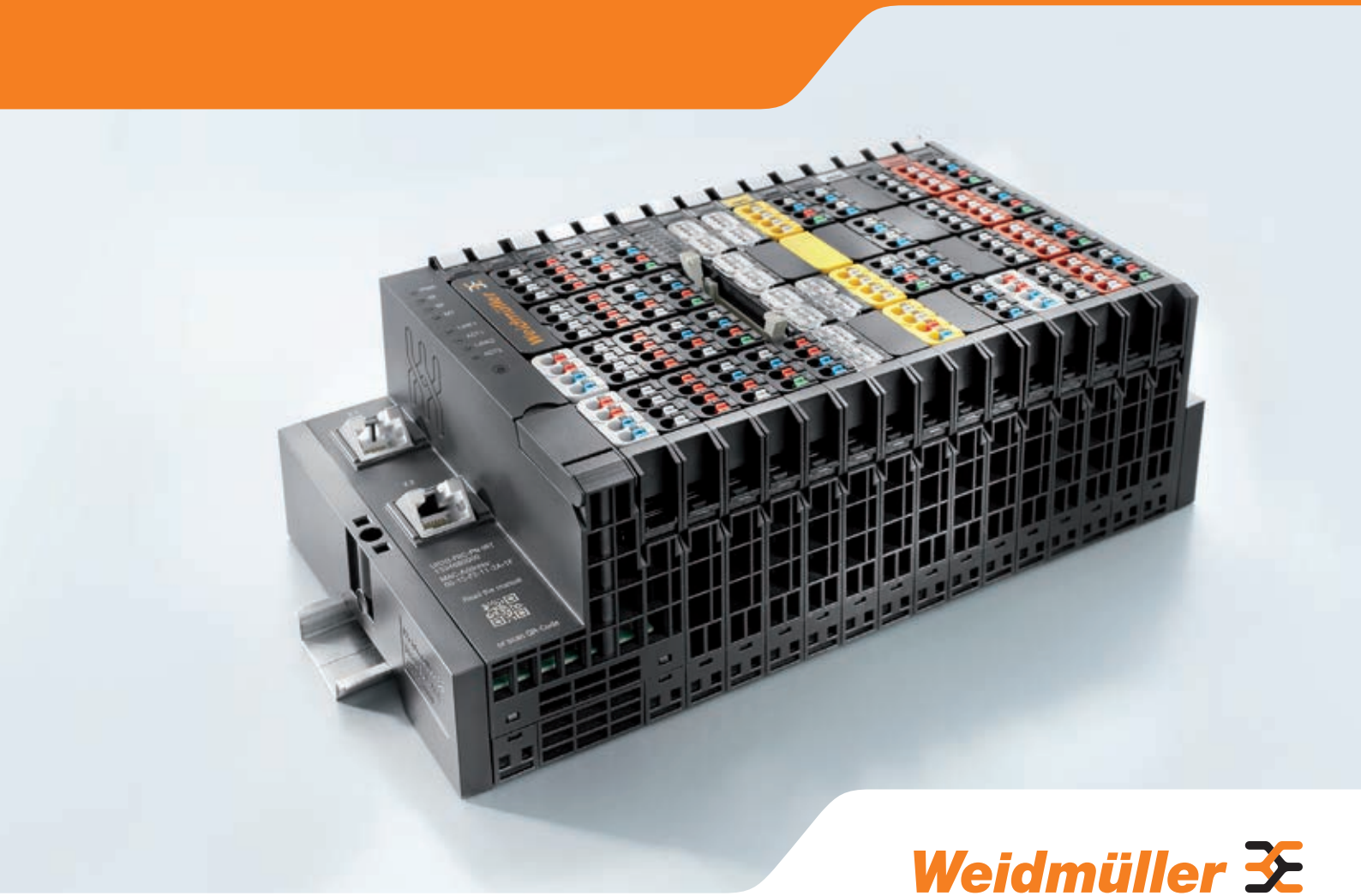
Remote-I/O-System u-remote

Manual (Original)

Let's connect.



Weidmüller

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1 About this documentation

1.1 Symbols and notes

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

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

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

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

ATTENTION

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



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

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

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

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

1.2 Complete documentation



When using u-remote PF-O-xDI-SIL modules, please also observe the "Modules for Functional Safety Manual".
The "u-remote Web Server Manual" describes how to use the web server application.
All documents are available to download from the Weidmüller website.

1.3 Standard data structure



All given details of data structure (e.g. process data, parameters) refer to the u-remote internal mapping, when the standard data format is set in the coupler parameters (see table below). The way these data are represented by other fieldbus participants (e.g. the PLC), depends additionally on the fieldbus specification and the data format of the communicating device. Therefore it might happen, that bytes are changed within a word or words are changed within a double word.

Standard data formats

Fieldbus coupler	Standard data format
UR20-FBC-PB-DP, UR20-FBC-PN-IRT, UR20-FBC-MOD-TCP UR20-FBC-CAN	Motorola
UR20-FBC-EC, UR20-FBC-EIP UR20-FBC-DN	Intel

1.4 Software releases described

The present manual describes the following firmware releases of the couplers:

Firmware releases

Fieldbus coupler	Release
UR20-FBC-PB-DP	01.00.48
UR20-FBC-PN-IRT	01.00.35
UR20-FBC-EC	01.00.43
UR20-FBC-MOD-TCP	02.00.08
UR20-FBC-EIP	01.00.17
UR20-FBC-DN	01.00.02
UR20-FBC-CAN	01.00.04

Device description files

Fieldbus protocol	Release
PROFIBUS	V2.61
PROFINET	20151202
EtherCAT	0028 (Coupler), 0034 (Modules)
Ethernet/IP	1.0
DeviceNet	1.0
CANopen	1.10

Web server language files

Language	Release
German	1.0.4
English	1.0.4
Chinese	1.0.4

2 Safety

This section includes general safety instructions for handling the u-remote system. Specific safety instructions for specific tasks and situations are given at the appropriate places in the documentation.



When using u-remote PF-O-xDI-SIL modules, please also observe the **Module for Functional Safety Manual.**

The manual is available to download from the Weidmüller website.

2.1 General safety notice

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

Before any work is carried out on the products (installation, maintenance, retrofitting), the power supply must be switched off and secured against being switched on again. Work may be carried out with safety extra-low voltage.

When working during continued operations, the emergency stop mechanisms must not be made ineffective.

If a malfunction on a u-remote product cannot be fixed after following the recommended measures (see Chapter 13), the product in question must be sent back to Weidmüller. Weidmüller does not assume any liability if the base or electronic module has been tampered with!

Electrostatic discharge

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

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

Open equipment

u-remote products are open equipment that may only be installed and operated in lockable housings, cabinets or electrical operations rooms. Only trained and authorised personnel may access the equipment.

For applications requiring functional safety, the surrounding housing must meet at least IP54.

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

Fusing

The operator must set up the equipment so that it is protected against overloading. The upstream fuse must be designed such that it does not exceed the maximum load current. The maximum permissible load current of the u-remote components can be found in the technical data.

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

To meet UL-specifications in accordance with UL 248-14, a UL-certified automatic fuse (e.g. ABB Type S201-B16) or a 10 A fuse with a medium time-lag (e.g. ESKA Part No. 522.227) must be used.

All connections of the u-remote components are protected against voltage pulses and overcurrent in accordance with IEC 61131-2, Zone B. The operator has to decide whether additional overvoltage protection according to IEC 62305 is required. Voltages that exceed +/-30 V may cause the destruction of couplers and modules.

The output voltage of the feed-in power supply has to fulfill overvoltage category 1 according to IEC 61010.

Earthing (functional earth FE)

Each u-remote I/O module is fitted with an FE spring on the underside which creates an electrical connection to the DIN rail. In order to establish a secure connection, the assembly must be carried out carefully in accordance with the instructions (see Chapter 7). The module is earthed by connecting the DIN rail to the protective earth via the earth terminal.

Modules UR20-16AUX-FE, UR20-4DI-P, UR20-4DO-P, UR20-4AI-UI-12 and UR20-4AI-UI-16 have connections with green pushers. An FE potential is also provided at these connections. They must not be used as a PE!

Shielding

Shielded lines are to be connected with shielded plugs and fixed on a shield bus in compliance with the relevant standard (see Chapter 8).

2.2 Intended use

The products of the u-remote series are intended for use in industrial automation. A u-remote station with bus coupler and connected modules is intended for the decentralised control of systems or sub-systems. Via the fieldbus coupler every module of a station is integrated into a fieldbus structure and connected to the superordinate control unit. The u-remote products conform to protection class IP20 (in accordance with DIN EN 60529), they can be used in potentially explosive atmospheres rated as Zone 2 (as per Directive 94/9/EC) and in safe zones.

The observance of the supplied documentation is part of the intended use. The products described in this manual may only be used for the intended applications and only in connection with certified third-party devices or components.

2.3 Use in a potentially explosive atmosphere

If u-remote products are used in potentially explosive atmospheres, the following notes are **also** applicable:

- Staff involved in assembly, installation and operation must be qualified to perform safe work on electrical systems protected against potentially explosive atmospheres.
- The requirements according to IEC 60079-15 must be observed.
- The housing enclosing must be ATEX/IECEx certified meeting the requirements of protection class IP54, accessible only by use of a tool.
- The housing enclosing must meet the requirements of explosion protection type Ex n or Ex e.
- Sensors and actuators that are located in Zone 2 or in a safe zone can be connected to the u-remote station.
- If the ambient temperature under rated conditions exeeds 55 °C, the cables used for feed-in (on the fieldbus coupler and on power-feed modules) must be specified for at least 90 °C.
- If the temperature under rated conditions exceeds 70 °C at the conductor or conduit entry point, or 80 °C at the contact, the temperature specification of the selected cable shall be in compliance with the actual measured temperature values.
- Devices are for use in an area of not more than pollution degree 2 in accordance with EN 60664-1.
- When using relais modules UR20-4RO-CO-255 in explosive atmosphere:
  - Condensation has to be avoided.
  - Provision shall also be made to prevent the relay circuit voltage from being exceeded by transient disturbances of more than 140% of the rated voltage.
- A visual inspection of the u-remote station is to be performed once per year.

2.4 Legal notice

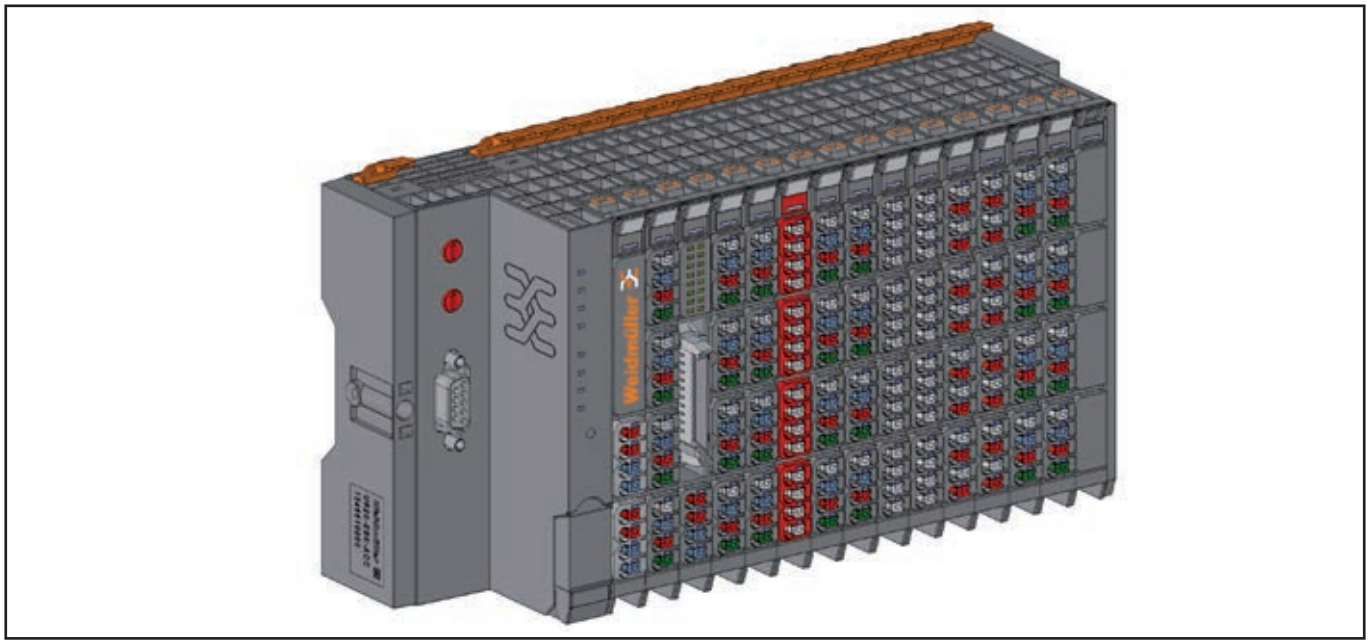
The u-remote series products are CE-compliant in accordance with Directive 2004/108/EC (EMC Directive) and Directive 2006/95/EC (Low Voltage Directive). They also meet the requirements of the ATEX Directive 94/9/EG.

Components of the following free software products are integrated into the u-remote products:

Components	Licence	Link
Ecos	modified GPL	http://ecos.sourceware.org/license-overview.html
mongoose web server	freeware	http://code.google.com/p/mongoose/source/browse/LICENSE
jQuery	MIT	http://jquery.org/license/
Jquery Tooltip	MIT	http://jquery.org/license/
Jquery SVG	MIT	http://jquery.org/license/
Jquery MD5	GPL	http://www.gnu.org/licenses/gpl.html
Jquery int. languages	MIT	http://jquery.org/license/

The results of the measurements according to CISPR 16-3-2 should also be suitable to demonstrate the compliance of the u-remote devices to the limits for radiated emissions as defined by CFR 47 Part 15, Subpart B, §15.109, Class A (2010) and ICES-003, Issue 5, Class A (2012).

3 System overview

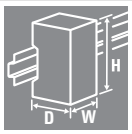


Example arrangement of a u-remote station

The modular u-remote system supports common fieldbus systems and conforms to IEC 61131-2. Each station is assigned a bus address in the fieldbus structure. Only the coupler is fieldbus-specific; the I/O modules are independent of the fieldbus.

Up to 64 active I/O modules can be combined in a u-remote station. The largest expansion possible depends on the maximum amount of data transmitted by the selected fieldbus, in particular the configuration, parameter, or process data for the module types provided.

The following components belong to the u-remote product series:
- Fieldbus coupler (gateway): Head station for converting the respective fieldbus protocol on the u-remote system bus
- Active I/O modules:
  - Modules with digital input (DI) or digital output (DO) with 2, 4, 8 or 16 channels
  - Modules with analogue input (AI) or analogue output (AO) with 4 or 8 channels
  - Pulse width modulation modules (PWM)
  - Digital counter modules (CNT)
  - Digital interface modules (SSI)
- Passive I/O modules (no fieldbus communication)
  - 24-V power-feed modules (PF) for input or output current
  - Potential distribution modules (AUX)
  - Empty modules acting as placeholders (ES)
- Functional safety modules
  - Safe power-feed modules (PF-O-xDI-SIL) 24 V for output current, providing one or two inputs (with two channels each) for safety circuits
- Mechanical fixing elements
  - End bracket
  - End plate

	Height (H)	Width (W)	Depth (D)
Fieldbus coupler	120.0 / 4.72	52.0 / 2.05	76.0 / 2.99
I/O module	120.0 / 4.72	11.5 / 0.45	76.0 / 2.99
End plate	120.0 / 4.72	3.5 / 0.14	76.0 / 2.99
End bracket	120.0 / 4.72	8.0 / 0.32	36.0 / 1.42

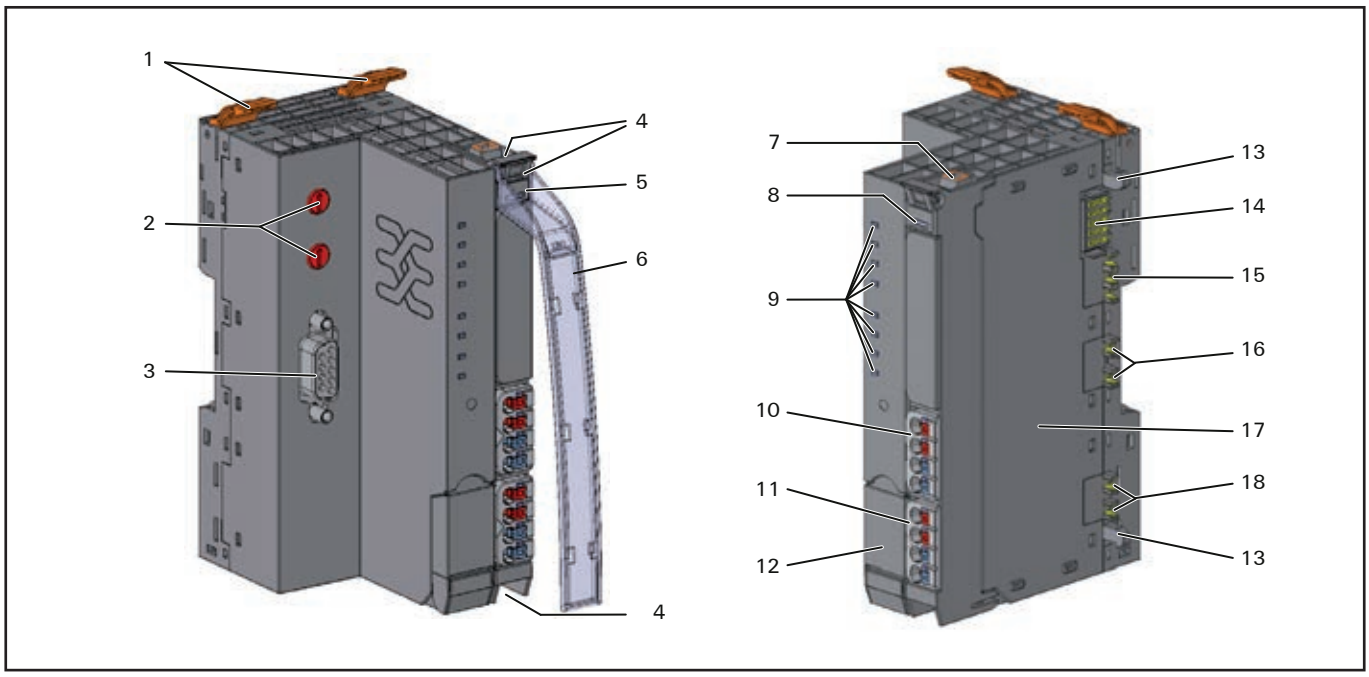
Dimensions of the u-remote components (mm / inch)

"Double-click" installation

The u-remote station modules can be installed quickly and simply. When attaching the module to the DIN rail, a clear clicking noise can be heard, which means that the module has clicked into place. In the second step, which involves pushing the module being installed together with the neighbouring module, a further clicking noise indicates that the modules have been correctly connected to each other.

3.1 General description of the fieldbus coupler

A fieldbus coupler is used to connect the station I/O modules to the fieldbus. All of the data traffic with the programmable logic controller including the diagnostic messages is exchanged via the coupler. The integrated power supply provides the coupler and all connected modules with power.
A detailed description of the individual coupler types is available in Chapter 5.



Fieldbus coupler (example: UR20-FBC-PB-DP)

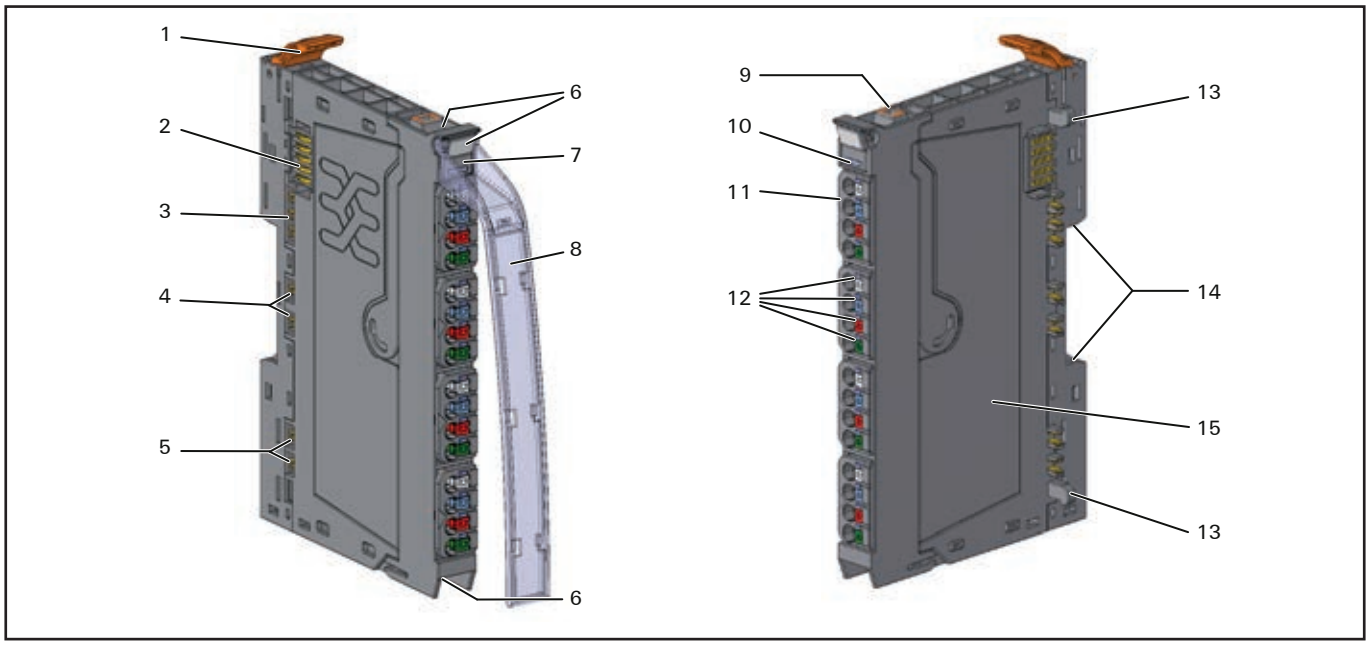
1 Release lever for the DIN rail fixing
2 Rotary switch
3 Data line connection (e.g. SUB-D socket)
4 Seats for module markers
5 Type designation
6 Swivel marker for labelling modules and channels (optional)
7 Connector frame unlocking device
8 LED power supply coupler
9 Fieldbus/coupler status LEDs
10 Power supply connector for the system and input modules
11 Power supply connector for output modules
12 Service flap ((access USB port)
13 Latching hook for latching onto module sides
14 System bus
15 System current path
16 Input current path
17 Type plate
18 Output current path

3.2 General technical data for the fieldbus coupler

Type of connection	"PUSH IN"	Single-wired, Fine-wired
		Conductor cross-section 0.14 – 1.5 mm² (AWG 16 – 26)
Configuration interface	USB 2.0	
Dimensions	Height	120.0 mm / 4.72" (with release lever: 128.0 mm / 5.04")
	Width	52.0 mm / 2.05"
	Depth	76.0 mm / 2.99"
Protection class (DIN EN 60529)	IP 20	
Flammability rating UL 94	V-0	
Temperature data	Operation (horizontal installation)	-20 °C to +60 °C / -4 ... +140 °F (8-A power supply) -20 °C to +55 °C / -4 ... +131 °F (10-A power supply)
	Operation (vertical installation)	-20 °C to +55 °C / -4 ... +131 °F (6-A power supply) -20 °C to +50 °C / -4 ... +122 °F (8-A power supply)
	Storage, transport	-40 °C to +85 °C / -40 ... +185 °F
Humidity	Operation	95 %, non-condensing as per IEC 61131-2
	Storage, transport	95 %, non-condensing as per IEC 61131-2
Air pressure	Operation	≥ 795 hPa (altitude ≤ 2000 m) as per IEC 61131-2
	Storage, transport	≥ 700 hPa (altitude ≤ 3000 m) as per IEC 61131-2
Vibration resistance	5 Hz ≤ f ≤ 8.4 Hz: 3.5 mm amplitude as per IEC 60068-2-6 8.4 Hz ≤ f ≤ 150 Hz: 1 g acceleration as per IEC 60068-2-6	
Shock resistance	15 g over 11 ms, half sinewave, as per IEC 60068-2-27	
Potential isolation	Test voltage	max. 28.8 V within one channel 500 V DC field/system
	Pollution severity level	2
	Overvoltage category	II
Approvals	cULus	UL 508
Standards	Potentially explosive atmosphere Zone 2	ATEX Directive 94/9/EC
	EMC	IEC 61000 (partial standards as per the requirements of IEC 61131-2)
	Explosion protection	IEC 60079-0:2012, IEC 60079-15:2010, EN 60079-0:2012, EN 60079-15:2010
	PLC	IEC 61131-2

All product-specific technical data are available in the corresponding product description in Chapter 5.

3.3 General description of I/O modules



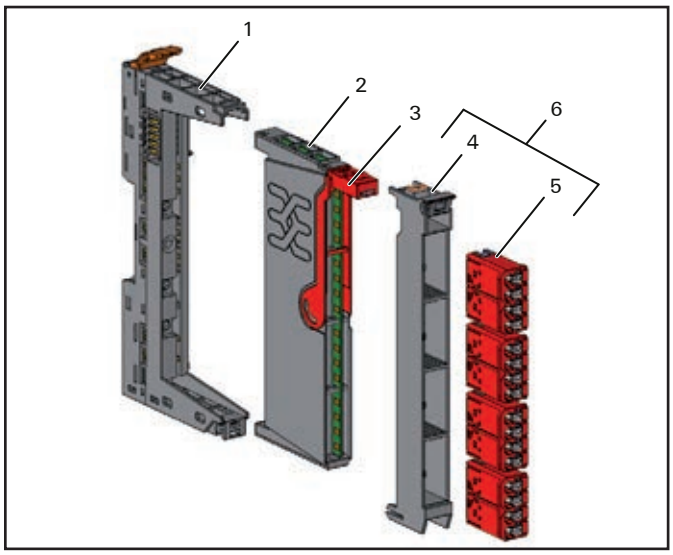
I/O module (Example UR20-4-DI-P)

1 Release lever for the DIN rail fixing
2 System bus
3 System current path
4 Input current path
5 Output current path
6 Seats for module markers
7 Type designation
8 Swivel marker for labelling modules and channels (optional)
9 Connector frame unlocking device
10 Module status LED (collective message)
11 Connector
12 Channel status LEDs
13 Latching hook for latching onto module sides
14 DIN rail foot
15 Type plate

Colour coding

The removal lever for the electronic unit as well as the connectors are colour-coded as follows:

Black	standard
White	power supply
Red	230 V
Yellow	functional safety



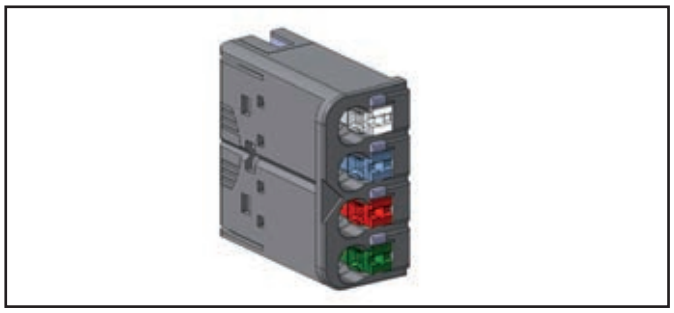
I/O module components

1 Base module
2 Electronic unit
3 Removal lever for electronic unit
4 Connector frame
5 Connector
6 Plug-in unit

A detailed description of the individual module types is available in Chapter 6.

Connector PG 1.5 mm

The connector frame can take up to four connectors, and four conductors can be connected to each connector. "PUSH IN" technology allows for fine-wired conductors with crimped wire-end ferrules or ultrasonically welded conductors, each with a maximum cross-section of 1.5 mm², to be inserted easily through the opening in the clamping terminal without having to use tools. To insert fine-wired conductors without wire-end ferrules, the pusher must be pressed in with a screwdriver (wiring see section 7.5).



Connector PG 1.5 mm with four conductor connections

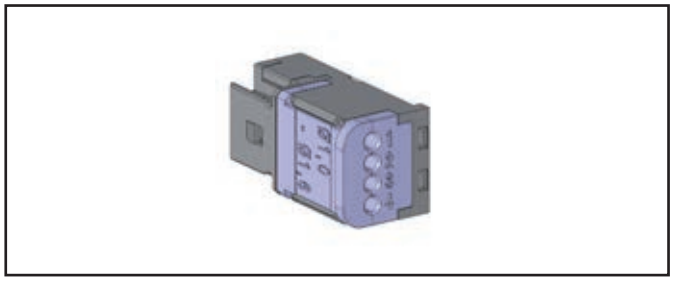
- conductor cross-section 0.14 to 1.5 mm² (AWG 16 – 26)
- max. ampacity: 10 A
- 4-pole

The pushers are colour-coded for the following connections:

White	Signal DC or AC
Blue	GND
Red	24 V DC
Green	Functional earth (FE)
Black	Signal AC

HD connector PG 0.35 mm

The connection frame can take up to four times two HD connectors UR20-PG0.35, and qualified SAI cables* with a cross-section from 0.14 to 0.35 mm² can be connected to each connector via insulation displacement contact (IDC) (wiring see section 7.5)



Connector UR20-PG0.35 for HD modules

- conductor cross-section: 0.14 to 0.35 mm² (AWG 22-26)
- insulation diameter 1.0 to 1.6 mm (0.04 to 0.06")
- max. ampacity: 1 A
- 4-pole

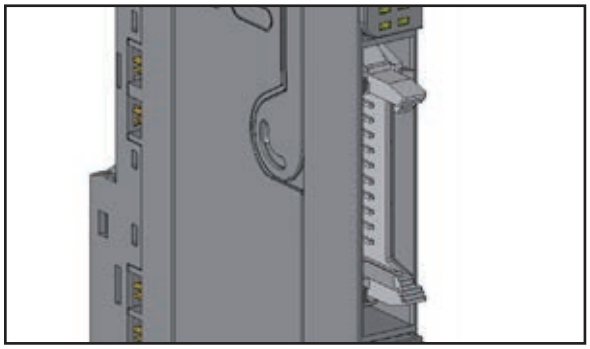
Tools

- multi-stripax 6-16 (Order No. 9202210000)
- Pressing tool PWZ-UR20-HD (Order No. 1525820000)

* A list of SAI cables approved for the use with HD-connectors (Document-No. 1541020000) is available to download from the Weidmüller website.

PLC Connection

Certain modules are provided with a 20-pole connection that enables to connect pre-assembled interface units.



PLC connection

- max. ampacity: 1 A per contact
- 20-pole

Accessories

- Pre-assembled cable, e.g. PAC-UNIV-HE20-LCH-1M (Order No. 7789306010)
- Direct input/output digital interface RS 16IO 1W H S (Order No. 9445700000)

Cable protection

The modules listed in the following table do not have a fused sensor/actuator power supply. Thus, all cables to the connected sensors/actuators must be fused corresponding to their conductor cross-sections (as per Standard DIN EN 60204-1, section 12).

Module	Order No.
Digital input modules	
UR20-4DI-P	1315170000
UR20-4DI-P-3W	2009360000
UR20-8DI-P-2W	1315180000
UR20-8DI-P-3W	1394400000
UR20-16DI-P-PLC-INT	1315210000
UR20-2DI-P-TS	1460140000
UR20-4DI-P-TS	1460150000
UR20-4DI-N	1315350000
UR20-8DI-N-3W	1315370000
UR20-16DI-N-PLC-INT	1315400000
Digital output modules	
UR20-4DO-P	1315220000
UR20-4DO-P-2A	1315230000
UR20-4DO-PN-2A	1394420000
UR20-16DO-P-PLC-INT	1315270000
UR20-4DO-N	1315410000
UR20-4DO-N-2A	1315420000
UR20-16DO-N-PLC-INT	1315450000
Analogue input modules	
UR20-4AI-UI-16	1315620000
UR20-4AI-UI-12	1394390000
UR20-8AI-I-PLC-INT	1315670000
Functional modules	
UR20-2PWM-PN-0.5A	1315600000
UR20-2PWM-PN-2A	1315610000
UR20-1CNT-100-1DO	1315570000
UR20-2CNT-100	1315590000
UR20-2FCNT-100	1508080000
Potential distribution modules	
UR20-16AUX-I	1334770000
UR20-16AUX-O	1334780000
UR20-16AUX-GND-I	1334800000
UR20-16AUX-GND-O	1334810000

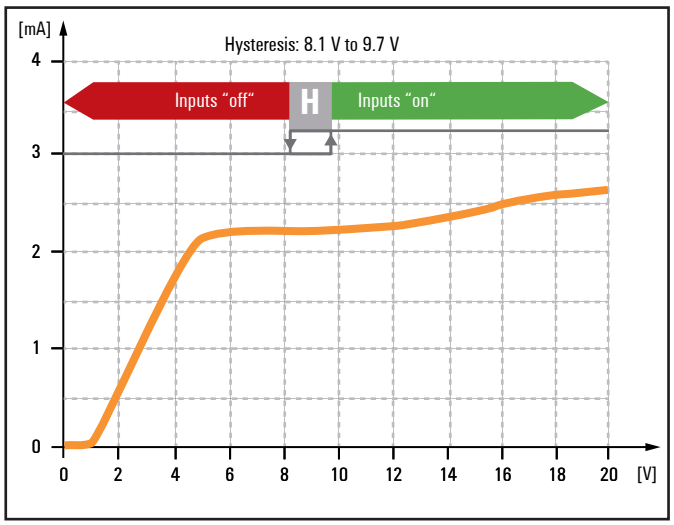
3.4 General technical data for I/O modules

Type of connection	"PUSH IN"	Single-wired, fine-wired
		Conductor cross-section 0.14 – 1.5 mm² (AWG 16 – 26)
	IDC (modules UR20-...-HD)	Single-wired, fine-wired
		Conductor cross-section 0.14 – 0.35 mm² (AWG 22 – 26)
Dimensions	Height	120.0 mm / 4.72" (with release lever: 128.0 mm / 5.04")
	Width	11.5 mm / 0.45"
	Depth	76.0 mm / 2.99"
Protection class (DIN EN 60529)	IP 20	
Flammability rating UL 94	V-0	
Temperature data	Operation	-20 °C ... +60 °C / -4 ... +140 °F
	Storage, transport	-40 °C ... +85 °C / -40 ... +185 °F
Humidity	Operation, storage, transport	5 % to 95 %, non-condensing as per IEC 61131-2
Air pressure	Operation	≥ 795 hPa (altitude ≤ 2000 m) as per IEC 61131-2
	Storage, transport	≥ 700 hPa (altitude ≤ 3000 m) as per IEC 61131-2
Vibration resistance	5 Hz ≤ f ≤ 8.4 Hz: 3.5-mm amplitude as per IEC 60068-2-6 8.4 Hz ≤ f ≤ 150 Hz: 1-g acceleration as per IEC 60068-2-6	
Shock resistance	15 g over 11 ms, half sinewave, as per IEC 60068-2-27	
Potential isolation	Test voltage	max. 28.8 V within one channel 500 V DC field/system
	Pollution severity level	2
	Overvoltage category	II
Approvals and Standards	cULus	UL 508
	Potentially explosive atmosphere Zone 2*	ATEX Directive 94/9/EC
	EMC	IEC 61000 (partial standards as per the requirements of IEC 61131-2)
	Explosion protection	IEC 60079-0:2012, IEC 60079-15:2010, EN 60079-0:2012, EN 60079-15:2010
	PLC	IEC 61131-2

*** unless otherwise noted within the product-specific technical data.**

All product-specific technical data are available in the corresponding product description in Chapter 6.

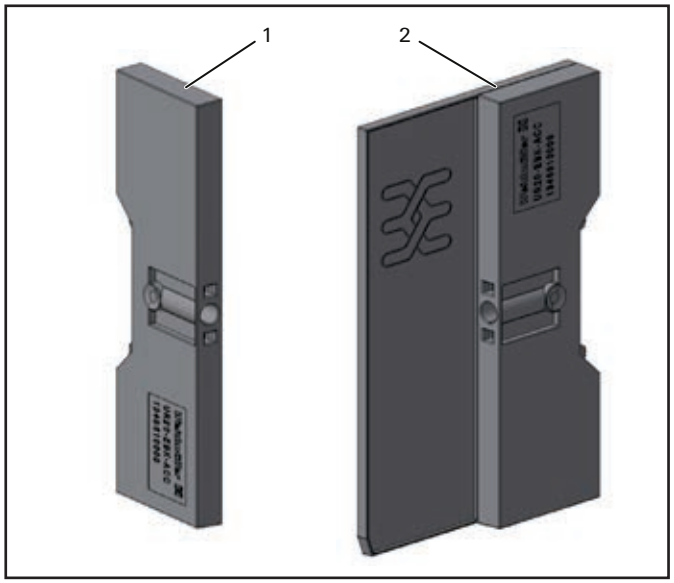
3.5 Current-voltage characteristic



Current-voltage characteristic of P-switching digital inputs

3.6 Mechanical fixing elements

The station is fixed in the installation position by an end bracket at either side. The last I/O module is protected against dust by a cover plate, into which the second end bracket is inserted and screwed to the mounting rail. Every u-remote coupler is supplied with a termination kit.



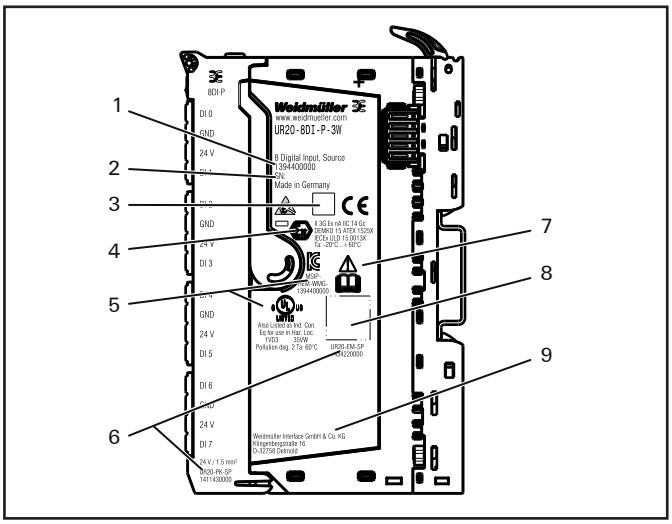
u-remote station fixing elements

1 End bracket (left end, on the coupler side)
2 Termination kit with end plate and end bracket (right end)

For vertical installation, a special end bracket (Order No. 1805610000 MEW 35/1) must also be installed below the station.

3.7 Type plate

Each fieldbus coupler and each module features a type plate, which includes identification information, the key technical specifications and a block diagram. In addition, a QR code allows for direct online access to the associated documentation. The software for reading the QR code must support inverted QR codes. A breakdown of the serial numbers can be found in the table provided in the annex.



Type plate (example of UR20-4 DI-P)

1 Product number (Order No.)
2 Serial number
3 Manufacturing code
4 ATEX marking
5 Logos of certification bodies
6 Replacement part order number
7 Notice documentation
8 QR code
9 Manufacturer

The following markings can be placed on the type plate:

Underwriters Laboratories Inc.

Korea Certification

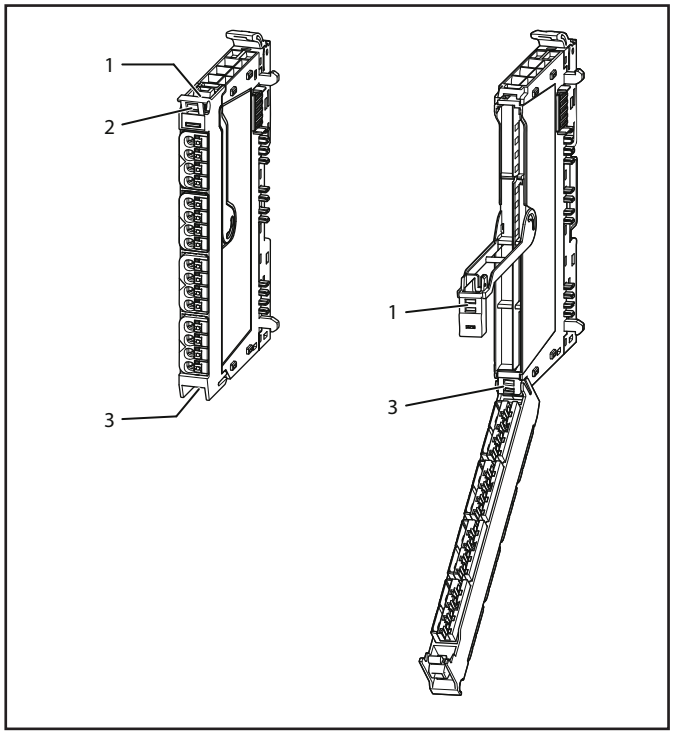
3.8 Markers

A wide range of markers are available as accessories for labelling equipment.

Module marker

Each I/O module can be labelled at three points using the markers. This ensures clear allocation when replacing individual modules or electronic units.

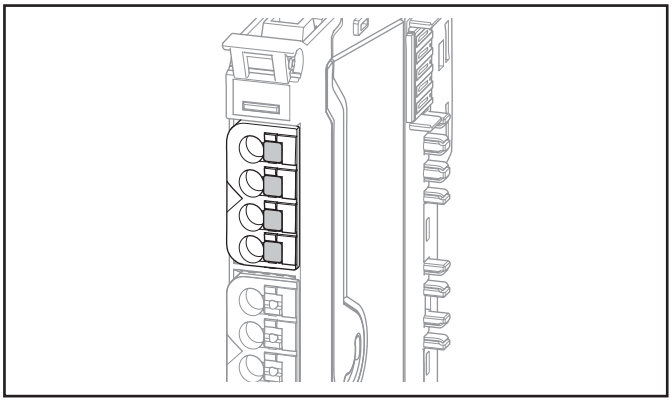
The following markers are available as accessories:
- With custom printing as per customer specifications (Order No. 1341610000)
- Blank (Order No. 1341630000), can be printed with the Weidmüller PrintJet ADVANCED (Order No. 1324380000)



Three attachment points for module markers

Connection marker for lines and channels

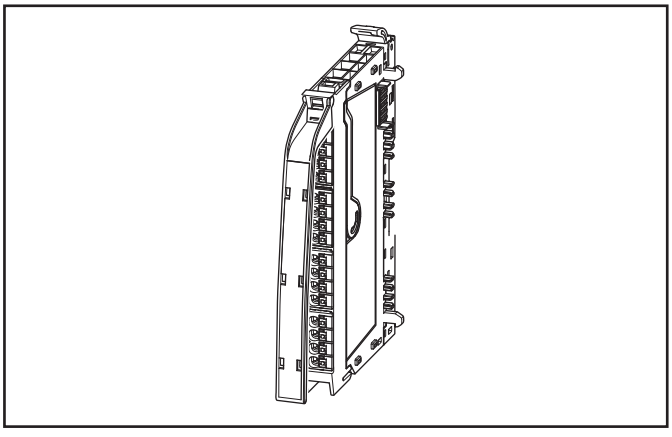
The connection marker is used to label lines and channels, and is attached to the pusher for the connector.
The following markers are available as accessories:
- With custom printing as per customer specifications (Order No. 1323700000)
- Blank (Order No. 1323710000) or yellow (Order No. 1435010000) can be printed with the Weidmüller PrintJet ADVANCED (Order No. 1324380000)



Connection marker

Swivel marker

Swivel markers (Order No. 1339920000) allow for modules and all respective channels and lines to be labelled in detail. They are attached to the connector frame.

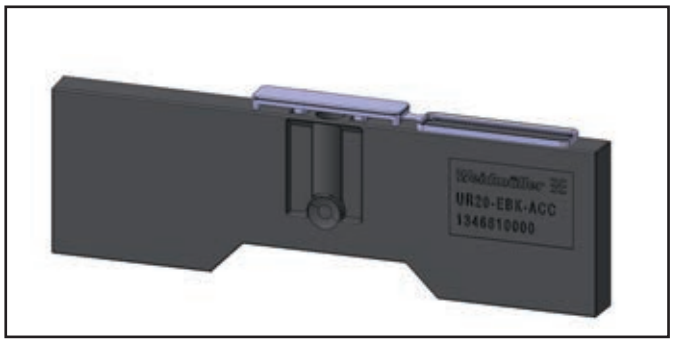


Module with swivel marker

The following labels are available for the labelling:
- Thermal transfer printer labels for printing with a thermal transfer printer (such as Order No. 1276230000)
  - Order No. 1429420000 THM UR20 WS
  - Order No. 1429910000 THM UR20 GE
- Paper labels for printing with laser printers (Order No. 1429430000, ESO UR20 DIN A4 WS)

End bracket marker EM 8/30

The end bracket of the u-remote station can be fitted with an end bracket marker (Order No. 1806120000).



End bracket with end bracket marker

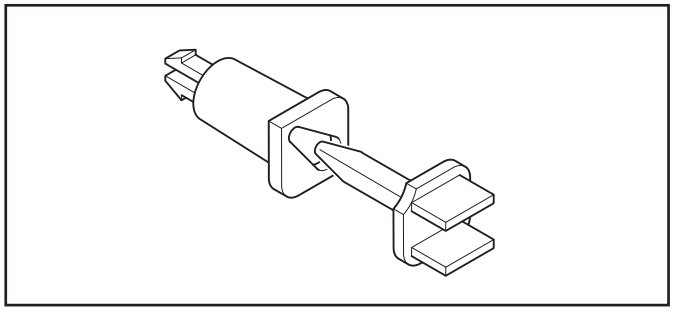
The following labels are available for the labelling:

- Paper labels for printing with laser printers
  - Order No. 1607720000, ESO 7 white
  - Order No. 1634780000, ESO 7 yellow
- Polyester labels for printing with laser printers
  - Order No. 1670390000, ESO 7POLY white
  - Order No. 1670400000, ESO 7POLY yellow

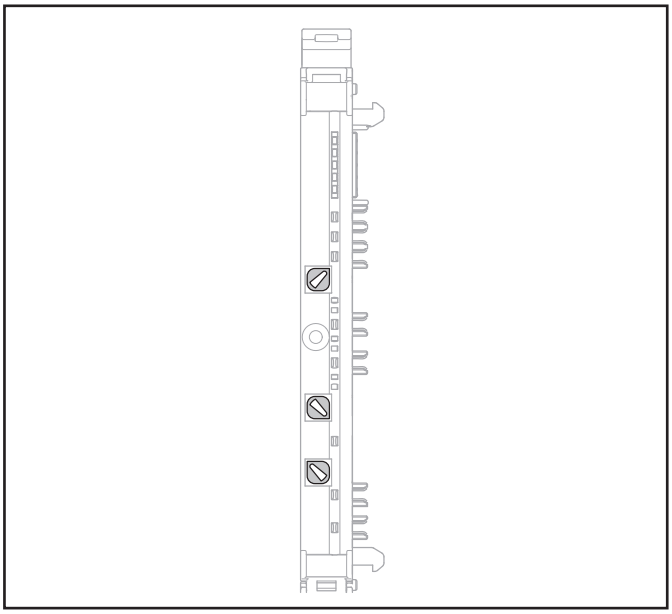
3.9 Module codings

Position coding

In order to prevent an electronic module being mismated, the modules can be coded by the customer. Coding is carried out by two small components: the orange coding socket and the black coding pin. Three codings can be applied to each basic module (see chapter 7.3).



Socket and pin for position coding

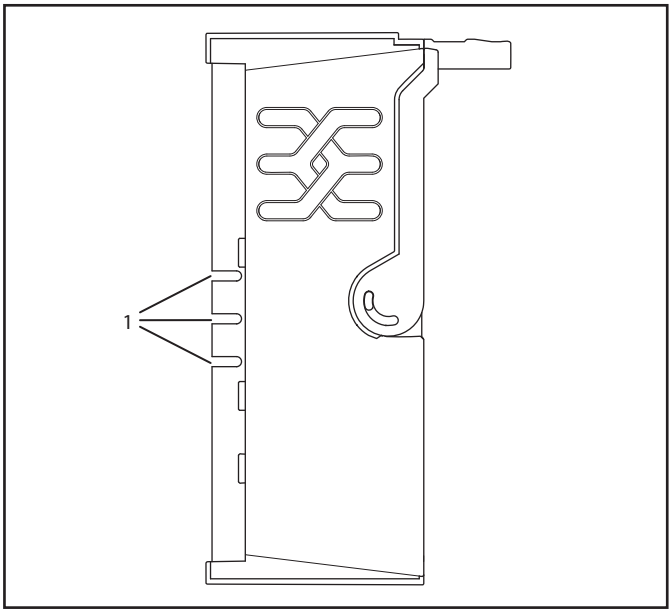


Basic module with inserted coding sockets

Functional coding

The I/O modules are mechanically coded using three cut-outs in the circuit board. There are four different function codes for:

- I/O modules
- Power-feed modules for the input current path (UR20-PF-I)
- Power-feed modules for the output current path (UR20-PF-O)
- Safe power-feed modules (UR20-PF-O-xDI-SIL)



Electronic unit with coding cut-outs (1) in the PCB

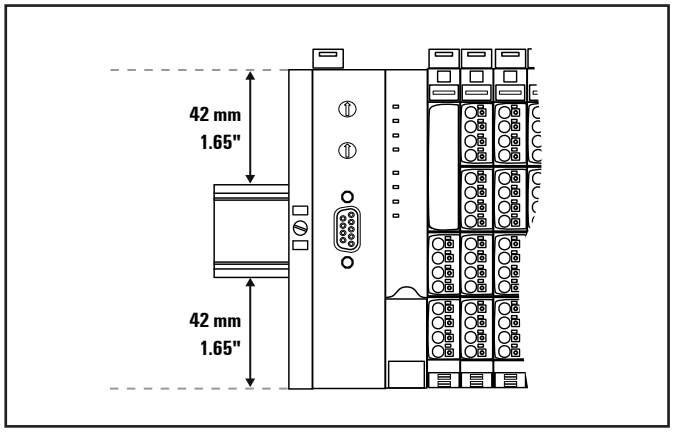
4 Configuration

4.1 Order and arrangement of the modules

The u-remote station is designed to be installed on a DIN rail (35 × 7.5 mm or 35 x 15 mm) made from steel or galvanised steel according to EN 60715.

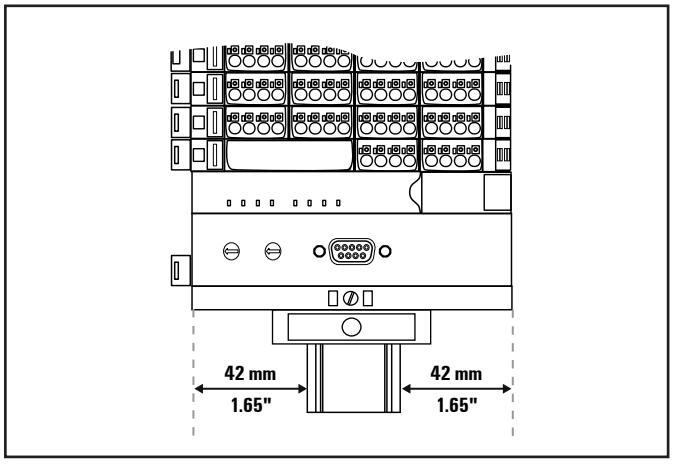
A u-remote station may be built up to a maximum length of 1 m. Therefore at most 82 modules (including max. 64 active modules) can be aligned on a coupler.

The u-remote station is usually installed on a horizontally positioned DIN rail.



Installation position of the u-remote station on the DIN rail (horizontal installation)

Installation on vertically positioned DIN rails is also possible. In this case however, the heat dissipation is reduced such that the derating values change (see Section 4.5).
In the case of vertical mounting, the fieldbus coupler must always be arranged as the first module at the bottom and secured with a MEW 35/1 end bracket for vertical mounting (Order No. 1805610000).



Installation position of the u-remote station on the DIN rail (vertical installation)

A u-remote station may only be installed in this sequence (starting from the left/bottom):
- End bracket
- Bus coupler
- Up to 82 modules (including max. 64 active modules)
- End plate and end bracket

ATTENTION

A maximum of three passive modules (potential distribution module, power-feed module or blank module) may be placed in successive positions. Then at least one active module must follow.

Arrangement of safe power-feed modules

A safe power-feed module PF-O-xDI-SIL module can be positioned anywhere in the u-remote station. All of the following output modules (except for the UR20-4RO-CO-255 and UR20-4RO-SSR-255 relay modules) up to the next PF-O module will be safely disconnected (safety segment). Multiple PF-O-xDI-SIL modules/safety segments can be arranged within a station.

When using safe power-feed modules, please also observe the **Module for Functional Safety Manual.**

The manual is available to download from the Weidmüller website.

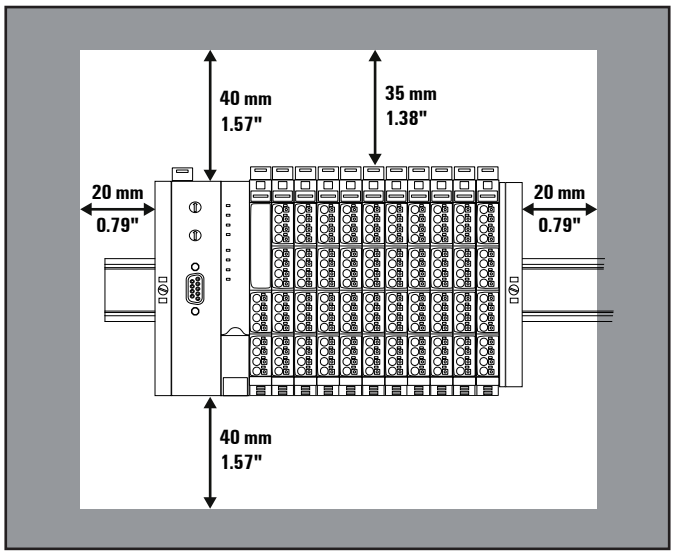
4.2 Installation distances

In order to be able to carry out the installation and subsequent maintenance work and to ensure sufficient ventilation, the u-remote station must be installed while observing the following minimum distances (see the following figures).

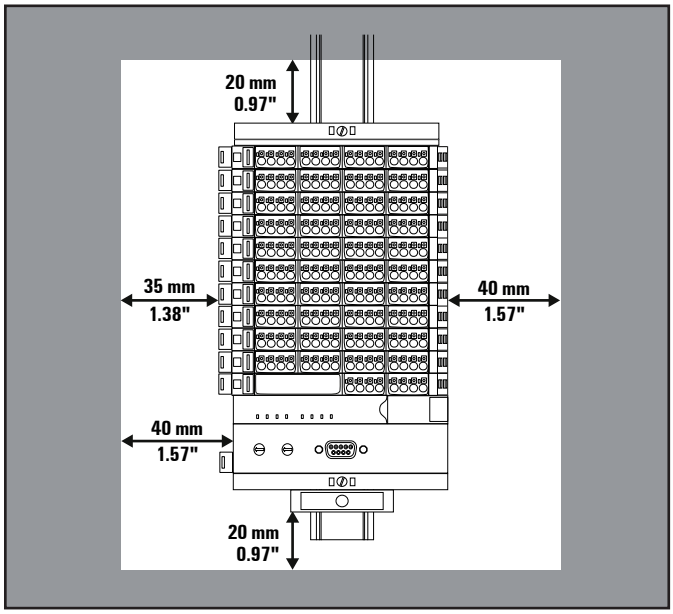
ATTENTION

Depending on how the station shielding is implemented, the specified distances may have to be made larger, where necessary.

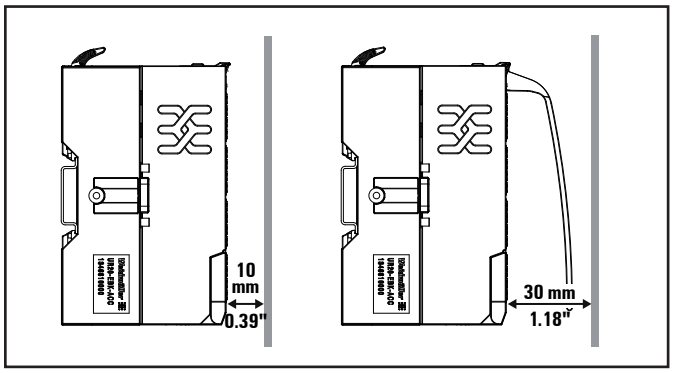
The minimum permissible conductor bending radii must also be observed. Earth terminals already installed can be ignored when calculating the distance.



