit at pin 2, with the earth
GT	Gate inputs	yellow	gesperrt
		green	frei
V/R	Direction inputs	green	forward
		yellow	backward
CN	Count inputs	green	normaly Count input
		yellow	quadratur encoder
		off	no impuls

Table 112 LED displays of the digital outputs for 2. connector (GT) and 3. connectors (V/R, CN)

Appendix

Appendix A: Product Overview

Modules		
Gateway I/O modules		
SAI-AU M12 PB GW 16DI		1938550000
SAI-AU M12 DN GW 16DI		1938570000
SAI-AU M12 IE GW 16DI		1938580000
SAI-AU M12 USB GW 16I8O		1962240000
Extension I/O modules		
SAI-AU M8 SB 8DI		1938600000
SAI-AU M12 SB 8DI		1938610000
SAI-AU M8 SB 8DIO		1938630000
SAI-AU M12 SB 8DIO		1938640000
SAI-AU M8 SB 8DO 2A		1938660000
SAI-AU M12 SB 8DO 2A		1938680000
SAI-AU M12 SB 4AI		1938690000
SAI-AU M12 SB 4AO		1938700000
SAI-AU M12 SB 4PT100		1938710000
SAI-AU M12 SB 4Thermo		1938720000
SAI-AU M12 SB 2Counter		1938730000

Plug-in connectors		
I/O and AUX connectors		
SAIS-5/7	M12 male connector, 5-pole, straight	9456940000
SAISW-5/7	M12 male connector, 5-pole, angled	9456950000
SAIB-5/7	M12 female connector, 5-pole, straight	9457250000
SAIBW-5/7	M12 female connector, 5-pole, angled	9457260000
SAIS-4-IDC	M12 small M12 male connector, 4-pole, IDC connection	1781550001
SAIB-4-IDC-	M12 small M12 female connector, 4-pole, IDC connection	1781540001
Sub-bus connector		
SAISM-M8-4P(TL)	M8 male connector, 4-pole, straight, metal	1921040000
SAIBM-M8-4P(TL)	M8 female connector, 4-pole, straight, metal	1921020000

Plug-in connectors		
PROFIBUS connectors		
SAISM 5/8S	M12 5P B-COD PROFIBUS male connector, straight, B-coded	1784790000
SAISM 5/8S	M12 5P B-COD PROFIBUS female connector, straight, B-coded	1784780000
SAIS-4-IDC-M12B-COD	male connector, 4-pole, IDC connection	1864730000
SAIB-4-IDC-M12B-COD	female connector, 4-pole, IDC connection	1864740000
PROFIBUS terminating resistor		
SAIEND PB M12 5P B-COD	M12 terminating resistor, B-coded	1784770000
terminating resistor Sub-Bus		
SAIEND CAN m8 4P		1955340000

Twin-plugs		
Twin-plugs		
SAI-Y-5S-M12/M12	M12 on 2 x M12, with connection for two sensors	1826880000
SAI-Y-4-4/2-4 M12/8	M12 on 2 x M8, with connection for two sensors	1783420000

Cables:		
General cables	Example: Cable lenght 3 m	
Sensor / actuator cables		
SAIL-M12G-5-3.0U	M12 male connector, 5-pole, straight, PUR, 3 m cable	9457610300
SAIL-M12BG-5-3.0U	M12 female connector, 5-pole, straight, PUR, 3 m cable	9457910300
SAIL-M12GM12G-5-1.5U	M12 male connector, 5-pole, straight on female, M12 straight, PUR, 3 m cable	9457340300
SAIL-M12W-5-3.0U	M12 male connector, 5-pole, angled, PUR, 3 m cable	9457670300
SAIL-M12BW-5-3.0U	M12 female connector, 5-pole, angled, PUR, 3 m cable	9457690300
SAIL-M12GM12G-5-3.0U	M12 male connector, 5-pole, straight on female, M12 straight, PUR, 3 m cable	9457900300
SAIL-M8GS-3-3.0U	M8 male connector, 3-pole, straight, PUR, 3 m cable	1824590300
SAIL-M8WS-3-3.0U	M8 male connector, 3-pole, angled, PUR, 3 m cable	1857550300
SAIL-M8GBS-3-3.0U	M8 female connector, 3-pole, straight, PUR, 3 m cable	9457450300
SAIL-M8WBS-3-3.0U	M8 female connector, 3-pole, angled, PUR, 3 m cable	9457380300
SAIL-M8GSM8GS-3-3.0U	M8 male connector, 3-pole, straight, on female, M8, straight, PUR, 3 m cable	1927150300
SAIL-M8GSM8GS-3-3.0U	M8 male connector, 3-pole, angled, on female, M8,	1857670300