Minimum distances for horizontal installation



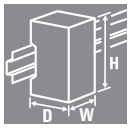
Minimum distances for vertical installation



Minimum distance for electrical cabinet door (without/with swivel marker)

Calculation of space requirements

The space requirements for a u-remote station with n modules (**horizontal installation**) is calculated as follows:



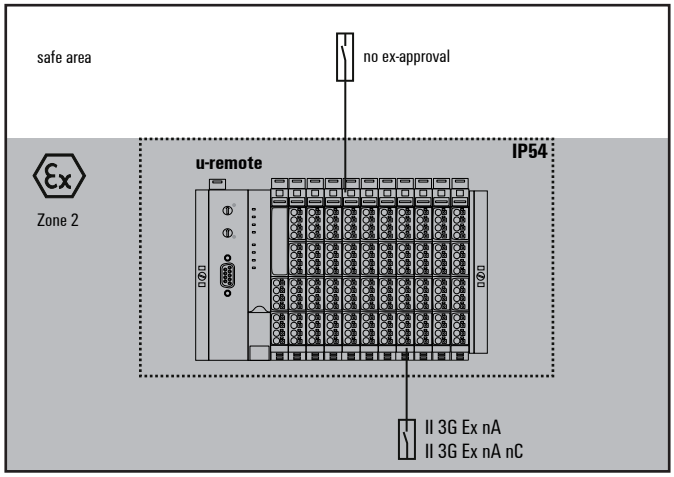
Height: 120 mm (4.72")
+ 2 x 40 mm (1.57") distances at top and bottom
= **200 mm (7.87")**

Width: 8 mm (1.57") end bracket
+ 52 mm (2.05") bus coupler
+ n x 11.5 mm (0.45") n modules
+ 11.5 mm (0.45") end plate and end bracket
+ 2 x 20 mm (0.79") distances to the sides
= **111.5 mm (4.39") + n x 11.5 mm (0.45")**

For **vertical installation** interchange height and width. When calculating the width, 4.5 mm / 0.18" for the must be added for the end bracket MEW 35/1 (Order No. 1805610000).

4.3 Use in a potentially explosive atmosphere

If the u-remote station is used in a potentially explosive atmosphere rated as Zone 2, the housing must meet the requirements of explosion protection type Ex n or Ex e and protection class IP54. Sensors and actuators that are located in Zone 2 or in a safe zone can be connected. All cable glands on the housing must be approved for Ex e.



Use in a potentially explosive atmosphere

ATEX marking

Ⓔx II 3 G Ex nA IIC T4 Gc
WI 13ATEX0002 X
Ta: -20 °C … +60 °C

4.4 "PUSH IN" system cabling

u-remote modules (except HD modules) and fieldbus couplers are equipped with the "PUSH IN" connector system. Single-strand and fine-strand lines with wire-end ferrules can be inserted without the need for a tool. Lines with a cross-section measuring between 0.14 mm² and 1.5 mm² can be connected.

We recommend using the following wire-end ferrules:

Cross-section	AWG	Weidmüller order no. Weidmüller colour code	Weidmüller order no. DIN colour code
0.14 mm²	26	9028240000	
0.25 mm²	24	9025760000	
0.34 mm²	22	9025770000	
0.50 mm²	20	9025870000	9019020000
0.75 mm²	18	9025860000	9019050000
1.00 mm²	17	9025950000	9019100000
1.50 mm²	16	0635100000	9019130000

Wire-end ferrules for the wiring

The external dimensions of the crimped wire-end ferrules must conform with IEC-60947-1. For crimping, we recommend crimp shape A and the following tools:

- Crimping tool for wire-end ferrules from 0.25 mm² to 1.5 mm² (AWG 24 to 16) with a trapezoidal indentation crimp, type: PZ 6/5 ZERT (Order No. 9017900000)
- Crimping tool for wire-end ferrules from 0.14 mm² to 0.75 mm² (AWG 26 to 18) with a trapezoidal crimp, type: PZ 1.5 ZERT (Order No. 9017310000)

4.5 Current demand and power supply

The u-remote system uses three internal current paths:

The **I_{SYS} system current path** supplies the communication part of the I/O modules; it is fed from the coupler input supply and cannot be interrupted by any module. The maximum current-carrying capacity of I_{SYS} allows a u-remote station to be expanded with a maximum of 64 active modules without having to refresh the power.

The **I_{IN} input current path** supplies the input circuit of the input modules as well as the connected I_S sensors. The current must be refreshed with UR20-PF-I (power feed in) modules as required. These UR20-PF-I modules isolate the input current path towards the left (towards the coupler), and as a result start a new electricity segment towards the right.

The **I_{OUT} output current path** supplies the output circuit of the output modules with power, as well as the connected I_L actuators. The current must be refreshed with the UR20-PF-O (power feed-out), as required. These UR20-PF-O modules isolate the output current path to the left (towards the coupler), and as a result start a new electricity segment to the right.

The design of the power supply being used must take start-up peaks into account.

Power supply derating

The power supply is restricted according to the temperature. The following values apply for the horizontal and vertical positioning of the u-remote station:

	Horizontal	Vertical
Coupler power supply	60 °C / 140 °F : 2 x 8 A 55 °C / 131 °F : 2 x 10 A	55 °C / 131 °F : 2 x 6 A 50 °C / 122 °F : 2 x 8 A
Power-feed module power supply	60 °C / 140 °F : 1 x 10 A	55 °C / 131 °F : 1 x 8 A

Temperature-dependent values for the power supply

ATTENTION

Equipment may become damaged if improperly rated circuit protection is used!

► In order to achieve spezification according to UL 248-14 use a UL-approved Type-B automatic circuit breaker (e. g. ABB Typ S201-B16) or use a fuse with a maximum of 10 A protection (e. g. ESKA Art. Nr. 522.227).

ATTENTION

Equipment may become damaged by overcurrent!

► Auxiliary supplies as well as signal inputs and outputs may not be used for supplying the station.

Current demand

Product group	Product	I_{SYS}	I_{IN}	I_{OUT}	I_S	I_L
Fieldbus coupler	UR20-FBC-PB-DP	100 mA				
	UR20-FBC-PN-IRT	116 mA				
	UR20-FBC-EC	110 mA				
	UR20-FBC-MOD-TCP, UR20-FBC-EIP	112 mA				
	UR20-FBC-DN	75 mA	(+ 15 mA from DeviceNet supply)			
	UR20-FBC-CAN	90 mA				
Digital input modules	UR20-4DI-P, UR20-4DI-N	8 mA	6 mA / 18 mA*		x	
	UR20-4DI-P-3W	8 mA	12 mA /		x	
	UR20-4DI-2W-230V-AC	8 mA	–			
	UR20-8DI-P-2W, UR20-8DI-P-3W, UR20-8DI-P-3W-HD, UR20-8DI-N-3W	8 mA	8 mA / 30 mA*		x	
	UR20-16DI-P, UR20-16DI-N	8 mA	8 mA / 52 mA*		x	
	UR20-16DI-P-PLC-INT, UR20-16DI-N-PLC-INT	8 mA	10 mA / 54 mA*		x	
	UR20-2DI-P-TS	8 mA	6 mA / 12 mA*		x	
	UR20-4DI-P-TS	8 mA	6 mA / 18 mA*		x	
Digital output modules	UR20-4DO-P, UR20-4DO-PN-2A, UR20-4DO-N	8 mA		20 mA		x
	UR20-4DO-P-2A, UR20-4DO-N-2A	8 mA		25 mA		x
	UR20-8DO-P, UR20-8DO-N	8 mA		35 mA		x
	UR20-8DO-P-2W-HD	8 mA		35 mA		x
	UR20-16DO-P, UR20-16DO-P-PLC-INT, UR20-16DO-N, UR20-16DO-N-PLC-INT	8 mA		25 mA		x
	UR20-4RO-SSR-255	11 mA				
	UR20-4RO-CO-255	8 mA		20 mA		
Analogue input modules	UR20-4AI-UI-16, UR20-4AI-UI-16-DIAG, UR20-4AI-UI-16-HD, UR20-4AI-UI-16-DIAG-HD, UR20-4AI-UI-12	8 mA	25 mA		x	
	UR20-8AI-I-PLC-INT, UR20-4AI-TC-DIAG, UR20-4AI-RTD-DIAG, UR20-8AI-I-16-HD, UR20-8AI-I-16-DIAG-HD	8 mA	20 mA			
Analogue output modules	UR20-4AO-UI-16, UR20-4AO-UI-16-DIAG	8 mA		85 mA		
	UR20-4AO-UI-16-HD, UR20-4AO-UI-16-DIAG-HD	8 mA		85 mA		
Functional modules	UR20-1CNT-100-1DO	8 mA	35 mA			x
	UR20-2CNT-100	8 mA	35 mA			
	UR20-1CNT-500	8 mA	20 mA		x	
	UR20-2FCNT-100	8 mA	35 mA		x	
	UR20-2PWM-PN-0.5A, UR20-2PWM-PN-2A	8 mA		40 mA		x
	UR20-1SSI	8 mA	25 mA		x	
	UR20-1COM-232-485-422	8 mA	16 mA			
	UR20-1COM-SAI-PRO	8 mA	17 mA			
Safe I/O modules	UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSPS, UR20-8DI-PN-FSOE, UR20-8DI-PN-FSPS	8 mA		20 mA	x	

I_{SYS}	Current consumption from the system current path	I_S	Current demand of the connected sensors
I_{IN}	Power consumption from input current path (*all inputs active)	I_L	Current demand of the connected actuators
I_{OUT}	Power consumption from output current path at maximum load	x	Must be included when calculating the power supply

Current demand

Product group	Product	I_{SYS}	I_{IN}	I_{OUT}	I_S	I_L
Power-feed modules	UR20-PF-O			10 mA		
	UR20-PF-I		10 mA			
	UR20-PF-O-1DI-SIL, UR20-PF-O-2DI-SIL, UR20-PF-O-2DI-DELAY-SIL	8 mA	45 mA			x
Potential distribution modules	UR20-16AUX-O	-	-	-	-	-
	UR20-16AUX-I	-	-	-	-	-

I_{SYS} Current consumption from the system current path
I_{IN} Power consumption from input current path (*all inputs active)
I_{OUT} Power consumption from output current path at maximum load
I_S Current demand of the connected sensors
I_L Current demand of the connected actuators
x Must be included when calculating the power supply

4.6 Example calculation for the power supply

The power supply must be calculated individually for each station installation. Therefore the simultaneity factor g and the current demand of each module, as well as the devices to be connected must be established (see the example calculation table).

In the **example station**, a PROFINET-IRT coupler is configured with four UR20-4DI-P modules and eight UR20-8DO-P modules. The cumulative current demand for each module is now calculated to determine whether and at which point a UR20-PF-I power-feed module must be positioned to refresh the current path. A power-feed module must always be used where the current demand exceeds 10 A.

The power refresh must be separately calculated for the input and output current paths. The system voltage need not be considered during this step.

Calculation of the current demand for the input current

The current consumption of the fieldbus coupler must be considered for the **main power supply**, and the sum of consumption values is multiplied by the simultaneity factor g for each following module:

I_{SYS} coupler
$+ (I_{SYS} + I_{IN}) + (I_S \times g)$ module 1
$+ (I_{SYS} + I_{IN}) + (I_S \times g)$ module 2
$+ \sum ((I_{SYS} + I_{IN}) + (I_S \times g))$ modules 3 to 4
= Cumulative current demand

I_{SYS} Current consumption from the system current path
I_{IN} Current consumption from the input current path
I_S Power supplies for the connected sensors

In the case of an additional power supply (**power refresh**) with a UR20-PF-I power-feed module, only the sensor power supplies and the module current consumption have to be considered:

$((I_{IN} + I_S$ module x) x g)
$+ ((I_{IN} + I_S$ module y) x g)
$+ \sum ((I_{IN} + I_S) \times g)$ n modules
= Cumulative current demand

Calculation of current demand for the output current

The current consumption of each module and the current demand of the connected actuators must be considered for the output current. There is no difference in the calculation of the main power supply and power refresh:

$$\begin{aligned} &(I_{OUT} + (I_L \times g) \text{ module } 1 \\ &+ (I_{OUT} + (I_L \times g) \text{ module } 2 \\ &+ \sum (I_{OUT} + (I_L \times g)) \text{ n modules} \\ &= \text{Cumulative current demand} \end{aligned}$$

I_{OUT} module current consumption from the output current path
I_L Current demand of the connected actuators

Example:
The values in the following table are used to calculate the current demand of the example station (cumulative for each module). The input current is:
Module 1:
I = 0.116 A + (0.008 A + 0.012 A) + (0.06 A x 1) = 0.196 A

Module 2:
I = 0.196 A + (0.008 A + 0.012 A) + (0.06 A x 1) = 0.276 A

The values for the other modules are calculated accordingly. The result shows that the accumulated value for up to 12 modules remains under 10 A, and therefore a power-feed module need not be used for the input current path.
Results for the output current path:
Module 5:
I = 0.015 A + (2 A x 0.5) = 1.015 A

Modul6 6:
I = 1.015 A + (0.015 A + (4 A x 0.5) = 3.03 A

Module 10:
I = 6.175 A + (0.015 A + (4 A x 0.5) = 8.19 A

Module 11 (without power refresh):
I = 8.19 A + (0.015 A + (4 A x 0.5) = **10.205 A**

Therefore the available 10 A would be exceeded. As a result, a PF-O power-feed module must be positioned e 11th module, which will supply anocalculation of current consumption is repeated for each power-feed module. Unused current values may not be included.

Module 11 (as per PF-O):
I = (0.015 A + (4 A x 0.5) = 2.015 A

Module 12 (as per PF-O):
I = 2.015 A (0.015 A + (4 A x 0.5) = 4.030 A

Example calculation for the current demand (all current values in A)

Module no.	Product	I_{SYS}	I_{IN}	I_{OUT}	I_S	I_L	Simultaneity factor g	Cumulative current demands of the input current path	Cumulative current demand of the output power path coupler	Cumulative current demand of the PF-O output power path
	UR20-FBC-PN-IRT	0.116						0.116	0	
1	UR20-4DI-P	0.008	0.012		0.06		1	0.196	0	
2	UR20-4DI-P	0.008	0.012		0.06		1	0.276	0	
3	UR20-4DI-P	0.008	0.012		0.12		1	0.416	0	
4	UR20-4DI-P	0.008	0.012		0.18		1	0.616	0	
5	UR20-8DO-P	0.008		0.015		2	0.5	0.624	1.015	
6	UR20-8DO-P	0.008		0.015		4	0.5	0.632	3.03	
7	UR20-8DO-P	0.008		0.015		3	0.5	0.64	4.545	
8	UR20-8DO-P	0.008		0.015		2	0.5	0.648	5.56	
9	UR20-8DO-P	0.008		0.015		1.2	0.5	0.656	6.175	
10	UR20-8DO-P	0.008		0.015		4	0.5	0.664	**8.19**	
	UR20-PF-O									
11	UR20-8DO-P	0.008		0.015		4	0.5	0.672		2.015
12	UR20-8DO-P	0.008		0.015		4	0.5	0.68		4.030

I_{SYS} Current consumption from the system power supply
I_{IN} Power consumption from input current path
I_{OUT} Power consumption from output current path
I_S Current demand of the connected sensors
I_L Current demand of the connected actuators

The current demand is just under 10 A! The output current path must therefore be refreshed **before the 11th module**.

10 A is supplied by the UR20-PF-O module. The 1.81 A calculated as remaining after the 10th module must **not** be added to the 10 A after the UR20-PF-O module!

4.7 Calculation of power loss

The power loss of the fieldbus coupler is calculated als follows:

$$P_{coupler} = P_0 + N * P_{mod} + I_{in} * \Delta U_{in} + I_{out} * \Delta U_{out}$$

P_0	Static power loss in the fieldbus coupler	24 V * I_{SYS}
I_{SYS}	Current consumption from the system current path	See table "Current demand" in section 4.5
N	Number of modules	
P_{mod}	Power loss due to module supply from the system current path	0.02 W
I_{in}	Current fed in through the input current path	
ΔU_{in}	Voltage drop across the contacts in the input current path	0.18 V
I_{out}	Current fed in through the output current path	
ΔU_{out}	Voltage drop across the contacts in the output current path	0.18 V

The power loss of a u-remote station is calculated using the power loss of the fieldbus coupler and the power loss of the individual modules. It depends on the current in both current paths. It is assumed that there is a maximum power loss (P_{module}) of 2 watts for the modules.

$$P_{station} = P_{koppler} + N * P_{module}$$

Maximum values were assumed for these calculations. If you need detailed calculations, please contact the Weidmüller Service.

4.8 Feedback energy in DO modules

With digital output modules, power is fed back through the channels when inductive loads are switched off. The respective permissible breaking energy is noted in the technical data of the DO modules. Depending on the switching frequency the breaking energy leads to additional energy loss in the output module.

If the maximum permissible output power loss of a module is exceeded, the module shuts down temporarily.

Feedback energy can be prevented by installing external freewheeling protection. With it, the same switching rate can be achieved with an inductive load as with a resistive load.

Calculation of output power loss

The module specific data needed to calculate the output power loss are provided in the ATEX certificate which you can download from the Weidmüller website.

4.9 Data width of I/O modules, dependent on the coupler used

UR20-FBC-PB-DP

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1334870000	UR20-FBC-PB-DP	–	8	47	–	–
1315170000	UR20-4DI-P	3	7/3*	47	1	–
2009360000	UR20-4DI-P-3W	3	7/3*	47	1	–
1315180000	UR20-8DI-P-2W	3	11/3*	47	1	–
1394400000	UR20-8DI-P-3W	3	11/3*	47	1	–
1315190000	UR20-8DI-P-3W-HD	3	11/3*	47	1	–
1315200000	UR20-16DI-P	3	–	47	2	–
1315210000	UR20-16DI-P-PLC-INT	3	–	47	2	–
1460140000	UR20-2DI-P-TS	3	9	47	60	–
1460150000	UR20-4DI-P-TS	3	11	47	60	–
1315350000	UR20-4DI-N	3	7/3*	47	1	–
1315370000	UR20-8DI-N-3W	3	11/3*	47	1	–
1315390000	UR20-16DI-N	3	–	47	2	–
1315400000	UR20-16DI-N-PLC-INT	3	–	47	2	–
1550070000	UR20-4DI-2W-230V-AC	3	–	47	1	–
1315220000	UR20-4DO-P	3	4/3*	47	–	1
1315230000	UR20-4DO-P-2A	3	4/3*	47	–	1
1394420000	UR20-4DO-PN-2A	3	4	47	–	1
1315240000	UR20-8DO-P	3	4/3*	47	–	1
1509830000	UR20-8DO-P-2W-HD	3	4/3*	47	–	1
1315250000	UR20-16DO-P	3	–	47	–	2
1315270000	UR20-16DO-P-PLC-INT	3	–	47	–	2
1315410000	UR20-4DO-N	3	4/3*	47	–	1
1315420000	UR20-4DO-N-2A	3	4/3*	47	–	1
1315430000	UR20-8DO-N	3	4/3*	47	–	1
1315440000	UR20-16DO-N	3	–	47	–	2
1315450000	UR20-16DO-N-PLC-INT	3	–	47	–	2
1315540000	UR20-4RO-SSR-255	3	4/3*	47	–	1
1315550000	UR20-4RO-CO-255	3	4/3*	47	–	1
1315600000	UR20-2PWM-PN-0.5A	3	11	47	4	12
1315610000	UR20-2PWM-PN-2A	3	11	47	4	12
1315620000	UR20-4AI-UI-16	3	9	47	8	–
1315690000	UR20-4AI-UI-16-DIAG	3	11	47	8	–
1506920000	UR20-4AI-UI-16-HD	3	9	47	8	–
1506910000	UR20-4AI-UI-16-DIAG-HD	3	11	47	8	–

***Modules with /3, such as UR20-8DO-P-NoParam, are present in the GSD and then have 3 Bytes parameters.**

UR20-FBC-PB-DP

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1394390000	UR20-4AI-UI-12	3	9	47	8	–
1315650000	UR20-8AI-I-16-HD	3	13	47	16	–
1315720000	UR20-8AI-I-16-DIAG-HD	3	15	47	16	–
1315670000	UR20-8AI-I-PLC-INT	3	13	47	16	–
1315700000	UR20-4AI-RTD-DIAG	3	31	47	8	–
1315710000	UR20-4AI-TC-DIAG	3	31	47	8	–
1315680000	UR20-4AO-UI-16	3	15	47	–	8
1315730000	UR20-4AO-UI-16-DIAG	3	16	47	–	8
1510690000	UR20-4AO-UI-16-HD	3	15	47	–	8
1506930000	UR20-4AO-UI-16-DIAG-HD	3	16	47	–	8
1315570000	UR20-1CNT-100-1DO	3	24	47	12	10
1315590000	UR20-2CNT-100	3	43	47	12	12
1315580000	UR20-1CNT-500	3	24	47	8	10
1508080000	UR20-2FCNT-100	3	5	47	20	12
1508090000	UR20-1SSI	3	11	47	6	0
1315750000	UR20-1COM-232-485-422	3	9	47	16	16
2007430000	UR20-1COM-SAI-PRO	3	–	47	–	–
1529780000	UR20-4DI-4DO-PN-FSOE	–	–	–	–	–
1529800000	UR20-8DI-PN-FSOE	–	–	–	–	–
1335060000	UR20-4DI-4DO-PN-FSPS	7	26	47	5	5
1335070000	UR20-8DI-PN-FSPS	7	26	47	5	5
1335030000	UR20-PF-O-1DI-SIL	3	–	47	4	–
1335040000	UR20-PF-O-2DI-DELAY-SIL	3	–	47	4	–
1335050000	UR20-PF-O-2DI-SIL	3	–	47	4	–
Max. data (in bytes)		244	244	244	244	244

***Modules with /3, such as UR20-8DO-P-NoParam, are present in the GSD and then have 3 Bytes parameters.**

UR20-FBC-PN-IRT

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1334880000	UR20-FBC-PN-IRT	4	10	47	4	4
1315170000	UR20-4DI-P	4	8	47	2	1
2009360000	UR20-4DI-P-3W	4	8	47	2	1
1315180000	UR20-8DI-P-2W	4	12	47	2	1
1394400000	UR20-8DI-P-3W	4	12	47	2	1
1315190000	UR20-8DI-P-3W-HD	4	12	47	2	1

UR20-FBC-PN-IRT

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1315200000	UR20-16DI-P	4	–	47	3	1
1315210000	UR20-16DI-P-PLC-INT	4	–	47	3	1
1460140000	UR20-2DI-P-TS	4	10	47	61	1
1460150000	UR20-4DI-P-TS	4	12	47	61	1
1315350000	UR20-4DI-N	4	8	47	2	1
1315370000	UR20-8DI-N-3W	4	12	47	2	1
1315390000	UR20-16DI-N	4	–	47	3	1
1315400000	UR20-16DI-N-PLC-INT	4	–	47	3	1
1550070000	UR20-4DI-2W-230V-AC	4	–	47	2	1
1315220000	UR20-4DO-P	4	5	47	1	2
1315230000	UR20-4DO-P-2A	4	5	47	1	2
1394420000	UR20-4DO-PN-2A	4	5	47	1	2
1315240000	UR20-8DO-P	4	5	47	1	2
1509830000	UR20-8DO-P-2W-HD	4	5	47	1	2
1315250000	UR20-16DO-P	4	–	47	1	3
1315270000	UR20-16DO-P-PLC-INT	4	–	47	1	3
1315410000	UR20-4DO-N	4	5	47	1	2
1315420000	UR20-4DO-N-2A	4	5	47	1	2
1315430000	UR20-8DO-N	4	5	47	1	2
1315440000	UR20-16DO-N	4	–	47	1	3
1315450000	UR20-16DO-N-PLC-INT	4	–	47	1	3
1315540000	UR20-4RO-SSR-255	4	5	47	1	2
1315550000	UR20-4RO-CO-255	4	5	47	1	2
1315600000	UR20-2PWM-PN-0.5A	4	12	47	5	13
1315610000	UR20-2PWM-PN-2A	4	12	47	5	13
1315620000	UR20-4AI-UI-16	4	10	47	9	1
1315690000	UR20-4AI-UI-16-DIAG	4	12	47	9	1
1506920000	UR20-4AI-UI-16-HD	4	10	47	9	1
1506910000	UR20-4AI-UI-16-DIAG-HD	4	12	47	9	1
1394390000	UR20-4AI-UI-12	4	10	47	9	1
1315650000	UR20-8AI-I-16-HD	4	14	47	17	1
1315720000	UR20-8AI-I-16-DIAG-HD	4	16	47	17	1
1315670000	UR20-8AI-I-PLC-INT	4	14	47	17	1
1315700000	UR20-4AI-RTD-DIAG	4	32	47	9	1
1315710000	UR20-4AI-TC-DIAG	4	32	47	9	1
1315680000	UR20-4AO-UI-16	4	16	47	1	9
1315730000	UR20-4AO-UI-16-DIAG	4	17	47	1	9

UR20-FBC-PN-IRT

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1510690000	UR20-4AO-UI-16-HD	4	16	47	1	9
1506930000	UR20-4AO-UI-16-DIAG-HD	4	17	47	1	9
1315570000	UR20-1CNT-100-1DO	4	25	47	13	11
1315590000	UR20-2CNT-100	4	44	47	13	13
1315580000	UR20-1CNT-500	4	25	47	9	11
1508080000	UR20-2FCNT-100	4	6	47	21	13
1508090000	UR20-1SSI	4	12	47	7	1
1315750000	UR20-1COM-232-485-422	4	10	47	17	17
2007430000	UR20-1COM-SAI-PRO	4	–	47	1	1
1529780000	UR20-4DI-4DO-PN-FSOE	–	–	–	–	–
1529800000	UR20-8DI-PN-FSOE	–	–	–	–	–
1335060000	UR20-4DI-4DO-PN-FSPS	4	23	47	6	6
1335070000	UR20-8DI-PN-FSPS	4	23	47	6	6
1335030000	UR20-PF-O-1DI-SIL	4	–	47	5	1
1335040000	UR20-PF-O-2DI-DELAY-SIL	4	–	47	5	1
1335050000	UR20-PF-O-2DI-SIL	4	–	47	5	1
Max. data (in bytes)		260	4362	1408	512	512

UR20-FBC-EC

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1334910000	UR20-FBC-EC	256	4096	3328	1024	1024
1315170000	UR20-4DI-P	4	4	47	2	–
2009360000	UR20-4DI-P-3W	4	4	47	2	–
1315180000	UR20-8DI-P-2W	4	8	47	2	–
1394400000	UR20-8DI-P-3W	4	8	47	2	–
1315190000	UR20-8DI-P-3W-HD	4	8	47	2	–
1315200000	UR20-16DI-P	4	–	47	3	–
1315210000	UR20-16DI-P-PLC-INT	4	–	47	3	–
1460140000	UR20-2DI-P-TS	4	–	47	61	–
1460150000	UR20-4DI-P-TS	4	1	47	62	1
1315350000	UR20-4DI-N	4	4	47	2	–
1315370000	UR20-8DI-N-3W	4	8	47	2	–
1315390000	UR20-16DI-N	4	–	47	3	–
1315400000	UR20-16DI-N-PLC-INT	4	–	47	3	–
1550070000	UR20-4DI-2W-230V-AC	4	4	47	2	–

UR20-FBC-EC

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1315220000	UR20-4DO-P	4	4	47	1	1
1315230000	UR20-4DO-P-2A	4	4	47	1	1
1394420000	UR20-4DO-PN-2A	4	4	47	1	1
1315240000	UR20-8DO-P	4	8	47	1	1
1509830000	UR20-8DO-P-2W-HD	4	8	47	1	1
1315250000	UR20-16DO-P	4	–	47	1	2
1315270000	UR20-16DO-P-PLC-INT	4	–	47	1	2
1315410000	UR20-4DO-N	4	4	47	1	1
1315420000	UR20-4DO-N-2A	4	4	47	1	1
1315430000	UR20-8DO-N	4	4	47	1	1
1315440000	UR20-16DO-N	4	–	47	1	2
1315450000	UR20-16DO-N-PLC-INT	4	–	47	1	2
1315540000	UR20-4RO-SSR-255	4	4	47	1	1
1315550000	UR20-4RO-CO-255	4	4	47	1	1
1315600000	UR20-2PWM-PN-0.5A	4	8	47	5	12
1315610000	UR20-2PWM-PN-2A	4	8	47	5	12
1315620000	UR20-4AI-UI-16	4	9	47	9	–
1315690000	UR20-4AI-UI-16-DIAG	4	21	47	9	–
1506920000	UR20-4AI-UI-16-HD	4	9	47	9	–
1506910000	UR20-4AI-UI-16-DIAG-HD	4	21	47	9	–
1394390000	UR20-4AI-UI-12	4	9	47	9	–
1315650000	UR20-8AI-I-16-HD	4	17	47	17	–
1315720000	UR20-8AI-I-16-DIAG-HD	4	33	47	17	–
1315670000	UR20-8AI-I-PLC-INT	4	17	47	17	–
1315700000	UR20-4AI-RTD-DIAG	4	37	47	9	–
1315710000	UR20-4AI-TC-DIAG	4	37	47	9	–
1315680000	UR20-4AO-UI-16	4	16	47	1	8
1315730000	UR20-4AO-UI-16-DIAG	4	20	47	1	8
1510690000	UR20-4AO-UI-16-HD	4	16	47	1	8
1506930000	UR20-4AO-UI-16-DIAG-HD	4	20	47	1	8
1315570000	UR20-1CNT-100-1DO	4	30	47	13	10
1315590000	UR20-2CNT-100	4	52	47	13	12
1315580000	UR20-1CNT-500	4	30	47	13	10
1508080000	UR20-2FCNT-100	4	2	47	21	12
1508090000	UR20-1SSI	4	11	47	7	–
1315750000	UR20-1COM-232-485-422	4	10	47	17	16
2007430000	UR20-1COM-SAI-PRO	4	–	47	1	0

UR20-FBC-EC

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1529780000	UR20-4DI-4DO-PN-FSOE	4	5	47	6	6
1529800000	UR20-8DI-PN-FSOE	4	5	47	6	6
1335060000	UR20-4DI-4DO-PN-FSPS	–	–	–	–	–
1335070000	UR20-8DI-PN-FSPS	–	–	–	–	–
1335030000	UR20-PF-O-1DI-SIL	4	–	47	5	–
1335040000	UR20-PF-O-2DI-DELAY-SIL	4	–	47	5	–
1335050000	UR20-PF-O-2DI-SIL	4	–	47	5	–
max. data (in Byte)		1514 pro telegramm + CoE	1514 pro telegramm + CoE	1514 pro telegramm + CoE	1024	1024

UR20-FBC-EIP

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1334930000	UR20-FBC-EIP	8	–	–	2/10	2/10
1315170000	UR20-4DI-P	4	4	47	1	–
2009360000	UR20-4DI-P-3W	4	4	47	1	–
1315180000	UR20-8DI-P-2W	4	8	47	1	–
1394400000	UR20-8DI-P-3W	4	8	47	1	–
1315190000	UR20-8DI-P-3W-HD	4	8	47	1	–
1315200000	UR20-16DI-P	4	–	47	2	–
1315210000	UR20-16DI-P-PLC-INT	4	–	47	2	–
1460140000	UR20-2DI-P-TS	4	6	47	60	–
1460150000	UR20-4DI-P-TS	4	8	47	60	–
1315350000	UR20-4DI-N	4	4	47	1	–
1315370000	UR20-8DI-N-3W	4	8	47	1	–
1315390000	UR20-16DI-N	4	–	47	2	–
1315400000	UR20-16DI-N-PLC-INT	4	–	47	2	–
1550070000	UR20-4DI-2W-230V-AC	4	–	47	1	–
1315220000	UR20-4DO-P	4	1	47	–	1
1315230000	UR20-4DO-P-2A	4	1	47	–	1
1394420000	UR20-4DO-PN-2A	4	1	47	–	1
1315240000	UR20-8DO-P	4	1	47	–	1
1509830000	UR20-8DO-P-2W-HD	4	1	47	–	1
1315250000	UR20-16DO-P	4	–	47	–	2
1315270000	UR20-16DO-P-PLC-INT	4	–	47	–	2
1315410000	UR20-4DO-N	4	1	47	–	1
1315420000	UR20-4DO-N-2A	4	1	47	–	1

UR20-FBC-EIP

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1315430000	UR20-8DO-N	4	1	47	–	1
1315440000	UR20-16DO-N	4	–	47	–	2
1315450000	UR20-16DO-N-PLC-INT	4	–	47	–	2
1315540000	UR20-4RO-SSR-255	4	1	47	–	1
1315550000	UR20-4RO-CO-255	4	1	47	–	1
1315600000	UR20-2PWM-PN-0.5A	4	8	47	4	12
1315610000	UR20-2PWM-PN-2A	4	8	47	4	12
1315620000	UR20-4AI-UI-16	4	6	47	8	–
1315690000	UR20-4AI-UI-16-DIAG	4	8	47	8	–
1506920000	UR20-4AI-UI-16-HD	4	6	47	8	–
1506910000	UR20-4AI-UI-16-DIAG-HD	4	8	47	8	–
1394390000	UR20-4AI-UI-12	4	6	47	8	–
1315650000	UR20-8AI-I-16-HD	4	10	47	16	–
1315720000	UR20-8AI-I-16-DIAG-HD	4	12	47	16	–
1315670000	UR20-8AI-I-PLC-INT	4	10	47	16	–
1315700000	UR20-4AI-RTD-DIAG	4	28	47	8	–
1315710000	UR20-4AI-TC-DIAG	4	28	47	8	–
1315680000	UR20-4AO-UI-16	4	12	47	–	8
1315730000	UR20-4AO-UI-16-DIAG	4	13	47	–	8
1510690000	UR20-4AO-UI-16-HD	4	12	47	–	8
1506930000	UR20-4AO-UI-16-DIAG-HD	4	13	47	–	8
1315570000	UR20-1CNT-100-1DO	4	21	47	12	10
1315590000	UR20-2CNT-100	4	40	47	12	12
1315580000	UR20-1CNT-500	4	21	47	8	10
1508080000	UR20-2FCNT-100	4	2	47	20	12
1508090000	UR20-1SSI	4	8	47	6	0
1315750000	UR20-1COM-232-485-422	4	6	47	16	16
2007430000	UR20-1COM-SAI-PRO	4	0	47	0	0
1529780000	UR20-4DI-4DO-PN-FSOE	–	–	–	–	–
1529800000	UR20-8DI-PN-FSOE	–	–	–	–	–
1335060000	UR20-4DI-4DO-PN-FSPS	–	–	–	–	–
1335070000	UR20-8DI-PN-FSPS	–	–	–	–	–
1335030000	UR20-PF-O-1DI-SIL	4	–	47	4	–
1335040000	UR20-PF-O-2DI-DELAY-SIL	4	–	47	4	–
1335050000	UR20-PF-O-2DI-SIL	4	–	47	4	–
max. data (in Byte)		1514 pro telegramm + CoE	1514 pro telegramm + CoE	1514 pro telegramm + CoE	1024	1024

UR20-FBC-DN

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1334900000	UR20-FBC-DN	-	11	47	2/10	2/10
1315170000	UR20-4DI-P	4	4	47	1	–
2009360000	UR20-4DI-P-3W	4	4	47	1	–
1315180000	UR20-8DI-P-2W	4	8	47	1	–
1394400000	UR20-8DI-P-3W	4	8	47	1	–
1315190000	UR20-8DI-P-3W-HD	4	8	47	1	–
1315200000	UR20-16DI-P	4	–	47	2	–
1315210000	UR20-16DI-P-PLC-INT	4	–	47	2	–
1460140000	UR20-2DI-P-TS	–	–	–	–	–
1460150000	UR20-4DI-P-TS	–	–	–	–	–
1315350000	UR20-4DI-N	4	4	47	1	–
1315370000	UR20-8DI-N-3W	4	8	47	1	–
1315390000	UR20-16DI-N	4	–	47	2	–
1315400000	UR20-16DI-N-PLC-INT	4	–	47	2	–
1550070000	UR20-4DI-2W-230V-AC	4	–	47	1	–
1315220000	UR20-4DO-P	4	1	47	–	1
1315230000	UR20-4DO-P-2A	4	1	47	–	1
1394420000	UR20-4DO-PN-2A	4	1	47	–	1
1315240000	UR20-8DO-P	4	1	47	–	1
1509830000	UR20-8DO-P-2W-HD	4	1	47	–	1
1315250000	UR20-16DO-P	4	–	47	–	2
1315270000	UR20-16DO-P-PLC-INT	4	–	47	–	2
1315410000	UR20-4DO-N	4	1	47	–	1
1315420000	UR20-4DO-N-2A	4	1	47	–	1
1315430000	UR20-8DO-N	4	1	47	–	1
1315440000	UR20-16DO-N	4	–	47	–	2
1315450000	UR20-16DO-N-PLC-INT	4	–	47	–	2
1315540000	UR20-4RO-SSR-255	4	1	47	–	1
1315550000	UR20-4RO-CO-255	4	1	47	–	1
1315600000	UR20-2PWM-PN-0.5A	4	8	47	4	12
1315610000	UR20-2PWM-PN-2A	4	8	47	4	12
1315620000	UR20-4AI-UI-16	4	6	47	8	–
1315690000	UR20-4AI-UI-16-DIAG	4	8	47	8	–
1506920000	UR20-4AI-UI-16-HD	4	6	47	8	–
1506910000	UR20-4AI-UI-16-DIAG-HD	4	8	47	8	–
1394390000	UR20-4AI-UI-12	4	6	47	8	–

UR20-FBC-DN

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1315650000	UR20-8AI-I-16-HD	4	10	47	16	–
1315720000	UR20-8AI-I-16-DIAG-HD	4	12	47	16	–
1315670000	UR20-8AI-I-PLC-INT	4	10	47	16	–
1315700000	UR20-4AI-RTD-DIAG	4	28	47	8	–
1315710000	UR20-4AI-TC-DIAG	4	28	47	8	–
1315680000	UR20-4AO-UI-16	4	12	47	–	8
1315730000	UR20-4AO-UI-16-DIAG	4	13	47	–	8
1510690000	UR20-4AO-UI-16-HD	4	12	47	–	8
1506930000	UR20-4AO-UI-16-DIAG-HD	4	13	47	–	8
1315570000	UR20-1CNT-100-1DO	4	21	47	12	10
1315590000	UR20-2CNT-100	4	40	47	12	12
1315580000	UR20-1CNT-500	4	21	47	8	10
1508080000	UR20-2FCNT-100	4	2	47	20	12
1508090000	UR20-1SSI	4	8	47	6	0
1315750000	UR20-1COM-232-485-422	4	6	47	16	16
2007430000	UR20-1COM-SAI-PRO	4	–	47	1	0
1529780000	UR20-4DI-4DO-PN-FSOE	–	–	–	–	–
1529800000	UR20-8DI-PN-FSOE	–	–	–	–	–
1335060000	UR20-4DI-4DO-PN-FSPS	–	–	–	–	–
1335070000	UR20-8DI-PN-FSPS	–	–	–	–	–
1335030000	UR20-PF-O-1DI-SIL	4	–	47	4	–
1335040000	UR20-PF-O-2DI-DELAY-SIL	4	–	47	4	–
1335050000	UR20-PF-O-2DI-SIL	4	–	47	4	–
max. data (in Byte)		264	400	47	496/504	496/504

UR20-FBC-CAN

Order No.	Module	Configuration	Parameter[1]	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1334890000	UR20-FBC-CAN	–		47	–	–
1315170000	UR20-4DI-P	2		47	1	–
2009360000	UR20-4DI-P-3W	2		47	1	–
1315180000	UR20-8DI-P-2W	2		47	1	–
1394400000	UR20-8DI-P-3W	2		47	1	–
1315190000	UR20-8DI-P-3W-HD	2		47	1	–

1) Each parameter is transferred individually by a SDO transfer (service data objects). For that reason there is no size limit, nevertheless every transfered parameter prolongs starting up the station.

UR20-FBC-CAN

Order No.	Module	Configuration	Parameter[1]	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1315200000	UR20-16DI-P	2		47	2	–
1315210000	UR20-16DI-P-PLC-INT	2		47	2	–
1315350000	UR20-4DI-N	2		47	1	–
1315370000	UR20-8DI-N-3W	2		47	1	–
1315390000	UR20-16DI-N	2		47	2	–
1315400000	UR20-16DI-N-PLC-INT	2		47	2	–
1550070000	UR20-4DI-2W-230V-AC	2		47	1	–
1315220000	UR20-4DO-P	2		47	–	1
1315230000	UR20-4DO-P-2A	2		47	–	1
1394420000	UR20-4DO-PN-2A	2		47	–	1
1315240000	UR20-8DO-P	2		47	–	1
1509830000	UR20-8DO-P-2W-HD	2		47	–	1
1315250000	UR20-16DO-P	2		47	–	2
1315270000	UR20-16DO-P-PLC-INT	2		47	–	2
1315410000	UR20-4DO-N	2		47	–	1
1315420000	UR20-4DO-N-2A	2		47	–	1
1315430000	UR20-8DO-N	2		47	–	1
1315440000	UR20-16DO-N	2		47	–	2
1315450000	UR20-16DO-N-PLC-INT	2		47	–	2
1315540000	UR20-4RO-SSR-255	2		47	–	1
1315550000	UR20-4RO-CO-255	2		47	–	1
1315600000	UR20-2PWM-PN-0.5A	2		47	4	12
1315610000	UR20-2PWM-PN-2A	2		47	4	12
1315620000	UR20-4AI-UI-16	2		47	8	–
1315690000	UR20-4AI-UI-16-DIAG	2		47	8	–
1506920000	UR20-4AI-UI-16-HD	2		47	8	–
1506910000	UR20-4AI-UI-16-DIAG-HD	2		47	8	–
1394390000	UR20-4AI-UI-12	2		47	8	–
1315650000	UR20-8AI-I-16-HD	2		47	16	–
1315720000	UR20-8AI-I-16-DIAG-HD	2		47	16	–
1315670000	UR20-8AI-I-PLC-INT	2		47	16	–
1315700000	UR20-4AI-RTD-DIAG	2		47	8	–
1315710000	UR20-4AI-TC-DIAG	2		47	8	–
1315680000	UR20-4AO-UI-16	2		47	–	8
1315730000	UR20-4AO-UI-16-DIAG	2		47	–	8

1) Each parameter is transferred individually by a SDO transfer (service data objects). For that reason there is no size limit, nevertheless every transfered parameter prolongs starting up the station.

UR20-FBC-CAN

Order No.	Module	Configuration	Parameter[1]	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
1510690000	UR20-4AO-UI-16-HD	2		47	–	8
1506930000	UR20-4AO-UI-16-DIAG-HD	2		47	–	8
1315570000	UR20-1CNT-100-1DO	2		47	12	10
1315590000	UR20-2CNT-100	2		47	12	12
1315580000	UR20-1CNT-500	2		47	8	10
1508080000	UR20-2FCNT-100	2		47	20	12
1508090000	UR20-1SSI	2		47	6	0
1315750000	UR20-1COM-232-485-422	2		47	16	16
2007430000	UR20-1COM-SAI-PRO	2		47	–	–
1335030000	UR20-PF-O-1DI-SIL	2		47	4	–
1335040000	UR20-PF-O-2DI-DELAY-SIL	2		47	4	–
1335050000	UR20-PF-O-2DI-SIL	2		47	4	–
max. data (in Byte)		128	–	3055	256	256

1) Each parameter is transferred individually by a SDO transfer (service data objects). For that reason there is no size limit, nevertheless every transfered parameter prolongs starting up the station.

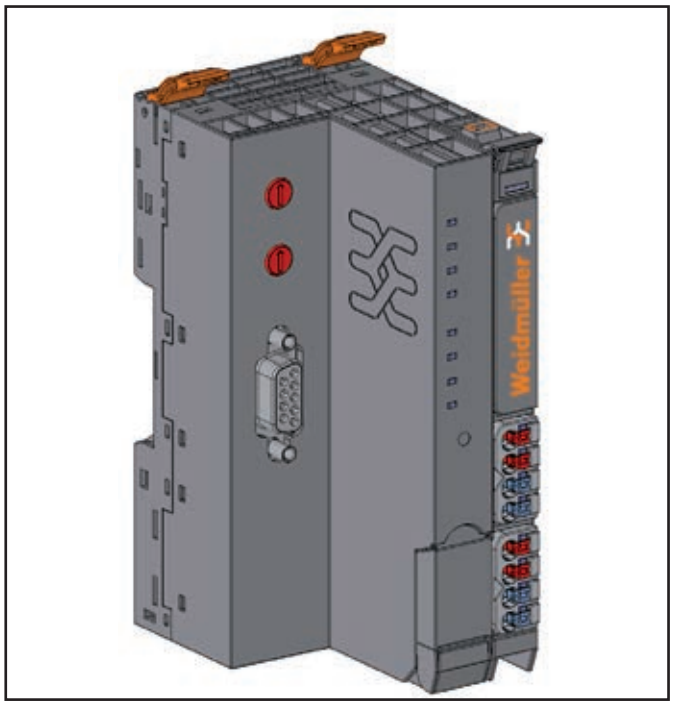
5 Detailed descriptions of the fieldbus coupler

5.1 PROFIBUS fieldbus coupler UR20-FBC-PB-DP

The UR20-FBC-PB-DP fieldbus coupler is a PROFIBUS-DP participant certified by the PROFIBUS user organisation. The coupler is the head module for the u-remote system bus, to which up to 64 active u-remote modules can be connected. The PROFIBUS-DP coupler has a Sub-D socket and supports all services in accordance with the DP-V1 specification.

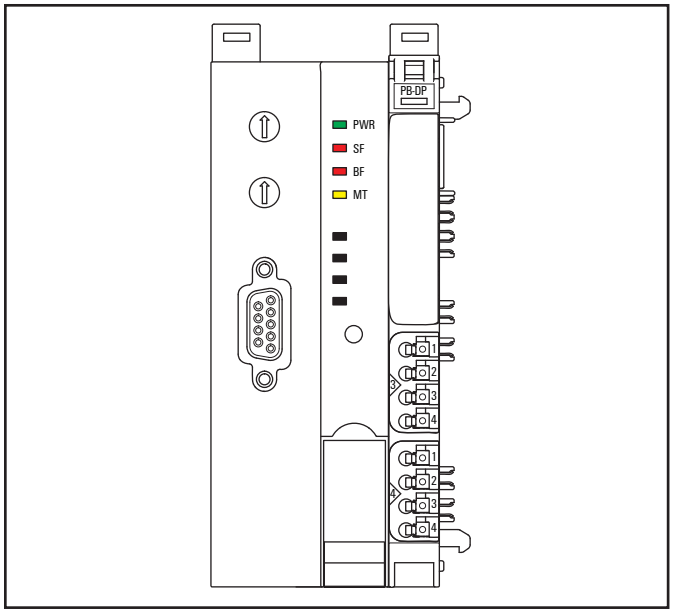
The coupler can be accessed with a system-independent web server application via the USB service interface. Thus, all information, such as diagnostics, status values and parameters, can be read and all connected modules can be simulated or forced.

The station's main power supply is integrated in the coupler. Power is supplied via two 4-pole connectors, separated into the input and output current paths.



Fieldbus coupler UR20-FBC-PB-DP (Order No. 1334870000)

Status indicators



LED status indicators UR20-FBC-PB-DP, error messages see Chapter 13

PWR	Power LED	**Green**: Supply voltage connected
SF	Collective error	**Red:** Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode
BF	Bus failure	**Red:** No connection to the fieldbus **Red flashing**: Configuration error, no connection to the control unit, or error in the parameter set or slave address error or firmware update is running
MT	Maintenance	**Yellow**: Error on the system bus or fieldbus

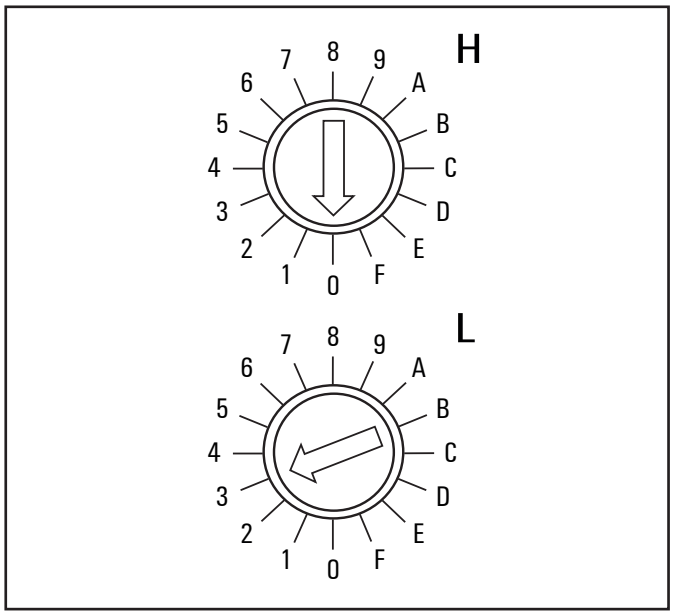
Addressing

The fieldbus coupler on the PROFIBUS-DP is addressed via the two rotary switches.

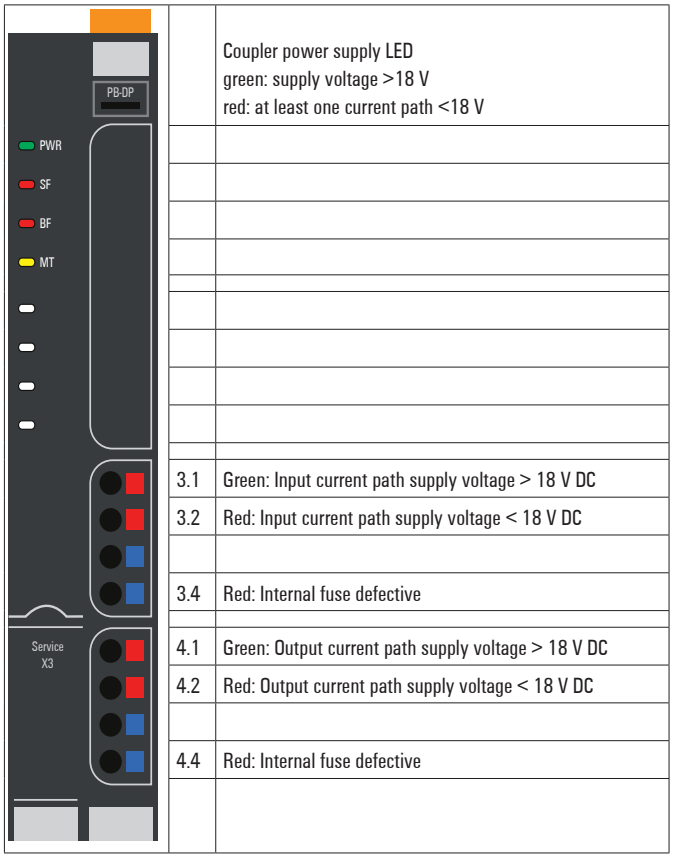
A maximum of 125 addresses (1 to 125) can be assigned. Each address may be assigned only **once** in the overall bus structure. Addresses 1 and 2 are generally used by the control systems. Bus addresses 000 plus 126 and higher may not be used!

The high order digit is set with rotary switch **H**, the least significant digit with rotary switch **L** . The switches are labelled in the hexadecimal numbering system (0 to 9, A=10, B=11, C=12, ... F = 15). A decimal to hexadecimal conversion table is provided in the annex.

Coding: Address = (H*16) + L



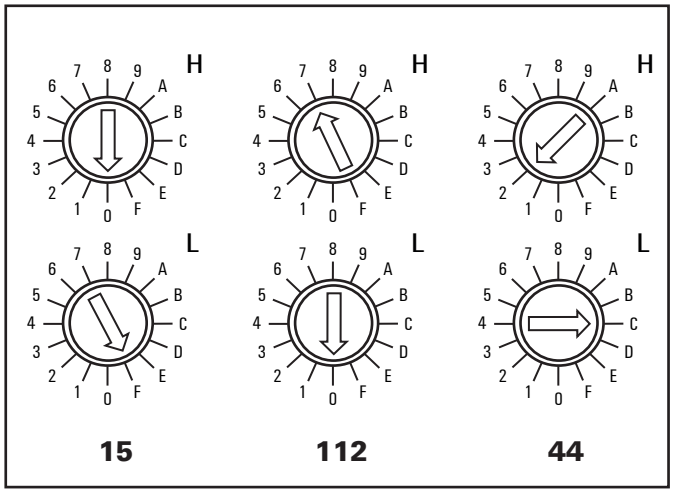
Default setting UR20-FBC-PB-DP: Address = 3



	Coupler power supply LED green: supply voltage >18 V red: at least one current path <18 V
3.1	Green: Input current path supply voltage > 18 V DC
3.2	Red: Input current path supply voltage < 18 V DC
3.4	Red: Internal fuse defective
4.1	Green: Output current path supply voltage > 18 V DC
4.2	Red: Output current path supply voltage < 18 V DC
4.4	Red: Internal fuse defective

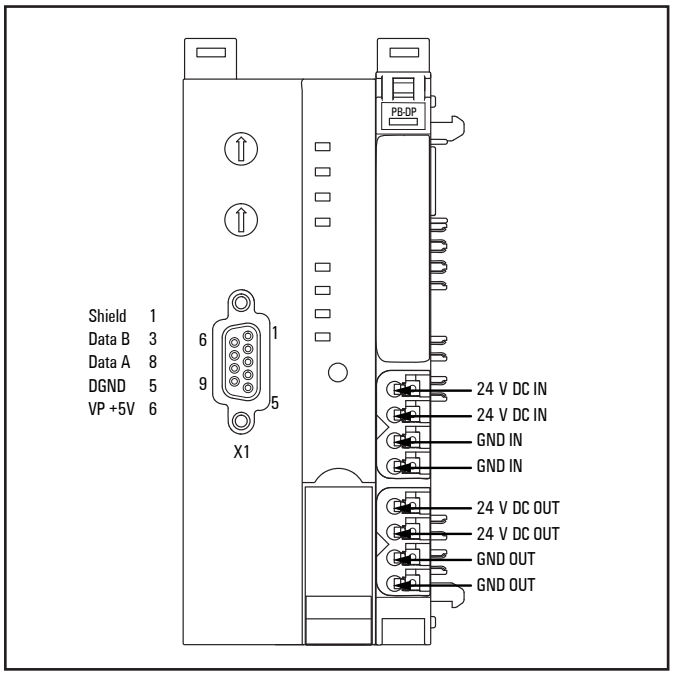
LED indicators UR20-FBC-PB-DP, error messages see Chapter 13

Addressing examples:

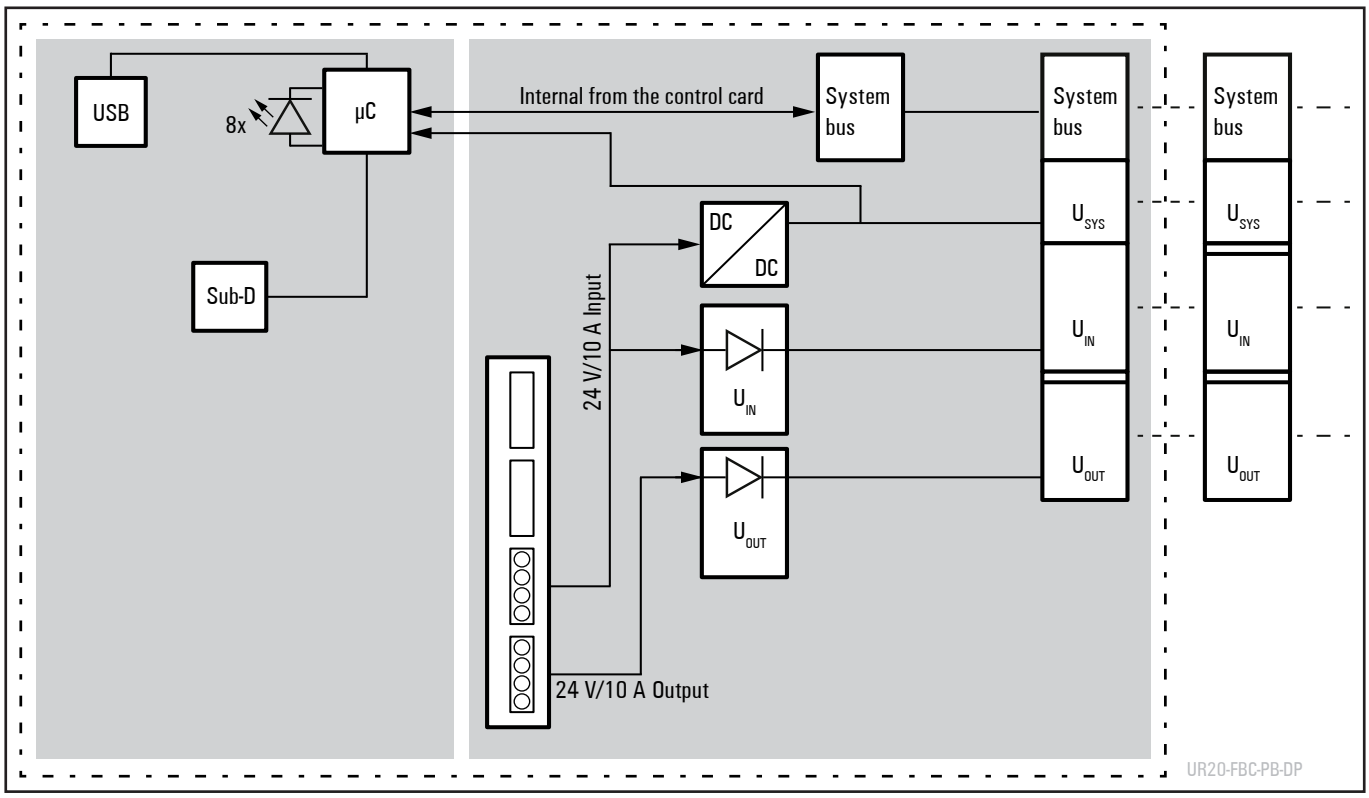


Examples for addressing the UR20-FBC-PB-DP

PROFIBUS address **15**: H = 0, L = F
PROFIBUS address **112**: H = 7, L = 0
PROFIBUS address **44**: H = 2, L = C



Connection diagram UR20-FBC-PB-DP



Block diagram UR20-FBC-PB-DP

ATTENTION

Risk of material damage!
In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!