	angled, PUR, 3 m cable	
Cables:		
Sub-bus connectors		
SAIL-M8GM8G-4S-0.3Q-SB	M8 male connector, 4-pole, straight, on female, M8, straight, shielded, PUR, 0.3 m	1981900030
SAIL-M8GM8G-4S-1.5Q-SB	M8 male connector, 4-pole, straight, on female, M8, straight, shielded, PUR, 1.5 m	1981900150
SAIL-M8GM8G-4S-3.0Q-SB	M8 male connector, 4-pole, straight, on female, M8, straight, shielded, PUR, 3 m	1981900300
SAIL-M8GM8G-4S-5.0Q-SB	M8 male connector, 4-pole, straight, on female, M8, straight, shielded, PUR, 5 m	1981900500
SAIL-M8GM8G-4S-10Q-SB	M8 male connector, 4-pole, straight, on female, M8, straight, shielded, PUR, 10 m	1981901000
SAIL-M8GM8G-4S-1.5Q-SB	M8 male connector, 4-pole, straight, shielded, PUR, 1.5 m	1981920150
SAIL-M8GM8G-4S-3.0Q-SB	M8 male connector, 4-pole, straight, shielded, PUR, 3 m	1981920300
SAIL-M8GM8G-4S-5.0Q-SB	M8 male connector, 4-pole, straight, shielded, PUR, 5 m	1981920500
SAIL-M8GM8G-4S-10Q-SB	M8 male connector, 4-pole, straight, shielded, PUR, 10 m	1981921000
SAIL-M8GM8G-4S-1.5Q-SB	M8 female connector, 4-pole, straight, shielded, PUR, 1.5 m	1981910150
SAIL-M8GM8G-4S-3.0Q-SB	M8 female connector, 4-pole, straight, shielded, PUR, 3 m	1981910300
SAIL-M8GM8G-4S-5.0Q-SB	M8 female connector, 4-pole, straight, shielded, PUR, 5 m	1981910500
SAIL-M8GM8G-4S-10Q-SB	M8 female connector, 4-pole, straight, shielded, PUR, 10 m	1981911000
PROFIBUS cables	Example: Cable length 3 m	
SAIL-M12G-PB-3.0U	M12 male connector, straight, PUR, 3 m cable	1873300300
SAIL-M12GM12G-PB-3.0U	M12 male connector, 5-pole, straight on female, M12, straight, PUR, 3 m cable	1873310300
SAIL-M12BG-PB-3.0U	M12 female connector, straight, PUR, 3 m cable	1873320300