Technical data UR20-FBC-PB-DP Order No. 1334870000)

System data		
Connection	9-pole SUB-D socket	
Fieldbus protocol	PROFIBUS DP-V1	
Process image	Input data width	max. 244 Byte
	Output data width	max. 244 Byte
	Parameter data	max. 244 Byte
	Diagnostic data	max. 244 Byte
Number of modules	max. 64 active	
Configuration interface	Micro USB 2.0	
Transfer rate	Fieldbus	max. 12 Mbps
	u-remote system bus	max. 48 Mbps
Supply		
Supply voltage for system and inputs	24 V DC +20 % / -15 %	
Supply voltage for outputs	24 V DC +20 % / -15 %	
Max. feed-in current for input modules	10 A	
Max. feed-in current for output modules	10 A	
Current consumption from system current path I_{SYS}	100 mA	
Connection data		
Type of connection	"PUSH IN"	
Conductor cross-section	Single-wired, fine-wired	0.14 – 1.5 mm^2 (AWG 16 – 26)
Weight		
Weight (operational status)	223 g	
General data, see Section 3.2		

Overview of editable parameters UR20-FBC-PB-DP

Parameter	Additional explanations	Optional values	Default
IP address USB port[1)]		192.168.1.202, 192.168.2.202, 192.168.3.202, 192.168.4.202, 192.168.5.202	192.168.1.202
DP alarm mode		V0 / V1	V1
DP alarm mode V0	**For mode V0, the alarm triggers are set in the parameter data.**		
Diagnostic alarm	These switches are always selectable, but they only have a function in mode V0. Diagnostic messages are generated which are not acknowledged by the PLC.	enabled / disabled	disabled
Process alarm		enabled / disabled	disabled
Hot-plug alarm		enabled / disabled	enabled
DP alarm mode V1	**In mode V1, the alarm triggers are set in the engineering environment.**		
Diagnostic alarm	These switches can be selected only in mode V1, in V0 they are inactive. Diagnostic messages are generated which are acknowledged by the PLC.	enabled / disabled	disabled
Process alarm		enabled / disabled	disabled
Hot-plug alarm		enabled / disabled	enabled
Identifier-related diagnosis	A diagnostic block is attached to the diagnostic message.	enabled / disabled	enabled
Channel-related diagnosis	A diagnostic block is attached to the diagnostic message.	enabled / disabled	enabled
Module status	A diagnostic block is attached to the diagnostic message.	enabled / disabled	enabled
Data format		Motorola / Intel	Motorola
Output behaviour on fieldbus error		All outputs off / Enable substitute value / Hold last value	All outputs off
Module behaviour on hot swap		Continue data exchange / behaviour as with fieldbus error	Continue data exchange

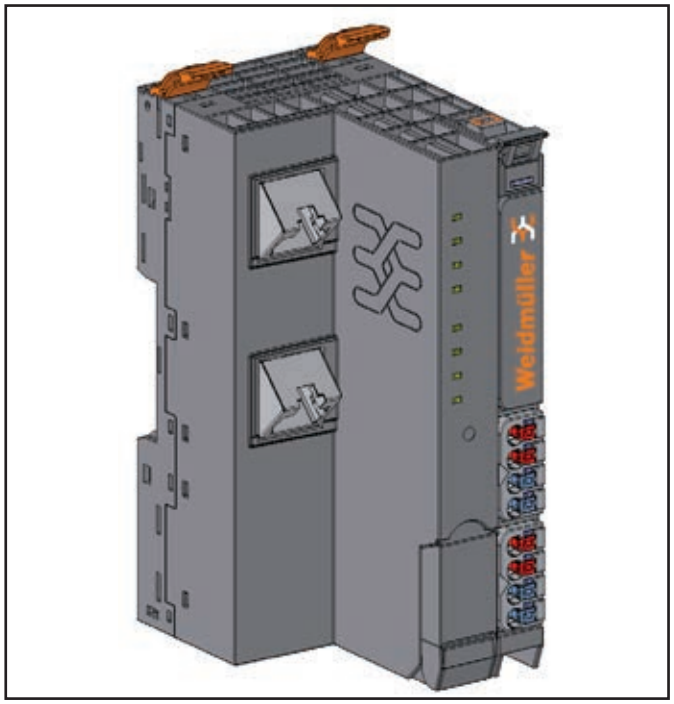
1) Change requires restart of the fieldbus coupler.

5.2 PROFINET fieldbus coupler UR20-FBC-PN-IRT

The UR20-FBC-PN-IRT fieldbus coupler is a PROFINET I/O participant certified by the PROFINET user organisation. The coupler is the head module for the u-remote system bus, to which up to 64 active u-remote modules can be connected. The PROFINET coupler has two Ethernet ports, and the integrated switch supports a line network structure.

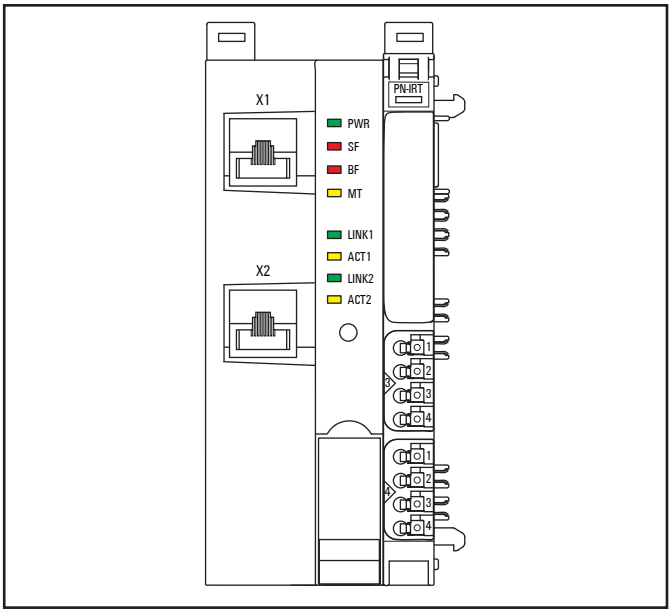
The coupler can be accessed with a system-independent web server application via the USB service interface or the Ethernet. Thus, all information, such as diagnostics, status values and parameters, can be read and all connected modules can be simulated or forced.

The station's main power supply is integrated in the coupler. Power is supplied via two 4-pole connectors, separated into the input and output current paths.



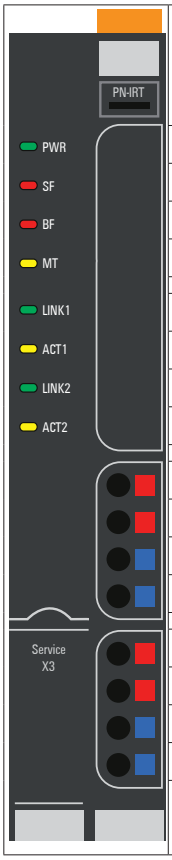
Fieldbus coupler UR20-FBC-PN-IRT (Order No. 1334880000)

Status indicators



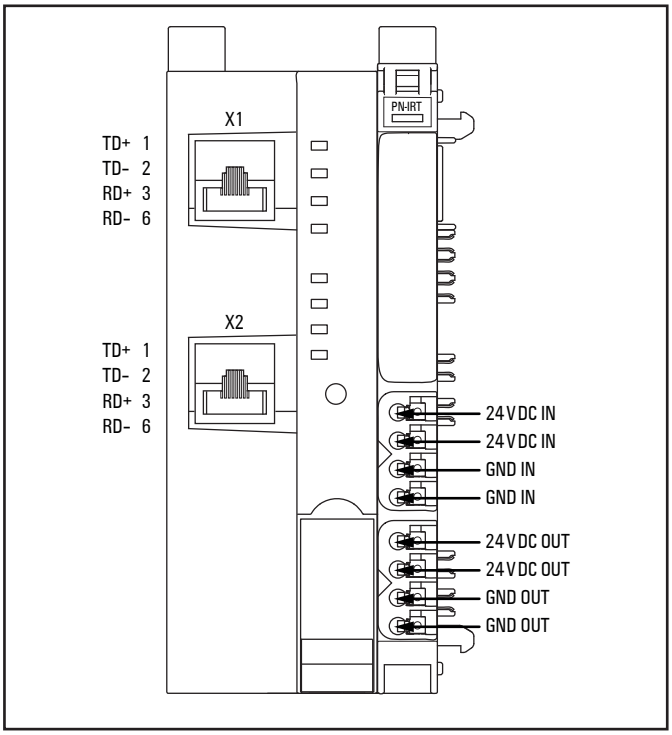
LED status indicators UR20-FBC-PN-IRT,, error messages see Chapter 13

PWR	Power LED	**Green**: Supply voltage connected
SF	Collective error	**Red:** Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode
BF	Bus failure	**Red:** No connection to the fieldbus **Red flashing**: Configuration error, no connection to the control unit, or error in the parameter set
MT	Maintenance	**Yellow**: Error on the system bus or the fieldbus
LINK1	Connection	**Green**: Connection established between port 1 of the coupler and another field device
ACT1	Active	**Yellow flashing**: Data being exchanged on port 1
LINK2	Connection	**Green**: Connection established between port 2 of the coupler and another field device
ACT2	Active	**Yellow flashing**: Data being exchanged on port 2



	Coupler power supply LED green: supply voltage > 18 V red: at least one current path < 18 V
3.1	Green: Input current path supply voltage > 18 V DC
3.2	Red: Input current path supply voltage < 18 V DC
3.4	Red: Internal fuse defective
4.1	Green: Output current path supply voltage > 18 V DC
4.2	Red: Output current path supply voltage < 18 V DC
4.4	Red: Internal fuse defective

LED indicators UR20-FBC-PN-IRT, error messages see Chapter 13

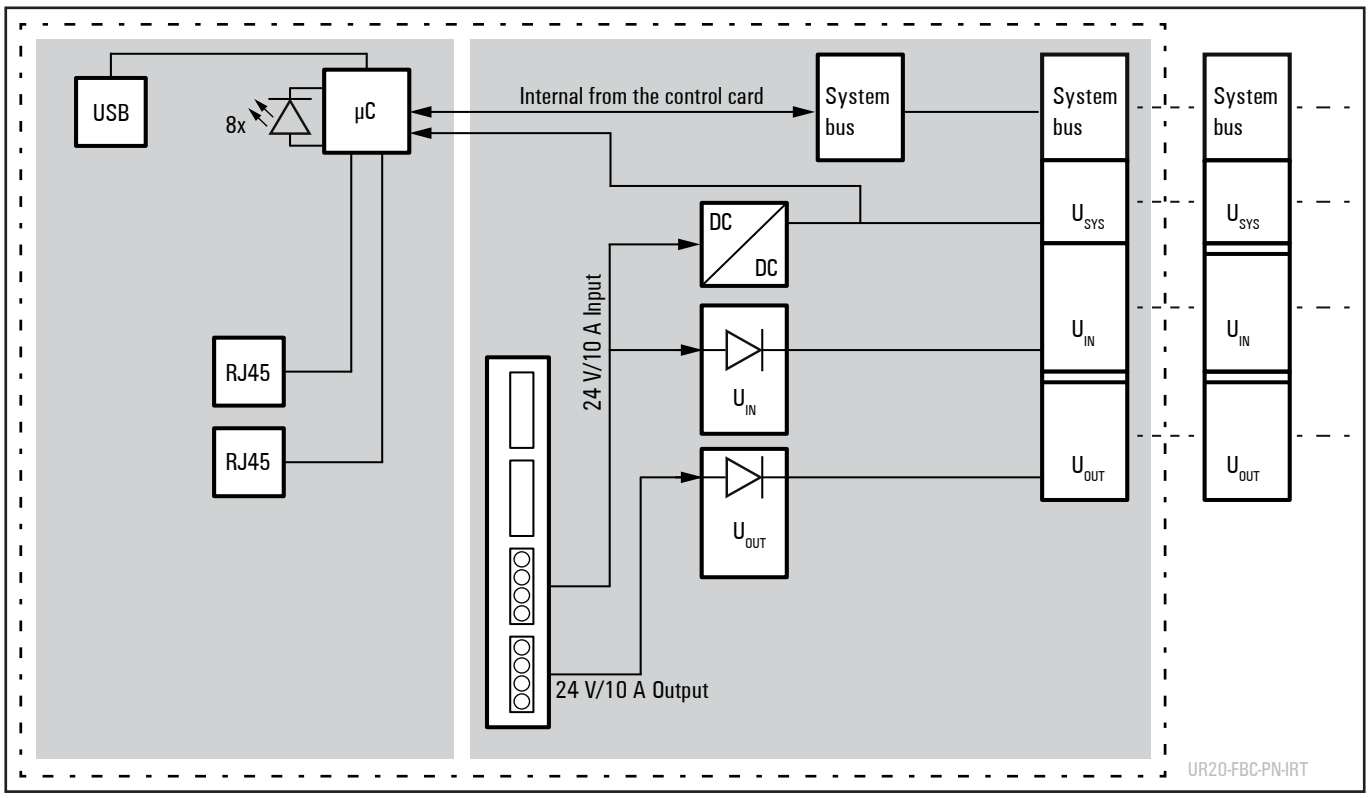


Connection diagram UR20-FBC-PN-IRT

ATTENTION

Risk of material damage!

In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!



Block diagram UR20-FBC-PN-IRT

Technical data UR20-FBC-PN-IRT (Order No. 1334880000)

System data		
Connection	2 x RJ-45	
Fieldbus protocol	PROFINET IO (IRT, RT)	
Redundancy protocol	MRP	
Process image	Input data width	max. 512 Byte
	Output data width	max. 512 Byte
	Parameter data	max. 4362 Byte
	Diagnostic data	max. 1408 Byte
Number of modules	max. 64 active	
Configuration interface	Micro USB 2.0	
Transfer rate	Fieldbus	max. 100 Mbps
	u-remote system bus	max. 48 Mbps
Fast start-up[1)]	< 500 ms	with a maximum of 10 modules
Supply		
Supply voltage for system and inputs	24 V DC +20 % / -15 %	
Supply voltage for outputs	24 V DC +20 % / -15 %	
Max. feed-in current for input modules	10 A	
Max. feed-in current for output modules	10 A	
Current consumption from system current path I_{SYS}	116 mA	
Connection data		
Type of connection	"PUSH IN"	
Conductor cross-section	Single-wired, fine-wired	0.14 – 1.5 mm² (AWG 16 – 26)
Weight		
Weight (operational status)	220 g	
General data, see Section 3.2		

1) To enable Fast Start-up media redundancy (MRP) must be deactivated on PLC start up.

Overview of editable parameters UR20-FBC-PN-IRT

Parameter	Optional values	Default
IP address	4 numbers between 0 and 255	
Subnet mask	4 numbers between 0 and 255	
Gateway	4 numbers between 0 and 255	
Webserver via Ethernet*	disabled / enabled	enabled
IP address USB port*	192.168.1.202; 192.168.2.202, 192.168.3.202, 192.168.4.202, 192.168.5.202	192.168.1.202
Process alarm	disabled / enabled	disabled
Diagnostic alarm	disabled / enabled	disabled
Type of diagnosis	Extended channel diagnostic (short diagnostic) / Vendor-specific diagnostic (complete diagnostic)	Extended channel diagnostic (short diagnostic)
Output behaviour on fieldbus error	All outputs off / Enable substitute value / Hold last value	All outputs off
Module behaviour on hot swap	Continue data exchange / Behaviour like fieldbus error	Continue data exchange
Data format	Motorola / Intel	Motorola
Lock force mode	Force mode unlocked / Force mode locked	Force mode unlocked

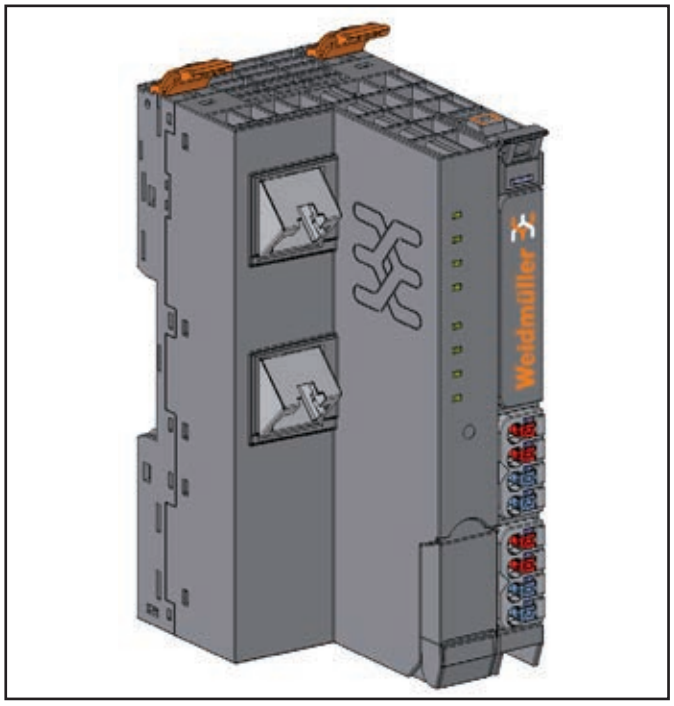
* Change requires restart of the fieldbus coupler.

5.3 EtherCAT fieldbus coupler UR20-FBC-EC

The UR20-FBC-EC fieldbus coupler is an EtherCAT participant certified by the EtherCAT[1] Technology Group. The coupler is the head module for the u-remote system bus, to which up to 64 active u-remote modules can be connected. The EtherCAT coupler has two Ethernet ports, the integrated switch supports a line network structure.

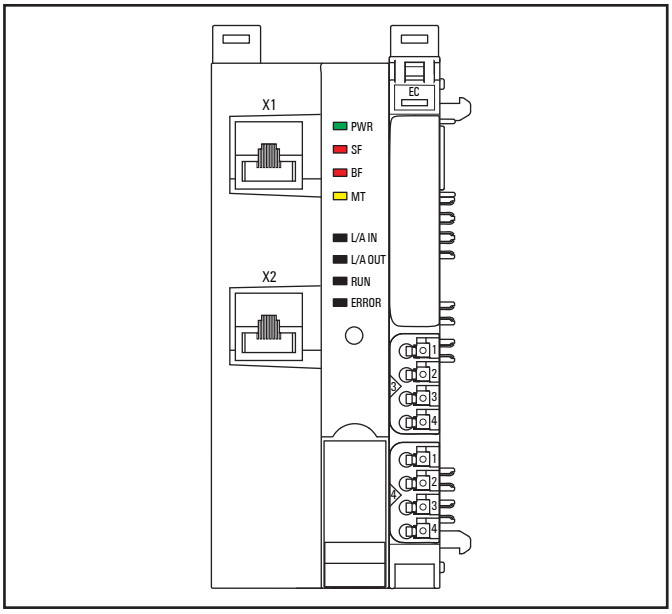
The coupler can be accessed with a system-independent web server application via the USB service interface or the EtherCAT. Thus, all information, such as diagnostics, status values and parameters, can be read and all connected modules can be simulated or forced.

The station's main power supply is integrated in the coupler. Power is supplied via two 4-pole connectors, separated into the input and output current paths.



Fieldbus coupler UR20-FBC-EC (Order No. 1334910000)

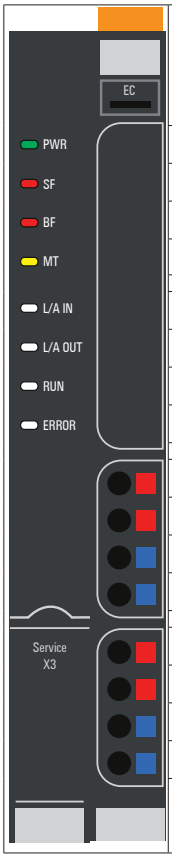
Status indicators



LED status indicators UR20-FBC-EC, error messages see Chapter 13

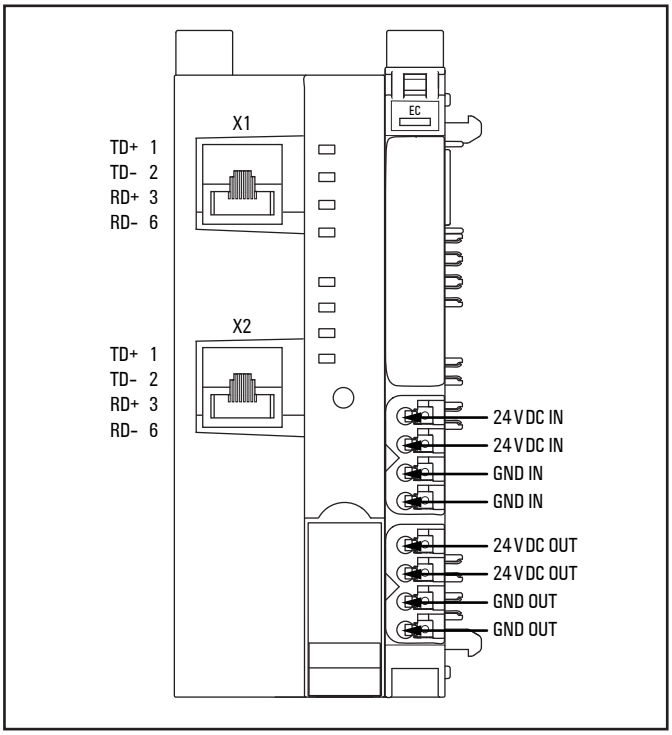
PWR	Power LED	**Green**: Supply voltage connected
SF	Collective error	**Red:** Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode
BF	Bus failure	**Red:** No connection to the fieldbus **Red flashing**: Configuration error, no connection to the control unit, or error in the parameter set
MT	Maintenance	**Yellow**: Error on the system bus
L/A IN	Connection/Activity	**Green**: Connection established between port 1 of the coupler and another field device **Green flashing**: Data being exchanged on port 1
L/A OUT	Connection/Activity	**Green**: Connection established between port 2 of the coupler and another field device **Green flashing**: Data being exchanged on port 2
RUN	Coupler state	**Off**: INIT **Green flashing** PRE-OPERATIONAL **Green lights up briefly**: SAFE-OPERATIONAL **Green**: OPERATIONAL
ERROR	Internal error	**Red**: Critical error in the coupler **Red lights up briefly**: Error in coupler application **Red briefly lights up twice**: Output Syncmanager Watchdog expired **Red flashing**: Configuration error

1) EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany



	Coupler power supply LED green: supply voltage > 18 V red: at least one current path < 18 V
3.1	Green: Input current path supply voltage > 18 V DC
3.2	Red: Input current path supply voltage < 18 V DC
3.4	Red: Internal fuse defective
4.1	Green: Output current path supply voltage > 18 V DC
4.2	Red: Output current path supply voltage < 18 V DC
4.4	Red: Internal fuse defective

LED indicators UR20-FBC-EC, error messages see Chapter 13

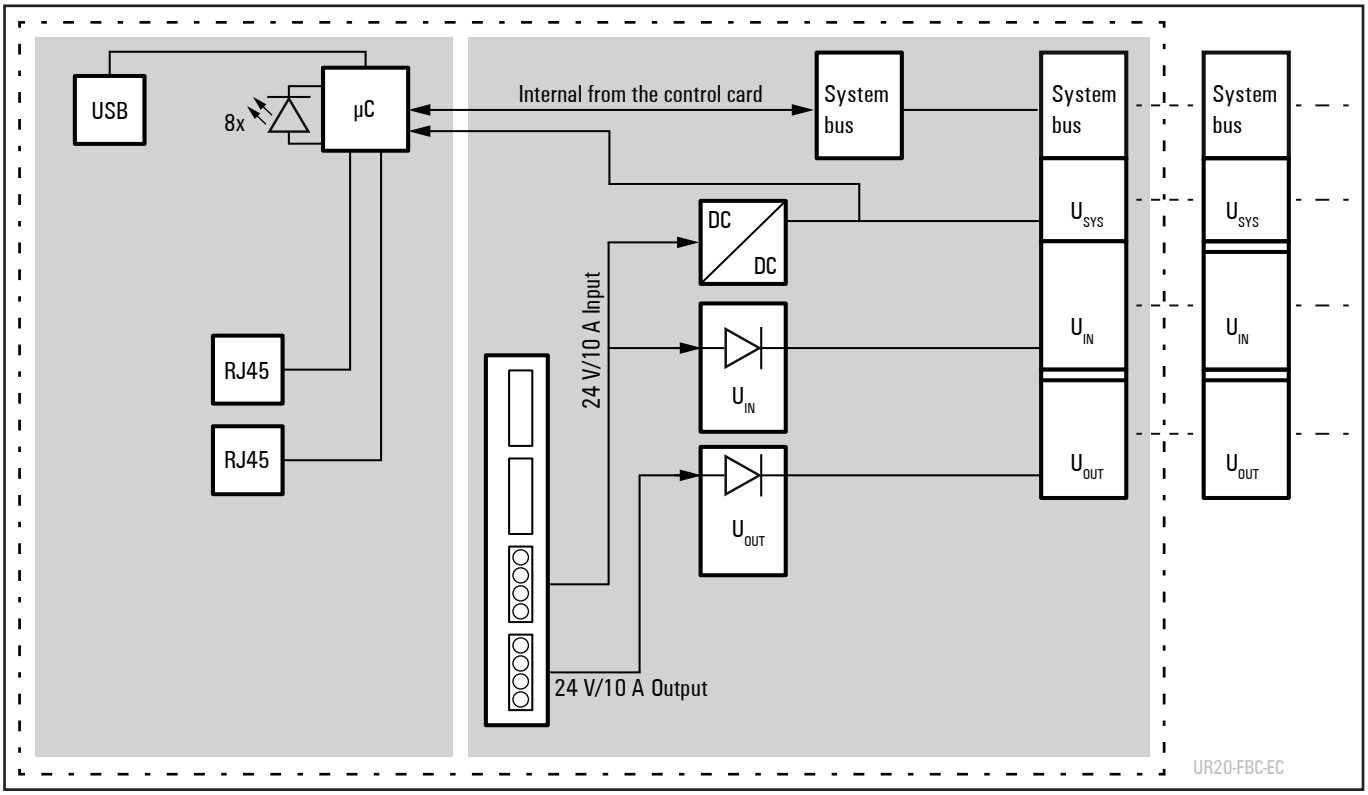


Connection diagram UR20-FBC-EC

ATTENTION

Risk of material damage!

In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!



Block diagram UR20-FBC-EC

Technical data UR20-FBC-EC (Order No. 1334910000)

System data		
Connection	2 x RJ-45	
Fieldbus protocol	EtherCAT	
Process image	Process data	max. 1024 Byte
	Parameter data	max. 64*64= 4 KB
	Diagnostic data	max. 64*50 Byte
Number of modules	max. 64 active	
Configuration interface	Micro USB 2.0	
Transfer rate	Fieldbus	max. 100 Mbps
	u-remote system bus	max. 48 Mbps
Supply		
Supply voltage for system and inputs	24 V DC +20 % / -15 %	
Supply voltage for outputs	24 V DC +20 % / -15 %	
Max. feed-in current for input modules	10 A	
Max. feed-in current for output modules	10 A	
Current consumption from system current path I_{SYS}	130 mA	
Connection data		
Type of connection	"PUSH IN"	
Conductor cross-section	Single-wired, fine-wired	0.14 – 1.5 mm^2 (AWG 16 – 26)
Weight		
Weight (operational status)	227 g	
General data, see Section 3.2.		

Overview of the editable parameters UR20-FBC-EC

Parameter	Optional values	Default
IP address USB port[1)]	192.168.1.202, 192.168.2.202, 192.168.3.202, 192.168.4.202, 192.168.5.202	192.168.1.202
Process alarm	disabled / enabled	disabled
Diagnosis	disabled / enabled	disabled
Output behaviour on fieldbus error	All outputs off / Enable substitute value/ Hold last value	All outputs off
Module behaviour on hot swap	Continue data exchange / behaviour like fieldbus error	Continue data exchange
Data format	Motorola / Intel	Intel
Webserver via Ethernet[1)]	disabled / enabled	enabled
Coupler control	Reserved	0

1) Change requires restart of the fieldbus coupler.

Status messages of the u-remote station

In addition to the process input data a coupler status word as well as module status bytes are transfered to the SPS. Thus diagnostics and status messages can be read directly.
The coupler status word describes the status of the u-remote station including the following information:

Coupler status bits UR20-FBC-EC

Bit	Name	Bedeutung
0	Summarized module diagnosis	Module diagnostic is present. A diagnosis is available for at least one module with diagnostics functionality.
1	Errorbit 1	Reserve bit 1, currently not used
2	Errorbit 2	Reserve bit 2, currently not used
3	Systembus error	Error on the system bus. Communication with the connected modules is disrupted.
4	Errorbit 4	Reserve bit 4, currently not used
5	Errorbit 5	Reserve bit 5, currently not used
6	I/O-Configuration error	Deviation in the configuration. The module list has changed. The list of configured modules (Configured Module Ident List 0xF030) differs from the module list detected by the coupler (Detected Module Ident List 0xF050).
7	Master configuration error	Master configuration error. The list of configured modules (Configured Module Ident List 0xF030) differs significantly from the module list detected by the coupler (Detected Module Ident List 0xF050). No process data can be exchanged with the modules. The station switches into PRE OPERATIONAL state.
8	Errorbit 8	Reserve bit 8, currently not used
9	Errorbit 9	Reserve bit 9, currently not used
10	Force mode active	Web server force mode is active. Force mode was activated through the web server. Process data cannot be exchanged between the EtherCAT master and forced channels.
11	Errorbit 11	Reserve bit 11, currently not used
12	Errorbit 12	Reserve bit 12, currently not used
13	Voltage U_{OUT} error	Error in the supply voltage of outputs
14	Voltage U_{IN} error	Error in the supply voltage of system and inputs
15	Errorbit 15	Reserve bit 15, currently not used

Status messages of the modules

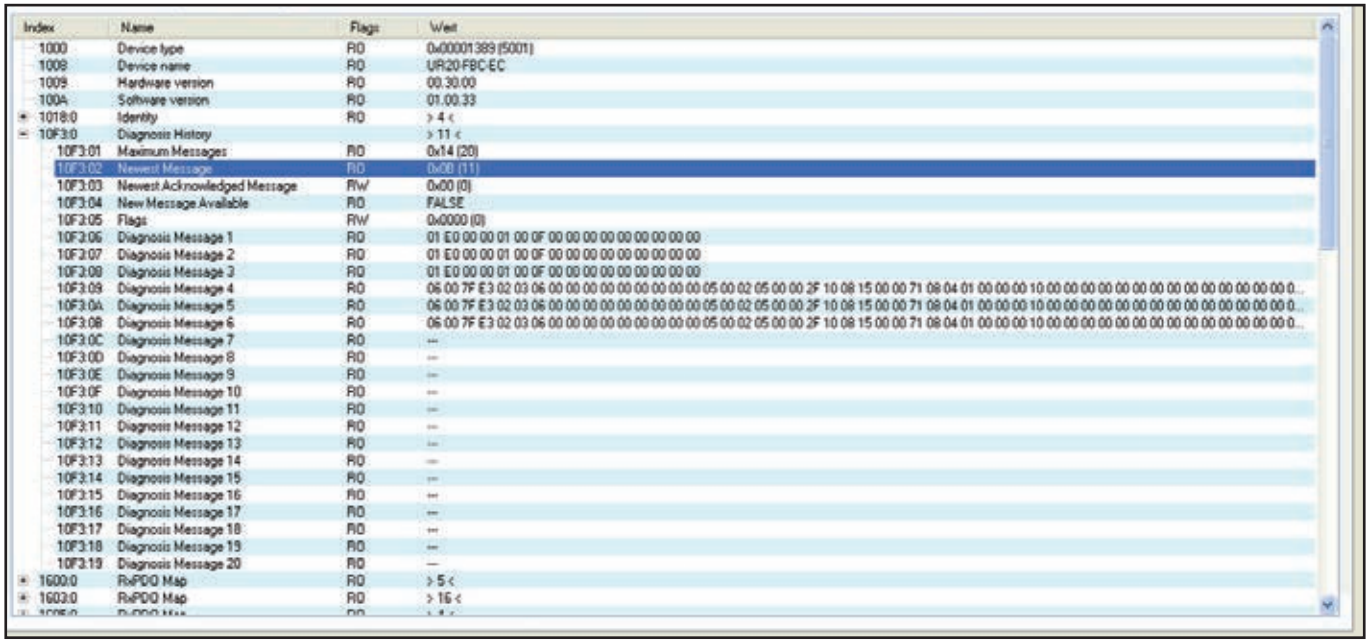
A module status byte is added to each module's process data (with the exception of safe I/O modules UR20-*-FSOE). It describes the status of the module including the following information:

Module status messages

Value	Meaning
0x00	Plug-in station is undefined
0x01	Plug-in station = module OK
0x80	Plug-in station empty, module has been removed
0x81	Incorrect module plugged in
0x82	Diagnosis available

Module diagnosis

The coupler`s status word reveals whether there is a module diagnosis. The history of the module diagnosis can be interrogated via object 0x10F3. A ring buffer stores 20 diagnosis in a way, that the current diagnosis overwrites the eldest one (subindex 06 to 19).



Index	Name	Flags	Wert
1000	Device type	RO	0x00001389 (5001)
1008	Device name	RO	UR20-FBC-EC
1009	Hardware version	RO	00.30.00
100A	Software version	RO	01.00.33
+ 1018:0	Identity	RO	> 4 <
- 10F3:0	Diagnosis History		> 11 <
10F3:01	Maximum Messages	RO	0x14 (20)
10F3:02	Newest Message	RO	0x0B (11)
10F3:03	Newest Acknowledged Message	RW	0x00 (0)
10F3:04	New Message Available	RO	FALSE
10F3:05	Flags	RW	0x0000 (0)
10F3:06	Diagnosis Message 1	RO	01 E0 00 00 01 00 0F 00 00 00 00 00 00 00 00 00
10F3:07	Diagnosis Message 2	RO	01 E0 00 00 01 00 0F 00 00 00 00 00 00 00 00 00
10F3:08	Diagnosis Message 3	RO	01 E0 00 00 01 00 0F 00 00 00 00 00 00 00 00 00
10F3:09	Diagnosis Message 4	RO	06 00 7F E3 02 03 06 00 00 00 00 00 00 00 00 00 00 00 05 00 02 05 00 00 2F 10 08 15 00 00 71 08 04 01 00 00 00 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0...
10F3:0A	Diagnosis Message 5	RO	06 00 7F E3 02 03 06 00 00 00 00 00 00 00 00 00 00 00 05 00 02 05 00 00 2F 10 08 15 00 00 71 08 04 01 00 00 00 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0...
10F3:0B	Diagnosis Message 6	RO	06 00 7F E3 02 03 06 00 00 00 00 00 00 00 00 00 00 00 05 00 02 05 00 00 2F 10 08 15 00 00 71 08 04 01 00 00 00 10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0...
10F3:0C	Diagnosis Message 7	RO	---
10F3:0D	Diagnosis Message 8	RO	---
10F3:0E	Diagnosis Message 9	RO	---
10F3:0F	Diagnosis Message 10	RO	---
10F3:10	Diagnosis Message 11	RO	---
10F3:11	Diagnosis Message 12	RO	---
10F3:12	Diagnosis Message 13	RO	---
10F3:13	Diagnosis Message 14	RO	---
10F3:14	Diagnosis Message 15	RO	---
10F3:15	Diagnosis Message 16	RO	---
10F3:16	Diagnosis Message 17	RO	---
10F3:17	Diagnosis Message 18	RO	---
10F3:18	Diagnosis Message 19	RO	---
10F3:19	Diagnosis Message 20	RO	---
+ 1600:0	RxPDO Map	RO	> 5 <
+ 1603:0	RxPDO Map	RO	> 16 <

History of module diagnosis as shown in TwinCat

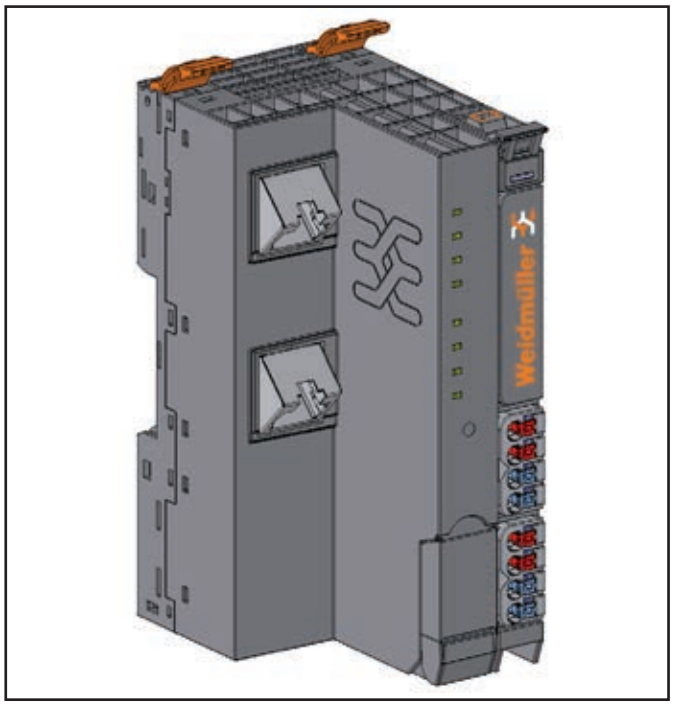
5.4 Modbus TCP fieldbus coupler UR20-FBC-MOD-TCP

ModbusTCP

The UR20-FBC-MOD-TCP fieldbus coupler is a Modbus TCP participant developed according to IEC 61158. The coupler is the head module for the u-remote system bus, to which up to 64 active u-remote modules can be connected. The Modbus TCP coupler has two Ethernet ports, the integrated switch supports a line network structure.

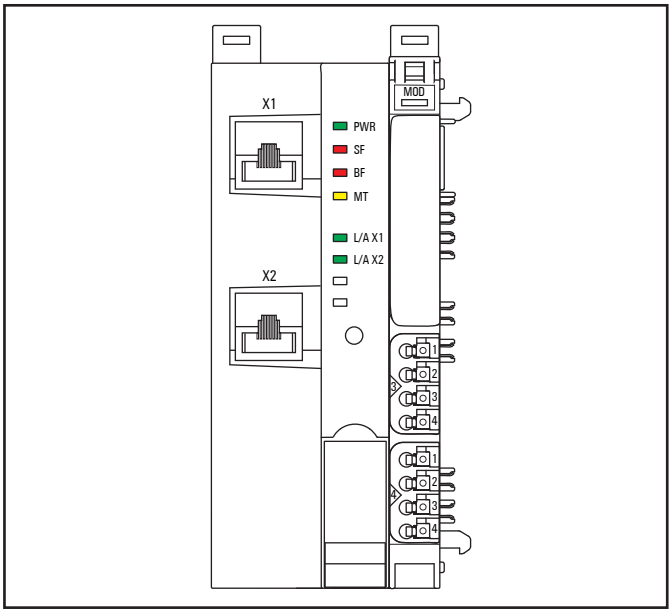
The coupler can be accessed with a system-independent web server application via the USB service interface or the Ethernet. Thus, all information, such as diagnostics, status values and parameters, can be read and all connected modules can be simulated or forced.

The station's main power supply is integrated in the coupler. Power is supplied via two 4-pole connectors, separated into the input and output current paths.



Fieldbus coupler UR20-FBC-MOD-TCP (Order No. 1334930000)

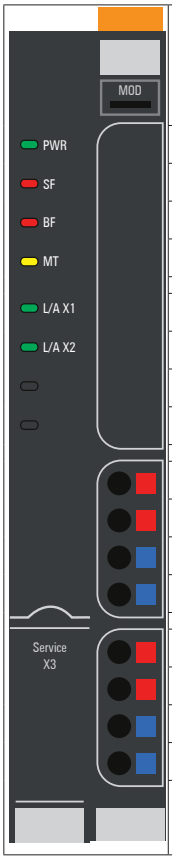
Status indicators



LED status indicators UR20-FBC-MOD-TCP, error messages see Chapter 13

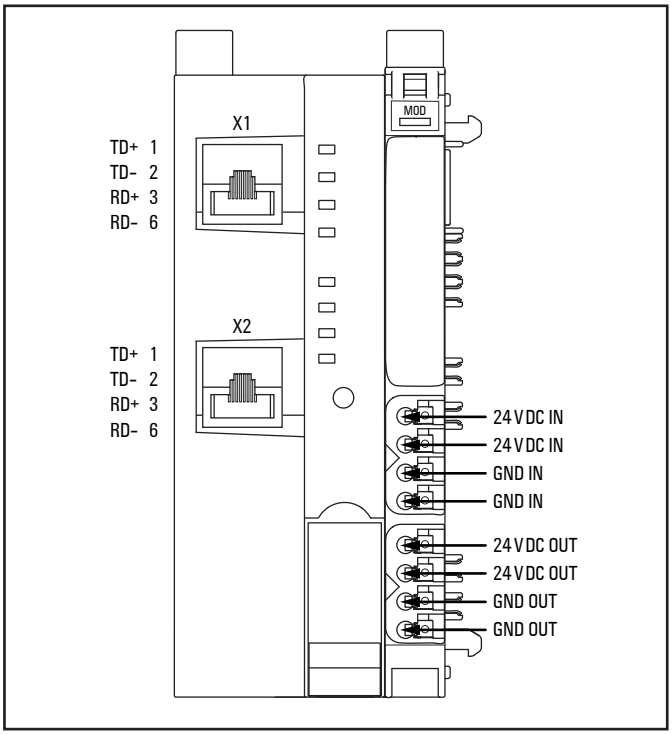
PWR	Power LED	**Green**: Supply voltage connected
SF	Collective error	**Red:** Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode
BF	Bus failure	**Red:** No connection to the fieldbus **Red flashing**: Configuration error, no connection to the control unit, or error in the parameter set
MT	Maintenance	**Yellow**: Error on the system bus or fieldbus
L/A X1	Connection/active	**Green / Yellow**[1)]: Connection established between port 1 of the coupler and another field device **Green flashing / Yellow flashing**[1)]: Data being exchanged on port 1
L/A X2	Connection/active	**Green / Yellow**[1)]: Connection established between port 2 of the coupler and another field device **Green flashing / Yellow flashing**[1)]: Data being exchanged on port 2

1) Green: Transfer rate 100 MBit/s, Yellow: Transfer rate 10 MBit/s



	Coupler power supply LED green: supply voltage >18 V red: at least one current path <18 V
3.1	Green: Input current path supply voltage > 18 V DC
3.2	Red: Input current path supply voltage < 18 V DC
3.4	Red: Internal fuse defective
4.1	Green: Output current path supply voltage > 18 V DC
4.2	Red: Output current path supply voltage < 18 V DC
4.4	Red: Internal fuse defective

LED indicators UR20-FBC-MOD-TCP, error messages see Chapter 13

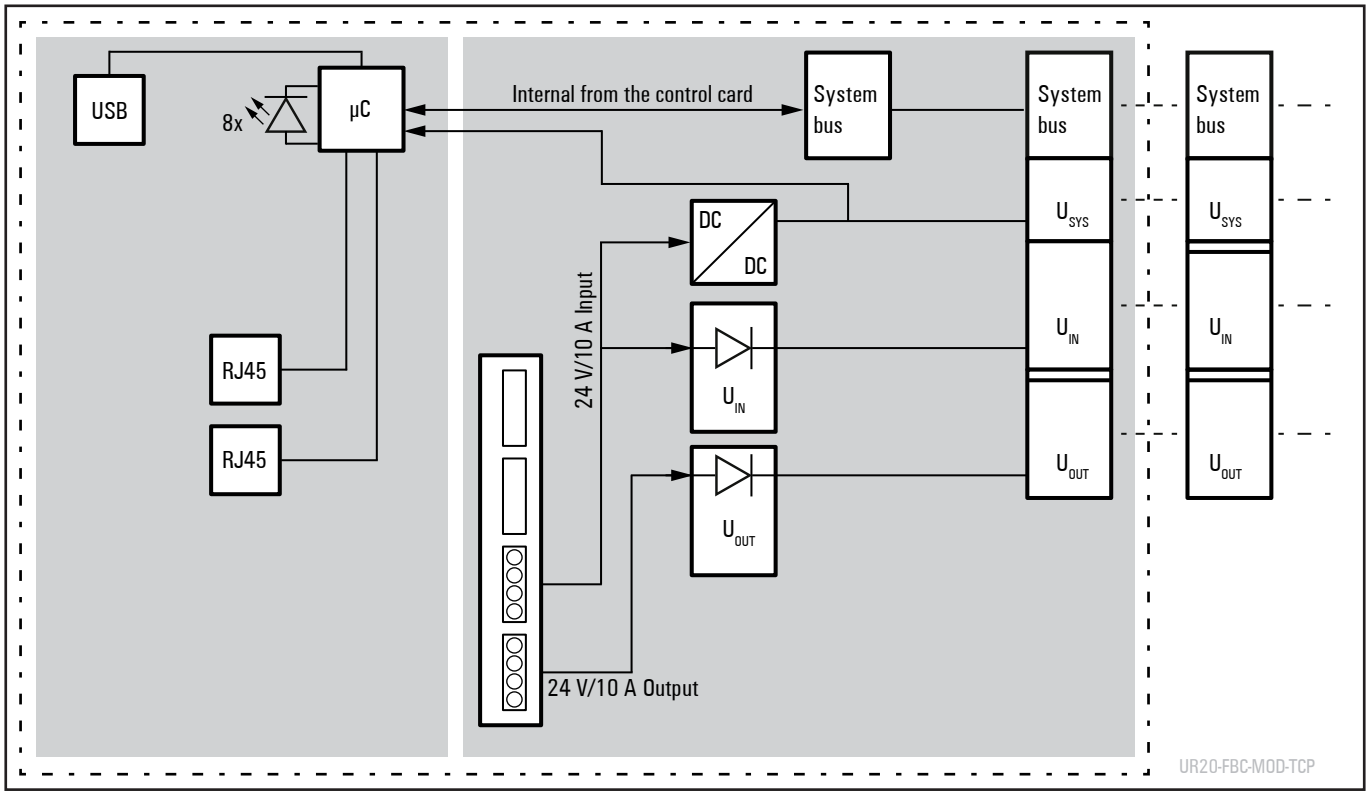


Connection diagram UR20-FBC-MOD-TCP

ATTENTION

Risk of material damage!

In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!



Block diagram UR20-FBC-MOD-TCP

Technical data UR20-FBC-MOD-TCP (Order No. 1334930000)

System data		
Connection	2 x RJ-45	
Fieldbus protocol	Modbus TCP	
Multi-client connections	max. 8	
Process image	Process data	max. 1 kBytes
	Parameter data	max. 1024 kBytes
	Diagnostic data	max. 1024 kBytes
Number of modules	max. 64 active	
Configuration interface	Micro USB 2.0	
Transfer rate	Fieldbus	10 Mbps/100 Mbps
	u-remote system bus	max. 48 Mbps
Supply		
Supply voltage for system and inputs	24 V DC +20 % / -15 %	
Supply voltage for outputs	24 V DC +20 % / -15 %	
Max. feed-in current for input modules	10 A	
Max. feed-in current for output modules	10 A	
Current consumption from system current path I_{SYS}	112 mA	
Connection data		
Type of connection	"PUSH IN"	
Conductor cross-section	Single-wired, fine-wired	0.14 – 1.5 mm^2 (AWG 16 – 26)
Weight		
Weight (operational status)	223 g	
General data, see Section 3.2		

Configuration of the IP address

The web server can be used to define whether a static IP address shall be used or the address shall be assigned automatically (DHCP/BootP).
Coupler using firmware version 01.xx.xx are preset to the static IP address 192.168.0.222.
Coupler using firmware version 02.00.00 or higher will by default send a DHCP discover first. If no assigment by a DHCP server follows during the parameterised waiting time, the static IP address 192.168.0.222 will be set.

Overview of the editable parameters UR20-FBC-MOD-TCP

Parameter	Optional values	Default
IP address	4 numbers between 0 and 255	192.168.0.222
Subnet mask	4 numbers between 0 and 255	255.255.255.0
Gateway	4 numbers between 0 and 255	192.168.0.1
IP configuration	Static, DHCP, BootP Firmware 02.00.00 and higher: additionally DHCP and static	Static (firmware 01.xx.xx) DHCP and static (firmware 02.00.00 or higher)
Modbus DHCP timeout	Waiting time, 1 to 1000 s	30 s
Additional TCP port[1)]	0 (disabled) / Value from 1 to 65535 (except for 80 and 161)	0
IP address USB port[2)]	192.168.1.202; 192.168.2.202, 192.168.3.202, 192.168.4.202, 192.168.5.202	192.168.1.202
Web server via Ethernet[2)]	disabled / enabled	enabled
Save module parameters[1)]	no / yes / Standard	no, see register 0x113C - 0x113F on page 70
Status Modbus watchdog	Watchdog time in steps of 10 ms	0 *10 ms, see register 0x1120 on page 68
Modbus connection timeout	Connection watchdog time in sec	1 s, see register 0x1131 on page 69
Writing access in multi-client operation	for all connections, for client with first write access, for client with first connection	for all connections, see register 0x1130 on page 69
Check reference list before data exchange	disabled / enabled	disabled, see register 0x1132 on page 69
Process alarm	disabled / enabled	disabled, see register 0x1133 on page 69
Diagnostic alarm	disabled / enabled	disabled, see register 0x1134 on page 69
Output behaviour on fieldbus error	All outputs off / Enable substitute value / Hold last value	All outputs off, see register 0x1135 on page 69
Module behaviour on hot swap	Continue data exchange / Behaviour like fieldbus error	Continue data exchange, see register 0x1136 on page 69
Data format	Motorola / Intel	Motorola, see register 0x1137 on page 69
Lock force mode	Force mode unlocked / Force mode locked	Force mode unlocked, see register 0x1122 on page 68

1) See description below; 2) Change requires restart of the coupler

Parameter „Additional TCP port“

Another TCP port additionally to the standard port (502) can be enabled using this parameter. Apart from the values 80 (reserved for http) and 161 (reserved for SNMP) every number from 1 to 65535 can be used. Value 0 deactivates the port. The standard port 502 will remain open in any case.

Parameter „Save module parameters“ in the web server

Due to the data structure it is not possible for this parameter to be set to appear as permanently ‘Yes’ or ‘Standard’. Once ‘Yes’ or ‘Standard’ have been selected, they will still appear as ‘No’ once the webserver has been closed and re-started.
Option”Standard“: If power is lost to the coupler, any settings that have been made in the modules will be lost, and default values loaded once power is restored.

Option “Yes” : Carry out the required module parameter adjustments, then go into this parameter and change it to ‘Yes’. This must be done every time that module parameters are changed. Otherwise the changes made to the module parameters will work until the coupler experiences a loss of power. Once power is restored, the modules will receive the settings which were entered the last time the ‘Yes’ command was carried out

Parameter „Restore module parameters“

This parameter is not editable. It will be automatically set to “Yes” as soon as the coupler will have sent saved parameter data to the modules.

Register structure (Access: ro = read only, input register; rw = read/write, holding register; wo = write only, holding register)

Register address (in hex)	Access	Data width	Description	Remarks
0x0000 – 0x01FF	ro	Module-dependent	Packed process data for inputs	byte granularly
0x0800 – 0x09FF	rw	Module-dependent	Packed process data for outputs	byte granularly
0x1000 – x1006	ro	Byte	Coupler identifier	
0x100C	ro	Word	Coupler status	Bit assignment as with UR20-FBC-EC
0x1010	ro	Word	Process image length in bits for the output modules	
0x1011	ro	Word	Process image length in bits for the input modules	
0x1017	ro	Word	Register mapping revision	
0x1018 – 0x101B	ro	Byte	Collective diagnostics message for I/O modules (1 bit per I/O module)	
0x101C – 0x101F	ro	Byte	Collective process alarm message for I/O modules (1 bit per I/O module)	
0x1028 – 0x102F	ro	Byte	Module status (2 bits per I/O module), 00 = module O.K., 01 = module error, 10 = incorrect module 11 = module not plugged in	Structure as in PROFIBUS module status
0x1030	ro	Word	Modbus watchdog, current time (x*10 ms) 0 = watchdog has expired, 0xFFFF = watchdog deactivated	Time still remaining for monitoring the exchange of process data
0x1120	rw	Word	Status Modbus watchdog, predefined time (x*10 ms), default = 0 ms (no watchdog active)	Time for monitoring the exchange of process data
0x1121	rw	Word	Data exchange Modbus watchdog, reset register Bit 0 = 1: watchdog reset at predefined time Bit 8 = 1: restart after expired watchdog	Bit 0: reset watchdog while it is running (retrigger) Bit 8: restart of expired watchdog
0x1122	rw	DWort	Lock of the force mode via webserver	„LOCK“ to lock, „FREE“ to unlock
0x1130	rw	Word	Writing access in multi-client operation	
0x1131	rw	Word	Modbus connection timeout in sec. Default = 1 (0 not allowed)	
0x1132	rw	Word	Check the reference list before data exchange 0x0000 = disabled, 0x0001 = enabled	
0x1133	rw	Word	Process alarm 0x0000 = disabled, 0x0001 = enabled	
0x1134	rw	Word	Diagnostic alarm 0x0000 = disabled, 0x0001 = enabled	
0x1135	rw	Word	Output behaviour on fieldbus error 0x0000 = all outputs off, 0x0001 = enable substitute values, 0x0002 = hold last value	
0x1136	rw	Word	Module behaviour on hot swap 0x0000 = continue data exchange 0x0001 = behaviour as on fieldbus error	
0x1137	rw	Word	Data format 0x0000 = Motorola, 0x0001 = Intel	
0x113C – 0x113D	wo	DWord	Restore module parameters Motorola =“LOAD”, Intel =“DAOL”	Corresponds to the option „default“ in the web server

Register structure (Access: ro = read only, input register; rw = read/write, holding register; wo = write only, holding register)

Register address (in hex)	Access	Data width	Description	Remarks
0x113E – 0x113F	wo	DWord	Save module parameters Motorola ="SAVE", Intel ="EVAS"	Corresponds to "SAVE" in the web server
0x27FE	ro	Word	Number of entries in the current module list	
0x27FF	ro	Word	Number of entries in the reference list	
0x2800 – 0x287F	rw	DWord	Reference list (max. 64 modules per station * 2 registers per module)	Always 2 registers per module must be transferred
0x2A00 – 0x2A7F	ro	DWord	Current module list (max. 64 modules per station * 2 registers per module)	Always 2 registers per module must be transferred
0x2B00 – 0x2B7F	ro	Word	Modul offsets of packed process data	
0x8000 – 0x87FF	ro	Module	Process data inputs (max. 64 modules per station * 32 registers per module)	
0x9000 – 0x97FF	rw	Module	Process data outputs (max. 64 modules per station * 32 registers per module)	
0xA000 – 0xA7FF	ro	Byte	Diagnostics (max. 64 modules per station * 32 registers per module)	Confirmation by readout
0xB000 – 0xB7FF	ro	Byte	Process alarms (max. 64 modules per station * 32 registers per module)	Confirmation by readout
0xC000 - 0xC7FF (Firmware 01.xx.xx) 0xC000 - 0xFFFF (Firmware 02.00.00 or higher)	rw	Byte	Module parameters (Firmware 01.xx.xx: max. 64 modules per station * 32 registers per module; Firmware 02.00.00 or higher: max. 64 modules per station * 256 registers per module)	

Implemented modbus functions

Function code no.	Function	Description
1	Read Coils	Reading of output bits in the range of 0x0800 – 0x0FFF[1)]
2	Read Discrete Inputs	Reading of input bits in the range of 0x0000 – 0x07FF[1)]
3	Read Holding Registers	Reading of multiple holding registers
4	Read Input Registers	Reading of multiple input registers
5	Write Single Coil	Writing of an individual output bit in the range of 0x0800 – 0x0FFF[1)]
6	Write Single Registers	Writing of individual holding registers
15	Write Multiple Coils	Writing of output bits in the range of 0x0800 – 0x0FFF[1)]
16	Write Multiple Registers	Writing of multiple holding registers
22	Mask Write Register	Bitwise changing of one holding register
23	Read/Write Multiple Registers	Reading of multiple input registers and writing of multiple holding registers simultaneously

1) Function codes 1, 2, 5 and 15 for bit-wise access to registers. For the usage of these codes please note:
In MODBUS protocol bit addressing separated from register addressing has not been specified. Bit and register address need to be implemented within the access address as follows: dismiss the most significant digit of the register address, shift the three less significant digits to the left and use the vacant least significant digit for bit addressing. Example: register access with function code 1 to address 0x80AB would be a read access to register 0x080A bit 11. Therefore the usage of function codes 1, 2, 5, 15 is limited to the address range of 0x0000 – 0x0FFF.

Overview of module IDs

Modul	Modul-ID
Digital input modules	
UR20-4DI-P	00091F84
UR20-4DI-P-3W	001B1F84
UR20-8DI-P-2W	00131FC1
UR20-8DI-P-3W	000A1FC1
UR20-8DI-P-3W-HD	00031FC1
UR20-16DI-P	00049FC2
UR20-16DI-P-PLC-INT	00059FC2
UR20-2DI-P-TS	0F014700
UR20-4DI-P-TS	0F024700
UR20-4DI-N	00011F84
UR20-8DI-N-3W	00021FC1
UR20-16DI-N	000C9FC2
UR20-16DI-N-PLC-INT	000D9FC2
UR20-4DI-2W-230V-AC	00169F84
Digital output modules	
UR20-4DO-P	01012FA0
UR20-4DO-P-2A	01052FA0
UR20-4DO-PN-2A	01152FC8
UR20-8DO-P	01022FC8
UR20-8DO-P-2W-HD	01192FC8
UR20-16DO-P	0103AFD0
UR20-16DO-P-PLC-INT	0104AFD0
UR20-4DO-N	010A2FA0
UR20-4DO-N-2A	010B2FA0
UR20-8DO-N	010C2FC8
UR20-16DO-N	010DAFD0
UR20-16DO-N-PLC-INT	010EAFD0
UR20-4RO-SSR-255	01072FA0
UR20-4RO-CO-255	01062FA0
Digital pulse width modulation output modules	
UR20-2PWM-PN-0.5A	09084880
UR20-2PWM-PN-2A	09094880
Analogue input modules	
UR20-4AI-UI-16	040115C4
UR20-4AI-UI-16-DIAG	04021544
UR20-4AI-UI-16-HD	041315C4
UR20-4AI-UI-16-DIAG-HD	04141544
UR20-4AI-UI-12	041115C4
UR20-8AI-I-16-HD	040415C5
UR20-8AI-I-16-DIAG-HD	04051545

Overview of module IDs

Modul	Modul-ID
UR20-8AI-I-PLC-INT	040915C5
Analogue output modules	
UR20-4AO-UI-16	050225E0
UR20-4AO-UI-16-DIAG	05012560
UR20-4AO-UI-16-HD	050425E0
UR20-4AO-UI-16-DIAG-HD	05032560
Digital counter modules	
UR20-1CNT-100-1DO	08C13800
UR20-2CNT-100	08C33800
UR20-1CNT-500	08C43801
UR20-2FCNT-100	088128EE
Communication modules	
UR20-1SSI	09C17880
UR20-1COM-232-485-422	0E413FED
UR20-1COM-SAI-PRO	0BC1E800
Analogue input modules DIAG	
UR20-4AI-RTD-DIAG	04061544
UR20-4AI-TC-DIAG	04071544
Safe feed-in modules	
UR20-PF-O-1DI-SIL	18019F43
UR20-PF-O-2DI-SIL	18039F43
UR20-PF-O-2DI-DELAY-SIL	18029F43

Packed process data

Packed input process data

Input register range: 0x0000 to 0x01FF



Access to all 512 registers is always possible regardless of the I/O structure. Unused registers respond with “0”.

Packed output process data

Output register range: 0x0800 to 0x09FF



Access to all 512 registers is always possible regardless of the I/O structure. Unused registers send “0” during a read access, write accesses are ignored.

Structure of packed process data

The byte granularly packed process data contains all input data (register range 0x0000 to 0x01FF) and output data (register range 0x0800 to 0x09FF) of the u-remote station.



The start address(es) of each module’s process data are listet in register 0x2B00 – 0x2B7F (s. section „Module offsets of process data“ on page 71).



Process data is mapped according to the modules are arranged. To avoid larger gaps in the process data, the different modules should be arranged in an optimal manner.

Example of an optimal module arrangement

Product	Input data	Output data	Number of input registers	Number of output registers	Remarks
UR20-FBC-MOD			0	0	
UR20-4AO-UI	–	4 words	0	4	allocates 4 registers
UR20-4AI-UI	4 words	–	4	0	allocates 4 registers
UR20-4DI-P	1 Byte	–	1	0	allocates 1/2 register low byte (1 byte)
UR20-4DI-P	1 Byte	–	0	0	allocates 1/2 register high byte (1 byte)
UR20-16DI-x	2 Byte		1		allocates 1 register
Total			6	4	

Example of a suboptimal module arrangement

Product	Input data	Output data	Number of input registers	Number of output registers	Remarks
UR20-FBC-MOD			0	0	
UR20-4DI-P	1 Byte	–	1	0	allocates 1 register
UR20-4AO-UI	–	4 words	0	4	allocates 4 registers
UR20-4AI-UI	4 words	–	4	0	allocates 4 registers
UR20-4DI-P	1 Byte	–	1	0	allocates 1 register
UR20-16DI-x	2 Byte		1		allocates 1 register
Total			7	4	

Data widths of I/O modules in the modbus register range

Order no.	Module	Process data	
		Input	Output
		Byte	Byte
1315170000	UR20-4DI-P	1 Byte	–
2009360000	UR20-4DI-P-3W	1 Byte	–
1315180000	UR20-8DI-P-2W	1 Byte	–
1394400000	UR20-8DI-P-3W	1 Byte	–
1315190000	UR20-8DI-P-3W-HD	1 Byte	–
1315200000	UR20-16DI-P	2 Byte	–
1315210000	UR20-16DI-P-PLC-INT	2 Byte	–
1460140000	UR20-2DI-P-TS	15*(2 Byte, 1 Word)	–
1460150000	UR20-4DI-P-TS	15*(2 Byte, 1 Word)	–
1315350000	UR20-4DI-N	1 Byte	–
1315370000	UR20-8DI-N-3W	1 Byte	–
1315390000	UR20-16DI-N	2 Byte	–

Data widths of I/O modules in the modbus register range

Order no.	Module	Process data	
		Input	Output
		Byte	Byte
1315400000	UR20-16DI-N-PLC-INT	2 Byte	–
1550070000	UR20-4DI-2W-230V-AC	1 Byte	–
1315220000	UR20-4DO-P	-	1 Byte
1315230000	UR20-4DO-P-2A	-	1 Byte
1394420000	UR20-4DO-PN-2A	-	1 Byte
1315240000	UR20-8DO-P	-	1 Byte
1509830000	UR20-8DO-P-2W-HD	-	1 Byte
1315250000	UR20-16DO-P	-	2 Byte
1315270000	UR20-16DO-P-PLC-INT	-	2 Byte
1315410000	UR20-4DO-N	-	1 Byte
1315420000	UR20-4DO-N-2A	-	1 Byte
1315430000	UR20-8DO-N	-	1 Byte
1315440000	UR20-16DO-N	-	2 Byte
1315450000	UR20-16DO-N-PLC-INT	-	2 Byte
1315540000	UR20-4RO-SSR-255	-	1 Byte
1315550000	UR20-4RO-CO-255	-	1 Byte
1315600000	UR20-2PWM-PN-0.5A	2 Word	2 DWord, 2 Word
1315610000	UR20-2PWM-PN-2A	2 Word	2 DWord, 2 Word
1315620000	UR20-4AI-UI-16	4 Word	–
1315690000	UR20-4AI-UI-16-DIAG	4 Word	–
1506920000	UR20-4AI-UI-16-HD	4 Word	–
1506910000	UR20-4AI-UI-16-DIAG-HD	4 Word	–
1394390000	UR20-4AI-UI-12	4 Word	–
1315650000	UR20-8AI-I-16-HD	8 Wort	–
1315720000	UR20-8AI-I-16-DIAG-HD	8 Wort	–
1315670000	UR20-8AI-I-PLC-INT	8 Word	–
1315700000	UR20-4AI-RTD-DIAG	4 Word	–
1315710000	UR20-4AI-TC-DIAG	4 Word	–
1315680000	UR20-4AO-UI-16	-	4 Word
1315730000	UR20-4AO-UI-16-DIAG	-	4 Word
1510690000	UR20-4AO-UI-16-HD	-	4 Wort
1506930000	UR20-4AO-UI-16-DIAG-HD	-	4 Wort

Data widths of I/O modules in the modbus register range

Order no.	Module	Process data	
		Input	Output
		Byte	Byte
1315570000	UR20-1CNT-100-1DO	2 DWord, 2 Word	2 DWord, 1 Word
1315590000	UR20-2CNT-100	2 DWord, 2 Word	2 DWord, 2 Word
1315580000	UR20-1CNT-500	1 DWord, 2 Word	2 DWord, 1 Word
1508080000	UR20-2FCNT-100	4 DWord, 2 Word	2 DWord, 2 Word
1508090000	UR20-1SSI	1 DWord, 1 Word	–
1315750000	UR20-1COM-232-485-422	16 Byte	16 Byte
2007430000	UR20-1COM-SAI-PRO	–	–
1529780000	UR20-4DI-4DO-PN-FSOE	–	–
1529800000	UR20-8DI-PN-FSOE	–	–
1335060000	UR20-4DI-4DO-PN-FSPS	–	–
1335070000	UR20-8DI-PN-FSPS	–	–
1335030000	UR20-PF-O-1DI-SIL	4 Byte	–
1335040000	UR20-PF-O-2DI-DELAY-SIL	4 Byte	–
1335050000	UR20-PF-O-2DI-SIL	4 Byte	–

0x1000 – 0x1006 Coupler identifier

The identifier is the "product designation": UR20-FBC-MOD.

0x100C Coupler status

Bit	Name	Meaning
0	Summarized module diagnosis	A diagnosis is available on at least one module with diagnostics functionality.
1	Errorbit 1	Reserve bit 1, currently not used
2	Errorbit 2	Reserve bit 2, currently not used
3	Systembus error	Error on system bus. Communication with the connected modules is disrupted.
4	Errorbit 4	Reserve bit 4, currently not used
5	Errorbit 5	Reserve bit 5, currently not used
6	I/O-Configuration error	Differing configuration. The module list has changed. The list of configured modules (reference list 0x2800 – 0x287F) differs from the module list detected by the coupler (current module list 0x2A00 – 0x2A7F).
7	Master configuration error	Master configuration error. The list of configured modules (reference list 0x2800 – 0x287F) differs significantly from the module list detected by the coupler (current module list 0x2A00 – 0x2A7F). Process data cannot be exchanged with the modules.
8	Errorbit 8	Reserve bit 8, currently not used
9	Errorbit 9	Reserve bit 9, currently not used
10	Force mode active	Force mode was activated via the web server. Forced channels do not exchange data with the master.
11	Errorbit 11	Reserve bit 11, currently not used
12	Errorbit 12	Reserve bit 12, currently not used
13	Voltage U_{OUT} error	Error in the supply voltage of outputs
14	Voltage U_{IN} error	Error in the supply voltage of system and inputs
15	Errorbit 15	Reserve bit 15, currently not used

0x1010 Process image length in bits for the output modules

0x1011 Process image length in bits for the input modules

0x1017 Register – mapping revision

Version of the register structure

0x1018 – 0x101B Collective diagnostics message for I/O modules

If a diagnostic alarm is activated (register 0x1134) and there is a diagnostic message for a module, it is indicated here with a set bit. A module's slot position corresponds to its position in the 64-bit data field (minus passive modules without slot recognition). Example: 0x0000 0000 0000 0002 = There is a diagnostic alarm for module 2.
Reading the module's diagnostic memory (0xAXXX) confirms the diagnosis and resets the corresponding bit. In case of multiple diagnoses for one module, only the most up-to-date diagnosis is displayed. The next diagnostic is then placed in a wait loop and only becomes active once the current one has been confirmed.

0x101C – 0x101F Collective process alarm message for the I/O modules

If a process alarm is activated (register 0x1133) and there is an alarm for a module, this is indicated here with a set bit. A module's slot position corresponds to its position in the 64-bit data field (minus passive modules without slot recognition). Example: 0x0000 0000 0000 0002 = There is a process alarm for module 2.
Reading the module's process alarm memory (0xBXXX) confirms the alarm and resets the corresponding bit. In case of multiple process alarms for one module, only the latest alarm is displayed. The next alarm is then placed in a wait loop and only becomes active once the current one has been confirmed.

0x1028 – 0x102F Module status

The module status (2 bits per module) of each detected module is displayed in the corresponding bit position of the 128 bits.

0 0	Valid data from this module
0 1	Invalid data, faulty module
1 0	Invalid data, incorrect module
1 1	Invalid data, missing module

There is no differentiation between fully functional modules and empty slots (both status "0 0"). Please check the reference list (0x1132) or read the number of entries in the current module list (0x27FE) to make sure that all modules have been detected.

0x1030 MODBUS DATA EXCHANGE watchdog, current time

Amount of time (input value * 10 ms) still remaining on the active watchdog to monitor the exchange of process data.
If a 0 is read, the watchdog has expired and must be restarted.
If 0xFFFF is read, the watchdog is deactivated.

0x1120 Status Modbus watchdog, predefined time

In this register, the watchdog is activated/deactivated and the watchdog time is set. Process data can be exchanged as long as the watchdog is deactivated or it is activated and still running. But it is accepted only after a watchdog reset to the current time. The length is calculated with the input value * 10 ms. Entering 0 deactivates the watchdog.

0x1121 Data exchange Modbus watchdog Reset Register

If Bit 0 in this register is set, the predefined time is loaded into the watchdog time (watchdog reset). To continue the process data exchange with activated watchdog this bit has to be set during each watchdog cycle within the defined time.
If Bit 8 in this register is set, an expired watchdog (value 0 in register 0x1030) is reactivated.

0x1122 Lock force mode on web server

In default setting the force mode can be enabled via the web server (after Login). The force mode can be locked by writing the double word „LOCK" (0x4C4F, 0x434B). Writing of „FREE" (0x4652, 0x4545) will unlock the force mode again.

0x1130 Writing access in multi-client operation

Bit	Name/Description
2 to 15	reserved
1	MB_ImmediateWritePermission
	– 0: During the first write access, write authorisation is requested for the corresponding modbus connection. If this is not successful, an exception response with the exception code 0x01 is generated. If it is successful, the write access is executed and write authorisation remains in effect until the end of the connection. – 1: Write authorisation for the corresponding modbus connection is already requested when the connection is being established. As a result, the first modbus connection receives the write authorisation, and nothing happens for all those that follow (as long as Bit 0 = 1).
0	MB_OnlyOneWritePermission
	– 0: All modbus connections have write authorisation – 1: In all cases only one modbus connection can be assigned write authorisation. Once assigned, write authorisation is retained until there is a disconnect. After the connection that has write authorisation is disconnected, the next connection which attempts write access receives write authorisation.

0x1131 Modbus connection timeout in sec.

This register determines after which time an inactive modbus connection will be disconnected.

0x1132 Check reference list prior to data exchange

If the value in this register is set to 0, the data exchange begins without checking the reference list (0x2800 and the following) against the current module list (0x2A00 and the following). The reference list does not need to be created.
If the value in this register is set to 1, the data exchange only starts if the reference list (0x2800 and the following) matches the current module list (0x2A00 and the following). As long as both lists do not match the fieldbus coupler reacts like on a fieldbus error (0x1135).

0x1133 Process alarm

If the value in this register is set to 0, process alarms are reported, but it is not necessary to confirm or read them.
If the value in this register is set to 1, process alarms are reported and they must be confirmed by reading the corresponding register.

0x1134 Diagnostic alarm

If the value in this register is set to 0, the diagnostic alarm is deactivated. Pending diagnostics do not have any effect on the exchange of process data and must not be confirmed. They are, however, displayed locally on the UR20 hardware with red LEDs (SF and module) and also can be read in the module-specific diagnostic registers 0xAXXX.
If the value in this register is set to 1, diagnostics alarms are reported, and they must be confirmed by reading the corresponding register.

0x1135 Field bus or reference list error behaviour

If the value in this register is set to 0, in case of a field bus or reference list error all outputs are set to 0.
If the value in this register is set to 1, in case of a field bus error all outputs are set to the substitute values.
If the value in this register is set to 2, in case of a field bus error all outputs are held at the last process value.

0x1136 Module removal behaviour

If the value in this register is set to 0, the exchange of process data continues.
If the value in this register is set to 1, the behaviour during a field bus error is used.

0x1137 Data format

If the value in this register is set to 0, data is transferred in Motorola format.
If the value in this register is set to 1, data is transferred in Intel format.

0x113C – 0x113F Save module parameters

Load default module parameters (0x113C – 0x113D) loads the default parameter set of all modules (LOAD). This conforms to the "Standard" option of the parameter "Safe module parameter" in the web server.

Save module parameters (0x113E – 0x113F) stores the current image of alle module parameters in the coupler (SAVE). Subsequent changes will not be considered unless they are saved again. There is no need to enter parameters again after restarting the coupler. This conforms to the "Yes" option of the parameter "Safe module parameter" in the web server.

Input in both register in the **Motorola** format follow this scheme

	„LOAD"				„SAVE"			
Letter of the alphabet	L	O	A	D	S	A	V	E
ASCII code decimal	076	079	065	068	083	065	086	069
ASCII hexadecimal	4C	4F	41	44	53	41	56	45
Input in register no.	**0x113C**		**0x113D**		**0x113E**		**0x113F**	
Hexadecimal	4C4F		4144		5341		5645	
Decimal	19535		16708		21313		22085	

Using the **Intel** format the inputs follow „DAOL" and „EVAS":

	„DAOL"				„EVAS"			
Letter of the alphabet	D	A	O	L	E	V	A	S
ASCII code decimal	068	065	079	076	069	086	065	083
ASCII hexadecimal	44	41	4F	4C	45	56	41	53
Input in register no.	**0x113C**		**0x113D**		**0x113E**		**0x113F**	
Hexadecimal	4441		4F4C		4556		4153	
Decimal	17473		20300		17750		16723	

The not editable parameter "Restore module parameters" in the web server will be set to "Yes" as soon as the coupler has sent saved parameters to the modules.

0x27FE Number of entries in the current module list

This displays the number of modules that were connected when the coupler was started.

0x27FF Number of entries in the reference list

This displays the number of modules that were entered into the reference list.

0x2800 – 0x287F Reference list

Each module identifier is made up of 4 bytes (2 registers) (see the overview of module IDs on page 66). If a 1 is set in register 1132, the reference list must be identical to the current module list before the data exchange can begin.

0x2A00 – 0x2A7F Current module list

Each module identifier is made up of 4 bytes (2 registers) (see the Overview of module IDs). The modules that were connected when the coupler was started are entered here. To simplify configuration, the current module list can be copied into the reference list.

0x2B00 – 0x2B7F Module offsets of process data

For each module there are two registers reserved to indicate the offset between the start address within the packed process data and the address 0x0000: The first register indicates the bit-offset of the outputs, the second one indicates the bit-offset of the inputs. Thus, it is possible to use these information directly for the access to coils or Descrete Inputs. Converting the address syntax is necessary for a register-wise access (see table "Implemented modbus functions"). In case there are no outputs or inputs, the register entry is 0xFFFF.

Example: For an arrangement of coupler, UR20-4AI-RTD-DIAG, UR20-1CNT-100-1DO, UR20-16DO-P the six registers 0x2B00 to 0x2B05 deliver the values 0xFFFF 0x0000 | 0x8000 0x0040 | 0x8050 0xFFFF.

Since the first module has not outputs and the last module has no inputs, the entry of the respective registers is 0xFFFF. The value 0x8050 indicates that the access to the first output of the UR20-16DO-P can be realised via address 0x8050, bit 0. The value 0x0040 indicates, that the first input of the UR20-1CNT-100-1DO is accessible via the address 0x0040, bit 0.

0x8000 – 0x87FF Process data inputs

For each module a data length of 64 bytes (32 registers) is reserved.
Example: Module 3 starts at address 0x8040.

0x9000 – 0x97FF Process data outputs

For each module a data length of 64 bytes (32 registers) is reserved.
Example: Module 3 starts at address 0x9040.

0xA000 – 0xA7FF Diagnostics

For each module a diagnostics data length of 64 bytes (32 registers) is reserved.
Example: Module 3 starts at address 0xA040.
In case of a diagnostics message, the 47 bytes of the module diagnosis are entered here from the corresponding tables (see the table of diagnostic data in the corresponding module description in the module chapter).
If a 1 is set in register 0x1134, reading out the corresponding diagnosis results in a confirmation of the alarm.

0xB000 – 0xB7FF Prozess alarms

For each module a process alarm data length of 64 bytes (32 registers) is reserved.
Example: Module 3 starts at address 0xB040.
In case of a process alarm, the 4 bytes of the module are entered here from the corresponding table (see the table of process alarms in the corresponding module description in the module chapter).

0xC000 –0xC7FF Parameters (Firmware version 01.xx.xx)

For each module a parameter data length of 32 registers is reserved. The modules can be parameterised via the web server (s. Chapter 10).

0xC000 –0xFFFF Parameters (Firmware version 02.00.00 or higher)

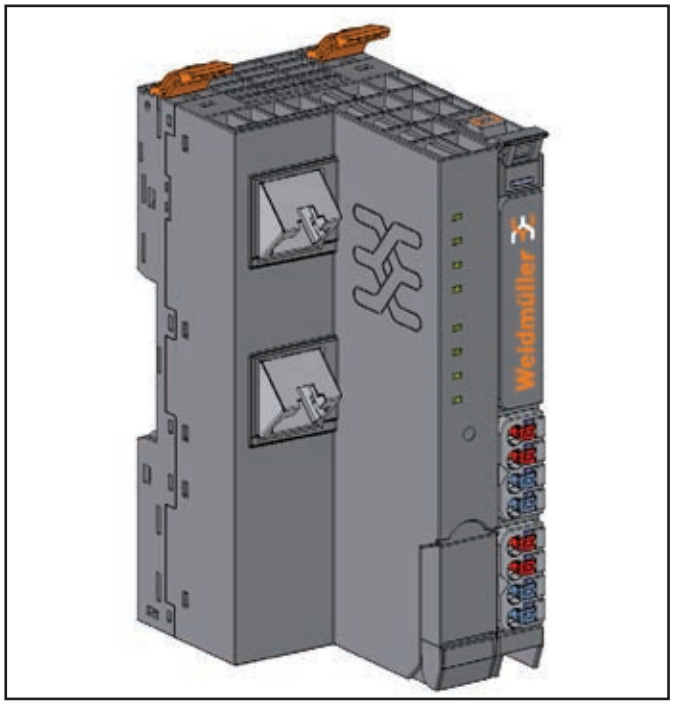
For each module a parameter data length of 256 registers is reserved. Example: Module 3 starts with address 0xC200.
The modules can be parameterised via the web server (s. Chapter 10) or via the Modbus master.
One register is assigned to each module parameter with a size of max. 16 bit. 32 bit parameters use two subsequent registers (consider Motorola format!). The sequence of parameters as well as the optional values are listed in the parameter tables of the individual module descriptions (s. Chapter 6).
Example: Parameter 8 of module 3 has the address 0xC207 (provided that there is no 32 bit parameter prior to it in the same module).
Examples for 32 bit parameters are "Period duration" of the pulse width modulation modules and „End value" of the counter modules.

5.5 EtherNet/IP fieldbus coupler UR20-FBC-EIP

The UR20-FBC-EIP fieldbus coupler is an EtherNet/IP™ participant developed according to IEC 61158. The coupler is the head module for the u-remote system bus, to which up to 64 active u-remote modules can be connected. The EtherNet/IP coupler has two Ethernet ports, and the integrated switch supports a line network structure.

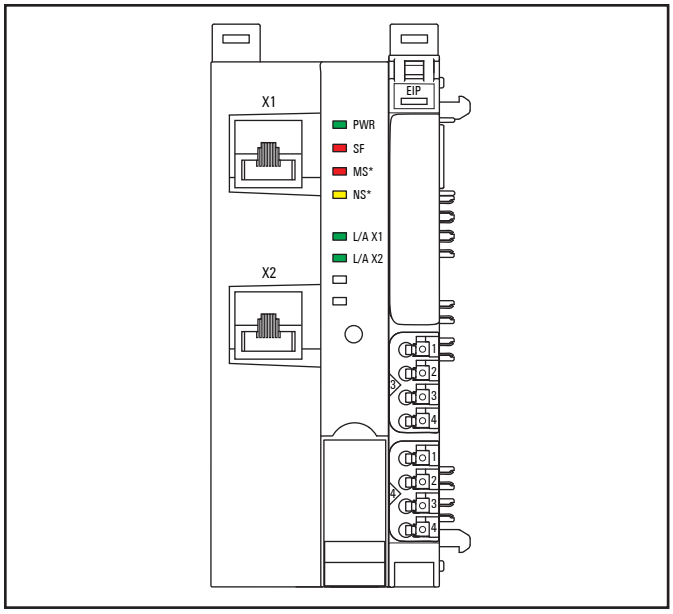
The coupler can be accessed with a system-independent web server application via the USB service interface or the Ethernet. Thus all information, such as diagnostics, status values and parameters, can be read and all connected modules can be simulated or forced.

The station's main power supply is integrated in the coupler. Power is supplied via two 4-pole connectors, separated into the input and output current paths.



Fieldbus coupler UR20-FBC-EIP (Order No. 1334920000)

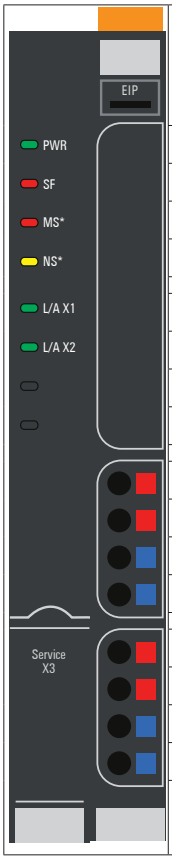
Status indicators



LED status indicators UR20-FBC-EIP, error messages see Chapter 13

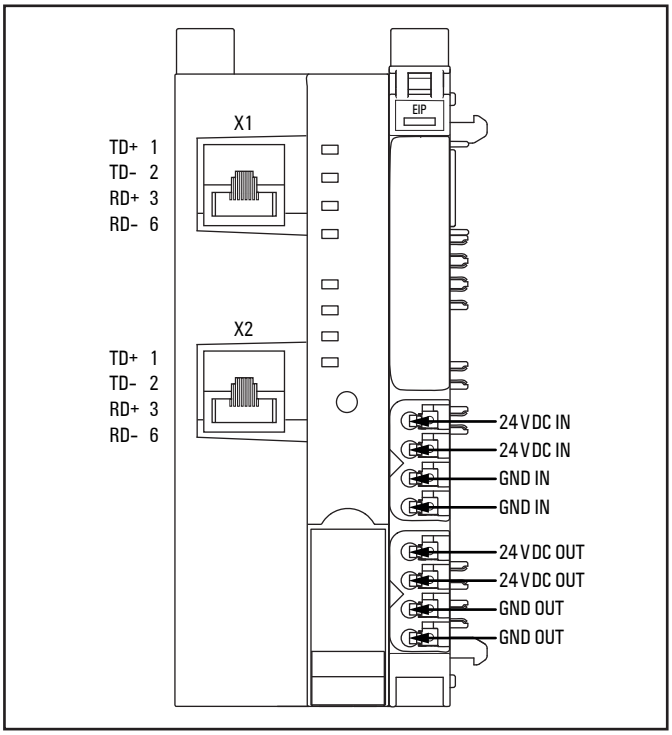
PWR	Power-LED	**Green**: Supply voltage connected
SF	Collective error	**Red:** Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode
MS*	Module status	**Red**: More than one module does not fit the start-up configuration **Red flashing**: One module does not fit the start-up configuration or there is a diagnosis report on at least one module
NS*	Network status	**Off**: At least one EtherNet/IP connection is established **Yellow**: Address conflict or no IP address configured **Yellow flashing (1 Hz)**: valid IP address but no EtherNet/IP connection established **Yellow flashing (4 Hz)**: Connection timeout on an exclusive owner
L/A X1	Connection/active	**Green / Yellow***: Connection established between port 1 of the coupler and another field device **Green flashing / Yellow flashing***: Data being exchanged on port 1
L/A X2	Connection/active	**Green / Yellow***: Connection established between port 2 of the coupler and another field device **Green flashing / Yellow flashing***: Data being exchanged on port 2

* Green: Transfer rate 100 MBit/s, Yellow: Transfer rate 10 MBit/s



	Coupler power supply LED green: supply voltage >18 V red: at least one current path <18 V
3.1	Green: Input current path supply voltage > 18 V DC
3.2	Red: Input current path supply voltage < 18 V DC
3.4	Red: Internal fuse defective
4.1	Green: Output current path supply voltage > 18 V DC
4.2	Red: Output current path supply voltage < 18 V DC
4.4	Red: Internal fuse defective

LED indicators UR20-FBC-EIP, error messages see Chapter 13

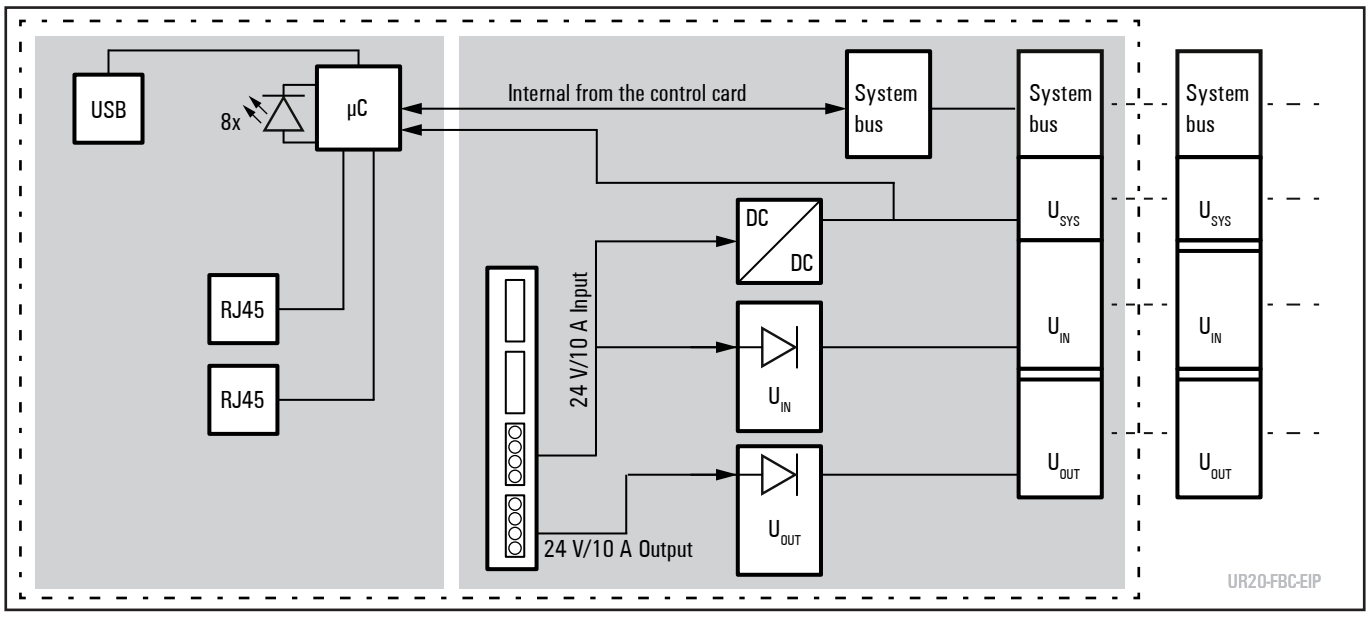


Connection diagram UR20-FBC-EIP

ATTENTION

Risk of material damage!

In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!



Block diagram UR20-FBC-EIP

Technical data UR20-FBC-EIP (Order No. 1334920000)

System data		
Connection	2 x RJ-45	
Fieldbus protocol	EtherNet/IP	
Process image	Process data	max. 2 * 494 byte
	Parameter data	max. 64 * 64 byte
	Diagnostic data	max. 64 * 47 byte
Number of modules	max. 64 active	
Configuration interface	Micro USB 2.0	
Transfer rate	Fieldbus	10 Mbps / 100 Mbps
	u-remote system bus	max. 48 Mbps
Supply		
Supply voltage for system and inputs	24 V DC +20% / -15%	
Supply voltage for outputs	24 V DC +20% / -15%	
Max. feed-in current for input modules	10 A	
Max. feed-in current for output modules	10 A	
Current consumption from system current path I_{SYS}	112 mA	
Connection data		
Type of connection	„PUSH IN“	
Conductor cross-section	Single-wired, fine-wired	0,14 ... 1,5 mm^2 (AWG 16 ... 26)
Weight		
Weight (operational status)	223 g	
General data, see Section 3.2		

Overview of the editable parameters UR20-FBC-EIP

Parameter	Optional values	Default
IP configuration	DHCP, BootP, Static	DHCP
IP address	4 numbers between 0-255	0.0.0.0
Subnet mask	4 numbers between 0-255	255.255.255.0
Gateway	4 numbers between 0-255	0.0.0.0
IP address USB port*	192.168.1.202; 192.168.2.202, 192.168.3.202, 192.168.4.202, 192.168.5.202	192.168.5.202
Webserver via Ethernet*	disabled / enabled	enabled
Save module parameters**	no / yes / Standard	no
Process alarm	disabled (0) / enabled (1)	disabled
Diagnostic alarm	disabled (0) / enabled (1)	disabled
Output behaviour on fieldbus error	All outputs off (0) / Enable substitute values (1) / Hold last value (2)	All outputs off
Module behaviour on hot swap	Continue data exchange (0) / Behaviour like fieldbus error (1)	Continue data exchange
Data format	Motorola (0) / Intel (1)	Intel
Lock force mode	Force mode unlocked / Force mode locked	Force mode unlocked

* Change requires restart of the coupler.

** Parameter „Save module parameter“ in the web server

The coice of the options “Yes” and “Standard” cannot be displayed in the web server, caused by the data structure of this parameter. The display will be reset to “No” anytime.
Option “Yes”: The current image of all module parameters is saved in the coupler and will be sent to the modules again during the coupler’s next restart. Subsequent changes of the module parameters are considered and saved only if the option “Yes” will be chosen again.
Option “Standard”: The default parameters will be loaded to the modules immediately. Subsequent changes of the module parameters are possible, but they will get loss during the coupler’s next restart.

Parameter „Restore module parameter“

This parameter is not editable. It will be automatically set to “Yes” as soon as the coupler will have sent saved parameter data to the modules.

Assignment of IP addresses

The automatic assignment via **DHCP** is the default setting of the UR20-FBC-EIP. Further options are **BootP** or **Static**. For automatic assigning a respective server must be available in the network. The mode of IP assignment can be changed either via the web server (see chapter 10) or via the fieldbus.

Changing the mode of IP mapping via the fieldbus

Providing that the coupler has already received an address, the mode of IP assignment ca be changed via the following data object: TCP/IP object 0xF5 (245), instance 0x01 (1), attribute 0x03 (3). The options are **Static** [0], **BootP** [1] or DHCP [2].
When switching to mode **Static**, the coupler will keep the address that has been assigned automatically before; this address will be saved permanently.
When switching to an automatic mode the coupler will start a request on the respective server immediately.

Allocating a new IP address

A new IP address can be allocated via the following data object: TCP/IP object 0xF5 (245), instance 0x01 (1), attribute 0x05 (5). The new address will be saved permanently, if the mode **Static** is set. Using the automatic assignment the address will be used temporarily only.

Address Conflict Detection

After an address has been allocated to the coupler, it will be checked whether this address is already used within the network (**ACD**, Address Conflict Detection). In case an address conflict is detected and the address is rejected, the coupler requests another address from the DHCP server, as long as DHCP mode is active. When using mode BootP or Static, the coupler must be disconnected from the Ehternet and connected again.

The address check is executed every two minutes during operating. It can be turned off via the following data object: TCP/IP object 0xF5 (245), instance 0x01 (1), attribute 0x0A (10).

Data types UR20-FBC-EIP

Data type	Size	Value range
USINT	1 byte	0 ... 255
UINT	2 byte	0 ... 65535
UDINT	4 byte	0 ... (2^{32}-1)
BOOL	1 bit	
BYTE	8 bits	
WORD	16 bits	
DWORD	32 bits	
STRING	2 byte length indicator, 1 byte per character	
SHORT_STRING	1 byte length indicator, 1 byte per character	
STRING	Structure of Strings	
Padded EPATH		
Packed EPATH		

Configuration assembly

The CLP can be configured in such a way that the configuration assembly 0x7A (122) will be transmitted during connection buildup. Writing access to the data attribute of the configuration assembly is not possible during an established connection. To change the station's parameters during an established connection you can use attribute 0x73 of the gateway object or of the slot objects. Alternatively the u-remote station can be configured via the web server.
The configuration assembly includes an 8 byte bit mask (equivalent 64 bit) followed by the parameters of all modules. For each module containing parameters a „1" is set at the corresponding position of the bit mask. The sequence corresponds with the modules' sequence within the station, starting with byte 0, bit 0 for slot 1 (first module). After that the parameters of modules with a 3 byte haeder will follow: 1 byte length and 2 byte for the upper 16 bit of the module ID.

Structure of the configuration assembly UR20-FBC-EIP

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	M 8	M 7	M 6	M 5	M 4	M 3	M 2	M 1
1	M 16	M 15	M 14	M 13	M 12	M 11	M 10	M 9
2	M 24	M 23	M 22	M 21	M 20	M 19	M 18	M 17
3	M 32	M 31	M 30	M 29	M 28	M 27	M 26	M 25
4	M 40	M 39	M 38	M 37	M 36	M 35	M 34	M 33
5	M 48	M 47	M 46	M 45	M 44	M 43	M 42	M 41
6	M 56	M 55	M 54	M 53	M 52	M 51	M 50	M 49
7	M 64	M 63	M 62	M 61	M 60	M 59	M 58	M 57
8	Parameter length of the first module that includes parameters							
9	Module ID							
10	Module ID							
11	Parameter							
...	...							
	Parameter length of the next module that includes parameters							
	Module ID							
	Module ID							
	Parameter							
...	...							

Process data

The UR20-FBC-EIP process data are being packed into these assemblies:

Packed process data UR20-FBC-EIP

Input data	
Assembly 0x65 (101)	Assembly 0x67 (103)
2 byte status word	2 byte status word
X byte process data of the modules	X byte process data of the modules
	8 byte diagnostic data
Output data	
Assembly 0x66 (102)	Assembly 0x68 (104)
2 byte control word	2 byte control word
X byte process data of the modules	X byte process data of the modules
	8 byte diagnostic data control word

Assemblies 0x66 (102) and 0x68 (104) have a run/idle header.

Only the associated assemblies 101 with 102 or 103 with 104 can be used. If the EDS file has been installed this will be checked and an invalid access will be rejected.

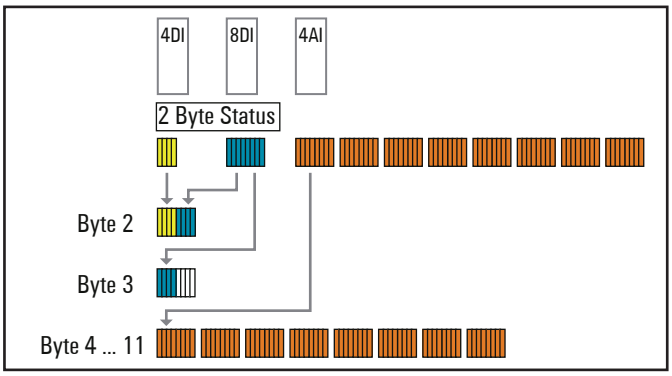
The first connection established consist either of two assemblies with one for input and one for output data each, or it is an „input only" connection used as output assembly 0xC6 (198). In addition to an existing output data connection a „listen only" connection can be established, which uses assembly 0xC7 (199) as output. Neither of these assemblies is accessible via the class assembly.
Only one PLC can write into the ouput data at a time, further connection attemps will be rejected. Although further „Input only" or „Listen only" connections can be established.

Connection options UR20-FBC-EIP

First Connection	Second Connection	Result
Input+Output	Input+Output	Not possible, as only one connection can write output data.
Input+Output	Input only	permitted
Input+Output	Listen only	permitted
Input only	Input+Output	permitted
Input only	Input only	permitted
Input only	Listen only	permitted
Listen only	–	Not possible, as Listen only cannot be established as first connection.

Packed process data of the modules

The process data of a digital module are packed directly on the process data of the previous module. The process data of all other modules always starts with the beginning of the next word.



Packed process data in an exemplified module arrangement 4DI, 8DI, 4AI

The modules' process data include a maximum of 494 byte. Thererfore the process data of assembly 0x65 (101) and 0x66 (102) will include a maximum of 496 byte, whereas the process data of assembly 0x67 (103) and 0x68 (104) include a maximum of 504 byte. The actual length is defined by the arrangement of the modules, the assemblies' size is always an even number of bytes (2 byte, 4 byte etc.). So in the example assembly 0x65 (101) is 12 byte long whereas assembly 0x67 (103) is 20 byte long.

The size which is expected during the connection is being established can be read from class 0x04 (4), instances 0x65 to 0x68 (101 to 104), attribute 0x04 (4) or via the web server.

Control word

The control word together with the diagnostics control word of assembly 0x68 (104) describe the diagnostic data in assembly 0x67 (103).

Control word UR20-FBC-EIP

Control word	Diagnostics control word	Diagnostic data
0	0	One bit of each module indicates whether it has a diagnosis
0	1 ... 64	Diagnostic data of the set module (the first 8 byte)
1	0	One bit of each module indicates whether it has a process alarm
1	1 ... 64	Process alarm data of the set module (4 byte are being used)

Status word UR20-FBC-EIP (packed process data input)

Bit	Name	Remarks
0	Summarized module diagnosis	A diagnosis is available for at least one module with diagnostics functionality.
1	Errorbit 1	Reserve bit 1, currently not used
2	Errorbit 2	Reserve bit 2, currently not used
3	Systembus error	Error on the system bus. Communication with the connected modules is disrupted.
4	Unacknowledged diagnosis alarm	Unacknowledged diagnosis alarm
5	Unacknowledged process alarm	Unacknowledged process alarm
6	I/O-Configuration error	Deviation in the configuration. The module list has changed. The list of configured modules (Configured Module Ident List class 0x65 (101), instance 0x01 (1), attribute 0x70 (112)) differs from the module list detected by the coupler (Detected Module Ident List class 0x65 (101), instance 0x01 (1), attribute 0x6F (111)).
7	Master configuration error	Master configuration error. The list of configured modules (Configured Module Ident List class 0x65 (101), instance 0x01, attribute 0x70 (112)) differs significantly from the module list detected by the coupler (Detected Module Ident List class 0x65 (101), instance 0x01 (1), attribute 0x6F (111)) ab. No process data can be exchanged with the modules.
8	Errorbit 8	Reserve bit 8, currently not used
9	Errorbit 9	Reserve bit 9, currently not used
10	Force mode active	Force mode was activated through the web server. Process data cannot be exchanged between the master and forced channels.
11	Errorbit 11	Reserve bit 11, currently not used
12	Errorbit 12	Reserve bit 12, currently not used
13	Voltage U_{OUT} error	Error in the voltage supply of output current path
14	Voltage U_{IN} error	Error in the voltage supply of system and input current path
15	Errorbit 15	Reserve bit 15, currently not used

Object descriptions UR20-FBC-EIP: CIP Common Classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Identity 0x01 (1)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	0x03	3	x			UINT	Number of Instances	Current number of instances
	0x06	6	x			UINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	0x07	7	x			UINT	Max Instance Attribute	ID of the last attribute of this class in the other instances
	Instance 0x01 (1)							
	0x01	1	x		x	UINT	Vendor ID	Vendor ID: 1015
	0x02	2	x		x	UINT	DeviceType	General type of device: 0x0C
	0x03	3	x		x	UINT	Product Code	Vendor assigned product code: 33492
	0x04	4	x		x	Struct{USINT,USINT}	Revision {Major, Minor}	Revision of the u-remote coupler
	0x05	5	x			WORD	Device Status	Bit0: Owned; Bit2= Configured; Bit4-7:Extended device status; Bit8: Minor recoverable fault; Bit9: Minor unrecoverable fault; Bit10: Major recoverable fault; Bit 11: Major unrecoverable fault; Bit12-15: Extended device status 2
	0x06	6	x		x	UDINT	Serial Number	Serial number of the device; 32 Bit value
	0x07	7	x		x	SHORT_STRING	Product Name	Product name: UR20-FBC-EIP
Message Router 0x02 (2)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	0x03	3	x			UINT	Number of Instances	Current number of instances
	0x04	4	x			Struct{UINT,Array of UINT}	Optional Attributes	List of optional attributes
	0x05	5	x			Struct{UINT,Array of UINT}	Optional Services	List of optional services
	0x06	6	x			UINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	0x07	7	x			UINT	Max Instance Attribute	ID of the last attribute of this class in the other instances
	Instance 0x01 (1)							
	0x01	1	x			Struct{UINT,Array of UINT}	List of supported objects	Number of objects; Class codes
	0x02	2	x			UINT	Number of supported connections	Number of supported connections

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Object descriptions UR20-FBC-EIP: CIP Common Classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Assembly 0x04 (4)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	0x03	3	x			UINT	Number of Instances	Current number of instances
	0x04	4	x			Struct{UINT,Array of UINT}	Optional Attributes	List of optional attributes implemented in this class
	0x06	6	x			UINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	0x07	7	x			UINT	Max Instance Attribute	ID of the last attribute of this class in the other instances
	Instances 0x65 ... 0x68 (101 ... 104)							
	0x03	3	x	x		Array of BYTE	Data	Process data
	0x04	4	x			UINT	Size	Size of process data
	Instances 0x7A (122)							
	0x03	3	x	x		Array of BYTE	Data	Configuration data
	0x04	4	x			UINT	Size	Size of configuration data
Connection Manager 0x06 (6)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	0x03	3	x			UINT	Number of Instances	Current number of Instances
	0x04	4	x			Struct{UINT,Array of UINT}	Optional Attributes	List of optional attributes implemented in this class
	0x06	6	x			UINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	0x07	7	x			UINT	Max Instance Attribute	ID of the last attribute of this class in the other instances
	Instance 0x01 (1)							
	0x01	1	x	x		UINT	Open Requests	Number of forward open requests
	0x02	2	x	x		UINT	Open Format Rejects	Number of forward open requests, rejected because of bad format
	0x03	3	x	x		UINT	Open Resource Rejects	Number of forward open requests, rejected because of too few resources
	0x04	4	x	x		UINT	Open Other Rejects	Number of forward open requests, rejected because of other reasons than format or ressouce
	0x05	5	x	x		UINT	Close Requests	Number of forward close requests

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Object descriptions UR20-FBC-EIP: CIP Common Classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
	0x06	6	x	x		UINT	Close Format Rejects	Number of forward close requests, rejected because of bad format
	0x07	7	x	x		UINT	Close Other Rejects	Number of forward close requests, rejected because of other reasons than format
	0x08	8	x	x		UINT	Connection Timeouts	Number of connection timeouts
SNMP 0x52 (82)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	0x03	3	x			UINT	Number of Instances	Current number of Instances
	0x04	4	x			Struct{UINT,Array of UINT}	Optional Attributes	List of optional Attributes implemented in this class
	0x06	6	x			UINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	0x07	7	x			UINT	Max Instance Attribute	ID of the last attribute of this class in the other instances
	Instance 0x01 (1)							
	0x01	1	x	(x)	x	USINT	SNMP enable	1 = enable, 0 = disable
	0x02	2	x		x	USINT	SNMP Version	1 = SNMPv1, 3 = SNMPv3, 31 = SNMPv1+v3
	0x03	3	x	(x)	x	Struct{USINT,STRING}	Trap 1	Destination of SNMP-traps, Byte1: 0 = unconfigured, 1 = IP address; String: IP address in form 123.123.123.123
	0x04	4	x	(x)	x	Struct{USINT,STRING}	Trap 2	Destination of SNMP-traps, Byte1: 0 = unconfigured, 1 = IP address; String: IP address in form 123.123.123.123
	0x05	5	x	(x)	x	BOOL	Trap enable	1 = enable, 0 = disable
	0x06	6	x		x	USINT	Trap Type	1 = TrapV1PDU, 2 = TrapV2PDU (only with SNMPv3)
TCP IP Interface 0xF5 (245)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	0x03	3	x			UINT	Number of Instances	Current number of instances
	0x04	4	x			Struct{UINT,Array of UINT}	Optional Attributes	List of optional attributes implemented in this class
	0x06	6	x			UINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	0x07	7	x			UINT	Max Instance Attribute	ID of the last attribute of this class in the other instances

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Object descriptions UR20-FBC-EIP: CIP Common Classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
TCP IP Interface 0xF5 (245)								
	Instance 0x01 (1)							
	0x01	1	x			DWORD	Interface Status	Status of the interface Bit 0 ... 3: 0 = not configured, 1 = configured by software, 2 = configured by hardware; Bit 4: Multicast pending; Bit 5: Interface configuration pending; Bit 6: ACD conflicted; Bit 7: ACD fault
	0x02	2	x		x	DWORD	Capability Flags	Bit 0: BootP; Bit 1: DNS; Bit 2: DHCP; Bit 4: Configuration settable; Bit 5: Configurable by hardware; Bit 6: Change requires reset; Bit 7: ACD capable
	0x03	3	x	x	x	DWORD	Control Flags	Bit 0 ... 3: 0 = static IP, 1 = BootP, 2 = DHCP;
	0x04	4	x		x	Struct{UINT,Padded EPATH}	Physical Link Object	Path to internal Ethernet interface
	0x05	5	x	x	x	Struct{5*UDINT,STRING}	Interface Configuration	IP, network mask, gateway; name server 1, name server 2; domain name
	0x06	6	x	x	x	STRING	Host Name	Host name, for informational purpose
	0x08	8	x	x	x	USINT	TTL Value	TTL value for multicast
	0x09	9	x	x	x	Struct{USINT,USINT,UINT,UDINT}	Mcast Config	Multicast configuration Byte 1: 0 = autogenerated, 1 = according to this parameter, 2 = reserved; Byte 2: reserved; Byte 3 - 4: number of multicast addresses; Byte 5 - 7: start address
	0xA	10	x	x	x	BOOL	ACD active	0 = ACD disabled, 1 = ACD enabled
	0xB	11	x	x	x	Struct{USINT,6*USINT,28*USINT}	Last ACD Conflict	Byte 1: Last conflict state, 0 = No conflict, 1 = during probe, 2 = during ongoing, 3 = during SemiActive; following 6 Bytes: MAC of the conflicting packet; following 28 Bytes: conflicting ARP packet
Ethernet Link 0xF6 (246)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	0x03	3	x			UINT	Number of Instances	Current number of instances
	0x04	4	x			Struct{UINT,Array of UINT}	Optional Attributes	List of optional attributes implemented in this class
	0x06	6	x			UINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	0x07	7	x			UINT	Max Instance Attribute	ID of the last attribute of this class in the other instances

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Object descriptions UR20-FBC-EIP: CIP Common Classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Ethernet Link 0xF6 (246)								
	Instances 0x01 ... 0x03 (1 ... 3)							
	0x01	1	x			UDINT	Interface Speed	Transfer rate 0 = undefined; 10 = 10 MBps; 100 = 100 MBps
	0x02	2	x			DWORD	Interface Flags	Information on the status and configuration of the interface Bit 0: Link active; Bit 1: 0 = Half duplex, 1 = Full duplex; Bit 2 ... 4: 0 = Autonegotiation in progress, 1 = Autonegotiation and speed detection failed, 2 = Autonegotiation failed but speed detected, 3 = Autonegotiation successfull, 4 = Autonegotiation deactivated; Bit 5: Requires reset before change settings; Bit 6: Hardware fault
	0x03	3	x		x	6*USINT	MAC address	MAC Address
	0x06	6	x	x	x	Struct{WORD,UINT}	Interface Control	Bit 0: 1 = Autonegotiation, 0 = no autonegotiation; Bit 1: 0 = Half Duplex, 1 = Full Duplex; Byte 3 ... 4: Speed: 10 = 10 MBps, 100 = 100 MBps
	0x07	7	x		x	USINT	Interface Type	0 = unknown, 1 = internal, 2 = Twisted Pair, 3 = optical
	0x08	8	x			USINT	Interface State	0 = unknown, 1 = enabled, 2 = disabled, 3 = testing
	0x09	9	x	x	x	USINT	Admin State	0 = reserved, 1 = enable, 2 = disable
	0xA	10	x		x	SHORT_STRING	Interface Label	Text string (Port1/Port2/internal)

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Object descriptions UR20-FBC-EIP: Vendor specific classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Gateway 0x64 (100)								
	Instance 0x00 (0)							
	0x64	100	x			UINT	Revision	Revision number
	0x65	101	x			USINT	Max Instance	Maximum number of instances
	0x66	102	x			USINT	Number of Instances	Current number of instances
	0x67	103	x			USINT	Max Class Attribute	ID of the last attribute of this class in instance 0

Object descriptions UR20-FBC-EIP: Vendor specific classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
	Instance 0x01 (1)							
	0x64	100	x		x	USINT	Max Attributes	ID of the last instance attribute
	0x65	101	x		x	STRING	Hardware Version	Hardware version of the coupler
	0x66	102	x		x	STRING	Software Version	Software version of the coupler
	0x67	103	x		x	STRING	Serial Number	Full serial number of the coupler
	0x68	104	x			WORD	Status Word	Status word as in assembly
	0x69	105	x	x		WORD	Control Word	Control word as in assembly
	0x6A	106	x	x	x	BYTE	Parameter Fieldbus error	Parameter “Output behaviour on fieldbus error”; All outputs off (0) / Enable substitute values (1) / Hold last value (2)
	0x6B	107	x	x	x	BOOL	Parameter Hot swap	Parameter “Module behaviour on hot swap”; Continue data exchange (0) / Behaviour like fieldbus error (1)
	0x6C	108	x			Array of Struct{USINT,BYTE,Array of 2 BYTE}	Diag Summary	Diag bytes of all modules with diag: Byte 1: Slot number; Byte 2: Slot state; Byte 3-4: First two bytes of diag
	0x6D	109	x	x	x	BOOL	Parameter Data format	Parameter “Data format”; Motorola (0) / Intel (1)
	0x6E	110	x	x		Array of 4 BYTE	Save/Restore Module Parameter	Write SAVE to save the module parameter; Write LOAD to load the defaults of the module parameter
	0x6F	111	x			Array of 64 DWORD	Current Module List	List of currently plugged modules
	0x70	112	x	x	x	Array of 64 DWORD	Module Ref List	List of expected modules
	0x71	113	x	x	x	BOOL	Diagnostic Alarm	Parameter “Diagnosis alarm”; disabled (0) / enabled (1)
	0x72	114	x	x	x	BOOL	Process Alarm	Parameter “Process alarm”; disabled (0) / enabled (1)
	0x73	115	x	x		Array of BYTE	Module Parameter	Array containing all parameter of all modules
Slot 0x65 (101)								
	Instance 0x00 (0)							
	0x64	100	x			UINT	Revision	Revision number
	0x65	101	x			USINT	Max Instance	Maximum number of instances
	0x66	102	x			USINT	Number of Instances	Current number of instances
	0x67	103	x			USINT	Max Class Attribute	ID of the last attribute of this class in instance 0
Slot 0x65 (101)								
	Instances 0x01 ... 0x40 (1 ... 64)							
	0x64	100	x		x	USINT	Max Attributes	ID of the last instance attribute
	0x65	101	x			STRING	Name	Name of the module
	0x66	102	x			STRING	Product Code	Order number of the module

Object descriptions UR20-FBC-EIP: Vendor specific classes

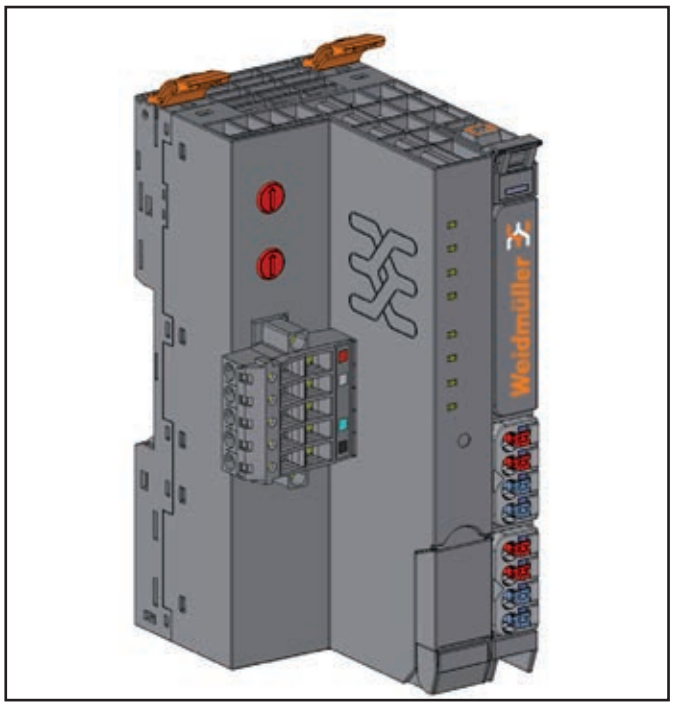
Class	Attribute		Get	Set	NV[1]	Data type[2]	Name	Description
	hex	dez						
	0x67	103	x			STRING	Serial Number	Serial number of the module
	0x68	104	x			UDINT	Module ID	ID of the module
	0x69	105	x			STRING	Hardware Version	Hardware version of the module
	0x6A	106	x			STRING	Software Version	Software version of the module
	0x6B	107	x			STRING	MX Version	MX version of the module
	0x6C	108	x			BYTE	Slot State	State of the module: 0x01: ok; 0x80: slot empty; 0x81: wrong module; 0x82: diagnosis active
	0x6D	109	x			UINT	Input Bit Length	Length of input data in Bit
	0x6E	110	x			UINT	Output Bit Length	Length of output data in Bit
	0x6F	111	x			UINT	Parameter Byte Length	Length of parameter data in Byte
	0x70	112	x			UINT	Diag Byte Length	Length of diagnosis data in Byte
	0x71	113	x			Array of BYTE	Process Data In	Input data of the module
	0x72	114	x	x		Array of BYTE	Process Data Out	Output data of the module
	0x73	115	x	x		Array of BYTE	Parameter Data	Parameter data of the module
	0x74	116	x			Array of BYTE	Diagnosis Data	Diagnosis data of the module
	0x75	117	x			Array of BYTE	Process Alarm Data	Process alarm data of the module
Process Data 0x66 (102)								
	Instance 0x00 (0)							
	0x64	100	x			UINT	Revision	Revision number
	0x65	101	x			USINT	Max Instance	Maximum number of instances
	0x66	102	x			USINT	Number of Instances	Current number of instances
	0x67	103	x			USINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	Instance 0x01 (1)							
	0x64	100	x		x	USINT	Max Attributes	ID of the last instance attribute
	0x65	101	x			Array of BYTE	Process Data In	All input data
	0x66	102	x			UINT	Length Process Data In	Total length of input data
	0x67	103	x	x		Array of BYTE	Process Data Out	All output data
	0x68	104	x			UINT	Length Process Data Out	Total length of output data
	0x69	105	x			Array of 8 BYTE	Diag Status	Diagnosis messages as in assembly
	0x6A	106	x			Array of 8 BYTE	Diag Control	Diagnosis control as in assembly

5.6 DeviceNet fieldbus coupler UR20-FBC-DN

The UR20-FBC-DN fieldbus coupler is the head module for the u-remote system bus, to which up to 64 active u-remote modules can be connected. The DeviceNet coupler is connected to the network with a 5-pole PCB plug-in connector.