Appendix B: Drilling Templates

Drilling templates for 8DI, 4AI, 4AO, PT100 and thermal modules

Overhead view Side view

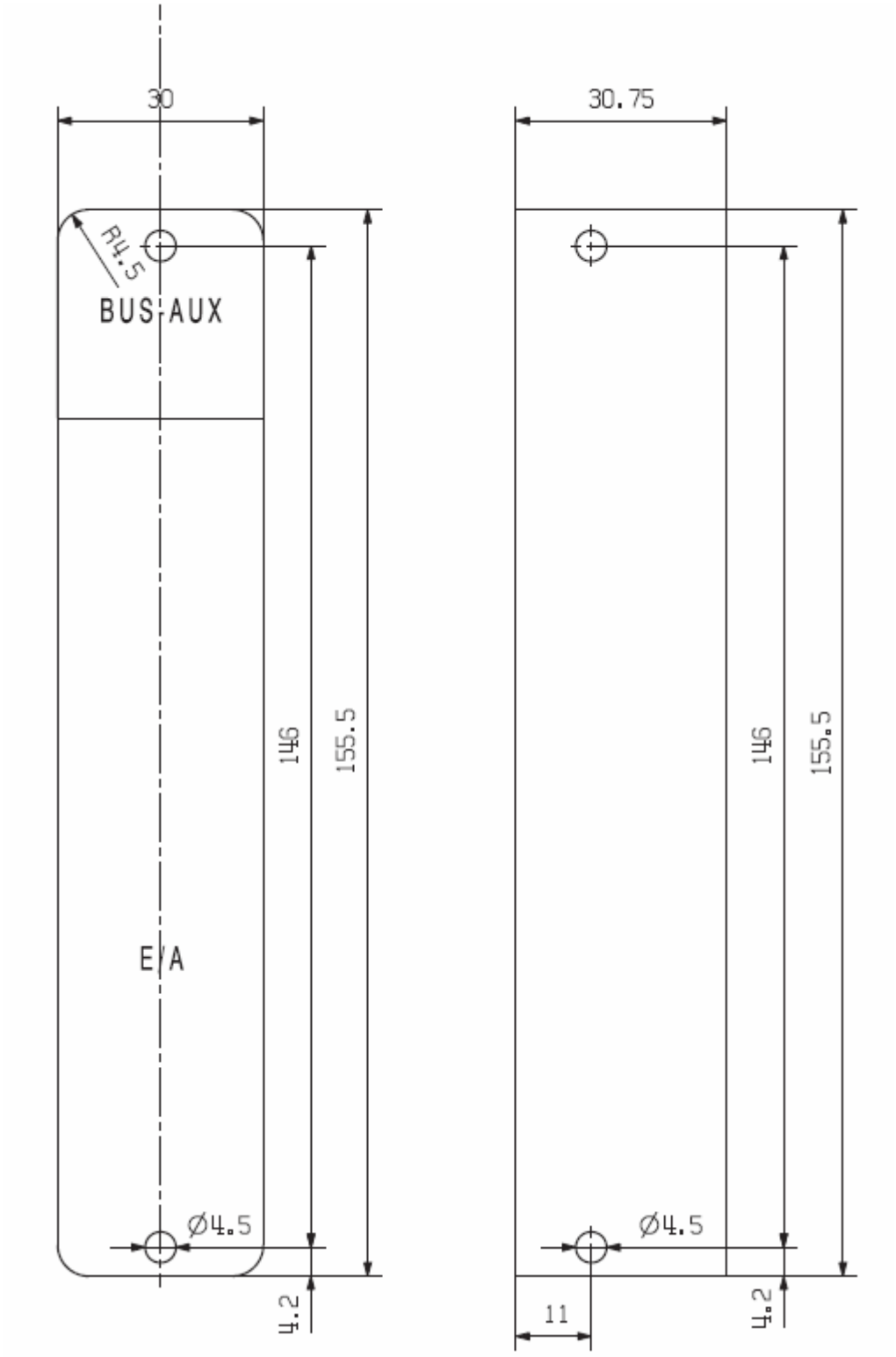

Figure 94 Drilling templates for the 8DI, 4AI, 4AO, PT100 and thermal modules

Drilling templates for the 8DIO, 8DO 2A, and counter modules

Overhead view

Side view

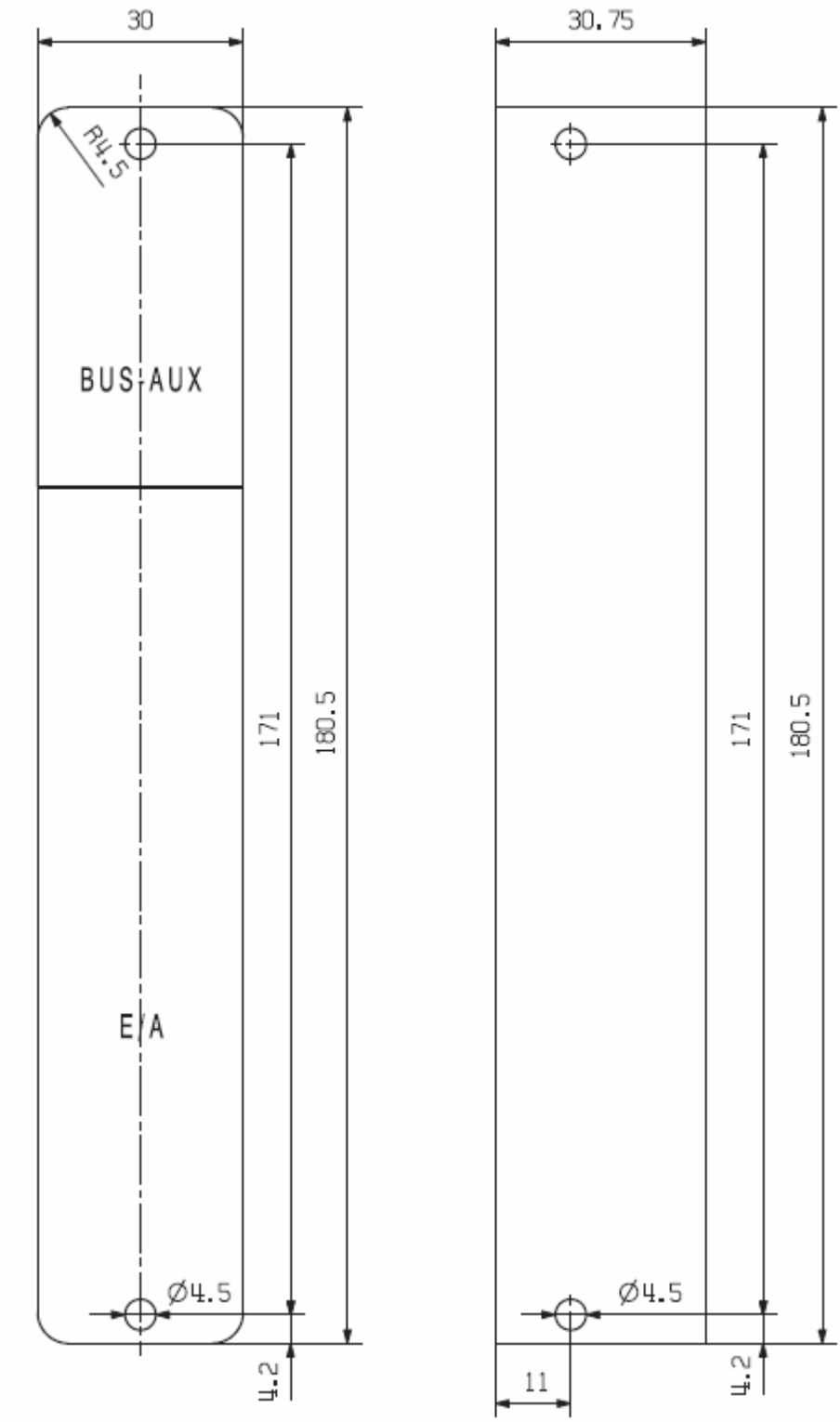

Figure 95 Drilling templates for the 8DIO, 8DO 2A, and counter modules

Drilling templates for the gateway I/Os

Overhead view

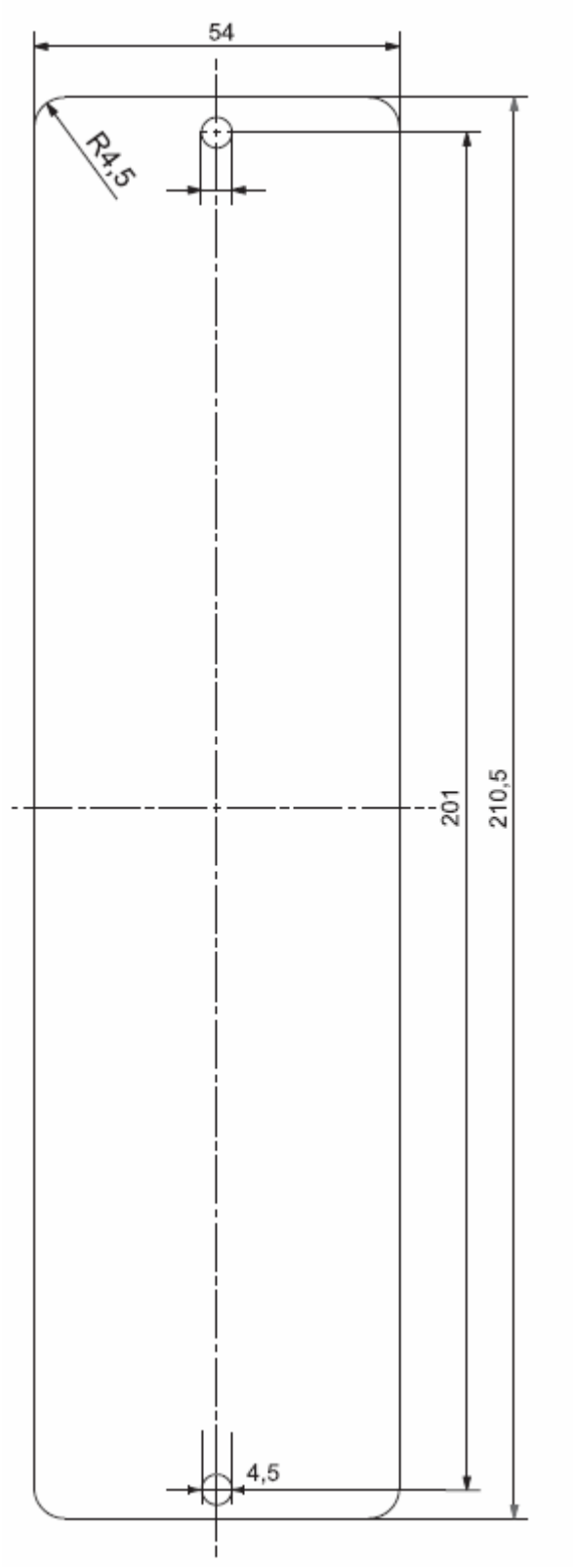

Figure 96 Drilling templates for the gateway I/Os

Appendix C: Converting from Hexadecimal to Decimal

Dec.	Hex.	Dec.	Hex.	Dec.	Hex.	Dec.	Hex.
0	00	32	20	64	40	96	60
1	01	33	21	65	41	97	61
2	02	34	22	66	42	98	62
3	03	35	23	67	43	99	63
4	04	36	24	68	44	100	64
5	05	37	25	69	45	101	65
6	06	38	26	70	46	102	66
7	07	39	27	71	47	103	67
8	08	40	28	72	48	104	68
9	09	41	29	73	49	105	69
10	0A	42	2A	74	4A	106	6A
11	0B	43	2B	75	4B	107	6B
12	0C	44	2C	76	4C	108	6C
13	0D	45	2D	77	4D	109	6D
14	0E	46	2E	78	4E	110	6E
15	0F	47	2F	79	4F	111	6F
16	10	48	30	80	50	112	70
17	11	49	31	81	51	113	71
18	12	50	32	82	52	114	72
19	13	51	33	83	53	115	73
20	14	52	34	84	54	116	74
21	15	53	35	85	55	117	75
22	16	54	36	86	56	118	76
23	17	55	37	87	57	119	77
24	18	56	38	88	58	120	78
25	19	57	39	89	59	121	79
26	1A	58	3A	90	5A	122	7A
27	1B	59	3B	91	5B	123	7B
28	1C	60	3C	92	5C	124	7C
29	1D	61	3D	93	5D	125	7D
30	1E	62	3E	94	5E	126	7E
31	1F	63	3F	95	5F		

Table 113 Converting from hexadecimal to decimal

Sources

Web addresses

www.weidmueller.com