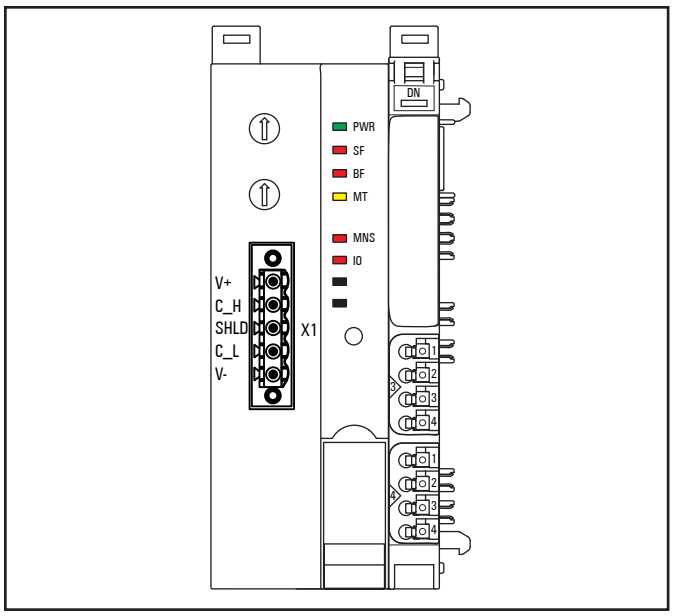
The coupler can be accessed with a system-independent web server application via the USB service interface. Thus, all information, such as diagnostics, status values and parameters, can be read and all connected modules can be simulated or forced.

The station's main power supply is integrated in the coupler. Power is supplied via two 4-pole connectors, separated into the input and output current paths.



Fieldbus coupler UR20-FBC-DN (Order No. 1334900000)

Status indicators



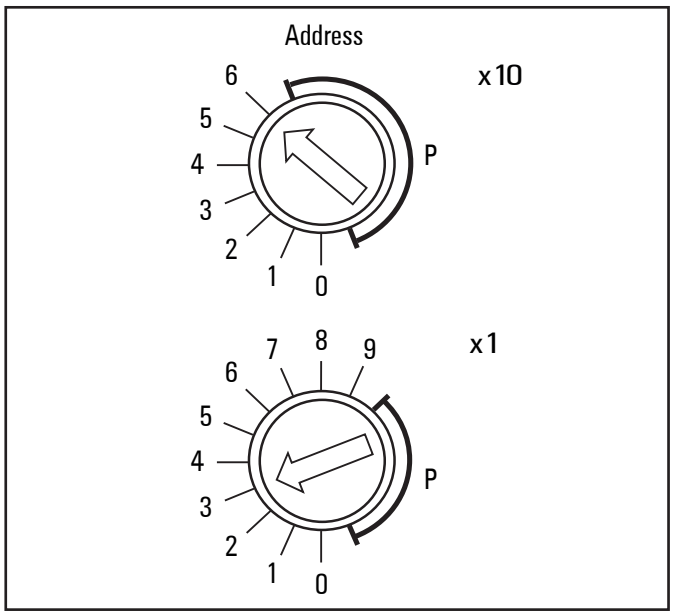
LED status indicators UR20-FBC-DN, error messages see Chapter 13

PWR	Power LED	**Green**: Supply voltage connected **Red**: Boot loader failure
SF	Collective error	**Red:** Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode
BF	Bus failure	**Red:** No connection to the fieldbus **Red flashing**: Configuration error, no connection to the control unit, or error in the parameter set or slave address error or firmware update is running **Red/green flickering:** Auto baud rate detection in progress
MT	Maintenance	**Yellow**: Error on the system bus or fieldbus
MNS	Module/Network status	**Off:** Duplicate MAC ID check active **Green**: DeviceNet connection established, device status OK **Green flashing**: No DeviceNet connection established, device status OK **Red**: Bus failure **Red flashing**: Bus connection timeout
IO	Input/Output	**Green**: Data exchange active, outputs are accessed by the PLC **Green flashing**: Station in idle mode (outputs are not accessed by the PLC) **Red**: At least one stack differs from the start configuration (e.g. one module has been pulled) **Red flashing**: Diagnostic message on at least one module

Addressing

The fieldbus coupler is addressed via the two rotary switches.

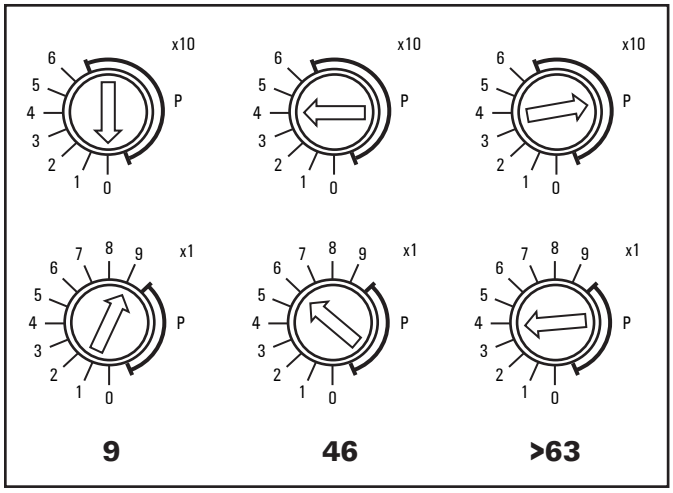
A maximum of 64 addresses (0 to 63) can be assigned. Each address may be assigned only **once** in the overall bus structure. The default setting ist 63.



Default setting UR20-FBC-DN: Address = 63

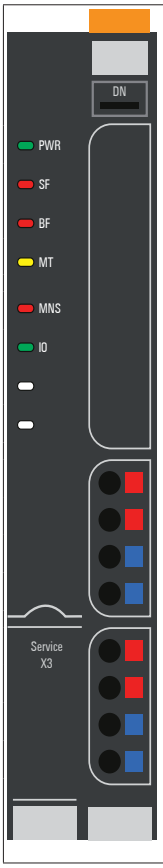
- ► Use the **x10** rotary switch to set the decade and the **x1** rotary switch to set the units digit.
- ► In order to set an address >63 turn one of the rotary switches to the **P** range (“programmable”) and programm the address via the PLC.

Addressing examples:



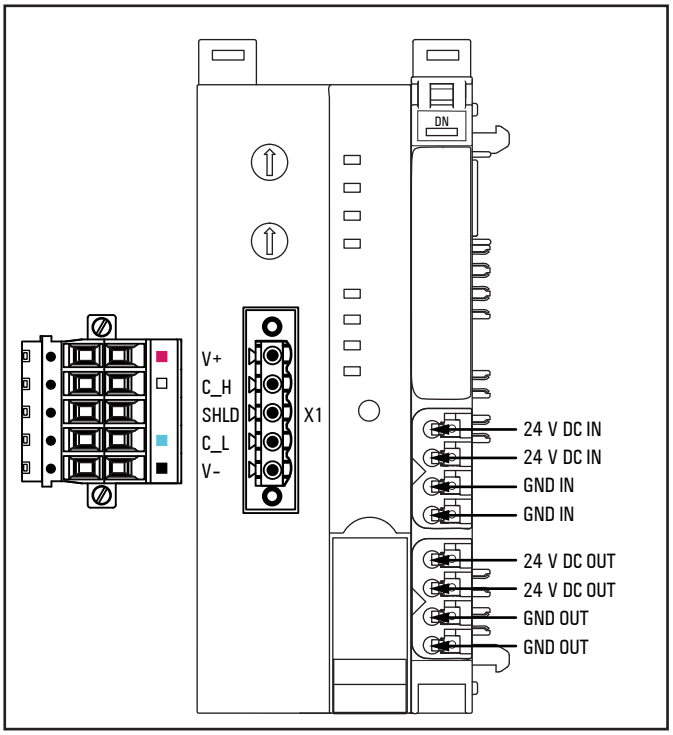
Examples for addressing the UR20-FBC-DN

DeviceNet address **9**: 0x10, 9x1
DeviceNet address **46**: 4x10, 6x1
DeviceNet address **>63**: at least one switch in the “P” area



	Coupler power supply LED green: supply voltage >18 V red: at least one current path <18 V
3.1	Green: Input current path supply voltage > 18 V DC
3.2	Red: Input current path supply voltage < 18 V DC
3.4	Red: Internal fuse defective
4.1	Green: Output current path supply voltage > 18 V DC
4.2	Red: Output current path supply voltage < 18 V DC
4.4	Red: Internal fuse defective

LED indicators UR20-FBC-DN, error messages see Chapter 13



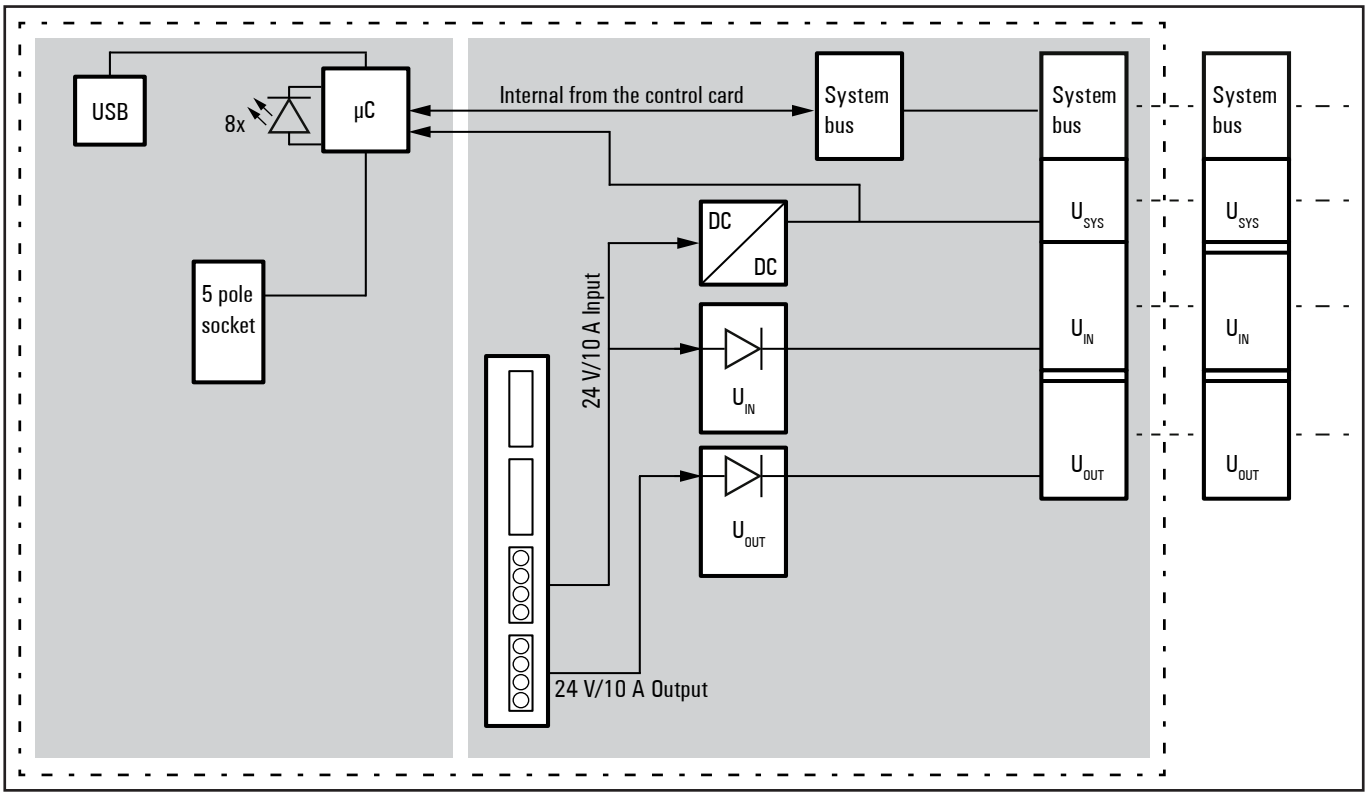
Connection diagram UR20-FBC-DN

ATTENTION

Risk of material damage!
In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!

Pin assignment of the 5 pole socket

Pin	Cable colour	Signal	Description
5	Red	V+	Fieldbus power supply (between 11 and 25 V)
4	White	CANH	CAN+ bus line
3	Bare	DRAIN / SHIELD	Cable shield - internally conected to FE via 1 M in parallel with 10 nF/500 V
2	Blue	CANL	CAN- bus line
1	Black	V-	Fieldbus power ground



Block diagram UR20-FBC-DN

Technical data UR20-FBC-DN (Order No. 1334900000)

System data		
Connection	Socket for 5-pole PCB plug-in connector	
Fieldbus protocol	DeviceNet	
Process image	Input data width	max. 504 Byte
	Output data width	max. 504 Byte
	Parameter data	max. 64*64 Byte
	Diagnostic data	max. 64*47 Byte
Number of modules	max. 64 active	
Configuration interface	Micro USB 2.0	
Transfer rate	Fieldbus	max. 500 kBit/s
	u-remote system bus	max. 48 MBit/s
Supply		
Supply voltage for system and inputs	24 V DC +20% / -15%	
Supply voltage for outputs	24 V DC +20% / -15%	
Max. feed-in current for input modules	Horizontal installation: 10 A (-20 ... +60 °C) Vertical installation: 10 A (-20 ... +55 °C), 8 A (-20 ...+60 °C)	
Max. feed-in current for output modules		
Current consumption from system current path I_{SYS}	75 mA (+ 15 mA from DeviceNet supply)	
Connection data		
Type of connection	„PUSH IN“	
Conductor cross-section	Single-wired, fine-wired	0,14 ... 1,5 mm^2 (AWG 16 ... 26)
Weight		
Weight (operational status)	225 g (without PCB plug-in connector)	
General data, see Section 3.2		

Overview of editable parameters UR20-FBC-DN

Parameter	Optional values	Default
Process alarm	disabled / enabled	disabled
Diagnostic alarm	disabled / enabled	disabled
Output behaviour on fieldbus error	All outputs off / Enable substitute value / Hold last value	All outputs off
Module behaviour on hot swap	Continue data exchange / Behaviour as with fieldbus error	Continue data exchange
Data format	Motorola / Intel	Motorola
Save module parameters	No / Yes / Standard	No
Restore module parameters	No / Yes	No
Power up baud rate	125 kB/s / 250 kB/s / 500 kB/s / Auto baud / Set by PLC	125 kB
Baud rate	125 kB/s / 250 kB/s / 500 kB/s	
MAC-ID	- Adjustable with rotary switches (values 0 ... 63) - Adjustable via PLC (Precondition: a value >63 must be set with the rotary switches)	
Assembly Selector	Asm 101 & 102 / Asm 103 & 104	Asm 101 & 102
Length of assembly input	2 ... 504	
Length of assembly output	2 ... 504	
IP-Address USB port	192.168.1.202; 192.168.2.202, 192.168.3.202, 192.168.4.202, 192.168.5.202	192.168.1.202
Major Revision	1 ... 127	Significant changes concerning form and function have been realised in a „Major revision“.
Minor Revision	0 ... 255	In a „Minor revision“ changes that do not affect the user behaviour have been realised.

Process data

Status word UR20-FBC-DN

Bit	Name	Description
0	Summarized module diagnosis	A diagnosis is available for at least one module with diagnostics functionality.
1	Errorbit 1	Reserve bit 1, currently not used
2	Errorbit 2	Reserve bit 2, currently not used
3	Systembus error	Error on the system bus. Communication with the connected modules is disrupted.
4	Unacknowledged diagnosis alarm	Unacknowledged diagnosis alarm
5	Unacknowledged process alarm	Unacknowledged process alarm
6	I/O-Configuration error	Deviation in the configuration. The module list has changed. The list of configured modules (Configured Module Ident List class 0x64 (101), instance 0x01 (1), attribute 0x70 (112)) differs from the module list detected by the coupler (Detected Module Ident List class 0x64 (101), instance 0x01 (1), attribute 0x6F (111)).
7	Master configuration error	Master configuration error. The list of configured modules (Configured Module Ident List class 0x64 (101), instance 0x01, attribute 0x70 (112)) differs significantly from the module list detected by the coupler (Detected Module Ident List class 0x64 (101), instance 0x01 (1), attribute 0x6F (111)) ab. No process data can be exchanged with the modules.
8	Errorbit 8	Reserve bit 8, currently not used
9	Errorbit 9	Reserve bit 9, currently not used
10	Force mode active	Force mode was activated through the web server. Process data cannot be exchanged between the master and forced channels.
11	Errorbit 11	Reserve bit 11, currently not used
12	Errorbit 12	Reserve bit 12, currently not used
13	Voltage UOUT error	Error in the voltage supply of output current path
14	Voltage UIN error	Error in the voltage supply of system and input current path
15	Errorbit 15	Reserve bit 15, currently not used

Control word UR20-FBC-DN

Bit	Name	Description
0	controlbit 0	for future use
1	controlbit 1	for future use
...	...	...
15	controlbit 15	for future use

Packed process data UR20-FBC-DN

Input data	
Assembly 101	Assembly 103
2 Byte Status word	2 Byte Status word
X Byte Process data of the modules	X Byte Process data of the modules
	8 Byte Diagnostic data status word
Output data	
Assembly 102	Assembly 104
2 Byte Control word	2 Byte Control word
X Byte Process data of the modules	X Byte Process data of the modules
	8 Byte Diagnostic data control word

Object descriptions UR20-FBC-DN: CIP Common classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Identity 0x01 (1)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Highest possible instance of this object
	Instance 0x01 (1) [3]							
	0x01	1	x		x	UINT	Vendor ID	Vendor ID: 1015
	0x02	2	x		x	UINT	DeviceType	General type of device: 0x0C
	0x03	3	x		x	UINT	Product Code	Vendor assigned product code: 33490
	0x04	4	x		x	Struct{USINT,USINT}	Revision {Major, Minor}	Revision of the u-remote coupler
	0x05	5	x			WORD	Device Status	Bit0: Owned; Bit2= Configured; Bit4-7:Extended device status; Bit8: Minor recoverable fault; Bit9: Minor unrecoverable fault; Bit10: Major recoverable fault; Bit 11: Major unrecoverable fault; Bit12-15: Extended device status 2
	0x06	6	x		x	UDINT	Serial Number	Serial number of the device; 32 Bit value
	0x07	7	x		x	SHORT_STRING	Product Name	Product name: UR20-FBC-DN
	0x08	8	x			USINT	State	Status of the device: 0 = Nonexistent, 1 = Device Self Testing, 2 = Standby, 3 = Operational, 4 = Major Recoverable Fault, 5 = Major Unrecoverable Fault, 6 – 254 = Reserved (255 = Default Value)
	0x0A	10	x	x	x	USINT	Heartbeat Intervall	Periodically sent messages that indicates the device is still there. The default value is 0 (transmission of the heartbeat message is disabled).

1) Non volatile (data are saved permanently); 2) For the description of data types refer to table Data types; 3) Reset; 4) Alloc Group2 idset; Release group2 id set; 5) Create; 6) Delete

Object descriptions UR20-FBC-DN: CIP Common classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
DeviceNet 0x03 (3)								
	Instanz 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	Instanz 0x01 (1) [4]							
	0x01	1	x	x	x	USINT	MAC ID	Network address of the device
	0x02	2	x	x	x	USINT	Baudrate	Baud rate of the device
	0x03	3	x	x	x	USINT	Bus-Off Interrupt	With "0" a communication fault will be sent on Bus-Off-Interrupt (s. LED). With "1" a reset of the CAN driver will be run.
	0x04	4	x	x		USINT	Bus-Off counter	Counter for Bus-Off-Interrupts
	0x05	5		x		Struct{Byte,USINT}	Allocation Information	Allocation Information. (Byte = Predefined Master/ Slave Connection Set. Attribute is neede, if the Pre-defined Master/Slave Connection Set is supported. USINT = MAC ID)
	0x06	6	x			BOOL	MAC ID Switch Changed	Rotary switch for the MAC-ID has been changed
	0x07	7	x			BOOL	Baudrate Switch Changed	The baud rate has been changed via the web server
	0x08	8	x			USINT	MAC ID Switch Value	MAC-ID value set by the rotary switches
	0x09	9	x			USINT	Baudrate Switch Value	Value of the baud rate switch in the web server
Assembly 0x04 (4)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x03	3	x			UINT	Number of Instances	Current number of Instances
	Instanceen 0x65 ... 0x68 (101 ... 104)							
	0x03	3	x	x		Array of BYTE	Data	Process data
	0x04	4	x			UINT	Size	Size of process data
Connection Class 0x05 (5)								
	Instance 0x00 (0) [5]							
	0x01	1	x			UINT	Revision	Revision of this object
	Instance 0x01 (1) [3] [6]							
	0x01	1	x			USINT	State	Status of this object
	0x02	2	x			USINT	Instance type	I/O or messaging connection
	0x03	3	x			BYTE	Transportclass trigger	Behaviour of the connection
	0x04	4	x			UINT	Produced connection ID	Value in the CAN identifier field for a message sent by the device
	0x05	5	x			UINT	Consumed connection ID	Value in the CAN identifier field for a message received by the device

1) Non volatile (data are saved permanently); 2) For the description of data types refer to table Data types; 3) Reset; 4) Alloc Group2 idset; Release group2 id set; 5) Create; 6) Delete

Object descriptions UR20-FBC-DN: CIP Common classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
	0x06	6	x			BYTE	Initial communication characteristic	Defines the message group(s) associated with this connection
	0x07	7	x			UINT	Produced connection size	Max. number of bytes for this connection
	0x08	8	x			UINT	Consumed connection size	Max. number of bytes for this connection
	0x09	9	x	x		UINT	Expected packet rate	Time intervall between two messages for this connection
	0x0C	12	x	x		USINT	Watchdog timeout action	Defines how to react on connection activites and Watchdog timeouts
	0x0D	13	x			UINT	Produced connection path length	Number of bytes in the produced connection path length attribute
	0x0E	14	x	x		Packed EPATH	Produced connection path	Specifies the application object, the data of which are produced by this connection
	0x0F	15	x			UINT	Consumed connection path length	Number of bytes in the consumed connection path length attribute
	0x10	16	x	x		Packed EPATH	Consumed connection path	Specifies the application object, the data of which are consumed by this connection
	0x11	17	x	x		UINT	Production inhibit time	Specifies the minimum time to produce new data
Acknowledge Handler 0x 2B (43)								
	Instance 0x00 (0)							
	0x01	1	x			UINT	Revision	Revision of this object
	0x02	2	x			UINT	Max Instance	Maximum number of Instances
	Instance 0x01 (1)							
	0x01	1	x	x		UINT	Acknowledge Timer	Time intervall waiting for acknowledgement
	0x02	2	x	x		USINT	Retry Limit	Number of Acknowledge Timeouts that must be achieved before the application gets informed
	0x03	3	x	x		UINT	COS Producing connection instance	Connection Instance waiting for the acknowledgement of produced data
	0x04	4	x			BYTE	Ack List size	Maximum number of members in the Acknowledge List
	0x05	5	x			BYTE and ARRAY of UINT	Ack List	List of active connections receiving acknowledge
	0x06	6	x			BYTE	Data with Ack Path List Size	Maximum number of data in the acknowledge path list
	0x07	7	x			BYTE and ARRAY of UINT, USINT and padded EPATH	Data with Ack Path List	List of connection instances and consuming application pairs

1) Non volatile (data are saved permanently); 2) For the description of data types refer to table Data types; 3) Reset; 4) Alloc Group2 idset; Release group2 id set; 5) Create; 6) Delete

Object descriptions UR20-FBC-DN: Vendor specific classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Gateway 0x64 (100)								
	Instance 0x00 (0)							
	0x64	100	x			UINT	Revision	Revision of this object
	0x65	101	x			USINT	Max Instance	Highest possible instance of this object
	0x66	102	x			USINT	Number of Instances	Current number of Instances
	0x67	103	x			USINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	Instance 0x01 (1)							
	0x64	100	x		x	USINT	Max Attributes	ID of the last attribute of this class in the other instances
	0x65	101	x		x	STRING	Hardware Version	Hardware version of the coupler
	0x66	102	x		x	STRING	Software Version	Software version of the coupler
	0x67	103	x		x	STRING	Serial Number	Serial number of the coupler
	0x68	104	x			WORD	Status Word	Status word as in assembly
	0x69	105	x	x		WORD	Control Word	Control word as in assembly
	0x6A	106	x	x	x	BYTE	Parameter Fieldbus error	Parameter “Output behaviour on fieldbus error”; All outputs off (0) / Enable substitute values (1) / Hold last value (2)
	0x6B	107	x	x	x	BOOL	Parameter Hot-Swap	Parameter “Module behaviour on hot swap”; Continue data exchange (0) / Behaviour like fieldbus error (1)
	0x6C	108	x			Array of Struct{USINT,BYTE,Array of 2 BYTE}	Diag Summary	Diag bytes of all modules with diag: Byte 1: Slot number; Byte 2: Slot state; Byte 3-4: First two bytes of diag
	0x6D	109	x	x	x	BOOL	Parameter Data format	Parameter “Data format”; Motorola (0) / Intel (1)
	0x6E	110	x	x		Array of 4 BYTE	Save/Restore Module Parameter	Write SAVE to save the module parameter; Write LOAD to load the defaults of the module parameter
	0x6F	111	x			Array of 64 DWORD	Current Module List	List of currently plugged modules (260*4 bytes). First entry is allways Zero (index), subsequent modules get their module ID from the coupler.
	0x70	112	x	x	x	Array of 64 DWORD	Module Ref List	List of expected modules
	0x71	113	x	x	x	BOOL	Diagnostic Alarm	Parameter “Diagnosis alarm”; disabled (0) / enabled (1)
	0x72	114	x	x	x	BOOL	Process Alarm	Parameter “Process alarm”; disabled (0) / enabled (1)
	0x73	115	x	x		Array of BYTE	Module Parameter	Array containing all parameter of all modules
	0x74	116	x	x	x	USINT	Assembly Selector	Assemblies to be used for the connection (0= Asm 101 & 102, 1 = Asm 103 & 104)

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Object descriptions UR20-FBC-DN: Vendor specific classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Slot 0x65 (101)								
	Instance 0x00 (0)							
	0x64	100	x			UINT	Revision	Revision of this object
	0x65	101	x			USINT	Max Instance	Highest possible instance of this object
	0x66	102	x			USINT	Number of Instances	Current number of instances
	0x67	103	x			USINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	Instances 0x01 ... 0x40 (1 ... 64)							
	0x64	100	x		x	USINT	Max Attributes	ID of the last instance attribute
	0x65	101	x			STRING	Name	Name of the module
	0x66	102	x			STRING	Product Code	Order number of the module
	0x67	103	x			STRING	Serial Number	Serial number of the module
	0x68	104	x			UDINT	Module ID	ID of the module
	0x69	105	x			STRING	Hardware Version	Hardware version of the module
	0x6A	106	x			STRING	Software Version	Software version of the module
	0x6B	107	x			STRING	MX Version	MX version of the module
	0x6C	108	x			BYTE	Slot State	State of the module: 0x01: ok; 0x80: slot empty; 0x81: wrong module; 0x82: diagnosis active
	0x6D	109	x			UINT	Input Bit Length	Length of input data in Bit
	0x6E	110	x			UINT	Output Bit Length	Length of output data in Bit
	0x6F	111	x			UINT	Parameter Byte Length	Length of parameter data in Byte
	0x70	112	x			UINT	Diag Byte Length	Length of diagnosis data in Byte
	0x71	113	x			Array of BYTE	Process Data In	Input data of the module
	0x72	114	x	x		Array of BYTE	Process Data Out	Output data of the module
	0x73	115	x	x		Array of BYTE	Parameter Data	Parameter data of the module
	0x74	116	x			Array of BYTE	Diagnosis Data	Diagnosis data of the module
	0x75	117	x			Array of BYTE	Process Alarm Data	Process alarm data of the module
	0x76	118	x	x		Array of BYTE	Slot Config Assembly	Configuration assembly for parameterising the modules (Rockwell controls)

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Object descriptions UR20-FBC-DN: Vendor specific classes

Class	Attribute hex	Attribute dez	Get	Set	NV[1]	Data type[2]	Name	Description
Process Data 0x66 (102)								
	Instance 0x00 (0)							
	0x64	100	x			UINT	Revision	Revision number
	0x65	101	x			USINT	Max Instance	Maximum number of instances
	0x66	102	x			USINT	Number of Instances	Current number of instances
	0x67	103	x			USINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	Instance 0x01 (1)							
	0x64	100	x		x	USINT	Max Attributes	ID of the last instance attribute
	0x65	101	x			Array of BYTE	Process Data In	All input data
	0x66	102	x			UINT	Length Process Data In	Total length of input data
	0x67	103	x	x		Array of BYTE	Process Data Out	All output data
	0x68	104	x			UINT	Length Process Data Out	Total length of output data
	0x69	105	x			Array of 8 BYTE	Diag Status	Diagnosis messages as in assembly
	0x6A	106	x			Array of 8 BYTE	Diag Control	Diagnosis control as in assembly
Module Parameter 0x67 (103)								
	Instance 0x00 (0)							
	0x64	100	x			UINT	Revision	Revision of this object
	0x65	101	x			USINT	Max Instance	Maximum number of instances
	0x66	102	x			USINT	Number of Instances	Current number of instances
	0x67	103	x			USINT	Max Class Attribute	ID of the last attribute of this class in instance 0
	Instance 0x01 ... 0x40 (1 ... 64)							
	0x64	100	x			USINT	Max Attributes	ID of the last instance attribute
	0x65	101	x	x		Depend on Parameter	First Parameter	First parameter
	0x66	102	x	x		Depend on Parameter	Second Parameter	Second parameter

1) Non volatile (data are saved permanently)
2) For the description of data types refer to table Data types

Data types UR20-FBC-DN

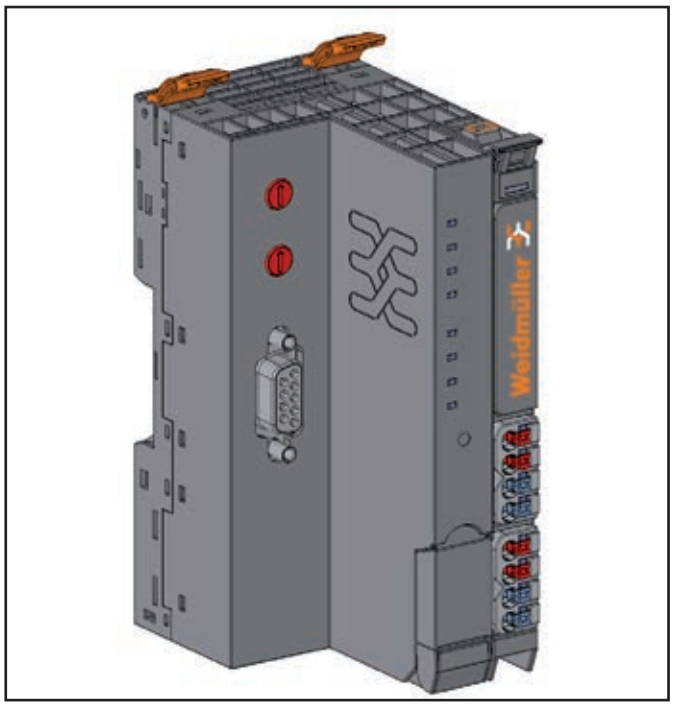
Data type	Size	Value range
USINT	1 byte	0 ... 255
UINT	2 byte	0 ... 65535
UDINT	4 byte	0 ... (2^{32}-1)
BOOL	1 bit	
BYTE	8 bits	
WORD	16 bits	
DWORD	32 bits	
STRING	2 Byte length indicator 1 Byte per character	
SHORT_STRING	1 Byte length indicator 1 Byte per character	
STRING	Structure of strings	
Padded EPATH		
Packed EPATH		

5.7 CANopen fieldbus coupler UR20-FBC-CAN

The UR20-FBC-CAN fieldbus coupler is designed according to the international standard (EN 50325-4). It is the head module for the u-remote system bus, to which up to 64 active u-remote modules can be connected. The CANopen coupler has a Sub-D socket and supports the CiA DS401 device profile.

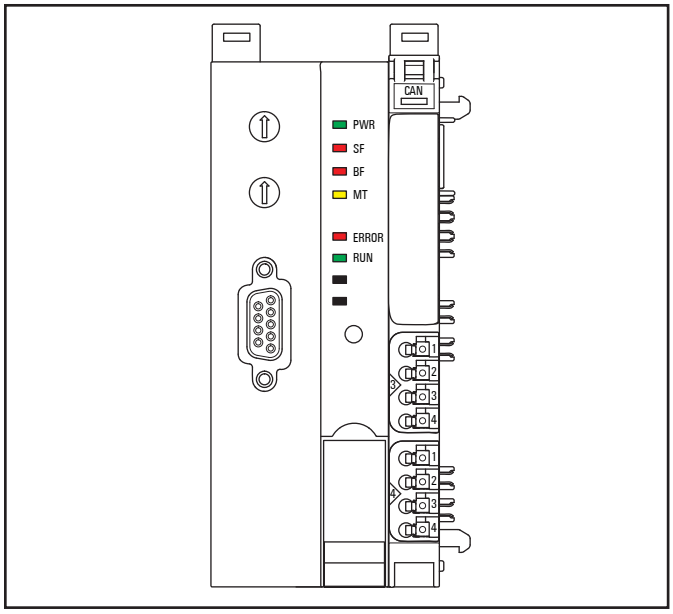
The coupler can be accessed with a system-independent web server application via the USB service interface. Thus, all information, such as diagnostics, status values and parameters, can be read and all connected modules can be simulated or forced.

The station's main power supply is integrated in the coupler. Power is supplied via two 4-pole connectors, separated into the input and output current paths.



Fieldbus coupler UR20-FBC-CAN (Order No. 1334890000)

Status indicators



LED status indicators UR20-FBC-CAN, error messages see Chapter 13

PWR	Power LED	**Green**: Supply voltage connected **Red**: Boot loader failure
SF	Collective error	**Red:** Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in force mode
BF	Bus failure	**Red:** No connection to the fieldbus **Red flashing**: Configuration error, no connection to the control unit, or error in the parameter set or slave address error or firmware update is running
MT	Maintenance	**Yellow**: Error on the system bus or fieldbus
ERROR	Internal error	**Red**: No fieldbus communication (BusOFF) ***Red fast flashing**: Auto baud rate detection running **Red flashing**: Configuration error **Red one short flash**: CAN error counter reached warning level **Red two short flashes:** Node guarding (node guard or heartbeat)
RUN	Coupler state	**Green**: Fieldbus running (OPERATIONAL) **Green flashing**: Fieldbus in state PRE-OPERATIONAL ***Green fast flashing**: Auto baud rate detection running

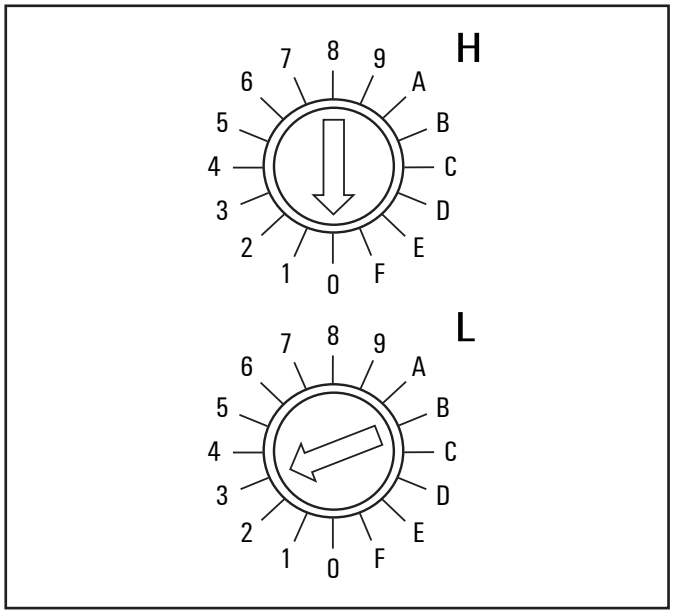
Addressing

The fieldbus coupler is addressed via the two rotary switches.

A maximum of 124 addresses (1 to 124) can be assigned. Each address may be assigned only **once** in the overall bus structure. Addresses 1 and 2 are generally used by the control systems. Bus addresses 000 plus 126 and higher may not be used!

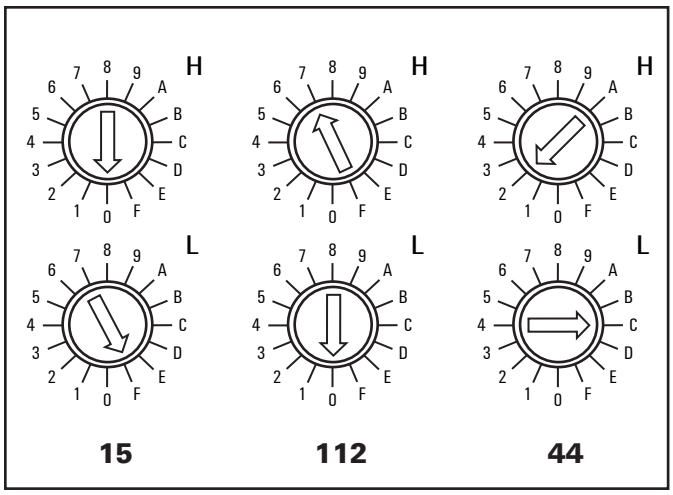
The most significant digit is set with rotary switch **H**, the least significant digit with rotary switch **L** . The switches are labelled in the hexadecimal numbering system (0 to 9, A=10, B=11, C=12, ... F = 15). A decimal/hexadecimal conversion table is provided in the annex.

Coding: Address = (H*16) + L



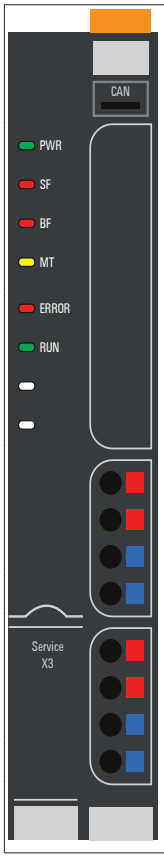
Default setting UR20-FBC-CAN: Address = 3

Addressing examples:



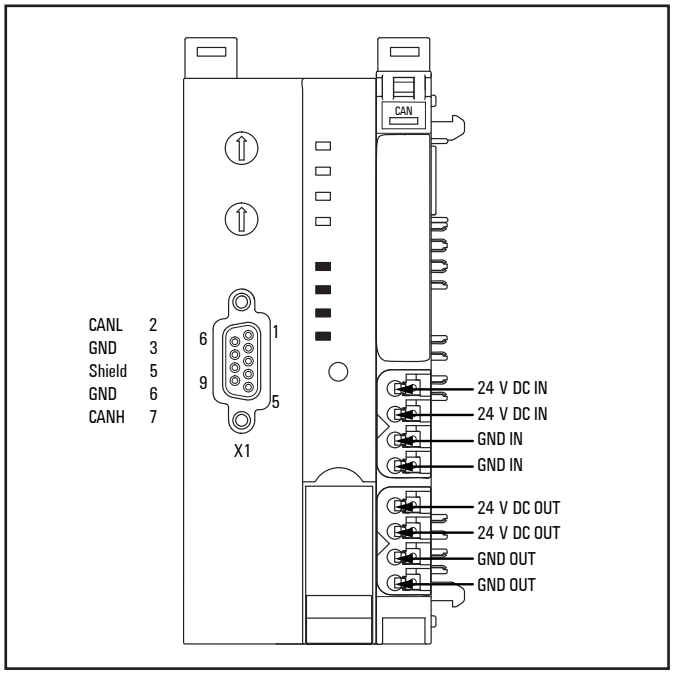
Examples for addressing the UR20-FBC-CAN

CANopen address **15**: H = 0, L = F
CANopen address **112**: H = 7, L = 0
CANopen address **44**: H = 2, L = C



	Coupler power supply LED green: supply voltage >18 V red: at least one current path <18 V
3.1	Green: Input current path supply voltage > 18 V DC
3.2	Red: Input current path supply voltage < 18 V DC
3.4	Red: Internal fuse defective
4.1	Green: Output current path supply voltage > 18 V DC
4.2	Red: Output current path supply voltage < 18 V DC
4.4	Red: Internal fuse defective

LED indicators UR20-FBC-CAN, error messages see Chapter 13



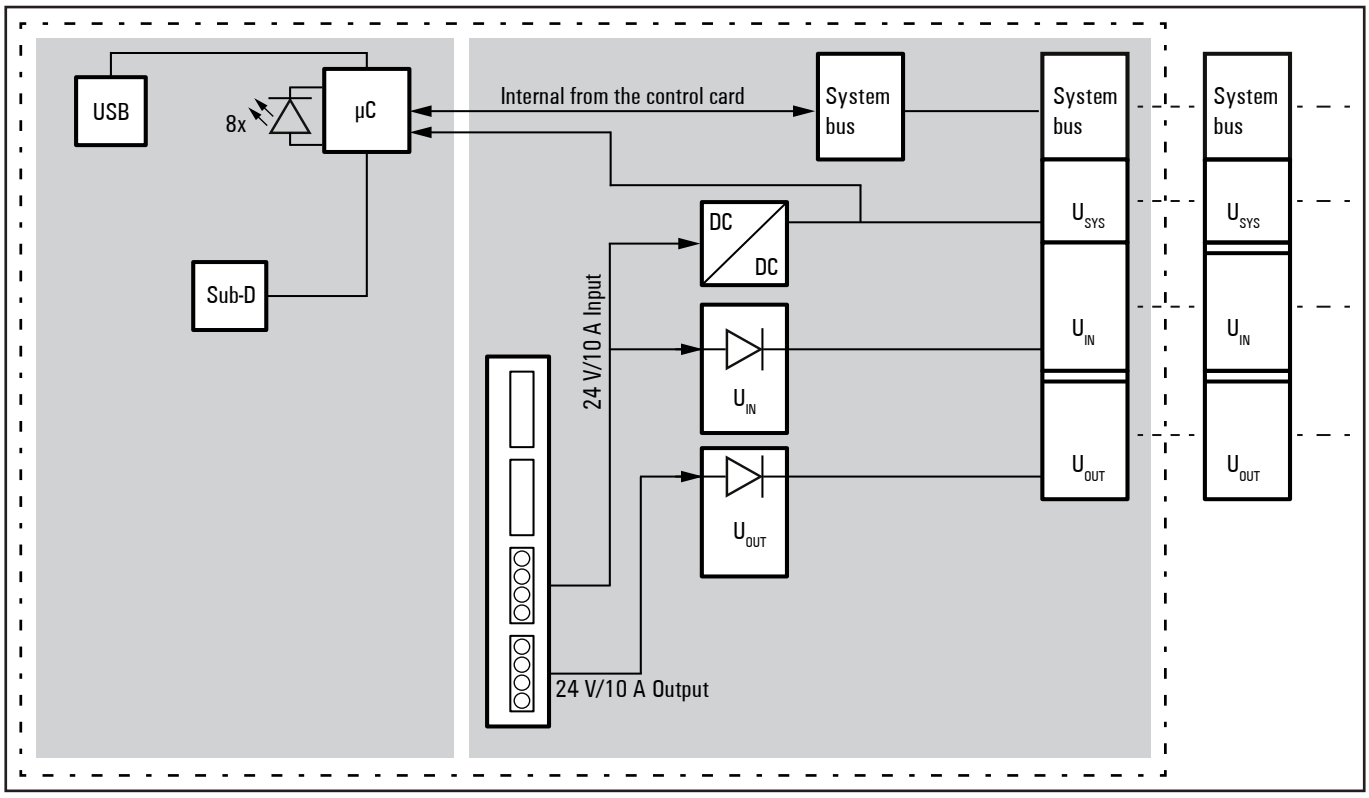
Connection diagram UR20-FBC-CAN

ATTENTION

Risk of material damage!
In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!

Sub-D pin assignment

Pin	Signal	Description
1	-	not connected
2	CANL	CAN- bus line
3	GND	Ground
4	-	not connected
5	SHIELD	Cable shield
6	GND	Ground
7	CANH	CAN+ bus line
8	-	not connected
9	-	not connected
Case	SHIELD	Cable shield



Block diagram UR20-FBC-CAN

Technical data UR20-FBC-CAN (Order No. 1334890000)

System data		
Connection	9-pole SUB-D socket	
Fieldbus protocol	CANopen	
Process image	Input data width	max. 244 Byte
	Output data width	max. 244 Byte
	Parameter data	max. 244 bytes
	Diagnostic data	max. 244 bytes
Number of modules	max. 64 active	
Configuration interface	Micro USB 2.0	
Transfer rate	Fieldbus	Max. 1 Mbps
	u-remote system bus	Max. 48 Mbps
Supply		
Supply voltage for system and inputs	24 V DC +20 % / -15 %	
Supply voltage for outputs	24 V DC +20 % / -15 %	
Max. feed-in current for input modules	Horizontal installation: 10 A (-20 ... +60 °C) Vertical installation: 10 A (-20 ... +55 °C), 8 A (-20 ... +60 °C)	
Max. feed-in current for output modules		
Current consumption from system current path I_{SYS}	90 mA	
Connection data		
Type of connection	"PUSH IN"	
Conductor cross-section	Single-wired, fine-wired	0.14 – 1.5 mm² (AWG 16 – 26)
Weight		
Weight (operational status)	227 g	
General data, see Section 3.2		

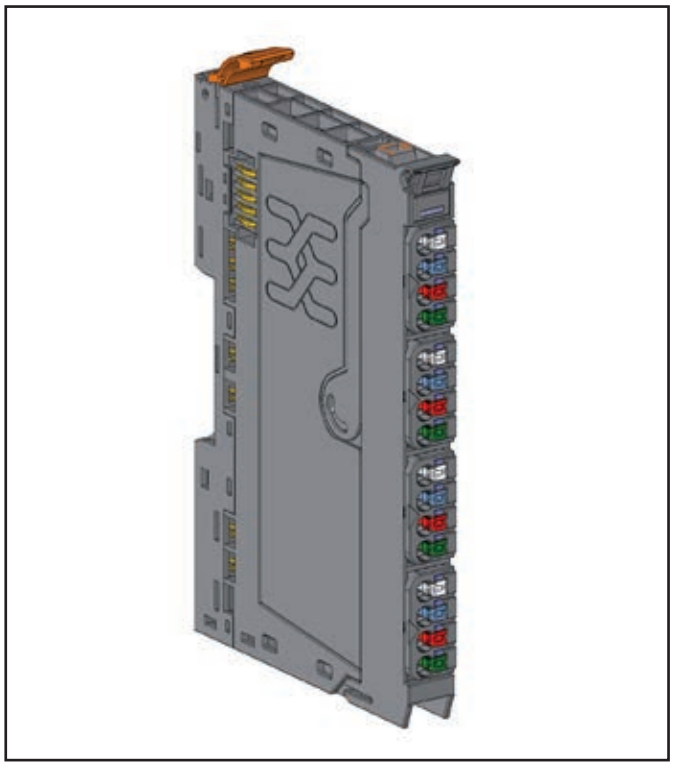
Overview of editable parameters UR20-FBC-CAN

Parameter	Optional values	Default
IP address USB port*	192.168.1.202; 192.168.2.202, 192.168.3.202, 192.168.4.202, 192.168.5.202	192.168.1.202
Power up baud rate	Auto Baudrate, 10 kbit/s, 20 kbit/s, 50 kbit/s, 100 kbit/s, 125 kbit/s, 250 kbit/s, 500 kbit/s, 800 kbit/s,1000 kbit/s	Auto baud rate
Save module parameters	no / yes / standard	no
Restore module parameters	This parameter is not editable. It will be automatically set to "yes" as soon as the coupler has sent saved parameters to the modules.	
Output behaviour on fieldbus error	All outputs off / Enable substitute value / Hold last value	All outputs off
Module behaviour on hot swap	Continue data exchange / behaviour as with fieldbus error	Continue data exchange
Data format	Motorola / Intel	Motorola

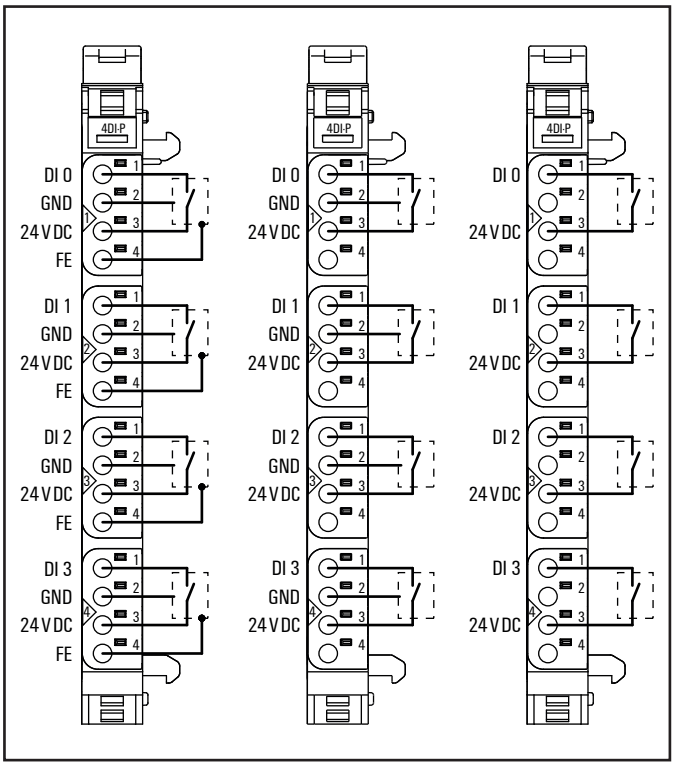
* Change requires restart of the fieldbus coupler

6 Detailed descriptions of I/O modules

6.1 Digital input module UR20-4DI-P

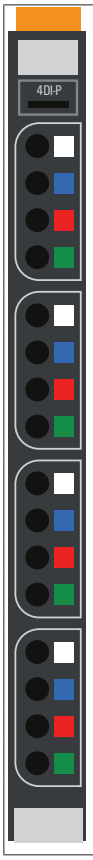


Digital input module UR20-4DI-P (Order No. 1315170000)



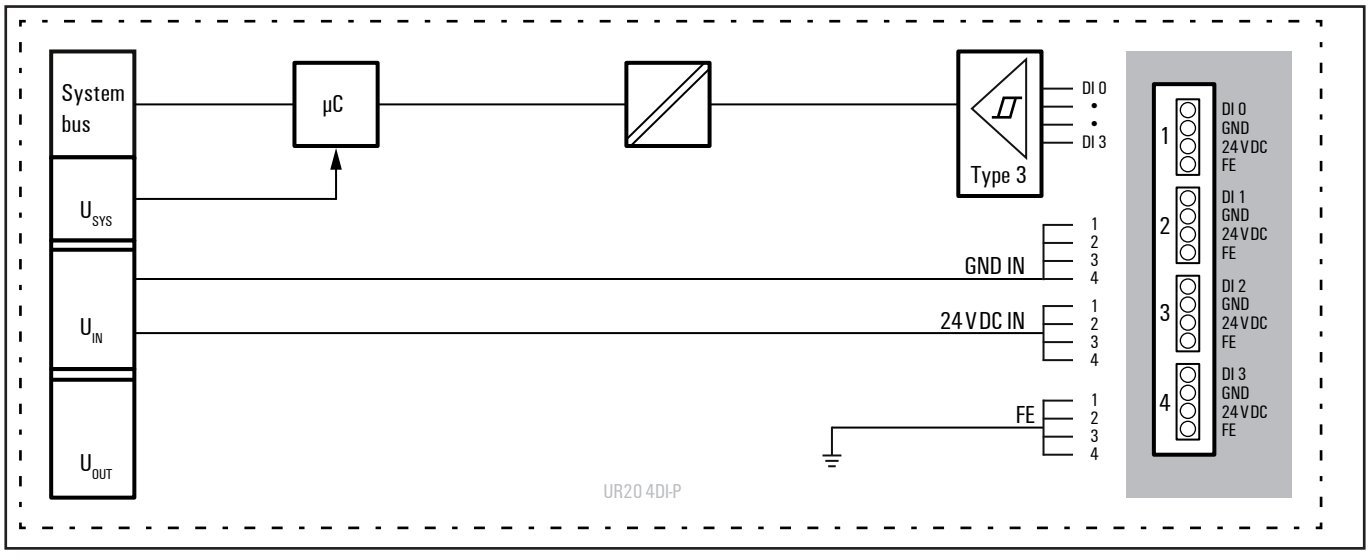
Connection diagram UR20-4DI-P

The digital input module UR20-4DI-P can detect up to 4 binary control signals. One sensor can be connected to each connector using a 2-wire, 3-wire or 3-wire + FE connection. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
2.1	Yellow: Input 1 active
3.1	Yellow: Input 2 active
4.1	Yellow: Input 3 active

LED indicators UR20-4DI-P, error messages see Chapter 13



Block diagram UR20-4DI-P

Technical data UR20-4DI-P (Order No. 1315170000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	4
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Sensor supply	max. 2 A per plug, total max. 8 A
Sensor connection	2-wire, 3-wire, 3-wire + FE
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 10 mA + sensor supply current
General data	
Weight (operational status)	87 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-4DI-P

Channel	Description	Options[1)]	Default
0 ... 3	Input delay	no (0) / 0,3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

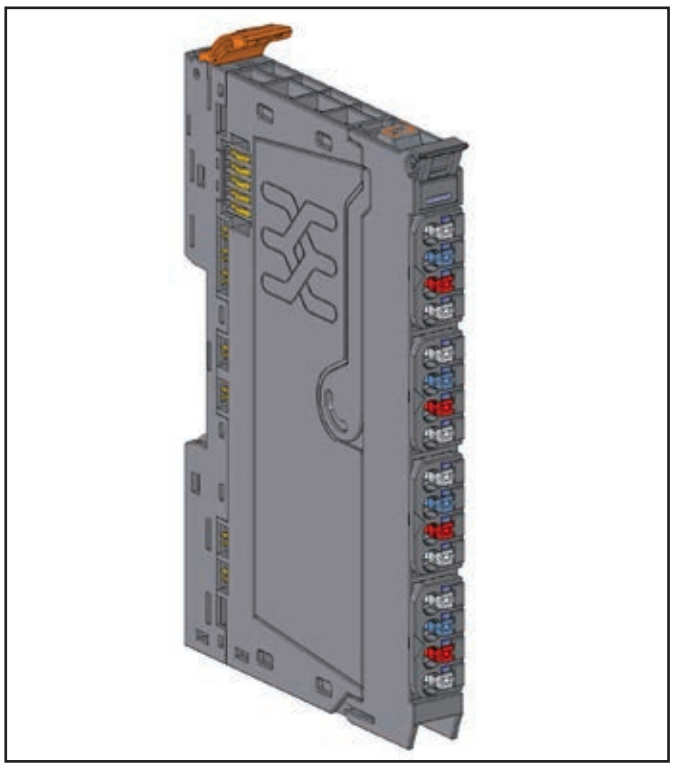
Diagnostic data UR20-4DI-P

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

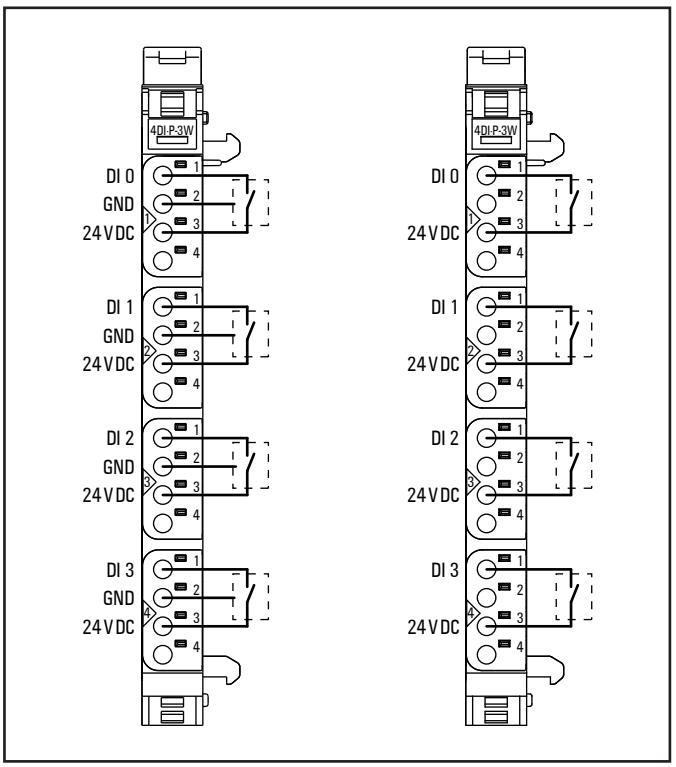
Process data inputs UR20-4DI-P

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	Reserved
	IX0.5	Reserved
	IX0.6	Reserved
	IX0.7	Reserved

6.2 Digital input module UR20-4DI-P-3W



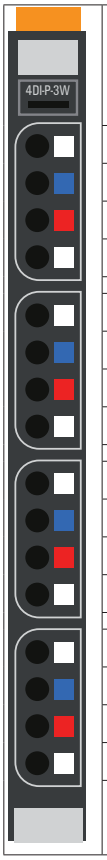
Digital input module UR20-4DI-P-3W (Order No. 2009360000)



Connection diagram UR20-4DI-P-3W

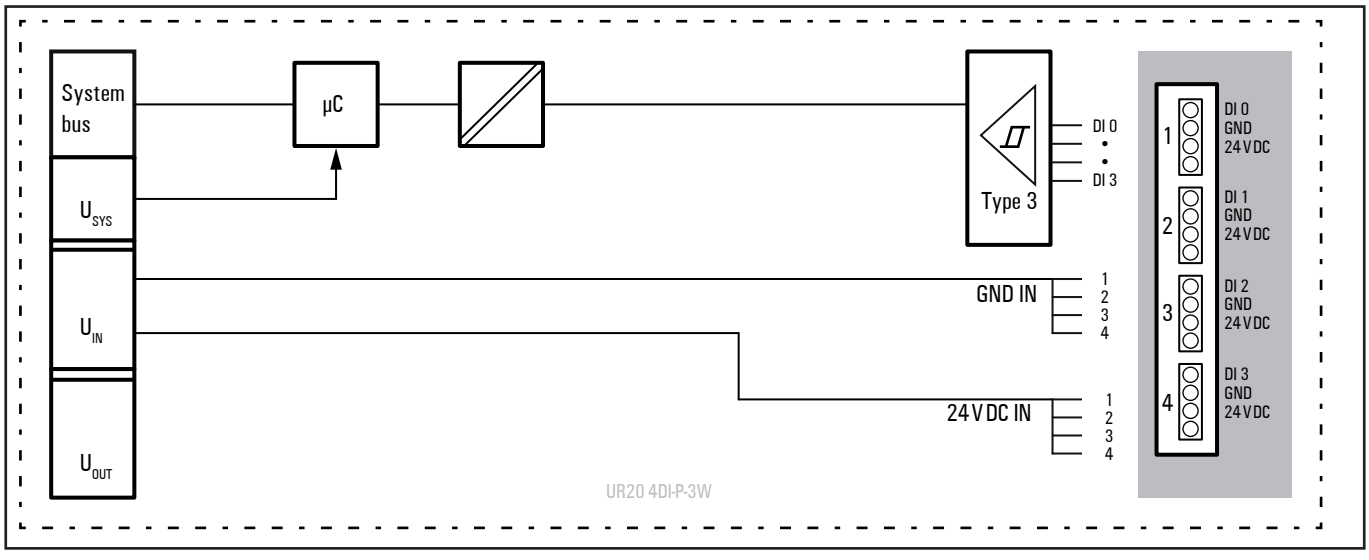
The digital input module UR20-4DI-P-3W can detect up to 4 binary control signals. One sensor can be connected to each connector using a 2-wire, 3-wire connection. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

The not connected fourth pin may only be used for signals from the same circuit like the other signals of this plug.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
2.1	Yellow: Input 1 active
3.1	Yellow: Input 2 active
4.1	Yellow: Input 3 active

LED indicators UR20-4DI-P-3W, error messages see Chapter 13



Block diagram UR20-4DI-P

Technical data UR20-4DI-P-3W (Order No. 2009360000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	4
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Sensor supply	max. 2 A per plug, total max. 8 A
Sensor connection	2-wire, 3-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 10 mA + sensor supply current
General data	
Weight (operational status)	87 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-4DI-P-3W

Channel	Description	Options[1)]	Default
0 ... 3	Input delay	no (0) / 0,3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

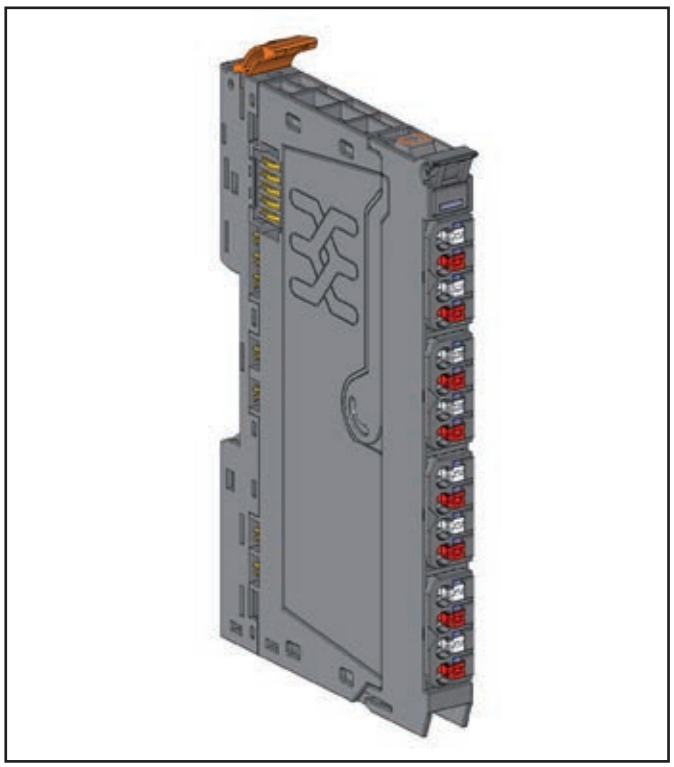
Diagnostic data UR20-4DI-P-3W

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

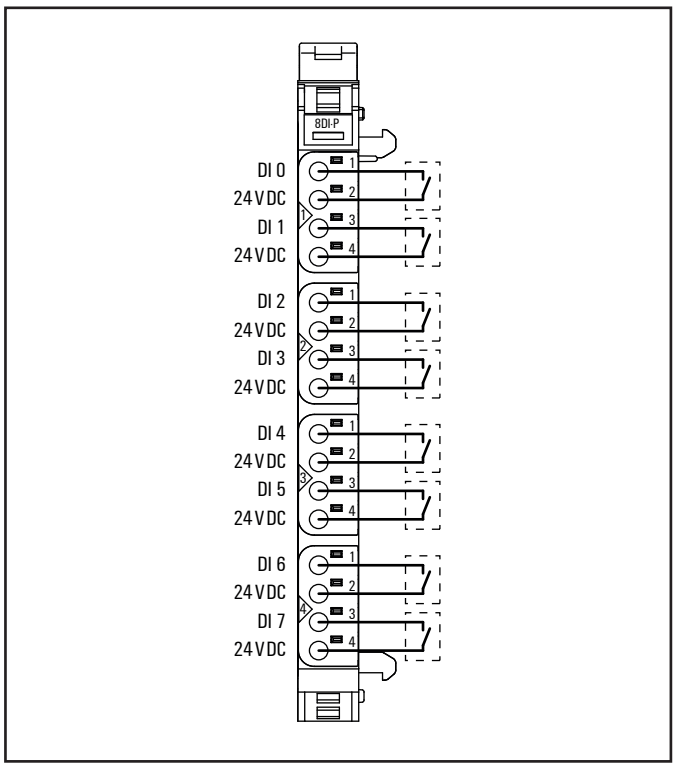
Process data inputs UR20-4DI-P-3W

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	Reserved
	IX0.5	Reserved
	IX0.6	Reserved
	IX0.7	Reserved

6.3 Digital input module UR20-8DI-P-2W

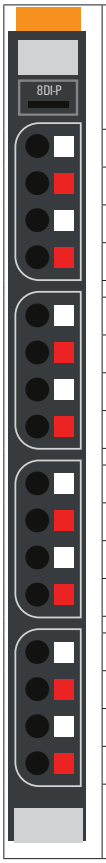


Digital input module UR20-8DI-P-2W (Best.-Nr. 1315180000)



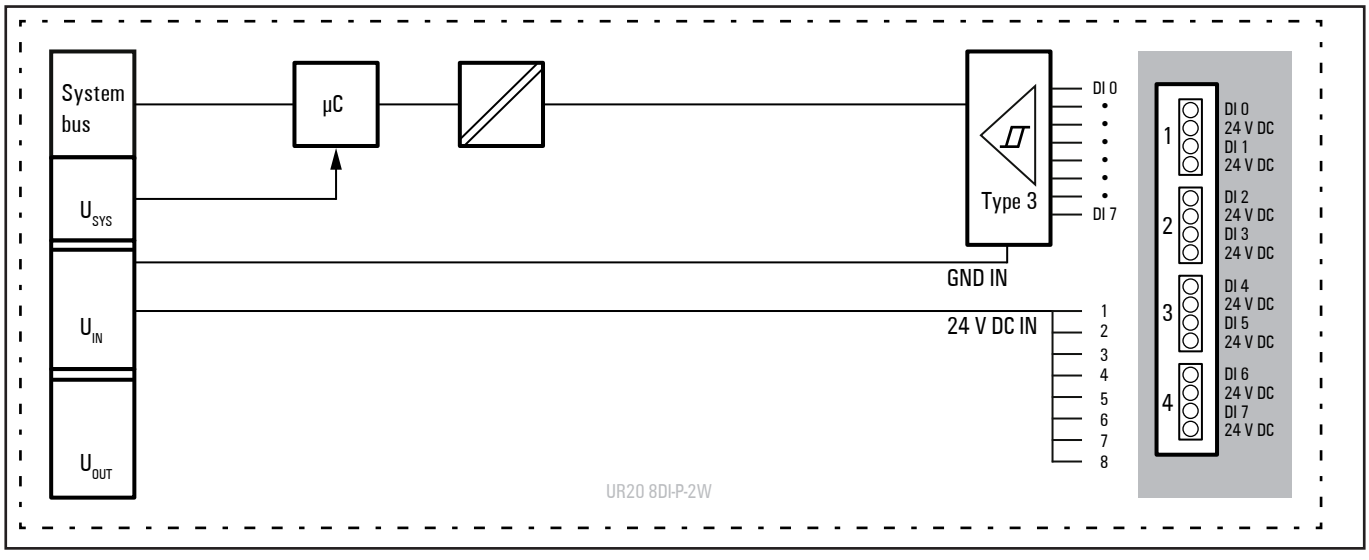
Connection diagram UR20-8DI-P-2W

The digital input module UR20-8DI-P-2W can detect up to 8 binary control signals. Two sensors can be connected to each connector using a 2-wire connection. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IIN}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.3	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.3	Yellow: Input 3 active
3.1	Yellow: Input 4 active
3.3	Yellow: Input 5 active
4.1	Yellow: Input 6 active
4.3	Yellow: Input 7 active

LED indicators UR20-8DI-P-2W, error messages see Chapter 13



Block diagram UR20-8DI-P-2W

Technical data UR20-8DI-P-2W (Best.-Nr. 1315180000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	8
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Sensor supply	max. 15 mA per channel
Sensor connection	2-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 30 mA + sensor supply current
General data	
Weight (operational status)	85 g
For additional general data, see Section 3.4	

Overview of the editable parameters UR20-8DI-P-2W

Channel	Description	Options[1)]	Default
0 ... 7	Input delay	no (0) / 0,3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

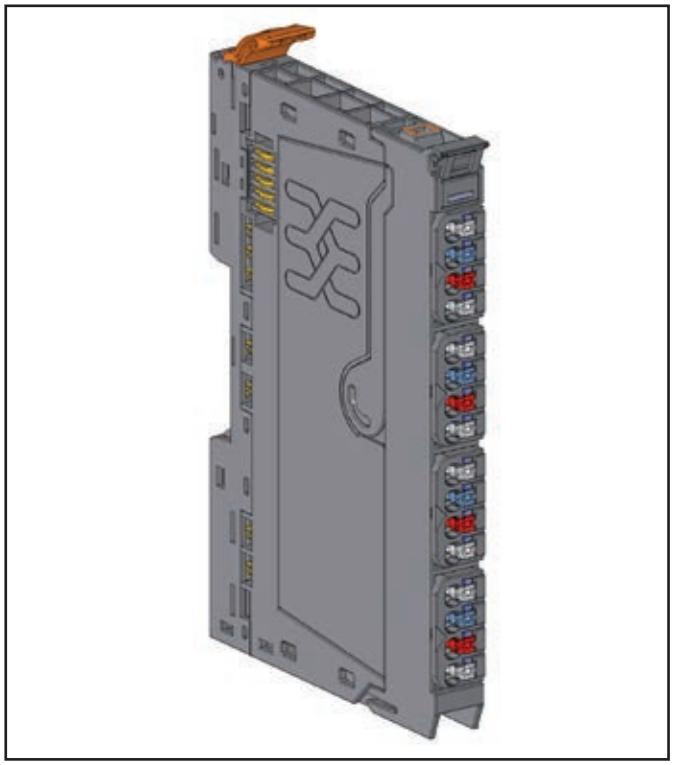
Diagnostic data UR20-8DI-P-2W

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

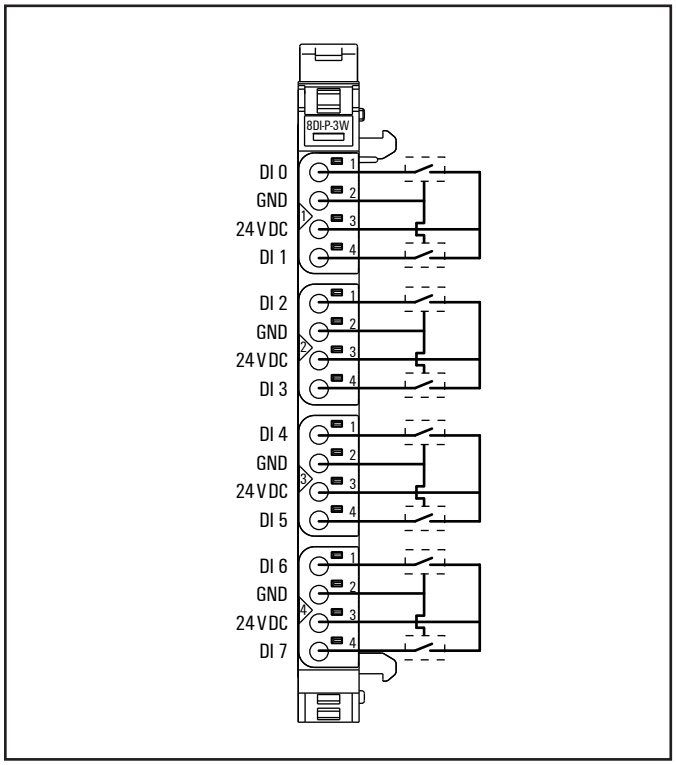
Process data inputs UR20-8DI-P-2W

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7

6.4 Digital input module UR20-8DI-P-3W

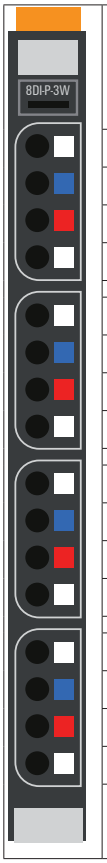


Digital input module UR20-8DI-P-3W (Order No. 1394400000)



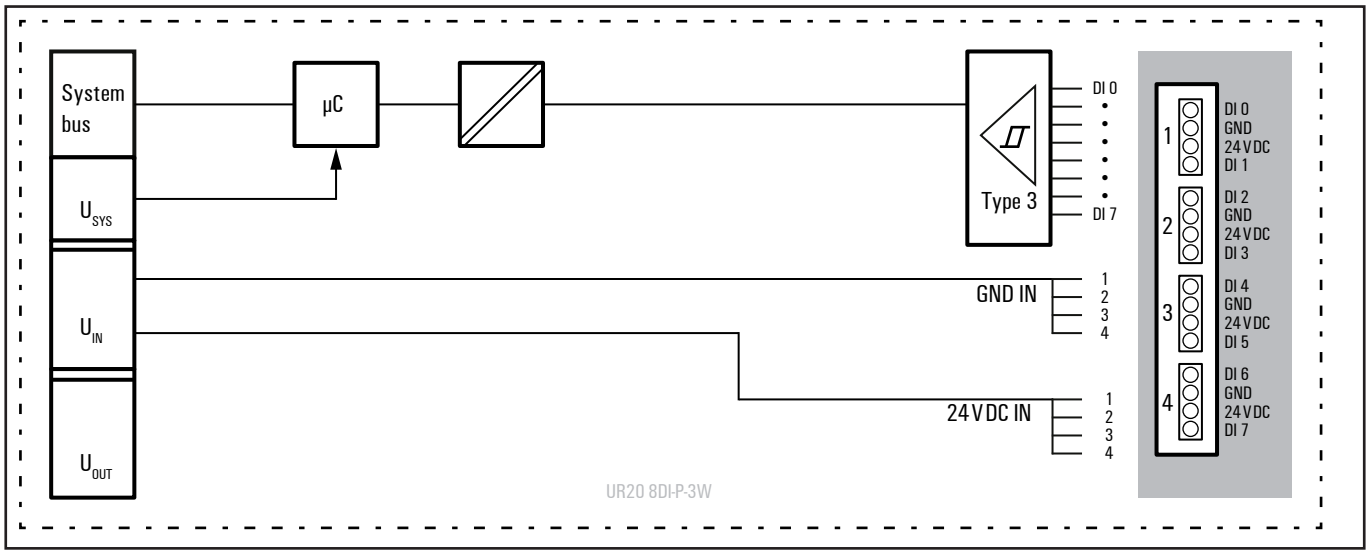
Connection diagram UR20-8DI-P-3W

The digital input module UR20-8DI-P-3W can detect up to 8 binary control signals. Two sensors can be connected to each connector using a 2-wire or 3-wire connection. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IIN}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.4	Yellow: Input 3 active
3.1	Yellow: Input 4 active
3.4	Yellow: Input 5 active
4.1	Yellow: Input 6 active
4.4	Yellow: Input 7 active

LED indicators UR20-8DI-P-3W, error messages see Chapter 13



Block diagram UR20-8DI-P-3 W

Technical data UR20-8DI-P-3W (Order No. 1394400000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	8
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PFORIBUS-DP to 20 ms)
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Sensor supply	max. 2 A per plug, total max. 8 A
Sensor connection	2-wire, 3-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 30 mA + sensor supply current
General data	
Weight (operational status)	83 g
For additional general data, see Section 3.4	

Overview of the editable parameters UR20-8DI-P-3W

Channel	Description	Options[1)]	Default
0 ... 7	Input delay	no (0) / 0,3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-8DI-P-3W

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

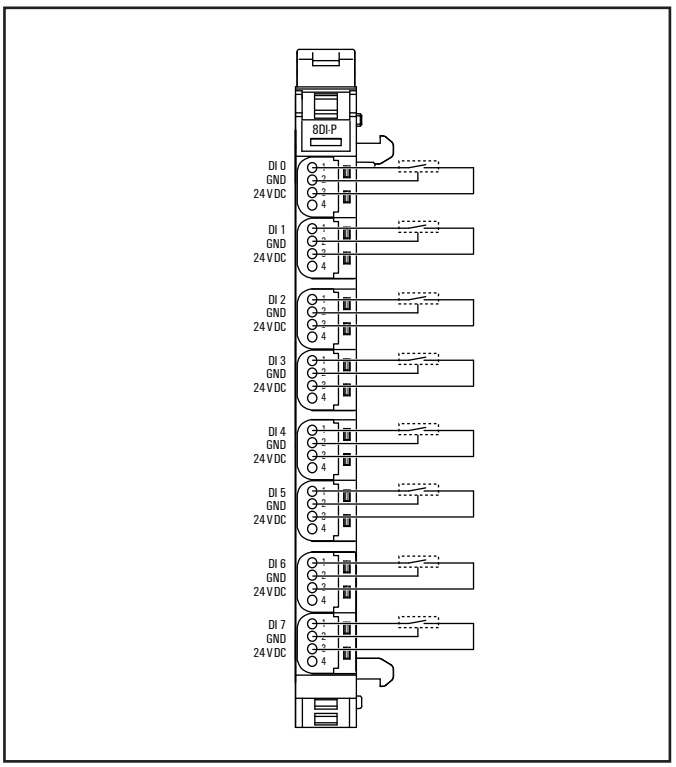
Process data inputs UR20-8DI-P-3W

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7

6.5 Digital input module UR20-8DI-P-3W-HD



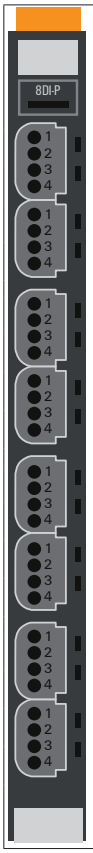
Digital input module UR20-8DI-P-3W-HD (Order No. 1315190000)



Connection diagram UR20-8DI-P-3W-HD

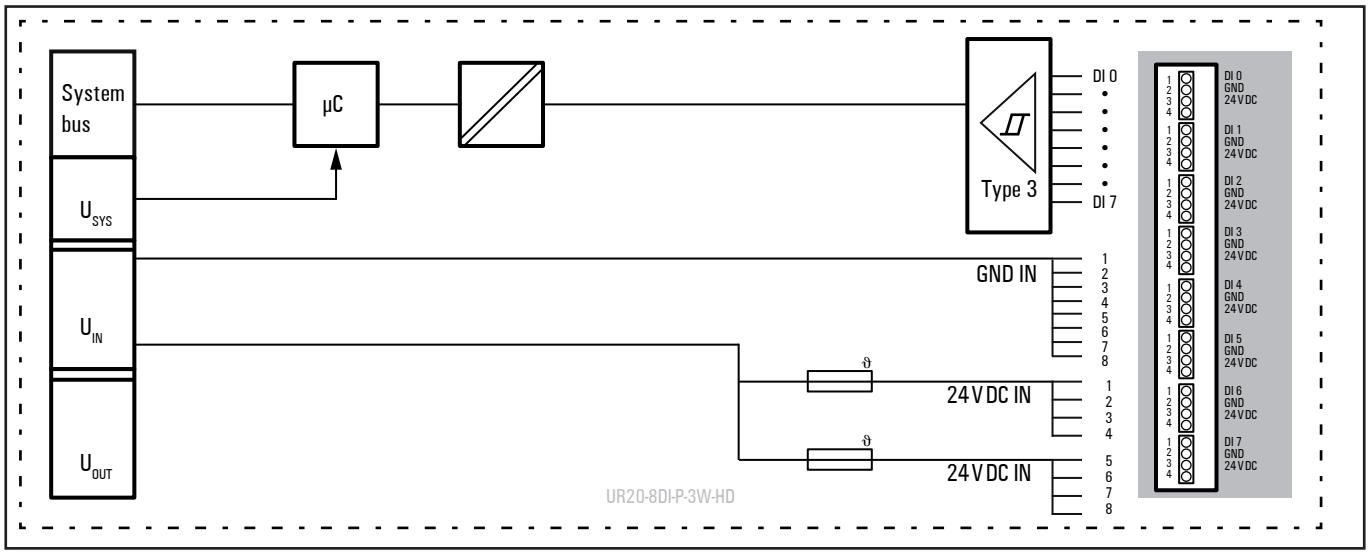
The digital input module UR20-8DI-P-3W-HD can detect up to 8 binary control signals. One sensor can be connected to each connector using a 2-wire or 3-wire connection (IDC). A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IIN}).

The not connected fourth pin may only be used for signals from the same circuit like the other signals of this plug.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
2.1	Yellow: Input 1 active
3.1	Yellow: Input 2 active
4.1	Yellow: Input 3 active
5.1	Yellow: Input 4 active
6.1	Yellow: Input 5 active
7.1	Yellow: Input 6 active
8.1	Yellow: Input 7 active

LED indicators UR20-8DI-P-3W-HD, error messages see Chapter 13



Block diagram UR20-8DI-P-3W-HD

Technical data UR20-8DI-P-3W-HD (Order No. 1315190000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	8
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Sensor supply	max. 125 mA per channel; both channel 0 … 3 and 4 … 7 respectively are fused combined
Sensor connection	2-wire, 3-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 30 mA + sensor supply current
General data	
Weight (operational status)	85 g
For additional general data, see Section 3.4	

Overview of the editable parameters UR20-8DI-P-3W-HD

Channel	Description	Options[1)]	Default
0 … 7	Input delay	no (0) / 0,3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-8DI-P-3W-HD

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 - 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		time stamp [µs] (32bit)	

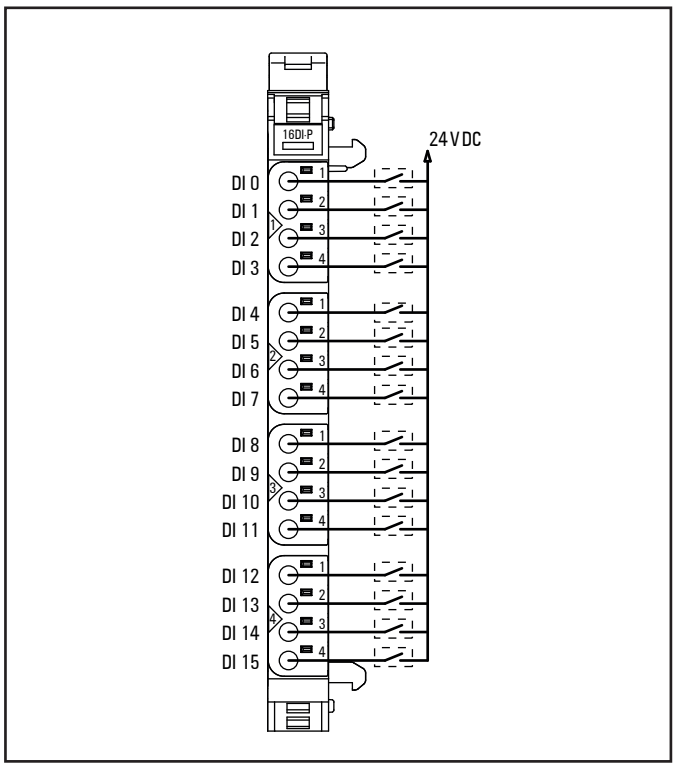
Process data inputs UR20-8DI-P-3W-HD

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7

6.6 Digital input module UR20-16DI-P

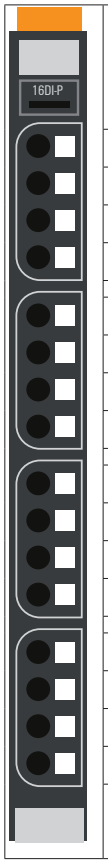


Digital input module UR20-16DI-P (Order No. 1315200000)



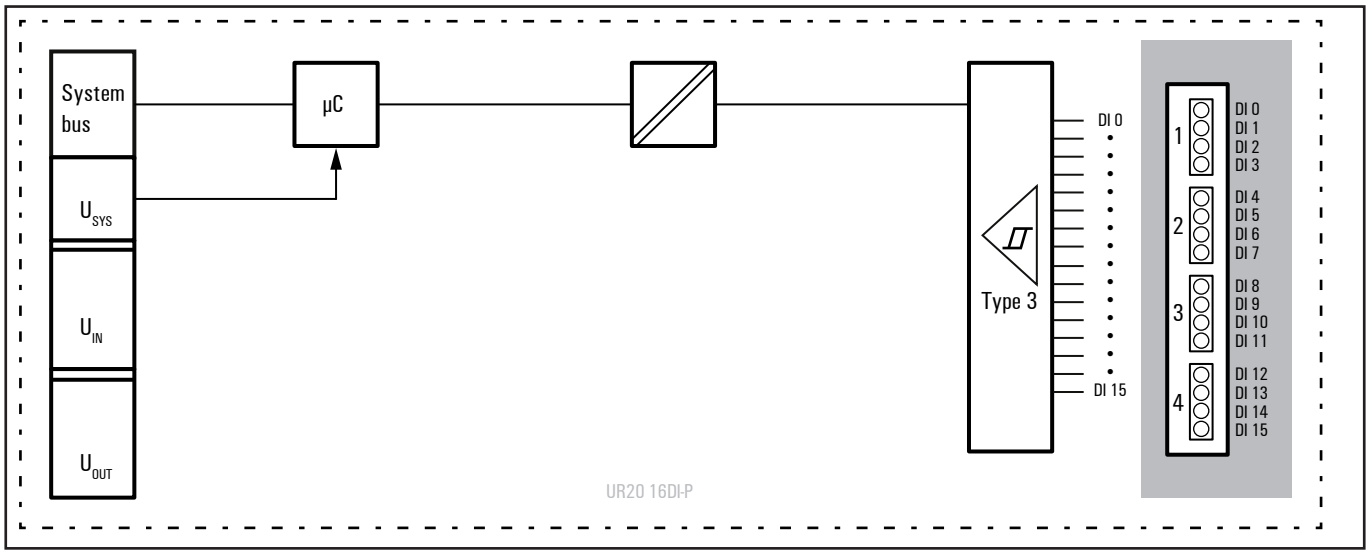
Connection diagram UR20-16DI-P

The UR20-16DI-P digital input module can detect up to 16 binary control signals. Four sensors can be connected to each connector in a 1-wire connection. A status LED is assigned to each channel. The connected sensors must be supplied with power from the input curent path I_{IN} (e.g. with potential distribution modules).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.2	Yellow: Input 1 active
1.3	Yellow: Input 2 active
1.4	Yellow: Input 3 active
2.1	Yellow: Input 4 active
2.2	Yellow: Input 5 active
2.3	Yellow: Input 6 active
2.3	Yellow: Input 7 active
3.1	Yellow: Input 8 active
3.2	Yellow: Input 9 active
3.3	Yellow: Input 10 active
3.4	Yellow: Input 11 active
4.1	Yellow: Input 12 active
4.2	Yellow: Input 13 active
4.3	Yellow: Input 14 active
4.4	Yellow: Input 15 active

LED indicators UR20-16DI-P, error messages see Chapter 13



Block diagram UR20-16DI-P

Technical data UR20-16DI-P (Order No. 1315200000)

System data	
Data	Process and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	16
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay 3 ms
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Sensor supply	no
Sensor connection	1-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 25 mA
General data	
Weight (operational status)	87 g
For additional general data, see Section 3.4	

Diagnostic data UR20-16DI-P

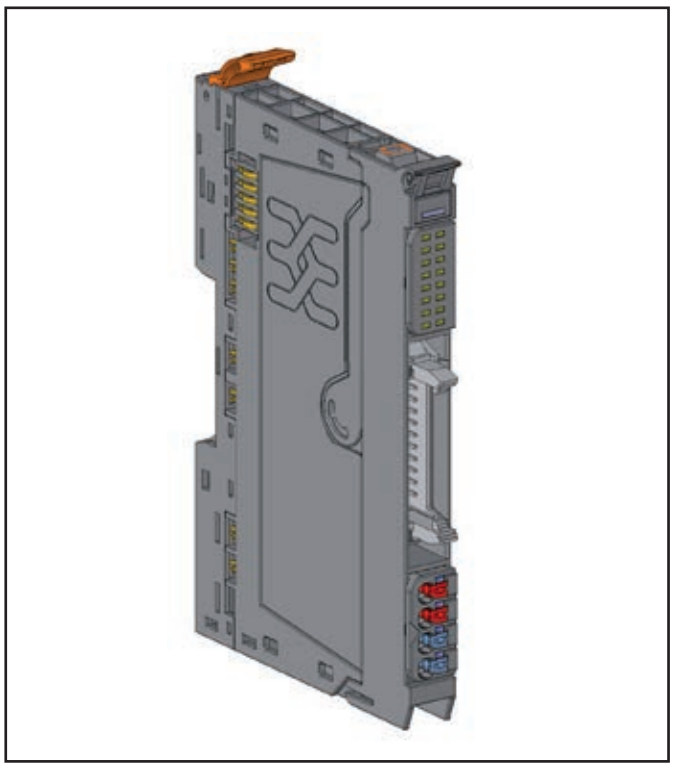
Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 – 7	Reserved	0
Error byte 3	3	0 – 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 … 7	Reserved	0
Channel type	4	0 – 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 – 10	0 – 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 – 7	Reserved	0
Time stamp	43 – 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-16DI-P

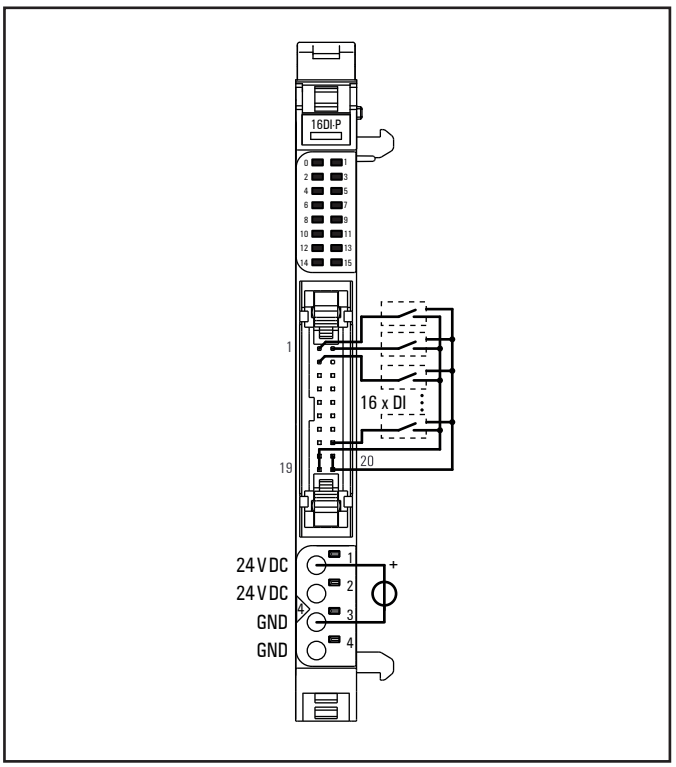
Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7
IB1	IX1.0	DI8
	IX1.1	DI9
	IX1.2	DI10
	IX1.3	DI11
	IX1.4	DI12
	IX1.5	DI13
	IX1.6	DI14
	IX1.7	DI15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.7 Digital input module UR20-16DI-P-PLC-INT



Digital input module UR20-16DI-P-PLC-INT (Order No. 1315210000)

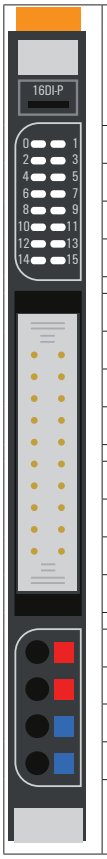


Connection diagram UR20-16DI-P-PLC-INT

The UR20-16DI-P-PLC-INT digital input module can detect up to 16 binary control signals. The sensors are connected via a standard PLC connection (20-pole). A status LED is assigned to each channel in a separate block. The module electronics can supply the sensors with power from the 4-pole feed-in plug (connector 4) via the PLC connection. Vice versa the module can be supplied via the PLC connection.

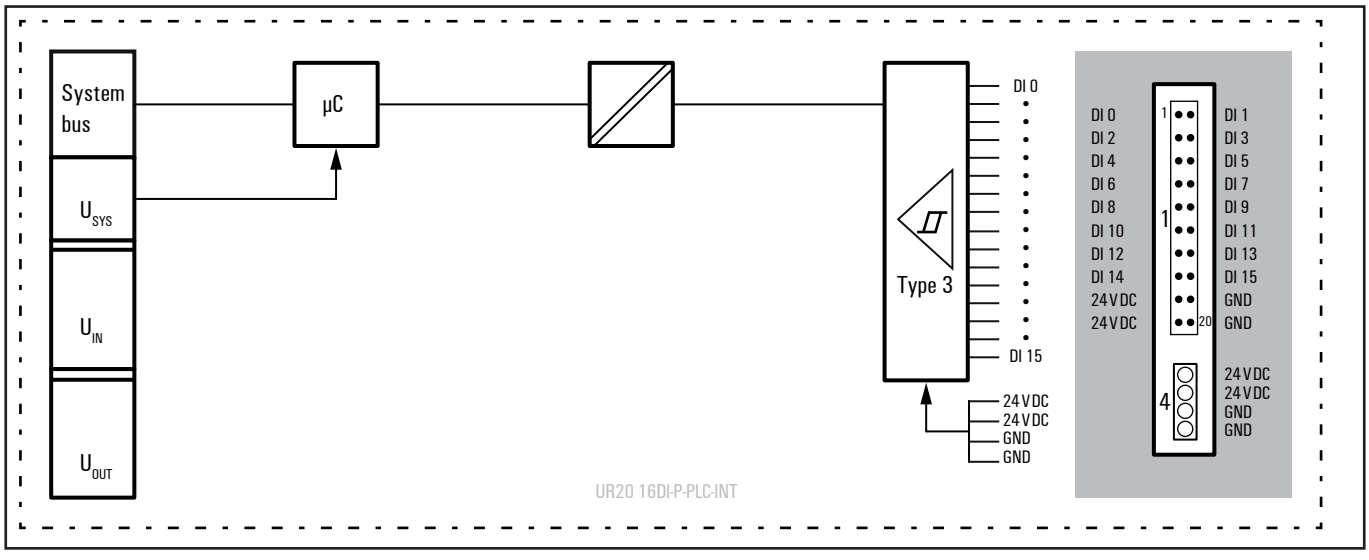
For the PLC connection, the following applies: a maximum current of 2 A (with a max. of 1 A per contact) can be taken from the +24 V connections or fed through the 0 V connections. In the case of a total current greater than 2 A, the common ground wire must be connected to the 4-pin feed-in plug (connector 4).

The power supply of the peripherals connected has to be calculated for each individual installation situation. When using a flat ribbon cable, please regard its higher internal resistance!



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
0	Yellow: Input 0 active
1	Yellow: Input 1 active
to	to
15	Yellow: Input 15 active
4.1	Green: Supply voltage feed-in plug > 18 V DC
4.2	Red: Error on the supply voltage of the feed-in plug

LED indicators UR20-16DI-P-PLC-INT, error messages see Chapter 13



Block diagram UR20-16DI-P-PLC-INT

Technical data UR20-16DI-P-PLC-INT (Order No. 1315210000)

System data	
Data	Process and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	16
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay 3 ms
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Sensor supply	External
Sensor connection	PLC interface unit
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption	< 25 mA, power supply via feed-in plug or PLC connection
General data	
Weight (operational status)	82 g
For additional general data, see Section 3.4	

Diagnostic data UR20-16DI-P-PLC-INT

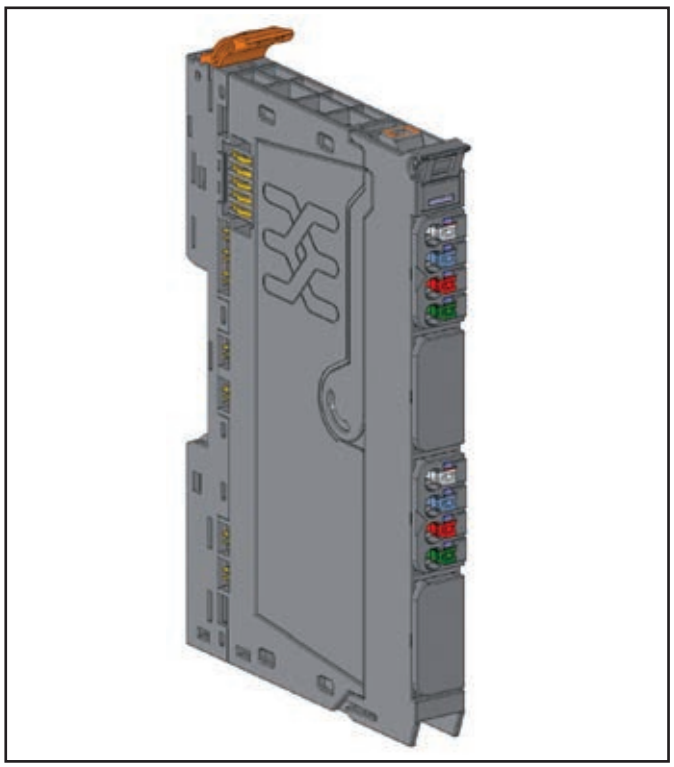
Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 – 7	Reserved	0
Error byte 3	3	0 – 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 – 7	Reserved	0
Channel type	4	0 – 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 – 10	0 – 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 – 7	Reserved	0
Time stamp	43 – 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-16DI-P-PLC-INT

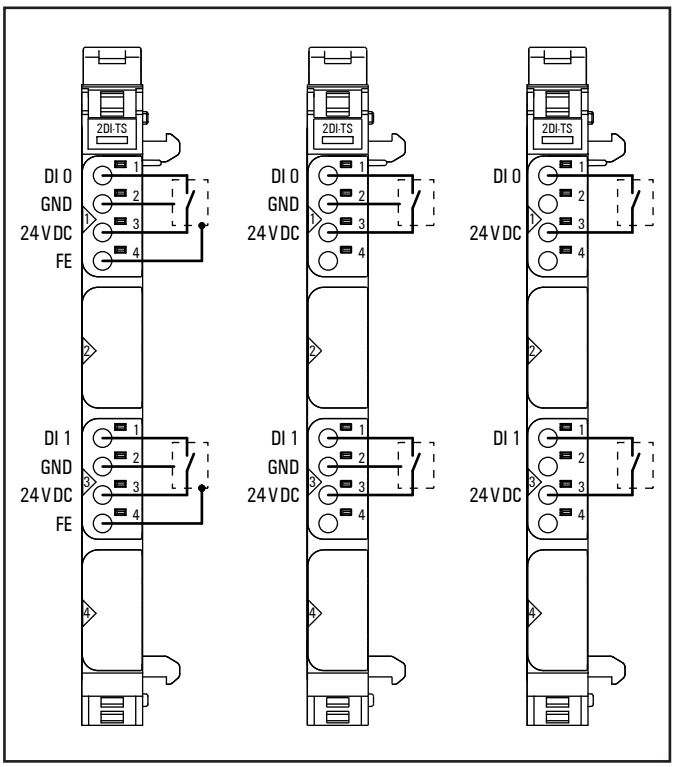
Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7
IB1	IX1.0	DI8
	IX1.1	DI9
	IX1.2	DI10
	IX1.3	DI11
	IX1.4	DI12
	IX1.5	DI13
	IX1.6	DI14
	IX1.7	DI15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.8 Digital input module with time stamp UR20-2DI-P-TS



Digital input module UR20-2DI-P-TS (Order No. 1460140000)



Connection diagram UR20-2DI-P-TS

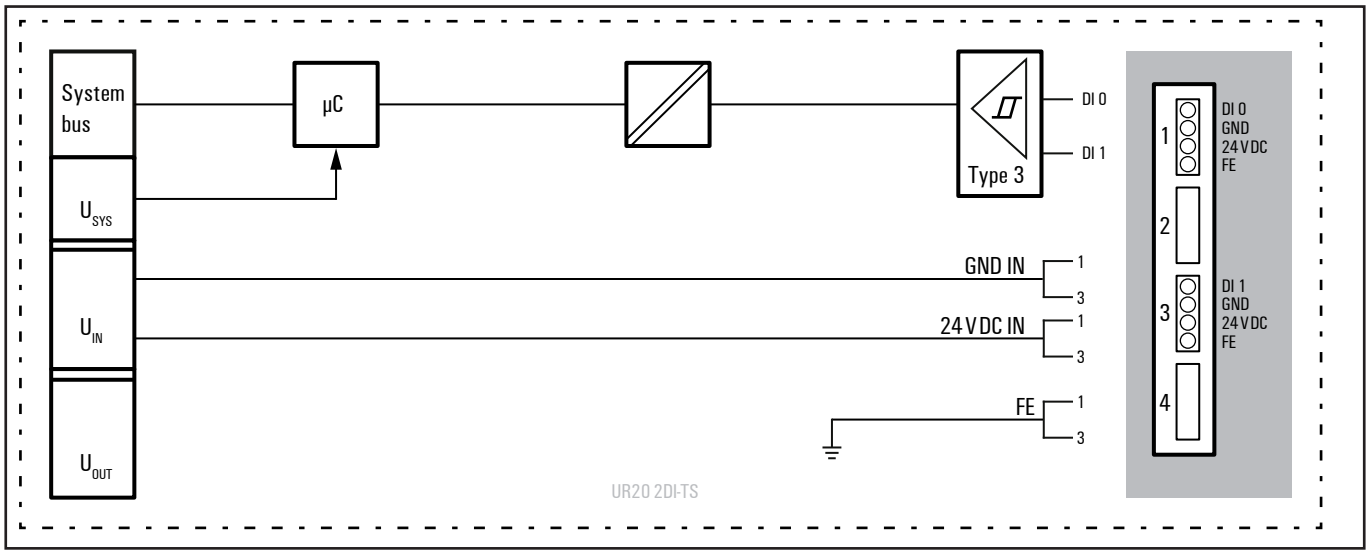
The digital input module with a time stamping function UR20-2DI-P-TS can detect up to 2 binary control signals and provide them with a time stamp (resolution 1 µs). Depending on the configuration of the module, up to 5 or 15 time stamp entries can be evaluated.

One sensor can be connected to each connector using a 2-wire, 3-wire or 3-wire connection + FE. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
3.1	Yellow: Input 1 active

LED indicators UR20-2DI-P-TS, error messages see Chapter 13



Block diagram UR20-2DI-P-TS

Technical data UR20-2DI-P-TS (Order No. 1460140000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	2
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Max. input current per channel	3 mA
Sensor supply	yes
Sensor connection	2-wire, 3-wire, 3-wire + FE
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Time stamp data width	16 bits
Time stamp resolution	1 µs
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	10 mA + sensor supply current
General data	
Weight (operational status)	83 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-2DI-P-TS

Channel	Description	Options[1)]	Default
0 ... 1	Input delay	no (0) / 0,3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms
0 ... 1	TimeStamp at edge 0-1	disabled (0) / enabled (1)	disabled
0 ... 1	TimeStamp at edge 1-0	disabled (0) / enabled (1)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-2DI-P-TS

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 – 7	Reserved	0
Error byte 3	3	0 – 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 – 7	Reserved	0
Channel type	4	0 – 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	2
Channel error	7 – 10	0 – 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 – 7	Reserved	0
Time stamp	43 – 46		time stamp [µs] (32 bit)	

Process data[1)] inputs UR20-2DI-P-TS

Byte	Format	Name	Remark
IB0	Byte	Input image 1	Bit0 = DI0 ... Bit1 = DI1, Bit2 ... 7 reserved
IB1	Byte	Running number 1	0 ... 127 rotating
IB2	Wort	Time stamp 1	0 ... 65535 µs rotating
IB3			
IB4	Byte	Input image 2	
IB5	Byte	Running number 2	
IB6	Wort	Time stamp 2	
IB7			
IB8	Byte	Input image 3	
IB9	Byte	Running number 3	
IB10	Wort	Time stamp 3	
IB11			
...	...	...	
IB56	Byte	Input image 15	
IB57	Byte	Running number 15	
IB58	Wort	Time stamp 15	
IB59			

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Time stamp function

With time stamp function (ETS = edge time stamp) enabled, at every corresponding edge the time value of the timer is stored in the process image as an ETS entry together with the status of the inputs and a running number.

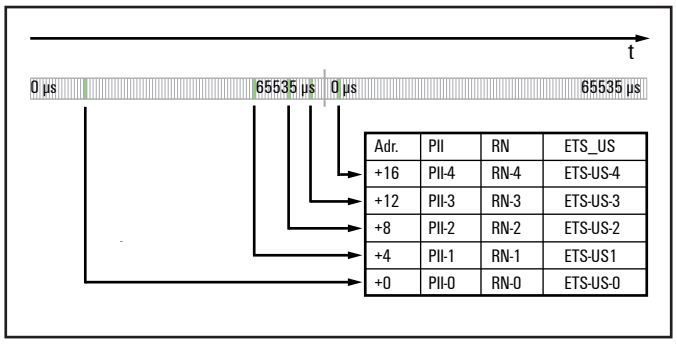
The module does not use any bytes in the output range. It uses 60 Bytes in the input range for 15 ETS entries each with 4 bytes.

Structure of an ETS entry

Input image PII
After the edge transition, the status of the inputs is stored here. The input byte has the following bit assignments:
Bit 0: DI 0
Bit 1: DI 1
Bit 2 ... 7: reserved (0)

Running Nummer RN
The RN (running number) is a consecutive number from 0 to 127. It describes the chronological sequence of the edges.

Time stamp ETS_US
The 16-bit timer (0 ... 65535µs) in the u-remote module is started as soon as the power supply ist switched on and after (2^{16}-1) µs restarts at 0.



Structure of the ETS entries in the input range in chronological order.

Example for the mode of operation

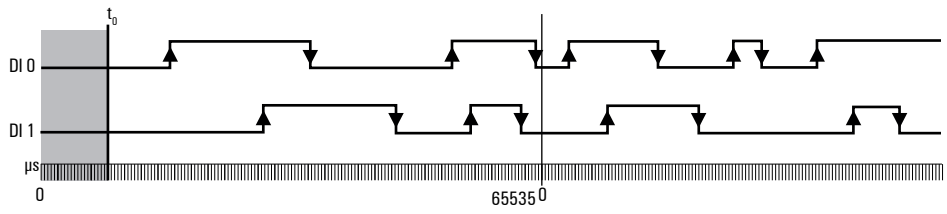
The following example shows the sequence in which ETS entries are stored. The input channels are predefined as follows:

DI 0 and DI 1: time stamp at edge 0-1 enabled
DI 0 and DI 1: time stamp at edge 1-0 enabled

The ETS entries available at time "t" are designated by the green area in the diagram. ETS entries that are not (or no longer) available have a grey background

New ETS entries are always entered starting at address + 0 and already existing ETS entries are each shifted by 4 bytes.