www.profibus.com

Standards

IEC 61158-x:	Digital data communications for measurement and control – Fieldbus for use in industrial control systems.
IEC 61784-1:	Digital Data Communications for Measurement and Control – Part1: profile sets for continuous and discrete Manufacturing relative to Fieldbus Use in Industrial Control Systems
EN 50170:	Universal Field Communication System, Revision A2

Technical support

If you have further questions or suggestions to the SAI-module, our technical support will help you with pleasure.

E-Mail:	sai-support@weidmueller.de
Phone:	+49 (0)3475 / 65 01 68
	+49 (0)3475 / 65 01 322
FAX:	+49 (0)3475 / 65 01 70

Index

Glossary

AC or DC drives

AC or DC motors.

AI

Please see Analogue input.

Analogue input

Analogue input, detects analogue signals as voltage signals from 0 to 10 V or as current signals from 0 to 20 mA or 4 to 20 mA; resolution is generally 10 or 12 bit, 16 bit representation.

Analogue output

Analogue input, control variable as analogue signal; voltage signals from 0 to 10 V or -10 V to +10 V or as current signals from 0 to 20 mA or 4 to 20 mA; resolution is generally 10 or 12 bit, representation 16 bit representation.

AO

Please see Analogue output.

AUX IN

Power supply, 24 V DC feed in

AUX OUT

Power supply, 24 V DC feed out

Baud rate

The baud rate describes the number of signal codes (symbol) that can be transmitted per second.

Bus / power section

The section on the SAI to which the Fieldbus and the supply voltage are connected.

Bus termination

Install the bus terminations at the physical beginning and physical end, according to the CANopen standard ISO11989 using the following values: An active bus termination must be fitted at the beginning and end of each CAN-bus segment, according to CANopen-Norm ISO11898.

CAL

CAN Application Layer. Application layer (ISO/OSI layer 7) as specified by the CiA.

CAN

Controller Area Network.

CiA

CAN in Automation - the organization of the CAN-bus device manufacturers and users

CiA Draft Standard 102

Description of the physical CAN communications (level 2) for industrial applications.

CiA Draft Standard 301

Description of the application and communication profile for industrial systems.

CiA Draft Standard 401

Description of the device profile for general input and output modules.

CMS

CAN-based Message Specification A service element which makes the application level available for object manipulation.

COB

Communication Object Messages are sent on the network as COBs and dealt with as communication objects.

COB-ID

COB Identifier Each communications object is identified by a unique COB-ID.

The COB-ID indicates the priority of the communications object.

Coding A

Special coding for male or female M12 connectors for purposes of recognition and non-reversal. On SAI modules, coding A is utilised for the power supply as well as inputs and outputs. DeviceNet and CANopen Fieldbus systems have also specified the A-coded version.

Coding B

Special coding for male or female M12 connectors for purposes of recognition and non-reversal. Coding B is used for the PROFIBUS-DP Fieldbus.