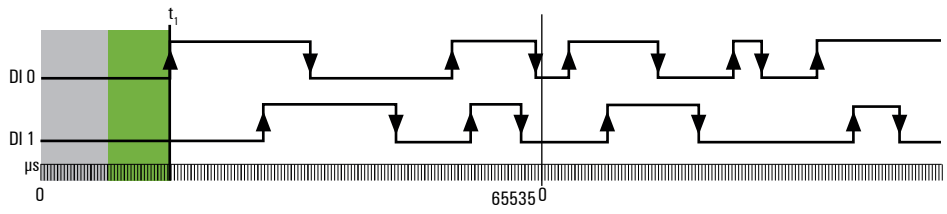
Process image is empty at t_0



Address	PII	RN	ETS_US
+0			
+4			
+8			
+12			
+16			

1st ETS entry at t_1

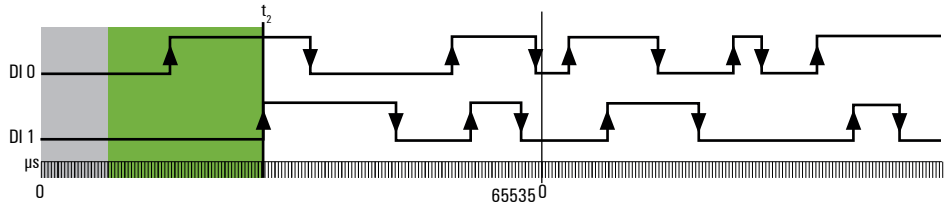
A rising 0-1 edge on DI 0 causes the 1st ETS entry at address + 0.



Address	PII	RN	ETS_US
+0	00000001	0	16875
+4			
+8			
+12			
+16			

2nd ETS entry at t_2

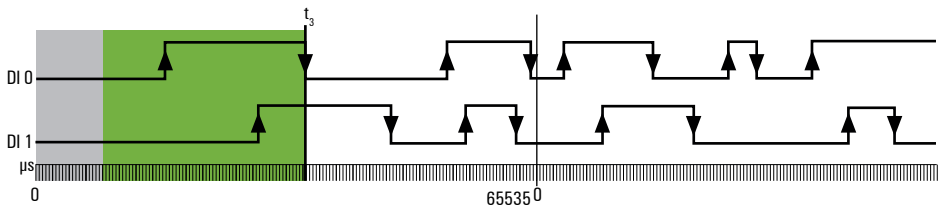
A rising 0-1 edge on DI 1 causes the 2nd ETS entry at address + 0. The 1st ETS entry is shifted by 4 bytes.



Address	PII	RN	ETS_US
+0	00000011	1	28344
+4	00000001	0	16875
+8			
+12			
+16			

3rd ETS entry at t_3

A falling 1-0 edge on DI 0 causes the 3rd ETS entry.

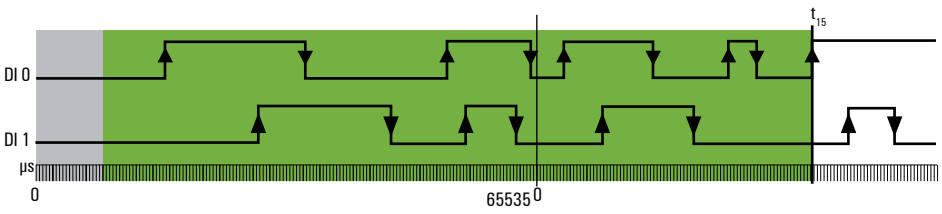


Address	PII	RN	ETS_US
+0	00000010	2	43194
+4	00000011	1	28344
+8	00000001	0	16875
+12			
+16			

... 4th to14th ETS entry ...

15. ETS entry at t_{15}

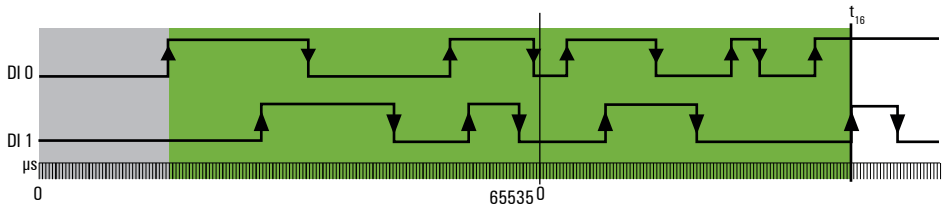
A rising 0-1 edge on DI 0 causes the15th ETS entry.



Address	PII	RN	ETS_US
+0	00000001	14	35717
+4	00000000	13	28344
+8	00000001	12	24576
+12	00000000	11	19988
+16	00000010	10	14745
+20	00000011	9	8192
+24	00000001	8	3277
+28	00000000	7	63896
+32	00000010	6	62422
+36	00000011	5	55869
+40	00000001	4	53247
+44	00000000	3	45875
+48	00000010	2	43194
+52	00000011	1	28344
+56	00000001	0	16875

16th ETS entry at t_{16}

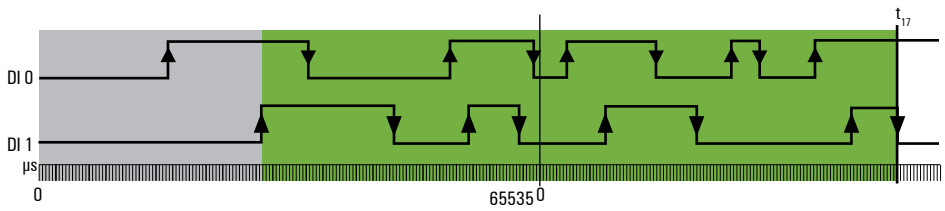
A rising 0-1 edge on DI 1 causes the16th ETS entry. The 1st ETS entry is deleted and not available anymore.



Address	PII	RN	ETS_US
+0	00000011	15	37683
+4	00000001	14	35717
+8	00000000	13	28344
+12	00000001	12	24576
+16	00000000	11	19988
+20	00000010	10	14745
+24	00000011	9	8192
+28	00000001	8	3277
+32	00000000	7	63896
+36	00000010	6	62422
+40	00000011	5	55869
+44	00000001	4	53247
+48	00000000	3	45875
+52	00000010	2	43194
+56	00000011	1	28344
	00000001	0	16875

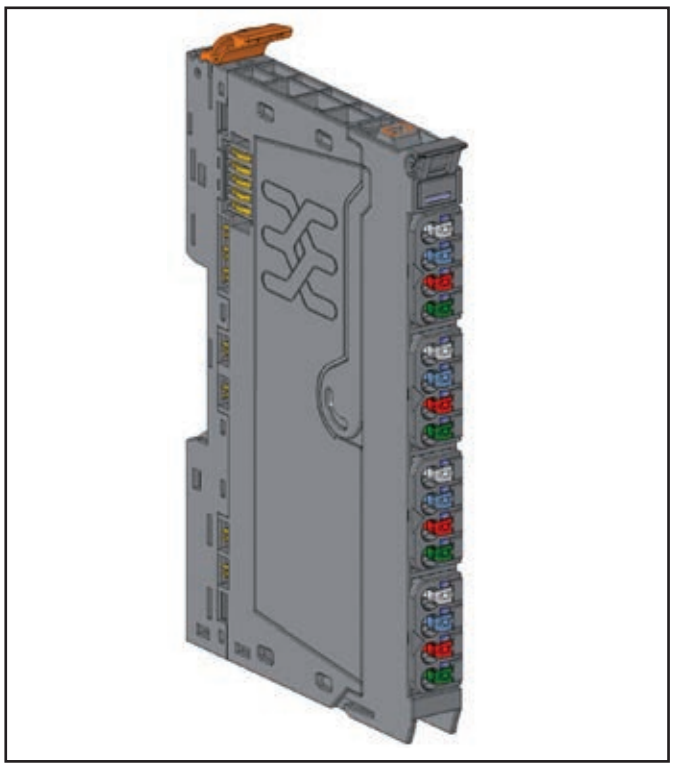
17. ETS entry at t_{17}

A falling 1-0 edge on DI 1 causes the17th ETS entry. The 2nd ETS entry is deleted and not available anymore.

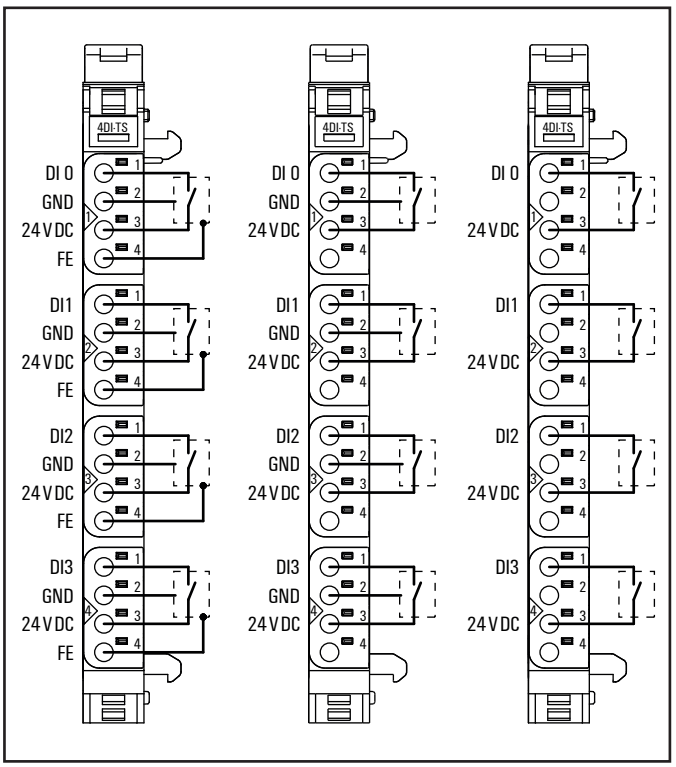


Address	PII	RN	ETS_US
+0	00000001	16	44236
+4	00000011	15	37683
+8	00000001	14	35717
+12	00000000	13	28344
+16	00000001	12	24576
+20	00000000	11	19988
+24	00000010	10	14745
+28	00000011	9	8192
+32	00000001	8	3277
+36	00000000	7	63896
+40	00000010	6	62422
+44	00000011	5	55869
+48	00000001	4	53247
+52	00000000	3	45875
+56	00000010	2	43194
	00000011	1	28344
	00000001	0	16875

6.9 Digital input module with time stamp UR20-4DI-P-TS



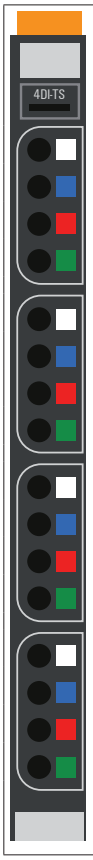
Digital input module UR20-4DI-P-TS (Order No. 1460150000)



Connection diagram UR20-4DI-P-TS

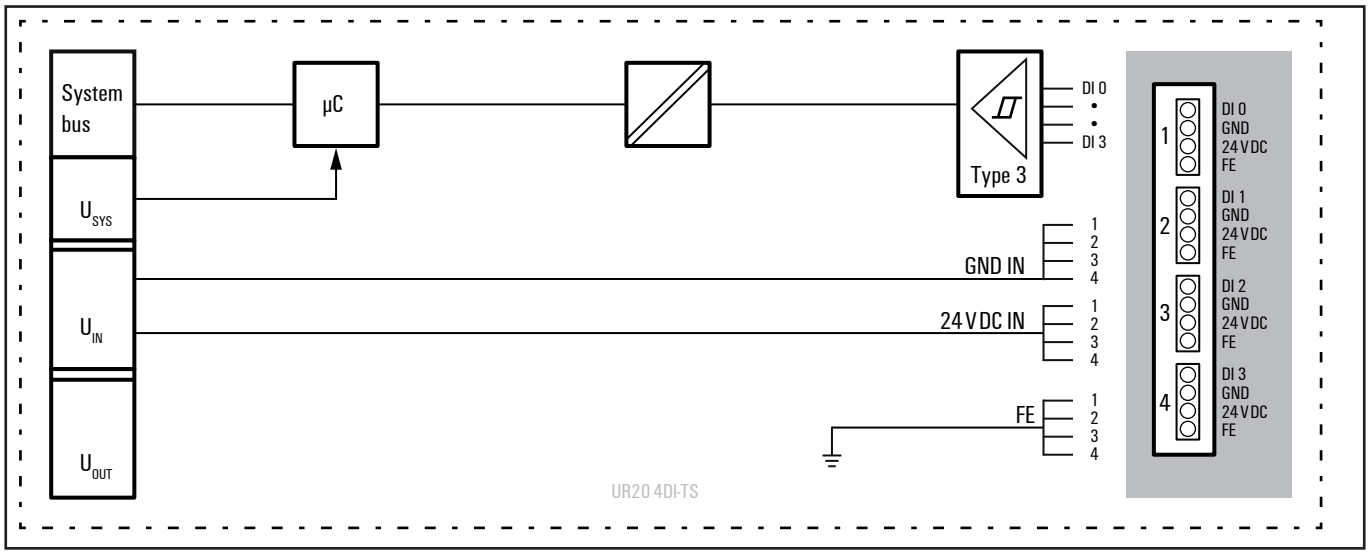
The digital input module with time stamp functionality UR20-4DI-P-TS can detect up to 4 binary control signals and provide them with a time stamp (resolution 1 µs). Depending on the configuration of the module, up to 5 or 15 time stamp entries can be evaluated.

One sensor can be connected to each connector using a 2-wire, 3-wire or 3-wire connection + FE. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).



	Module status LED Green: Communication on system bus Red: No communication on system bus or there is a diagnostic message displayed
1.1	Yellow: Input 0 active
2.1	Yellow: Input 1 active
3.1	Yellow: Input 1 active
4.1	Yellow: Input 1 active

LED indicators UR20-4DI-P-TS, error messages see Chapter 13



Block diagram UR20-4DI-P-TS

Technical data UR20-4DI-P-TS (Order No. 1460150000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	4
Input type	P-switching, for Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	< + 5 V referred to 0 V of the input power supply U_{IN}
High input voltage	> + 11 V referred to 0 V of the input power supply U_{IN}
Max. input current per channel	3 mA
Sensor supply	yes
Sensor connection	2-wire, 3-wire, 3-wire + FE
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Time stamp data width	16 bits
Time stamp resolution	1 µs
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	10 mA + sensor supply current
General data	
Weight (operational status)	87 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-4DI-P-TS

Channel	Description	Options[1)]	Default
0 ... 3	Input delay	no (0) / 0,3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms
0 ... 3	TimeStamp at edge 0-1	disabled (0) / enabled (1)	disabled
0 ... 3	TimeStamp at edge 1-0	disabled (0) / enabled (1)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4DI-P-TS

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 - 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-4DI-P-TS

Byte	Format	Name	Remark
IB0	Byte	Input image 1	Bit0 = DI0 ... Bit3 = DI3, Bit4 ... 7 reserved
IB1	Byte	Running number 1	0 ... 127 rotating
IB2	Wort	Time stamp 1	0 ... 65535 µs rotating
IB3			
IB4	Byte	Input image 2	
IB5	Byte	Running number 2	
IB6	Wort	Time stamp 2	
IB7			
IB8	Byte	Input image 3	
IB9	Byte	Running number 3	
IB10	Wort	Time stamp 3	
IB11			
...	...	...	
IB56	Byte	Input image 15	
IB57	Byte	Running number 15	
IB58	Wort	Time stamp 15	
IB59			

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Time stamp function

With time stamp function (ETS = edge time stamp) enabled, at every corresponding edge the time value of the timer is stored in the process image as an ETS entry together with the status of the inputs and a running number.

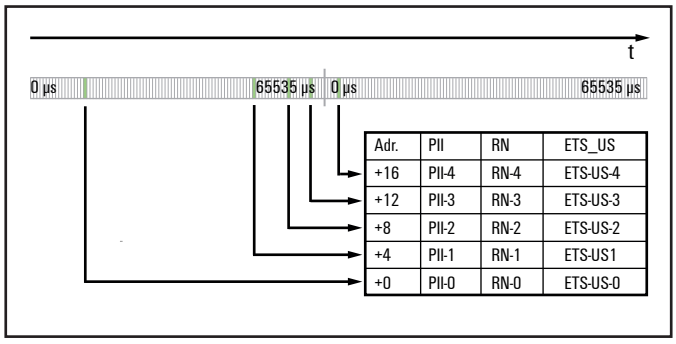
The module does not use any bytes in the output range. It uses 60 Bytes in the input range for 15 ETS entries each with 4 bytes.

Structure of an ETS entry

Input image PII After the edge transition, the status of the inputs is stored here. The input byte has the following bit assignments:
Bit 0: DI 0
Bit 1: DI 1
Bit 2: DI 2
Bit 3: DI 3
Bit 4 ... 7: reserved (0)

Running Number RN The RN (running number) is a consecutive number from 0 to 127. It describes the chronological sequence of the edges

Time stamp ETS_US The 16-bit timer (0 ... 65535µs) in the u-remote module is started as soon as the power supply is switched on and after (2^{16}-1) µs restarts at 0.



Structure of the ETS entries in the input range in chronological order.

Example for the mode of operation

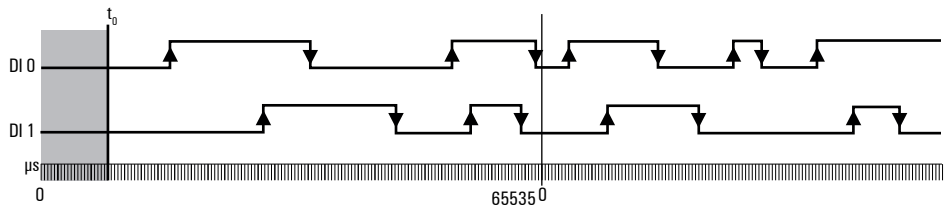
The following example shows the sequence in which ETS entries are stored. The input channels are predefined as follows:

DI 0 and DI 1: time stamp at edge 0-1 enabled
DI 2 and DI 3: time stamp at edge 0-1 disabled
DI 0 and DI 1: time stamp at edge 1-0 enabled
DI 2 and DI 3: time stamp at edge 1-0 disabled

The ETS entries available at time "t" are designated by the green area in the diagram. ETS entries that are not (or no longer) available have a grey background

New ETS entries are always entered starting at address + 0 and already existing ETS entries are each shifted by 4 bytes.

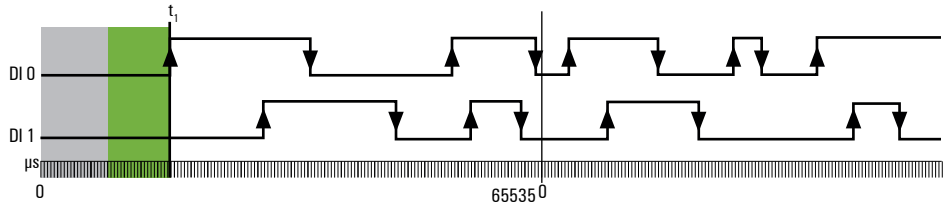
Process image is empty at t_0



Address	PII	RN	ETS_US
+0			
+4			
+8			
+12			
+16			

1st ETS entry at t_1

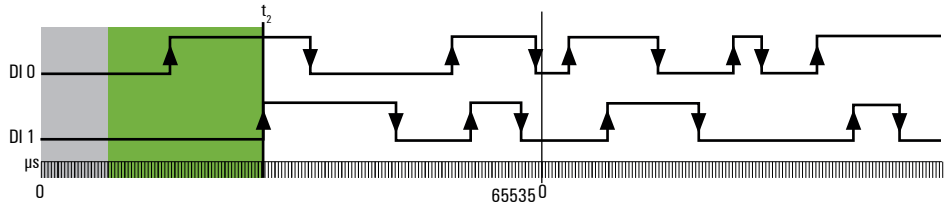
A rising 0-1 edge on DI 0 causes the 1st ETS entry at address + 0.



Address	PII	RN	ETS_US
+0	00000001	0	16875
+4			
+8			
+12			
+16			

2nd ETS entry at t_2

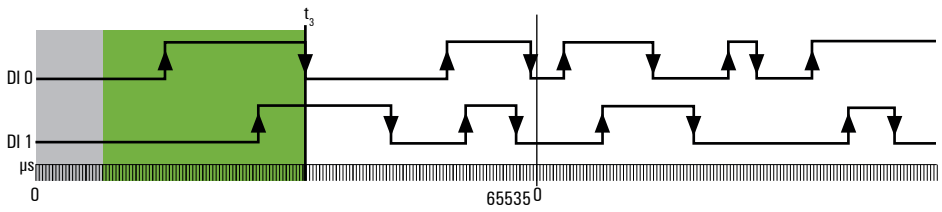
A rising 0-1 edge on DI 1 causes the 2nd ETS entry at address + 0. The 1st ETS entry is shifted by 4 bytes.



Address	PII	RN	ETS_US
+0	00000011	1	28344
+4	00000001	0	16875
+8			
+12			
+16			

3rd ETS entry at t_3

A falling 1-0 edge on DI 0 causes the 3rd ETS entry.

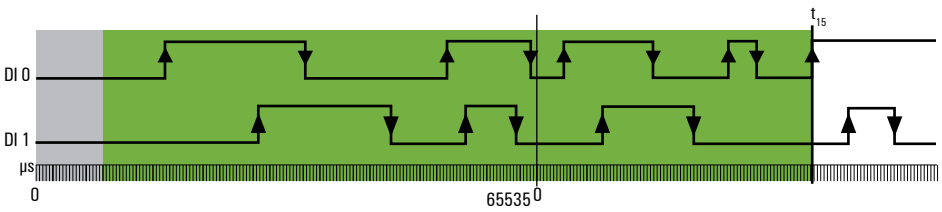


Address	PII	RN	ETS_US
+0	00000010	2	43194
+4	00000011	1	28344
+8	00000001	0	16875
+12			
+16			

... 4th to14th ETS entry ...

15. ETS entry at t_{15}

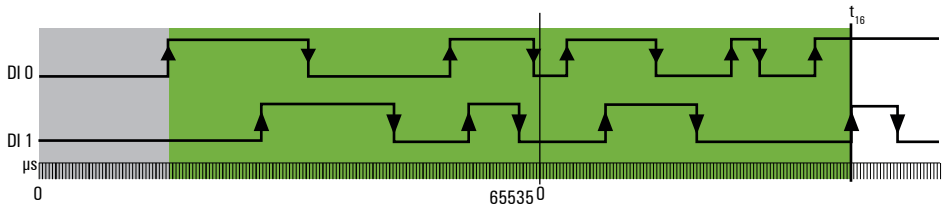
A rising 0-1 edge on DI 0 causes the15th ETS entry.



Address	PII	RN	ETS_US
+0	00000001	14	35717
+4	00000000	13	28344
+8	00000001	12	24576
+12	00000000	11	19988
+16	00000010	10	14745
+20	00000011	9	8192
+24	00000001	8	3277
+28	00000000	7	63896
+32	00000010	6	62422
+36	00000011	5	55869
+40	00000001	4	53247
+44	00000000	3	45875
+48	00000010	2	43194
+52	00000011	1	28344
+56	00000001	0	16875

16th ETS entry at t_{16}

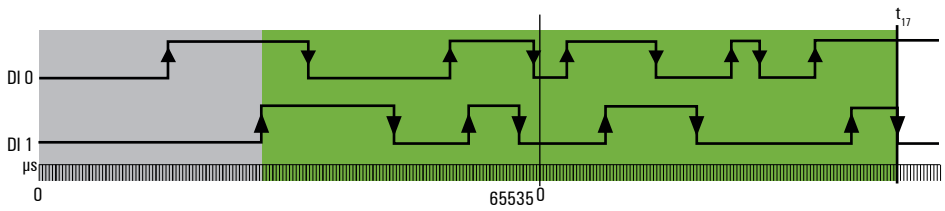
A rising 0-1 edge on DI 1 causes the16th ETS entry. The 1st ETS entry is deleted and not available anymore.



Address	PII	RN	ETS_US
+0	00000011	15	37683
+4	00000001	14	35717
+8	00000000	13	28344
+12	00000001	12	24576
+16	00000000	11	19988
+20	00000010	10	14745
+24	00000011	9	8192
+28	00000001	8	3277
+32	00000000	7	63896
+36	00000010	6	62422
+40	00000011	5	55869
+44	00000001	4	53247
+48	00000000	3	45875
+52	00000010	2	43194
+56	00000011	1	28344
	00000001	0	16875

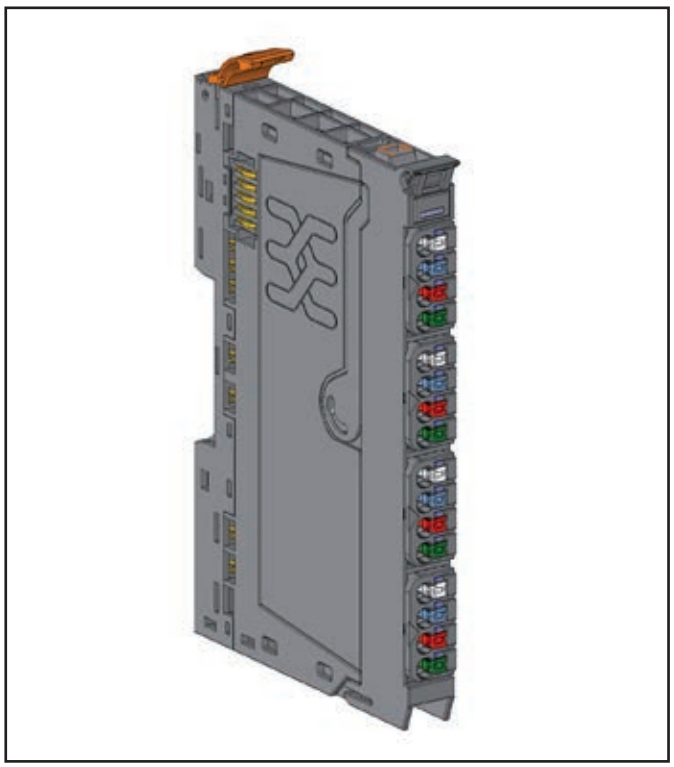
17. ETS entry at t_{17}

A falling 1-0 edge on DI 1 causes the17th ETS entry. The 2nd ETS entry is deleted and not available anymore.

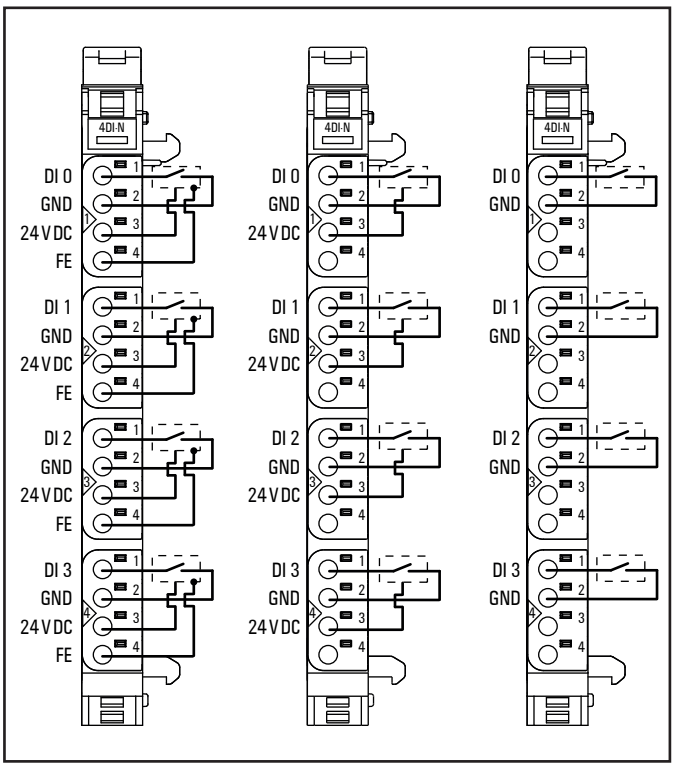


Address	PII	RN	ETS_US
+0	00000001	16	44236
+4	00000011	15	37683
+8	00000001	14	35717
+12	00000000	13	28344
+16	00000001	12	24576
+20	00000000	11	19988
+24	00000010	10	14745
+28	00000011	9	8192
+32	00000001	8	3277
+36	00000000	7	63896
+40	00000010	6	62422
+44	00000011	5	55869
+48	00000001	4	53247
+52	00000000	3	45875
+56	00000010	2	43194
	00000011	1	28344
	00000001	0	16875

6.10 Digital input module UR20-4DI-N

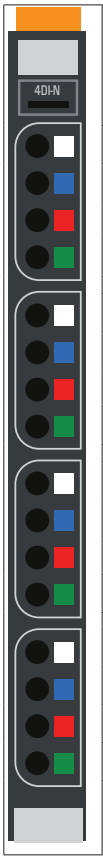


Digital input module UR20-4DI-N (Order No. 1315350000)



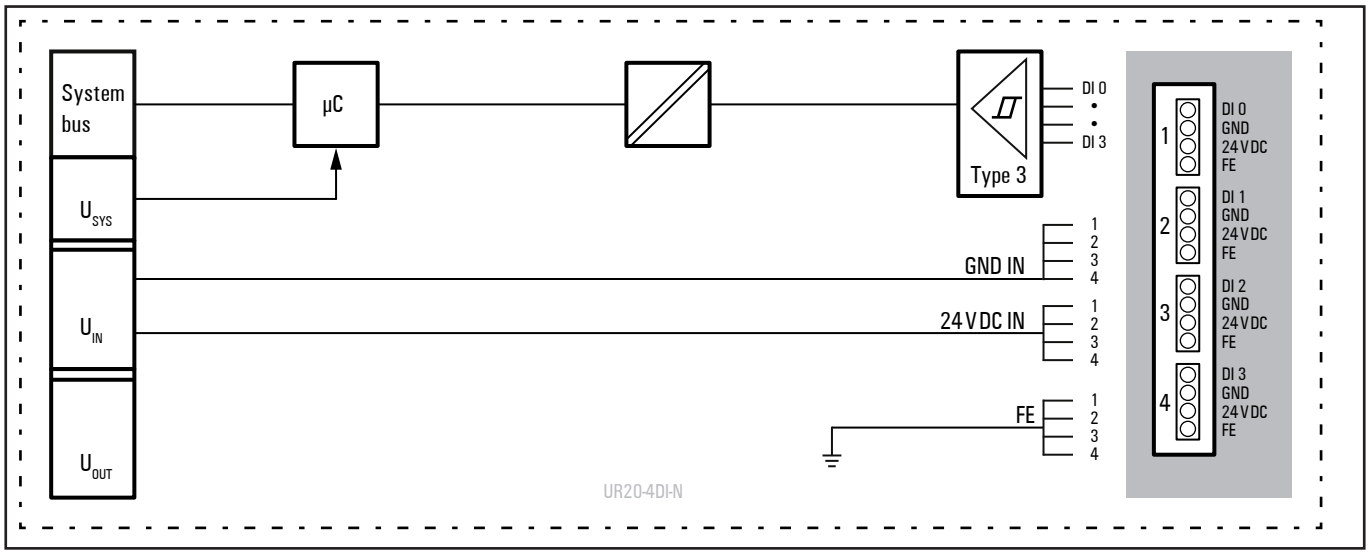
Connection diagram UR20-4DI-N

The digital input module UR20-4DI-N can detect up to 4 binary control signals. One sensor can be connected to each connector using a 2-wire, 3-wire or 3-wire + FE connection. The inputs are N-switching (sinking). A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
2.1	Yellow: Input 1 active
3.1	Yellow: Input 2 active
4.1	Yellow: Input 3 active

LED indicators UR20-4DI-N, error messages see Chapter 13



Block diagram UR20-4DI-N

Technical data UR20-4DI-N (Order No. 1315350000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	4
Input type	N-switching, comparable to Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	> -5 V referred to +24 V of the input power supply U_{IN}
High input voltage	< -11 V referred to +24 V of the input power supply U_{IN}
Sensor supply	max. 2 A per plug, total max. 8 A
Sensor connection	2-wire, 3-wire, 3-wire + FE
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 10 mA + sensor supply current
General data	
Weight (operational status)	87 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-4DI-N

Channel	Description	Options[1)]	Default
0 ... 3	Input delay	no (0) / 0.3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

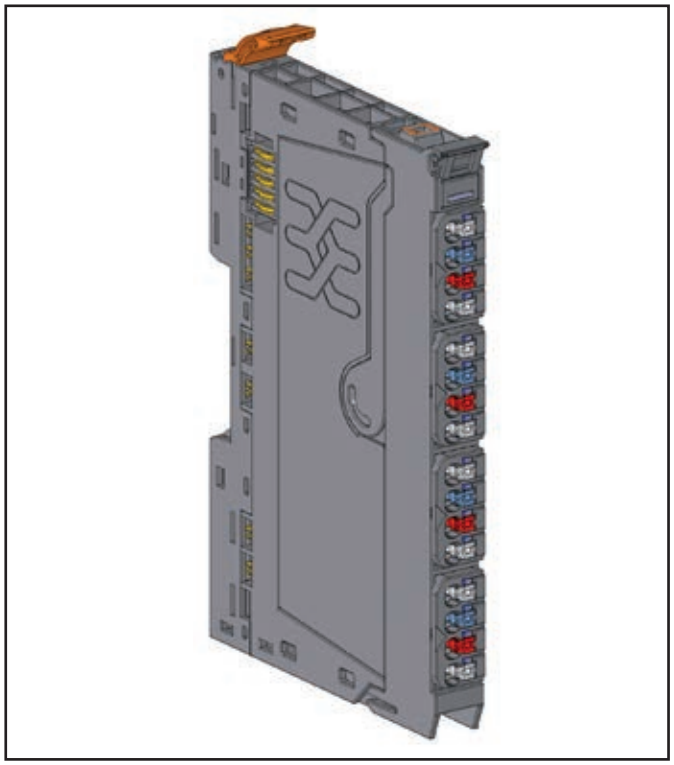
Diagnostic data UR20-4DI-N

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

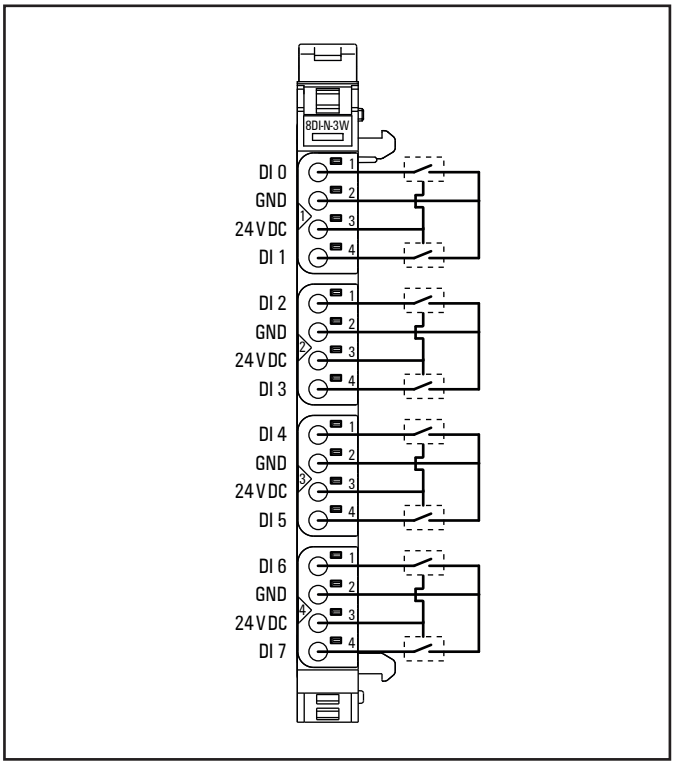
Process data inputs UR20-4DI-N

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	Reserved
	IX0.5	Reserved
	IX0.6	Reserved
	IX0.7	Reserved

6.11 Digital input module UR20-8DI-N-3W

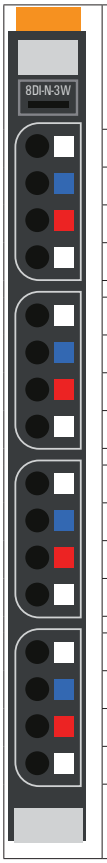


Digital input module UR20-8DI-N-3W (Order No. 1315370000)



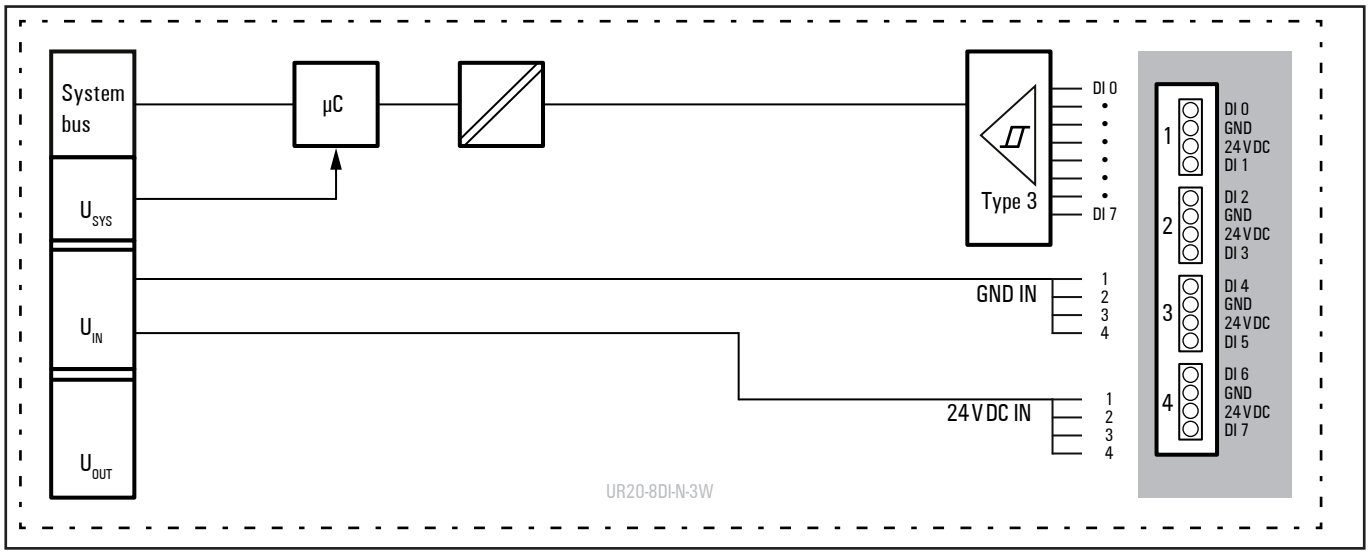
Connection diagram UR20-8DI-N-3W

The digital input module UR20-8DI-N-3W can detect up to 8 binary control signals. Two sensors can be connected to each connector using a 2-wire or 3-wire connection. The inputs are N-switching (sinking). A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IIN}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.4	Yellow: Input 3 active
3.1	Yellow: Input 4 active
3.4	Yellow: Input 5 active
4.1	Yellow: Input 6 active
4.4	Yellow: Input 7 active

LED indicators UR20-8DI-N-3W, error messages see Chapter 13



Block diagram UR20-8DI-N-3W

Technical data UR20-8DI-N-3W (Order No. 1315370000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	8
Input type	N-switching, comparable to Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay adjustable from 0 to 40 ms (PROFIBUS-DP to 20 ms)
Low input voltage	> -5 V referred to +24 V of the input power supply U_{IN}
High input voltage	< -11 V referred to +24 V of the input power supply U_{IN}
Sensor supply	max. 2 A per plug, total max. 8 A
Sensor connection	2-wire, 3-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 20 mA + sensor supply current
General data	
Weight (operational status)	83 g
For additional general data, see Section 3.4	

Overview of the editable parameters UR20-8DI-N-3W

Channel	Description	Options[1)]	Default
0 ... 7	Input delay	no (0) / 0.3 ms (1) (not at PROFIBUS-DP) / 3 ms (2) / 10 ms (3) / 20 ms (4) / 40 ms (5) (not at PROFIBUS-DP)	3 ms

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-8DI-N-3W

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

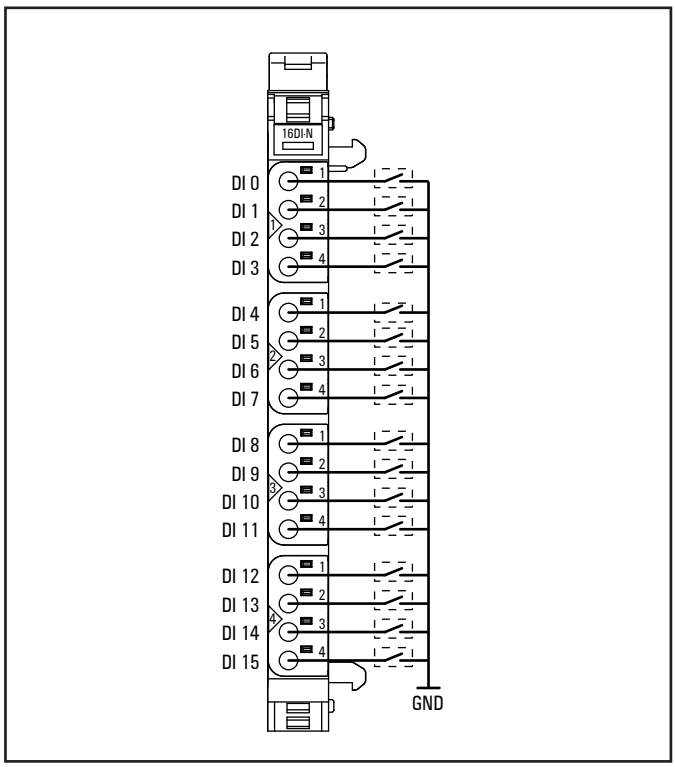
Process data inputs UR20-8DI-N-3W

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7

6.12 Digital input module UR20-16DI-N

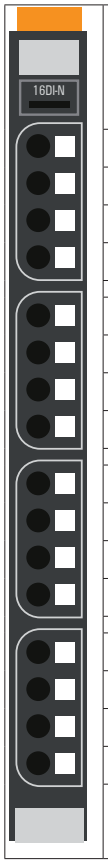


Digital input module UR20-16DI-N (Order No. 1315390000)



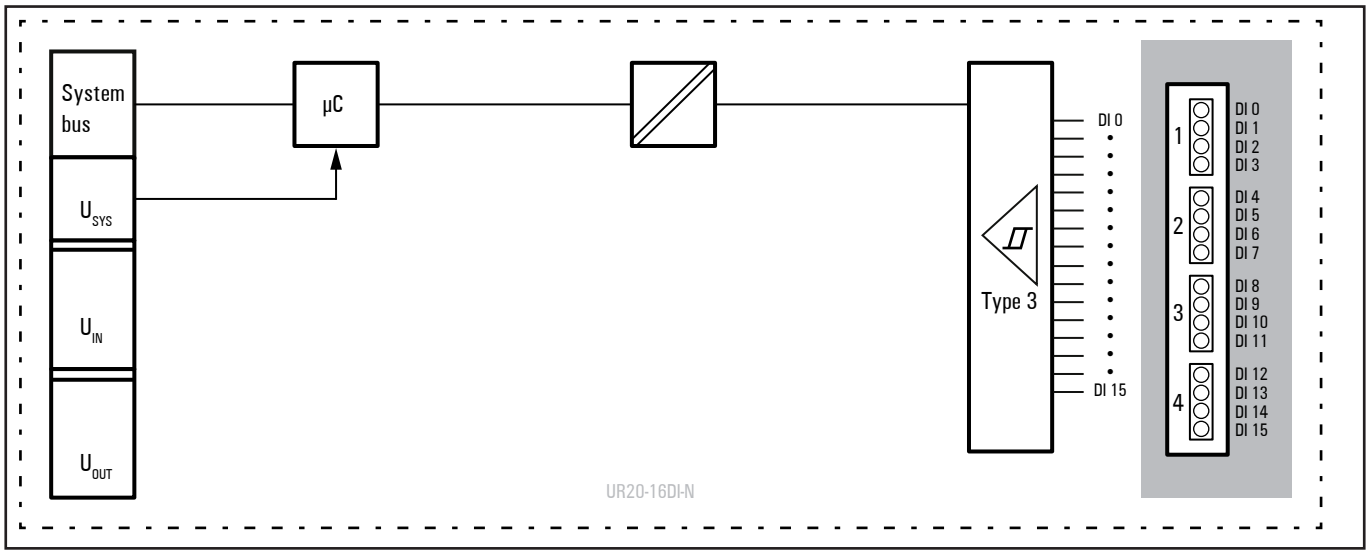
Connection diagram UR20-16DI-N

The UR20-16DI-N digital input module can detect up to 16 binary control signals. Four sensors can be connected to each connector in a 1-wire connection.
The inputs are N-switching (sinking). A status LED is assigned to each channel. The connected sensors must be supplied with power from the input curent path I_{IN} (e.g. with potential distribution modules).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.2	Yellow: Input 1 active
1.3	Yellow: Input 2 active
1.4	Yellow: Input 3 active
2.1	Yellow: Input 4 active
2.2	Yellow: Input 5 active
2.3	Yellow: Input 6 active
2.3	Yellow: Input 7 active
3.1	Yellow: Input 8 active
3.2	Yellow: Input 9 active
3.3	Yellow: Input 10 active
3.4	Yellow: Input 11 active
4.1	Yellow: Input 12 active
4.2	Yellow: Input 13 active
4.3	Yellow: Input 14 active
4.4	Yellow: Input 15 active

LED indicators UR20-16DI-N, error messages see Chapter 13



Block diagram UR20-16DI-N

Technical data UR20-16DI-N (Order No. 1315390000)

System data	
Data	Process and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	16
Input type	N-switching, comparable to Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay 3 ms
Low input voltage	> -5 V referred to +24 V of the input power supply U_{IN}
High input voltage	< -11 V referred to +24 V of the input power supply U_{IN}
Sensor supply	no
Sensor connection	1-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	< 15 mA
General data	
Weight (operational status)	88 g
For additional general data, see Section 3.4	

Diagnostic data UR20-16DI-N

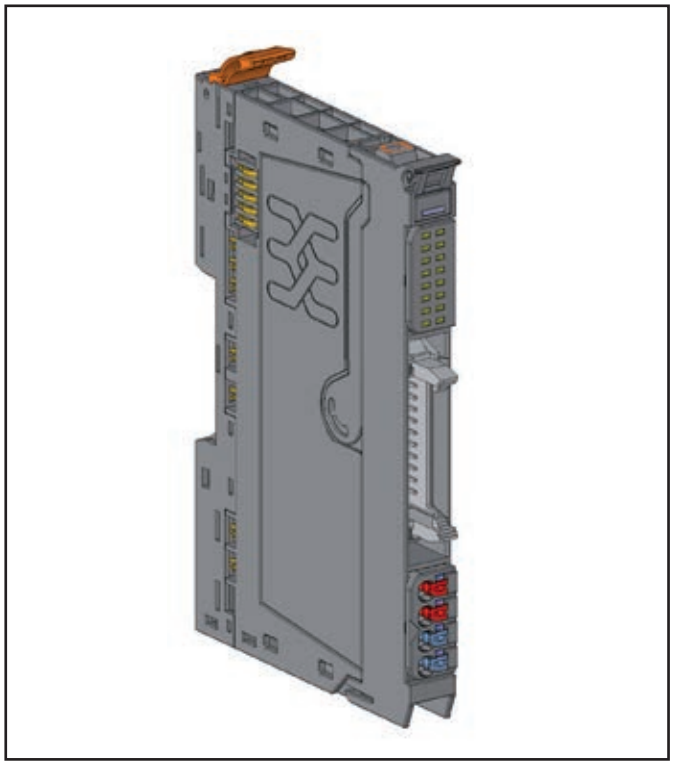
Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-16DI-N

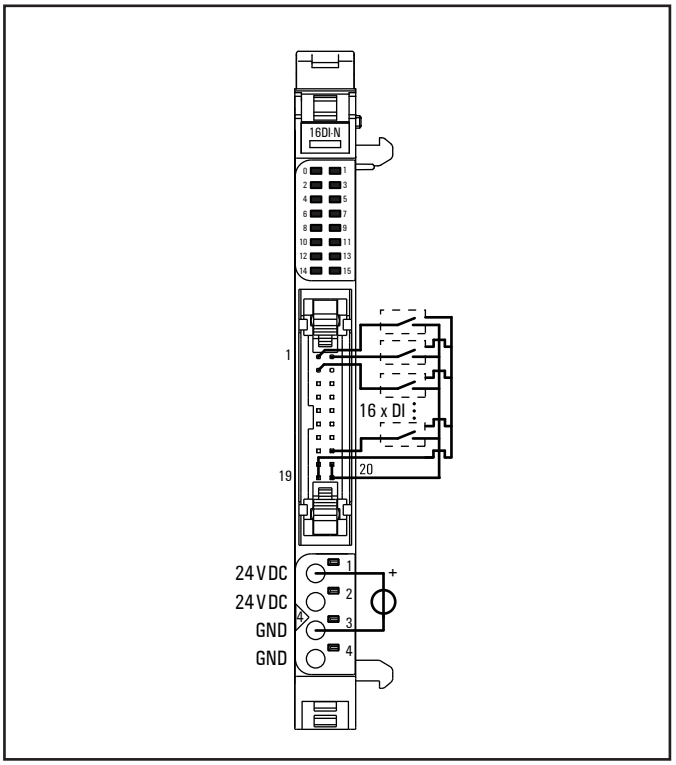
Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7
IB1	IX1.0	DI8
	IX1.1	DI9
	IX1.2	DI10
	IX1.3	DI11
	IX1.4	DI12
	IX1.5	DI13
	IX1.6	DI14
	IX1.7	DI15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.13 Digital input module UR20-16DI-N-PLC-INT



Digital input module UR20-16DI-N-PLC-INT (Order No. 1315400000)

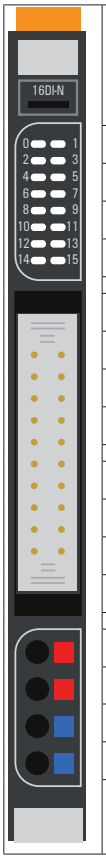


Connection diagram UR20-16DI-N-PLC-INT

The UR20-16DI-N-PLC-INT digital input module can detect up to 16 binary control signals. The sensors are connected via a standard PLC connection (20-pole).
The inputs are N-switching (sinking). A status LED is assigned to each channel in a separate block. The module electronics can supply the sensors with power from the 4-pole feed-in plug (connector 4) via the PLC connection. Vice versa the module can be supplied via the PLC connection.

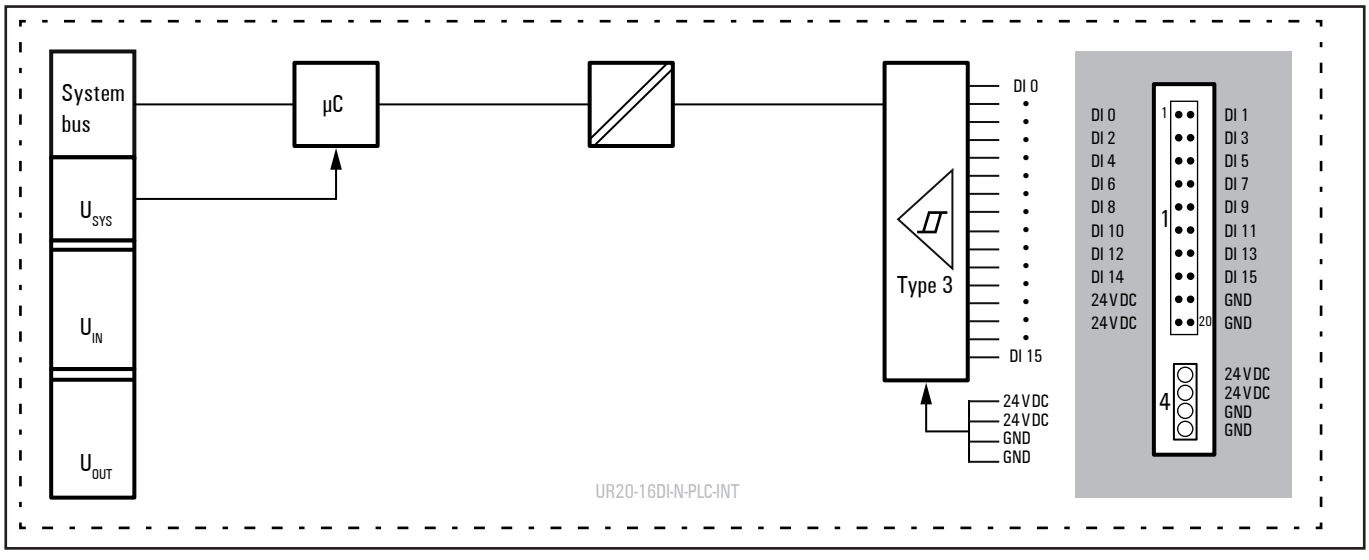
For the PLC connection, the following applies: a maximum current of 2 A (with a max. of 1 A per contact) can be taken from the +24 V connections or fed through the 0 V connections. In the case of a total current greater than 2 A, the common ground wire must be connected to the 4-pin feed-in plug (connector 4).

The power supply of the peripherals connected has to be calculated for each individual installation situation. When using a flat ribbon cable, please regard its higher internal resistance!



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
0	Yellow: Input 0 active
1	Yellow: Input 1 active
...	...
15	Yellow: Input 15 active
4.1	Green: Supply voltage feed-in plug > 18 V DC
4.2	Red: Error on the supply voltage of the feed-in plug

LED indicators UR20-16DI-N-PLC-INT, error messages see Chapter 13



Block diagram UR20-16DI-N-PLC-INT

Technical data UR20-16DI-N-PLC-INT (Order No. 1315400000)

System data	
Data	Process and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Inputs	
Number	16
Input type	N-switching, comparable to Type 1 and Type 3 sensors as per IEC 61131-2
Input filter	Input delay 3 ms
Low input voltage	> -5 V referred to +24 V of the input power supply U_{IN}
High input voltage	< -11 V referred to +24 V of the input power supply U_{IN}
Sensor supply	External
Sensor connection	PLC interface unit
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption	< 15 mA, power supply via feed-in plug or PLC connection
General data	
Weight (operational status)	82 g
For additional general data, see Section 3.4	

Diagnostic data UR20-16DI-N-PLC-INT

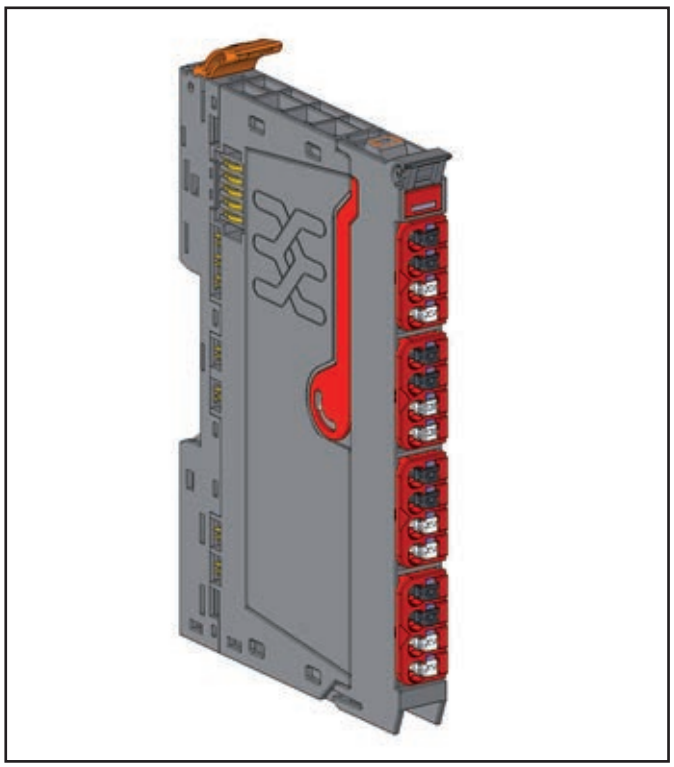
Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-16DI-N-PLC-INThhh

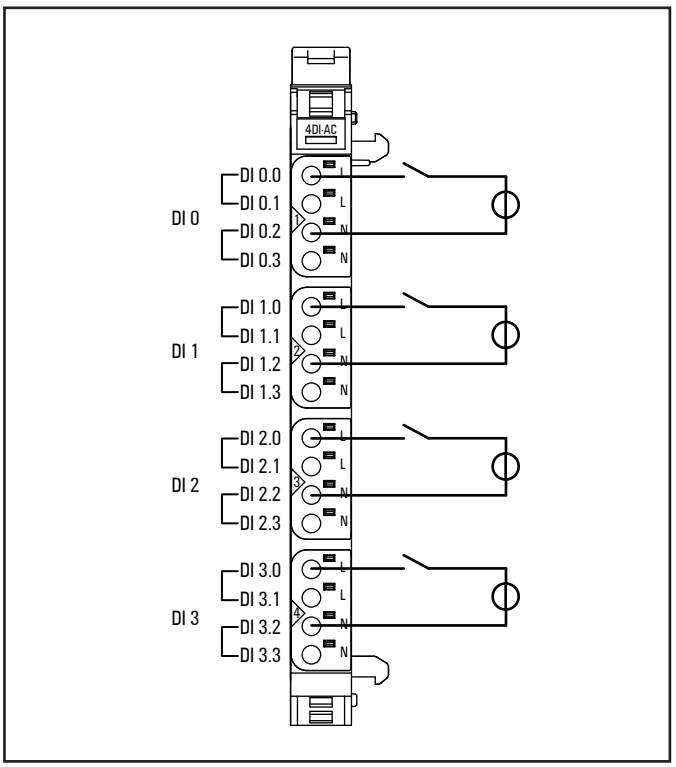
Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	DI4
	IX0.5	DI5
	IX0.6	DI6
	IX0.7	DI7
IB1	IX1.0	DI8
	IX1.1	DI9
	IX1.2	DI10
	IX1.3	DI11
	IX1.4	DI12
	IX1.5	DI13
	IX1.6	DI14
	IX1.7	DI15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.14 Digital input module UR20-4DI-2W-230V-AC



Digital input module UR20-4DI-2W-230V-AC (Order-No. 1550070000)



Connection diagramm UR20-4DI-2W-230V-AC

The digital input module UR20-4DI-2W-230V-AC can detect up to 4 binary control signals. One sensor can be connected to each connector using a 2-wire connection. Both L and N connections of each input are bridged internally. The four inputs are galvanic isolated, they can be supplied with input voltages between 110 V AC and 230 V AC. Solely AC measurements can be run.
A status LED is assigned to each channel.