Configuration

Please see Hardware configuration.

Configuration menu

This is used to enter and configure the hardware of a control system.

Please see Hardware configuration.

CSMA/CA

Carrier Sense Multiple Access / Collision Avoidance.

DATA A

Data from PROFIBUS is transmitted via a two-core, shielded twisted-pair cable with RS485 (transmission of differential signal). The strands are designated as DATA A (green strand) and DATA B (red strand).

DATA B

Data from PROFIBUS is transmitted via a two-core, shielded twisted-pair cable with RS485 physic (transmission of differential signal). The strands are designated as DATA A (green strand) and DATA B (red strand).

DBT

COB-ID Distributor. A service element of the application layer which is responsible for the assignment of the COB IDs to the relevant communication object of the CMS service.

DESINA

Please see Diagnostics input DESINA.

DI

Please see Digital input.

Diagnostic telegrams

Diagnostic telegrams indicate the status of the PROFIBUS-DP slave. A diagnostic telegram is composed of six bytes of standard diagnostics information as well as the vendor diagnostics information. The number of bytes required for the manufacturer's diagnostics varies from module to module.

Diagnostics data

Diagnostics data is transmitted in a diagnostics telegram. This information is differentiated between standard diagnostics information (6 bytes) and vendor diagnostics information, the length of which depends on the vendor.

Diagnostics input DESINA

DESINA stands for the DEcentralised and Standardised INstAllations technology for machine tools and production systems. DESINA describes the specification for standardising the electric, hydraulic and pneumatic installation of automated machine tools and manufacturing systems. DESINA diagnostics input supplies diagnostic information in addition to the digital input signal.

See also http://www.desina.de.

DIN

German Institute for Standardization.

DO

Please see Digital output.

DP

Please see PROFIBUS-DP.

EDS file

An EDS file (Electronic Data Sheet) is a text file containing the properties of a CANopen device.

EMC

Electro-Magnetic Compatibility indicates the disturbance degree of a device in relationship to its surroundings.

FE

See Functional Earth.

Field devices

Field devices is a term used to describe all of the devices operating on a Fieldbus. Field devices can be input and output modules (SAIs) as well as drives, controls and human-machine interfaces.

Frequency converter

A frequency converter generates an alternating current of a certain frequency from an alternating current of a different frequency and may also alter the voltage. It makes it possible to adjust rotational speeds. In particular for three-phase motors, frequency converters are an economic form of control.

Functional earth

The functional earth serves to discharge compensating and interference currents in order to guarantee EMC characteristics. According to VDE 0100, the functional earth is not the same as the protective earth; it is forbidden to use it as the protective earth.

Hardware configuration

All devices and parameters of a control system are defined in a hardware configuration.

Hardware configurator

Generally vendor specific, this is dedicated software for creating and downloading a hardware configuration.

Hexadecimal code

Base-16 numeric code that represents information from 1 digit, 4 bit, decimal numbers 0 to 15 using digits 0 to 9 together in conjunction with the letters A to F.

High byte

More-significant byte of a term consisting of two or more bytes, for example, a software version number.

Please see Low byte.

I/O section

The section of the SAI where the digital or analogue sensors and actuators are connected.

IEC

International Electrotechnical Commission

Industry PC

A standard PC adapted to suit harsh production environments.

Input addresses

External signals in a PLC are exchanged via digital or analogue inputs or outputs. These are controlled by the PLC programme via the addresses. The addresses can be a combination of station address, module address and connection address. It sometimes possible that the addresses can only be accessed byte for byte or word for word.

ISO

International Standard Organization

J1

Designation for a special jumper field used to link supply voltages.

Jumpers

Jumpers are used to configure electronic subassemblies or set operating parameters that are carried out either rarely or only once during commissioning procedures.

The jumper is usually made of a small metal plate and a plastic housing. It is plugged into two so-called pins which results in an electrical contact being created via the metal plates. Generally, that results in the function of the hardware component being activated, deactivated or configured.

LED

Light Emitting Diode – used to indicate signal statuses of the digital inputs and outputs as well as the statuses of the voltage supply and Fieldbus.

LED BF

Red/green LED for indicating status on PROFIBUS

Green ON = slave exchanging data

Green flashing = transition after SAI is turned on

Red = error, no data is being exchanged

LED U1

Red/green LED for indicating the status of supply voltage U1

Green ON = UI1 > 18 V DC

Green OFF = UI1 < 18 V DC

Red ON = UI1 < 18 V DC

Red OFF = UI1 > 18 V DC

LED U2

Red/green LED for indicating the status of supply voltage U2

Functions as LED U1

LED UI

Red/green LED for indicating the status of supply voltage UQ1

Functions as LED U1

LED UL

Two green LEDs for indicating module power supply; also serve to illuminate the address section.

LED UQ1

Red/green LED for indicating the status of supply voltage UQ1

Functions as LED U1

LED UQ2

Red/green LED for indicating the status of supply voltage UQ2

Functions as LED U1

LED UQ3

Red/green LED for indicating the status of supply voltage UQ3

Functions as LED U1

Low byte

Least-significant byte of a term consisting of two or more bytes, for example, a software version number.

Please see High byte.

M12

Metric thread with a major diameter of 12 mm.

M12 socket (female connector)

A socket with cavities containing contacts for creating an electrical connection. Sockets are also referred to as female connectors. The mating partner of a socket is referred to as the plug or male connector. The socket outlet can be described as a special form of socket.

M8

Metric thread with a minor diameter of 8 mm.

MNS

Module Network Status

NMT

Network Management Tool.The NMT enables the initialisation and monitoring of network nodes.

OSI

Open Systems Interconnection

Output addresses

External signals in a PLC are exchanged via digital or analogue inputs or outputs. These are controlled by the PLC programme via the addresses. The addresses can be a combination of station address, module address and connection address. It sometimes possible that the addresses can only be accessed byte for byte or word for word.

Output interval

Please see sampling period.

Parameter

Parameters describe the technical characteristics of technical devices. Weidmueller SAI parameters serve to activate the DESINA diagnostic input, to define plug-in connectors as inputs or outputs as well as define the analogue measurement ranges as a current or voltage input.

Parameterisation

Term used to describe assigning parameters with a parameterisation or programming tool.

PDO

Process Data Object. An object for the exchange of process data between different devices.

PE

Please see Protective earth.

Peripheral devices

These are devices outside of a central processing unit; with Fieldbus systems, this also applies to all devices in the Fieldbus.

PLC

PLC stands for Programmable Logic Control.

Plug and Play

Sometimes written as Plug 'n' Play or Plug & Play; it describes the characteristics of modern, mostly peripheral devices that are immediately available for use without having to first install a programme.

Plug-in connectors

A plug-in connector connects lines carrying electrical power or signals. On the one hand, the standards regulate the form and the contact assignment of the connector and the corresponding mating connector as well as defining the electrical signals to be transmitted on the other hand.

Polling

The generally recognised term for "to poll" or query. The poll function is an operating mode of Fieldbus devices in a Fieldbus system.

Power supply

Electrical loads require a voltage supply to provide the power. In control systems, the supply voltage used is 24 VDC.

Please see voltage range.

PROFIBUS

(PROcess FIeld BUS) is a part of the international standards IEC 61158 and IEC 61784. Physically, PROFIBUS is either an electrical network based on a shielded, two conductor cable or an optical network based on a fibre optics cable.

PROFIBUS slave

PROFIBUS slaves exchange data cyclically with a PROFIBUS master. In addition, parameterization, configuration and, in the case of a malfunction, diagnostic data is transmitted. Typical PROFIBUS slaves include connection terminals, repeaters, gateways, communication terminals, valve blocks and others.

PROFIBUS User Organisation

More than 260 vendors and users of the standardised communication system PROFIBUS have come together in the registered association PROFIBUS User Organisation (PUO; German = PNO) to jointly support further technical improvements and establish the use of the technology internationally. The PROFIBUS User Organisation is a registered association. Membership is open to any company or research facility anywhere in the world.

PROFIBUS-DP

This is a special application for automating factory production. DP = Decentralised Periphery.

PROFIBUS-DP address

With the PROFIBUS address you determine at which address your SAI distributor will be identified on PROFIBUS-DP.

PROFIBUS-FMS

This is utilised for the universal, object-oriented, cyclical and acyclic exchange of data at a medium speed. FMS is particularly suitable for exchanging data between intelligent slaves such as PCs and PLCs. PROFIBUS-DP and PROFIBUS-PA are special variants. FMS = Fieldbus Message Specification.

PROFIBUS-Master

PROFIBUS-DP differentiates between Class 1 and Class 2 masters. The Class 2 master is utilised for parameterization of PROFIBUS slaves by means of software; it is mainly used to set the PROFIBUS address. As well as exchanging data with the slave, the Class 1 master supplies the PROFIBUS slave with configuration and parameter data.

PROFIBUS-PA

This is used to control field devices by means of a process control system in the processing industry. This variant of PROFIBUS is used in hazardous areas (Ex-Zone 0 & 1). Low currents only are used so that no sparks flashover in the case of a malfunction; it uses a slower data transmission rate. PA = Process Automation. Vendor-independent compatibility is guaranteed by technical guidelines to ensure implementation of PROFIBUS technology. The technical guidelines are published and distributed centrally by the PROFIBUS User Organisation (PUO) to underline the fact that these are effectively a standard. Diverse PROFIBUS guidelines are available, for example: the "Optical transfer technology for PROFIBUS".

Protective earth

Protective earth conductors are often used in electrical equipment and cable lines. This is also known as the protective lead, earth, earth connection or PE (protective earth).

The task of the protective earth conductor in electrical systems is to protect human beings from dangerous touch voltages as well as to protect the system from damage. The PE conductor is fitted in such a manner that there is an electrical connection between the outer metal housing of the electrical equipment (for example lamps, fridges, motors).

Should a fault occur and the electrical supply voltage comes into contact with the exterior of a piece of electrical equipment, the short-circuit to ground via the PE conductor should ensure that the voltage between the housing of the respective electrical equipment and the ground, with which humans and animals are generally in contact, is reduced to a harmless level.

At the same time, the high short-circuit currents trip the fuse. That ensures that the electrical equipment with the fault is disconnected extremely quickly from the supply voltage.

German regulations stipulate that the PE conductor must be identifiable by the colour combination green/yellow.

Repeaters

Repeaters are necessary in order to create a PROFIBUS-DP network with more than 32 stations or establish a larger network extension. The repeater represents the beginning of a new segment in which the maximum number of stations can be used or the maximum extension is defined.

Resolution

Bit accuracy is a measure of the exactness of digital measurement and calculation operations. An accuracy of 8 bits, for example, 1 byte corresponds to an accuracy of 1/(2^8) = 1/256 or 0.390625% steps. This is particularly important when converting from an analogue signal to a digital value if the measurement value of a sensor (temperature, pressure or similar) is to undergo digital further processing.

Rotary coding switch

Rotary coding switches are used to make settings. They use a minimum of space. These settings are usually coded in decimal or hexadecimal formats.

RS-485

As a so-called differential voltage interface the RS-485 interface operates with +5V (high) and 0V (low) by which the non-inverted signal is transmitted via one strand and the inverted (or negative) signal via the other. As distortions have the same effect on both signals, the difference between both signals remains (virtually) the same and can be used for evaluation purposes.

An RS-485 connection constitutes a serial data transmission, which means the bits are transmitted one after the other on a line.

RTR

Remote Transmission Request. A request for data (data request telegram) with the same ID as used for data transmission.

SAI

The acronym SAI stands for Sensor Actuator Interface. It is a compact-designed distributor or collector of signal lines.

SAI distributor

Please see SAI.

Sampling period

The sampling period determines in which time interval an analogue input is converted. The sampling period for the SAI-AU AI/AO/DI can be set between 5 ms and 250 ms.

SDO

Service Data Object - communication objects for configuration and for access to entries in the object directory.

Segment

The PROFIBUS network consists of one or more segments. The maximum extension of a segment depends on the baud rate being used. Up to 32 PROFIBUS stations can be connected in each segment.

Settings range

Range on the SAI in which the configuration of the hardware is carried out; for example, the module address.

Shielding

The shielding is necessary to protect cables from radiated noise.

Supply voltage

Voltage with which the device is supplied. The power supply in automation engineering is usually 18 to 24 VDC.

SYNC

SYNChronization object

Temperature coefficient

The temperature coefficient is a relative change to a physical variable resulting from a change in temperature of 1 K (Kelvin).

Torx screwdriver

Torx is an improvement to the cross-head screw and hexagon-socket (Allen) as a tool receiving socket, for example in counter sunk screws.

The profile is similar to a six-pointed star with rounded off points and corners – more or less a wave form. Part of the Textron Group, Camcar was the inventor and patent holder. In the meantime, the Torx patent has run out and the hexalobular internal drive feature has been incorporated in international standards.

T-piece

This is offered to provide uninterrupted feed of the supply voltage and the Fieldbus.

T-pieces are connected straight onto the consumer and interconnected with the supply voltage or Fieldbus by means of male and female connectors.

Transmission rate

Please see Baud rate.

Voltage range

The voltage range of the 24 VDC supply voltage is 18 VDC to 30 VDC.

X1

Rotary switch for setting the CAN address, in hexadecimal format, low byte from 01H to 0FH.

X10

Rotary switch for setting the CAN address, in hexadecimal format, high byte from 10H to F0H.

Y-Plugs

Y-plugs separate two digital signals, inputs or outputs applied to an M12 connector in two digital signals.