WARNING

Possible danger to life!
All signal lines must be supplied from the same power system.

ATTENTION

The module can be destroyed by too high frequencies.
The input frequency may be 65 Hz at maximum, the switching frequency 15 Hz at maximum.

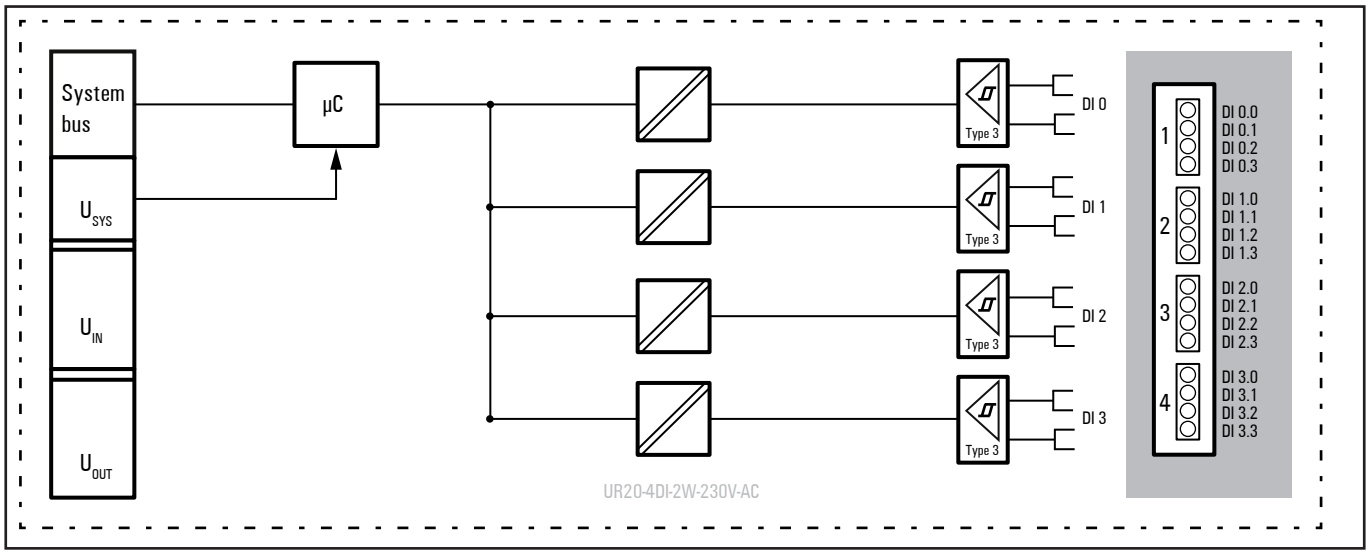
ATTENTION

The module can be destroyed by too high input currents of the sinal lines.
The inputs must be ensured using a slow fuse max. 4 A.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Input 0 active
2.1	Yellow: Input 1 active
3.1	Yellow: Input 2 active
4.1	Yellow: Input 3 active

LED indicators UR20-4DI-2W-230V-AC, error messages see chapter 13



Block diagramm UR20-4DI-2W-230V-AC

Technical data UR20-4DI-2W-230V-AC (Order-No. 1550070000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Galvanic isolation	4 kV between the channels as well as between channels and power supply
Line-to-line voltage	400 V between the channels possible
Inputs	
Number	4
Input type	P-switching, for Type 3 sensors as per IEC 61131-2
Input filter	Input delay 10 ms
Low input voltage	< 65 V
High input voltage	≥ 80 V
Input voltage max.	277 V AC (UL); 264,5 V AC (VDE)
Input frequency, typ.	50 Hz, 60 Hz
Sensor supply	no
Sensor connection	2-wire
Module diagnosis	yes
Individual channel diagnosis	no
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	no
General data	
Weight (operational status)	89 g
For additional general data, see Section 3.4	

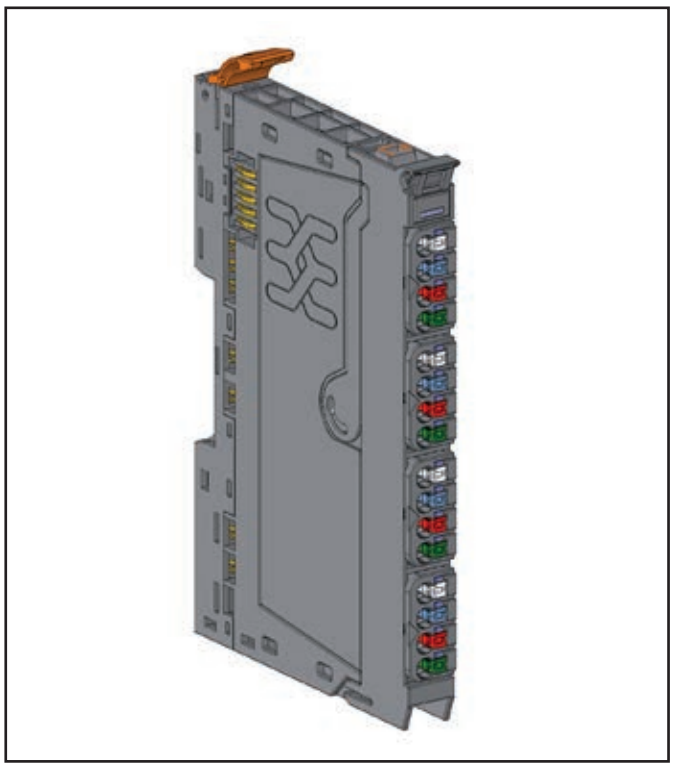
Diagnostic data UR20-4DI-2W-230V-AC

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4	Power supply fault	0
		5 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x70
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

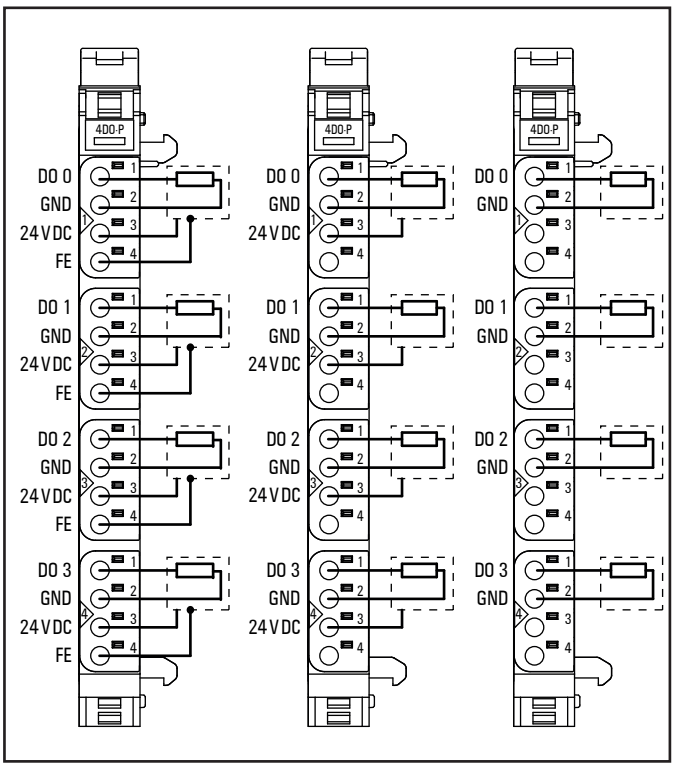
Process data inputs UR20-4DI-2W-230V-AC

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	Reserved
	IX0.5	Reserved
	IX0.6	Reserved
	IX0.7	Reserved

6.15 Digital output module UR20-4DO-P

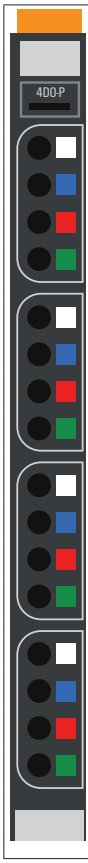


Digital output module UR20-4DO-P (Order No. 1315220000)



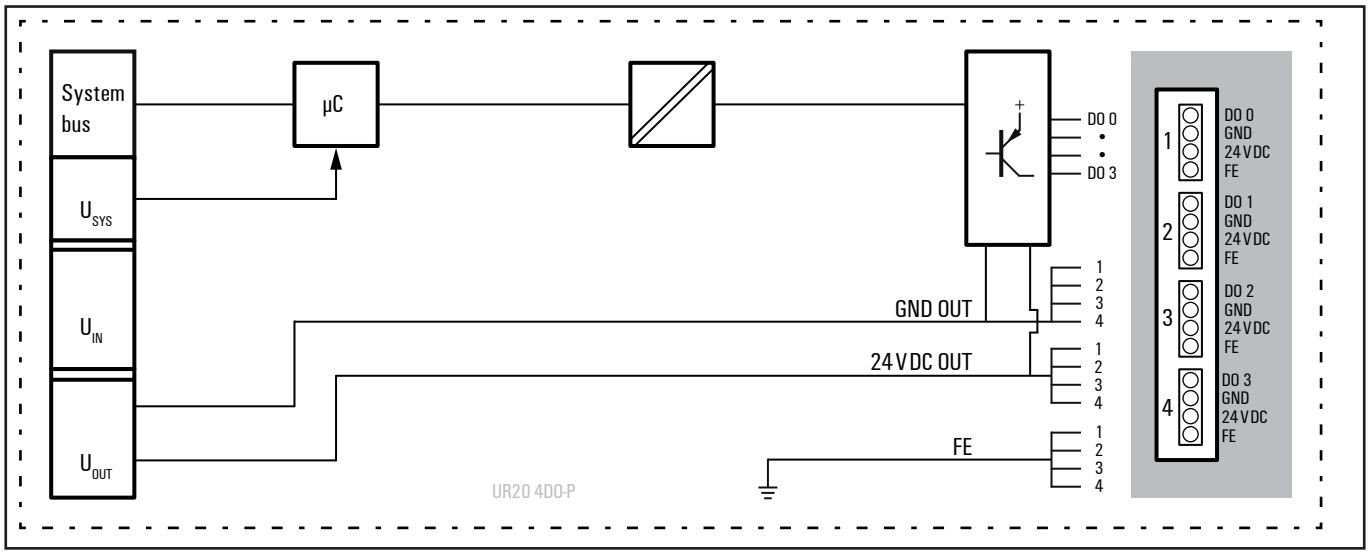
Connection diagram UR20-4DO-P

The UR20-4DO-P digital output module can control up to 4 actuators each with a maximum of 0.5 A. One actuator can be connected to each connector using a 2-wire, 3-wire or 3-wire connection + FE. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
2.1	Yellow: Output 1 active
3.1	Yellow: Output 2 active
4.1	Yellow: Output 3 active

LED indicators UR20-4DO-P, error messages see Chapter 13



Block diagram UR20-4DO-P

Technical data UR20-4DO-P (Order No. 1315220000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	4	
Type	P-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	2 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	1 kHz
Actuator connection	2-wire, 3-wire, 3-wire + FE	
Actuator supply	max. 2 A per plug, total max. 8 A	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	20 mA + load	
General data		
Weight (operational status)	86 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-4DO-P

Channel	Description	Options[1)]	Default
0 ... 3	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

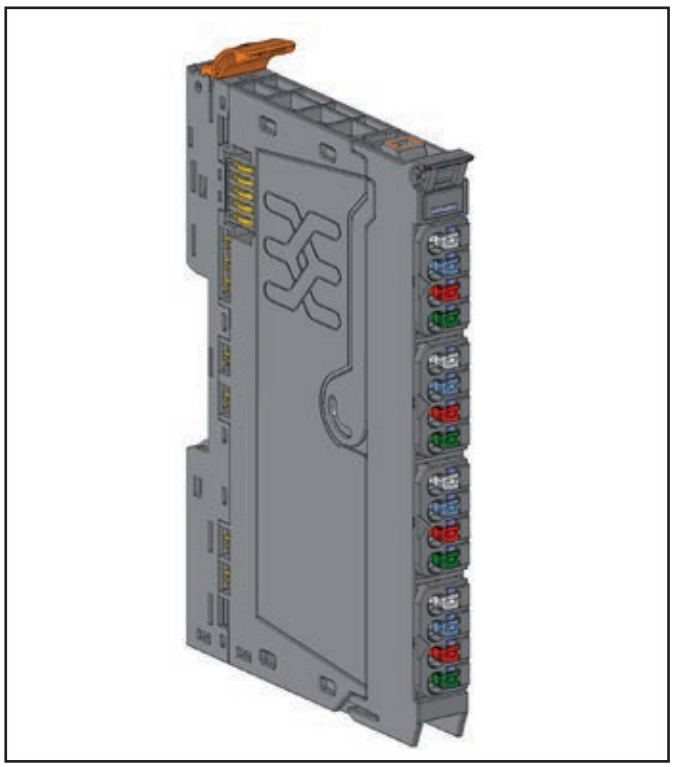
Diagnostic data UR20-4DO-P

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 - 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

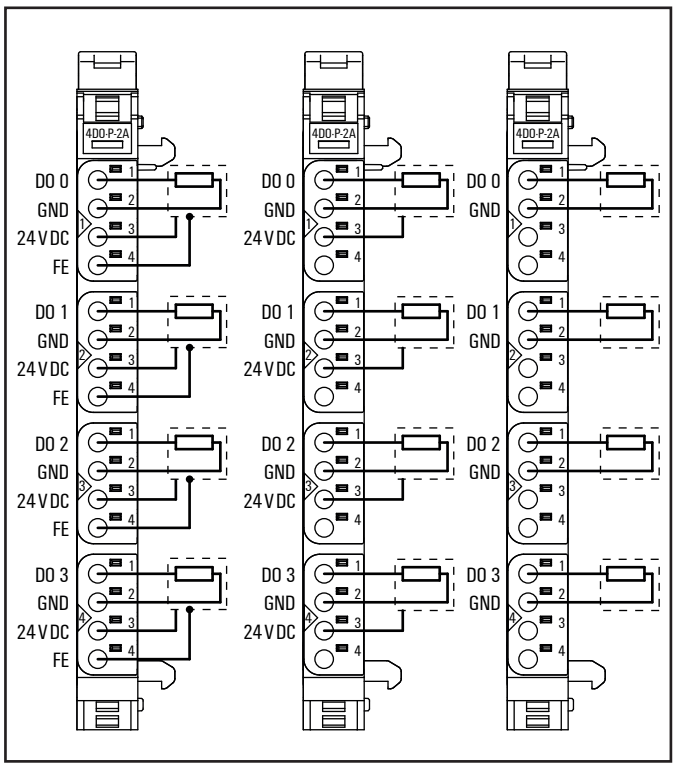
Process data outputs UR20-4DO-P

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	Reserved
	QX0.5	Reserved
	QX0.6	Reserved
	QX0.7	Reserved

6.16 Digital output module UR20-4DO-P-2A

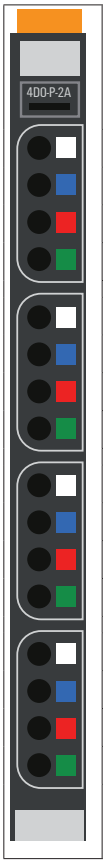


Digital output module UR20-4DO-P-2A (Order No. 1315230000)



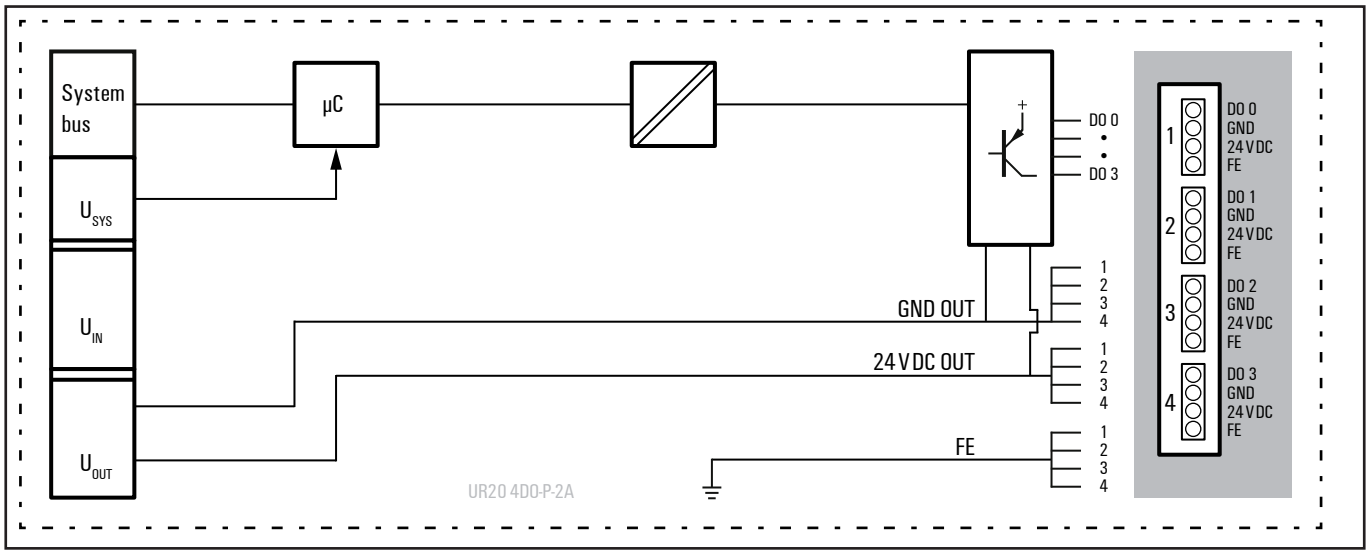
Connection diagram UR20-4DO-P-2A

The digital output module UR20-4DO-P-2A can control up to 4 actuators, each with a maximum of 2 A. One actuator can be connected to each connector using a 2-wire, 3-wire or 3-wire connection + FE. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
2.1	Yellow: Output 1 active
3.1	Yellow: Output 2 active
4.1	Yellow: Output 3 active

LED indicators UR20-4DO-P-2A, error messages see Chapter 13



Block diagram UR20-4DO-P-2A

Technical data UR20-4DO-P-2A (Order No. 1315230000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	4	
Type	P-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	2 A
	per module	8 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (48 W)	1 kHz
Actuator connection	2-wire, 3-wire, 3-wire + FE	
Actuator supply	max. 2 A per plug, total max. 8 A	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	25 mA + load	
General data		
Weight (operational status)	86 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-4DO-P-2A

Channel	Description	Options[1)]	Default
0 ... 3	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

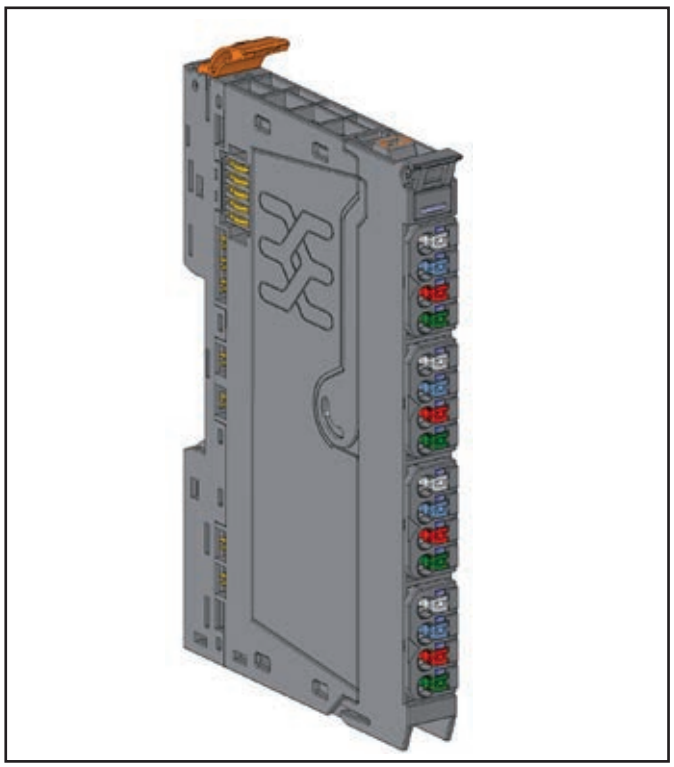
Diagnostic data UR20-4DO-P-2A

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 - 7	Reserved	0
Channel type	4	0 - 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 - 10	0 - 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

Process data outputs UR20-4DO-P-2A

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	Reserved
	QX0.5	Reserved
	QX0.6	Reserved
	QX0.7	Reserved

6.17 Digital output module UR20-4DO-PN-2A

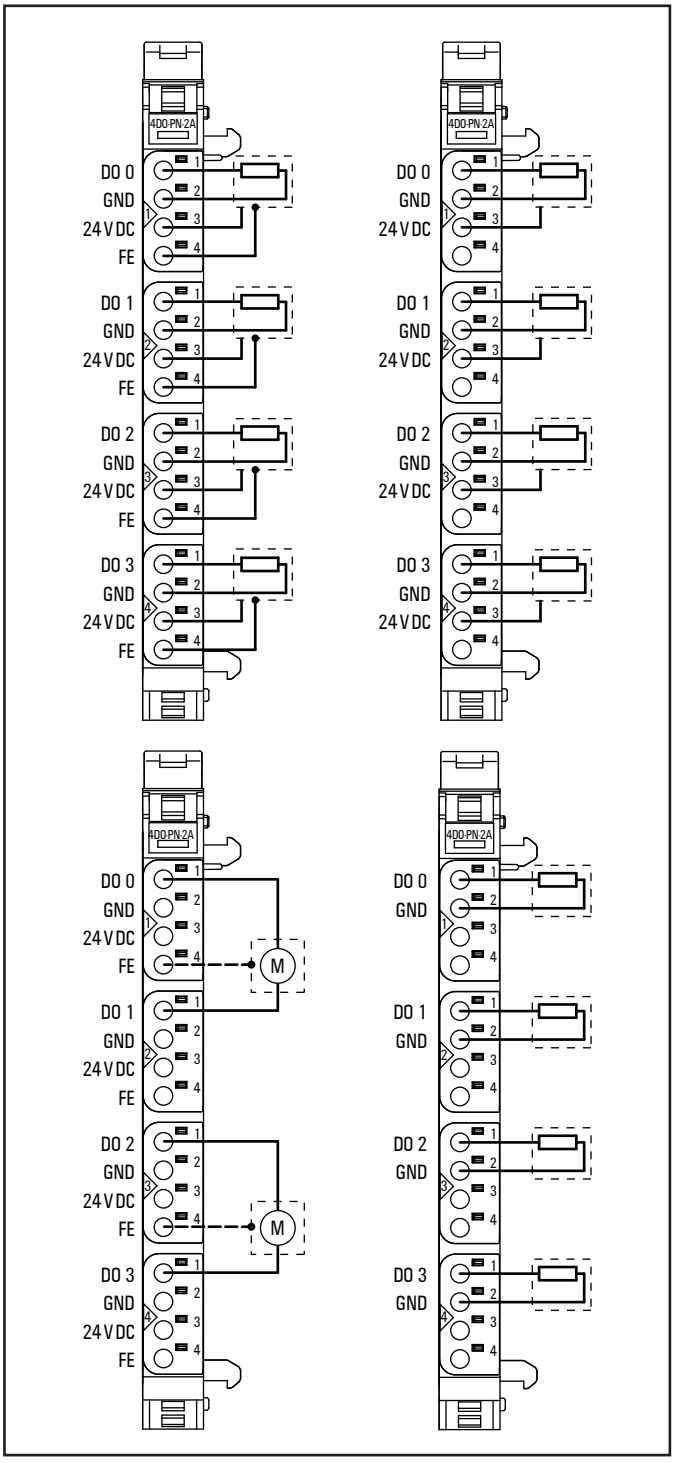


Digital output module UR20-4DO-PN-2A (Order No. 1394420000)

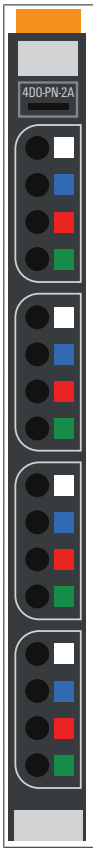
The digital output module UR20-4DO-PN-2A can control up to 4 actuators each with a maximum of 2 A. One actuator can be connected to each connector in a 2-wire or 3-wire + FE connection. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).

Each channel can be switched between positive and negative switching. This allows, among other things, a switch in rotational direction if an DC motor is connected between two outputs. For this purpose, an output byte is reserved for the physical outputs, and each channel is assigned two bits in this byte. The switching characteristics of each output are set in the low nibble of the byte. If a bit is set, the corresponding channel has positive switching, if it is 0 then it has negative switching. The outputs are switched in the high nibble. Example: If you write the value 185 decimal (1011 1001 binary) in the output byte, channel 1 is set to 24 V, channel 2 is set to GND, channel 3 is deactivated and channel 4 is set to 24 V.

The module is protected against external voltages between 0 V and the operating voltage.

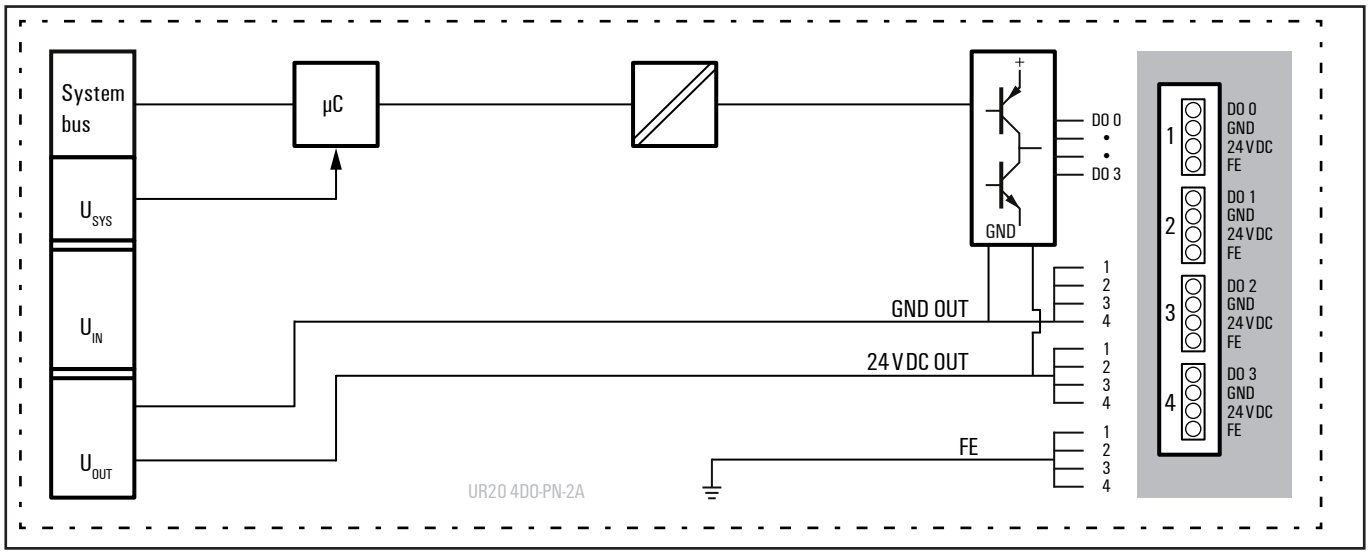


Connection diagram UR20-4DO-PN-2A



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active, P or N-switching (sourcing or sinking)
2.1	Yellow: Output 1 active, P or N-switching (sourcing or sinking)
3.1	Yellow: Output 2 active, P or N-switching (sourcing or sinking)
4.1	Yellow: Output 3 active, P or N-switching (sourcing or sinking)

LED indicators UR20-4DO-PN-2A, error messages see Chapter 13



Block diagram UR20-4DO-PN-2A

Technical data UR20-4DO-PN-2A (Order No. 1394420000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	4	
Type	switchable P- or N-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	2 A
	per module	8 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (48 W)	1 kHz
Actuator connection	2-wire, 3-wire, 3-wire + FE	
Short-circuit-proof	yes	
Actuator supply	max. 2 A per plug, total max. 8 A	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	20 mA + load	
General data		
Weight (operational status)	86 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-4DO-PN-2A

Channel	Description	Options[1)]	Default
0 ... 3	Substitute value OP-Mode	Sinking (0) / Sourcing (1)	Sourcing
0 ... 3	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

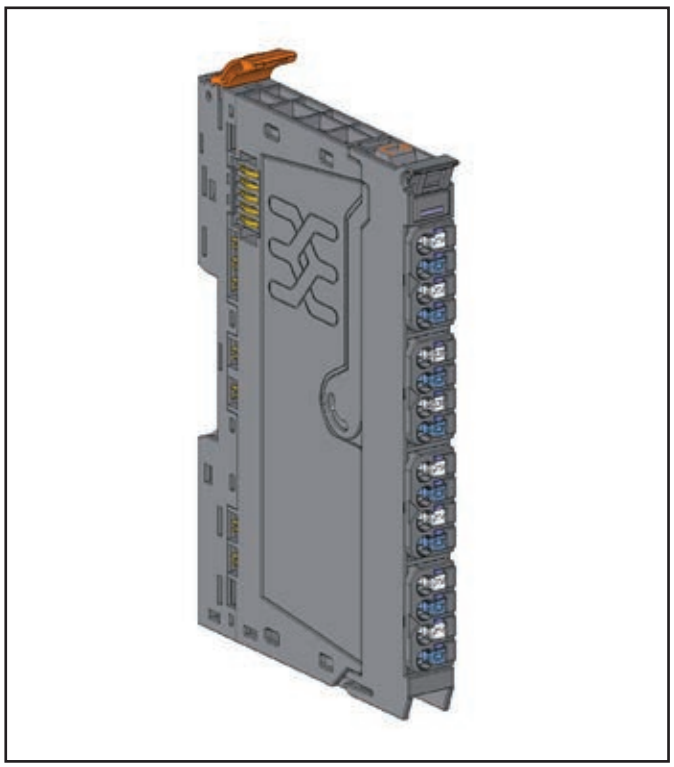
Diagnostic data UR20-4DO-PN-2A

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

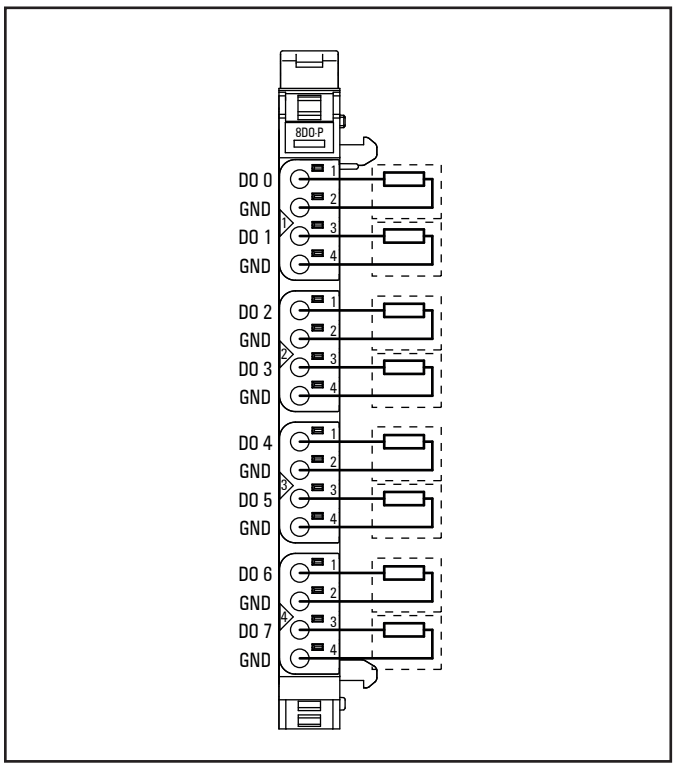
Process data outputs UR20-4DO-PN-2A

Byte	Format	Name	Remark
QB0	QX0.0	OP-mode DO0	0: Sinking, 1: Sourcing
	QX0.1	OP-mode DO1	0: Sinking, 1: Sourcing
	QX0.2	OP-mode DO2	0: Sinking, 1: Sourcing
	QX0.3	OP-mode DO3	0: Sinking, 1: Sourcing
	QX0.4	DO0	
	QX0.5	DO1	
	QX0.6	DO2	
	QX0.7	DO3	

6.18 Digital output module UR20-8DO-P

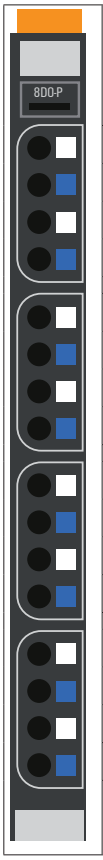


Digital output module UR20-8DO-P (Order No. 1315240000)



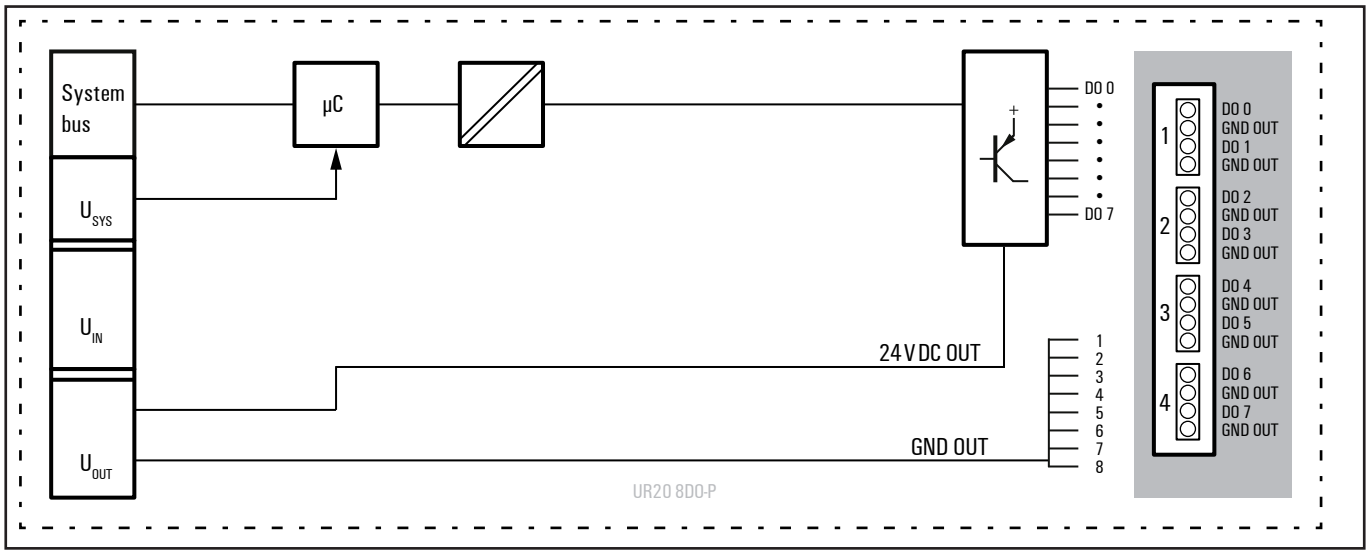
Connection diagram UR20-8DO-P

The UR20-8DO-P digital output module can control up to 8 actuators each with a maximum of 0.5 A. Actuators can be connected to each connector in a 2-wire connection. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
1.3	Yellow: Output 1 active
2.1	Yellow: Output 2 active
2.3	Yellow: Output 3 active
3.1	Yellow: Output 4 active
3.3	Yellow: Output 5 active
4.1	Yellow: Output 6 active
4.3	Yellow: Output 7 active

LED indicators UR20-8DO-P, error messages see Chapter 13



Block diagram UR20-8DO-P

Technical data UR20-8DO-P (Order No. 1315240000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	8	
Type	P-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	4 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0,2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	1 kHz
Actuator connection	2-wire	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	30 mA + load	
General data		
Weight (operational status)	87 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-8DO-P

Channel	Description	Options[1)]	Default
0 ... 7:	Substitute value	Off (0) / On (1)	Off (0)

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-8DO-P

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 - 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 ... 7	Reserved	0
Time stamp	43 - 46		time stamp [µs] (32bit)	

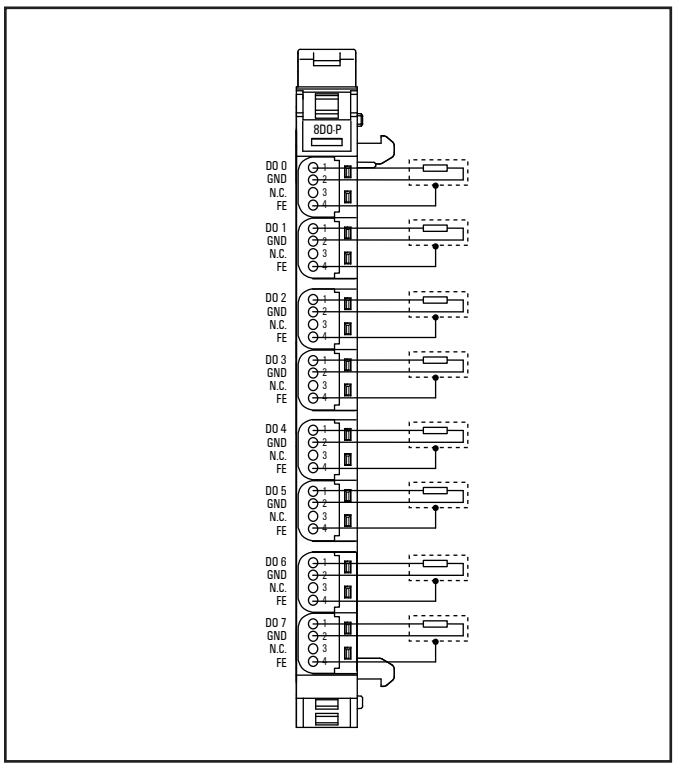
Process data outputs UR20-8DO-P

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	DO4
	QX0.5	DO5
	QX0.6	DO6
	QX0.7	DO7

6.19 Digital output module UR20-8DO-P-2W-HD

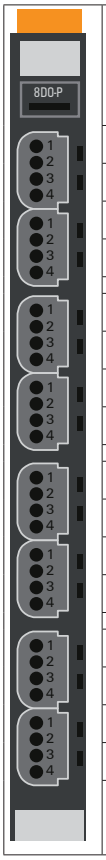


Digital output module UR20-8DO-P-2W-HD (Order No. 1509830000)



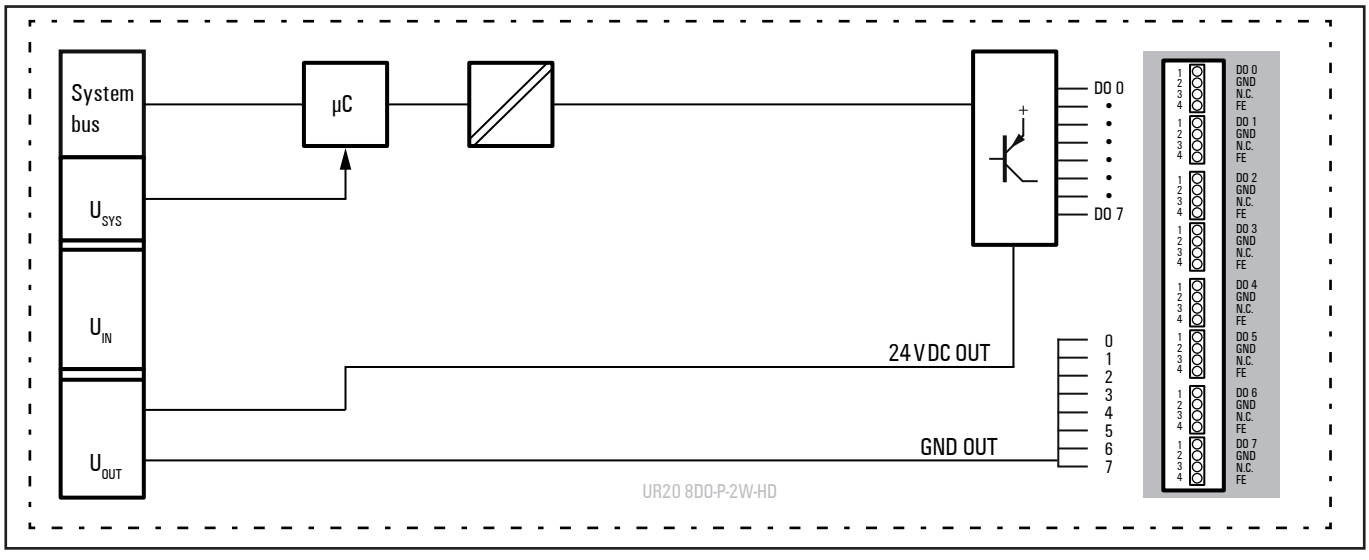
Connection diagram UR20-8DO-P-2W-HD

The UR20-8DO-P-2W-HD digital output module can control up to 8 actuators each with a maximum of 0.5 A. Actuators can be connected to each connector in a 2-wire or 2-wire + FE connection (IDC). A status LED is assigned to each channel. The outputs are supplied with power from the output current path (U_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
2.1	Yellow: Output 1 active
3.1	Yellow: Output 2 active
4.1	Yellow: Output 3 active
5.1	Yellow: Output 4 active
6.1	Yellow: Output 5 active
7.1	Yellow: Output 6 active
8.1	Yellow: Output 7 active

LED indicators UR20-8DO-P-2W-HD error messages see Chapter 13



Block diagram UR20-8DO-P-2W-HD

Technical data UR20-8DO-P-2W-HD (Order No. 1509830000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	8	
Type	P-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 50 µs; high » low max. 100 µs	
Max. output current	per channel	0.5 A
	per module	4 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 1 kHz with suitable free-weheeling diode
	Lamp load (12 W)	1 kHz
Actuator connection	2-wire, 2-wire + FE	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	40 mA + load	
Connection data		
Type of connection	Insulation Displacement Connection (IDC)	
Line connection cross-section	Single-wired, Fine-wired	0.14 … 0.35 mm²
General data		
Weight (operational status)	88 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-8DO-P-2W-HD

Channel	Description	Options[1)]	Default
0 ... 7:	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

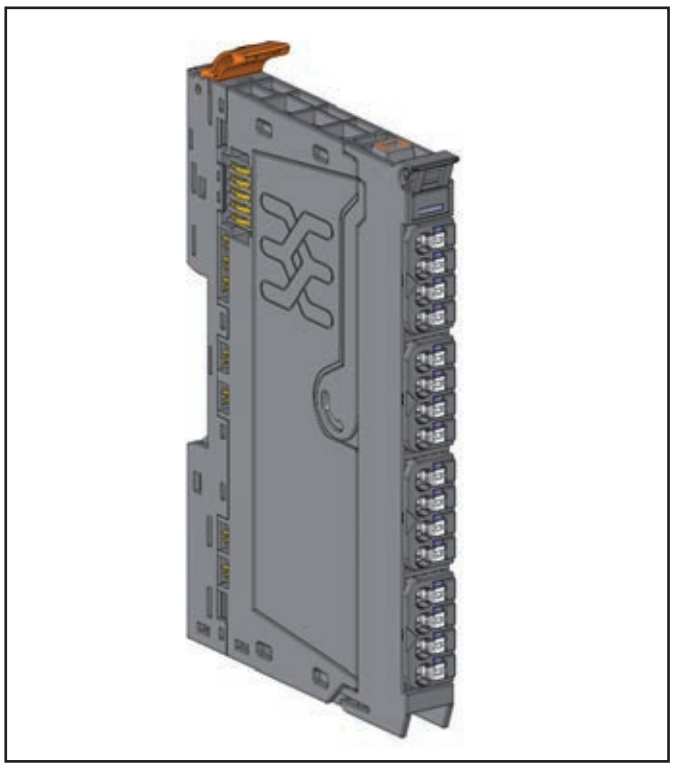
Diagnostic data UR20-8DO-P-2W-HD

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

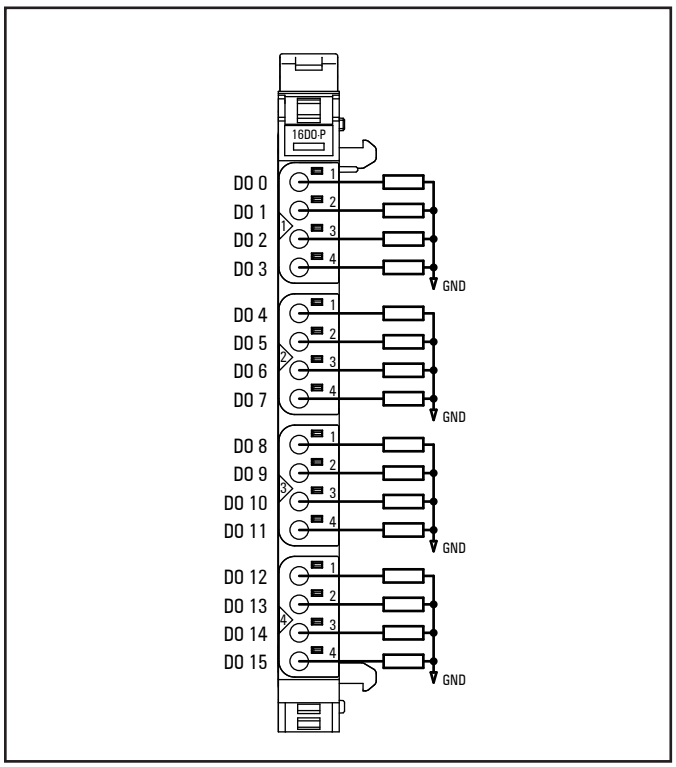
Process data outputs UR20-8DO-P-2W-HD

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	DO4
	QX0.5	DO5
	QX0.6	DO6
	QX0.7	DO7

6.20 Digital output module UR20-16DO-P



Digital output module UR20-16DO-P (Order No. 1315250000)



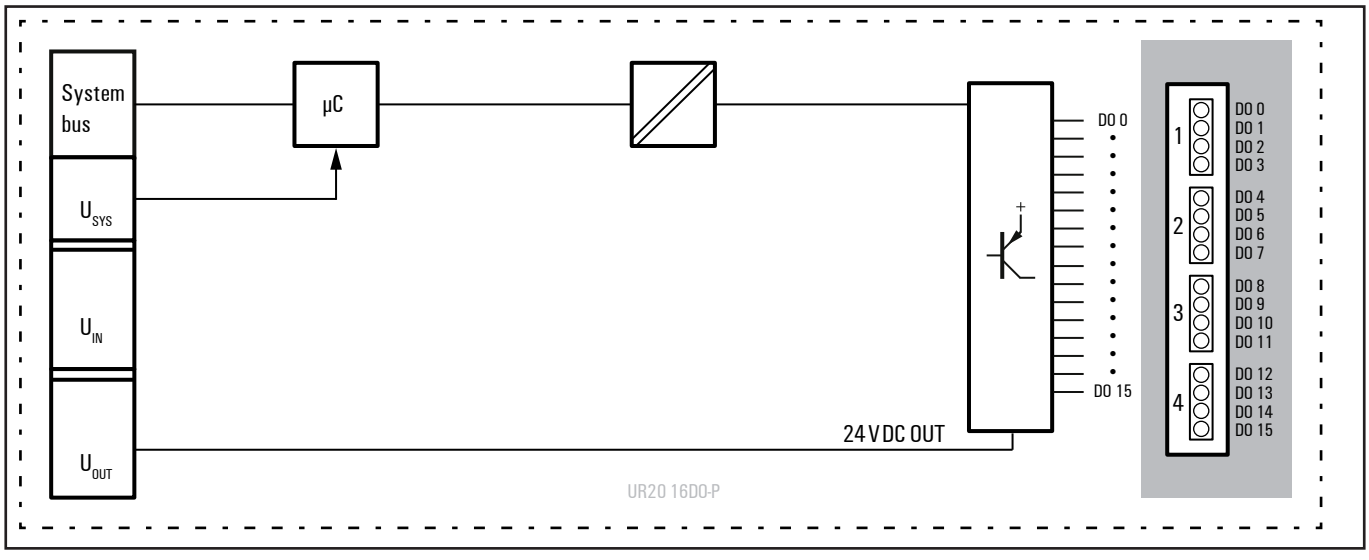
Connection diagram UR20-16DO-P

The UR20-16DO-P digital output module can control up to 16 actuators each with a maximum of 0.5 A. Four actuators can be connected to each connector. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
1.2	Yellow: Output 1 active
1.3	Yellow: Output 2 active
1.4	Yellow: Output 3 active
2.1	Yellow: Output 4 active
2.2	Yellow: Output 5 active
2.3	Yellow: Output 6 active
2.4	Yellow: Output 7 active
3.1	Yellow: Output 8 active
3.2	Yellow: Output 9 active
3.3	Yellow: Output 10 active
3.4	Yellow: Output 11 active
4.1	Yellow: Output 12 active
4.2	Yellow: Output 13 active
4.3	Yellow: Output 14 active
4.4	Yellow: Output 15 active

LED indicators UR20-16DO-P, error messages see Chapter 13



Block diagram UR20-16DO-P

Technical data UR20-16DO-P (Order No. 1315250000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	16	
Type	P-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	8 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	1 kHz
Actuator connection	1-wire	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	25 mA + load	
General data		
Weight (operational status)	83 g	
For additional general data, see Section 3.4		

Diagnostic data UR20-16DO-P

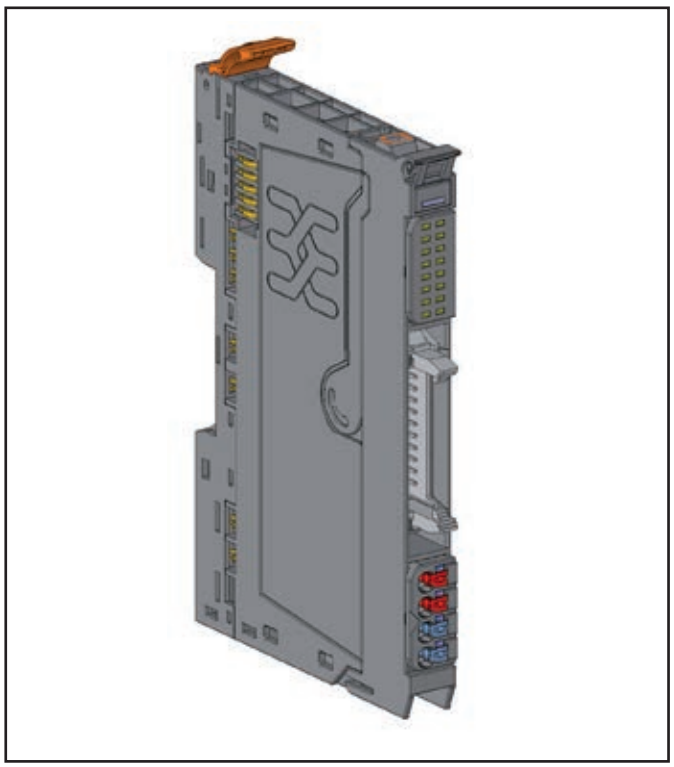
Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] outputs UR20-16DO-P

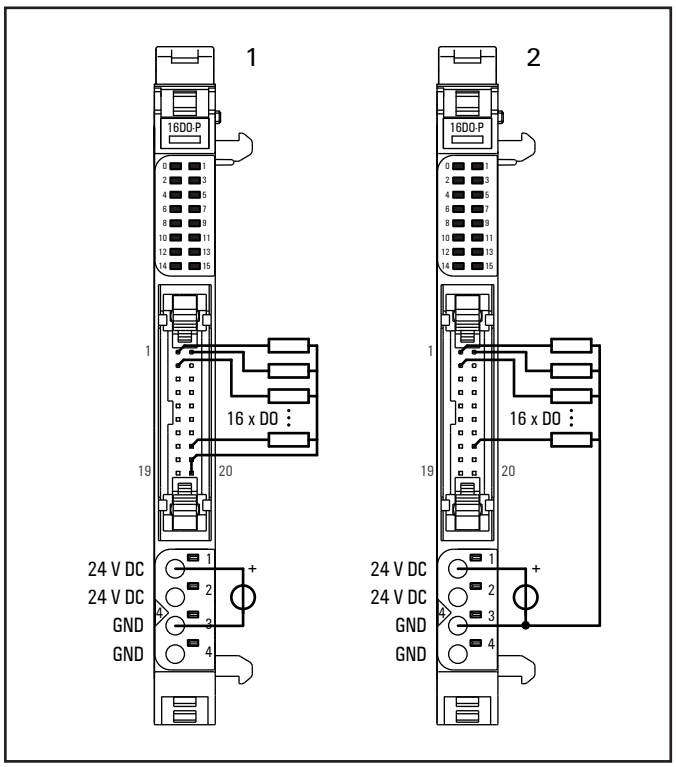
Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	DO4
	QX0.5	DO5
	QX0.6	DO6
	QX0.7	DO7
QB1	QX1.0	DO8
	QX1.1	DO9
	QX1.2	DO10
	QX1.3	DO11
	QX1.4	DO12
	QX1.5	DO13
	QX1.6	DO14
	QX1.7	DO15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.21 Digital output module UR20-16DO-P-PLC-INT



Digital output module UR20-16DO-P-PLC-INT (Order No. 1315270000)



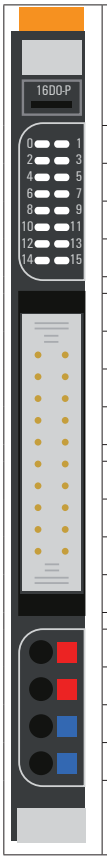
Connection diagram UR20-16DO-P-PLC-INT

1 Total current < 2 A
2 Total current > 2 A

The digital output module UR20-16DO-P-PLC-INT can control up to 16 actuators each with a maximum of 0.5 A. The actuators are connected via a standard PLC connection (20-pole). A status LED is assigned to each channel in a separate block. The module electronics can supply the actors with power from the 4-pole feed-in plug (connector 4) via the PLC connection. Vice versa the module can be supplied via the PLC connection.

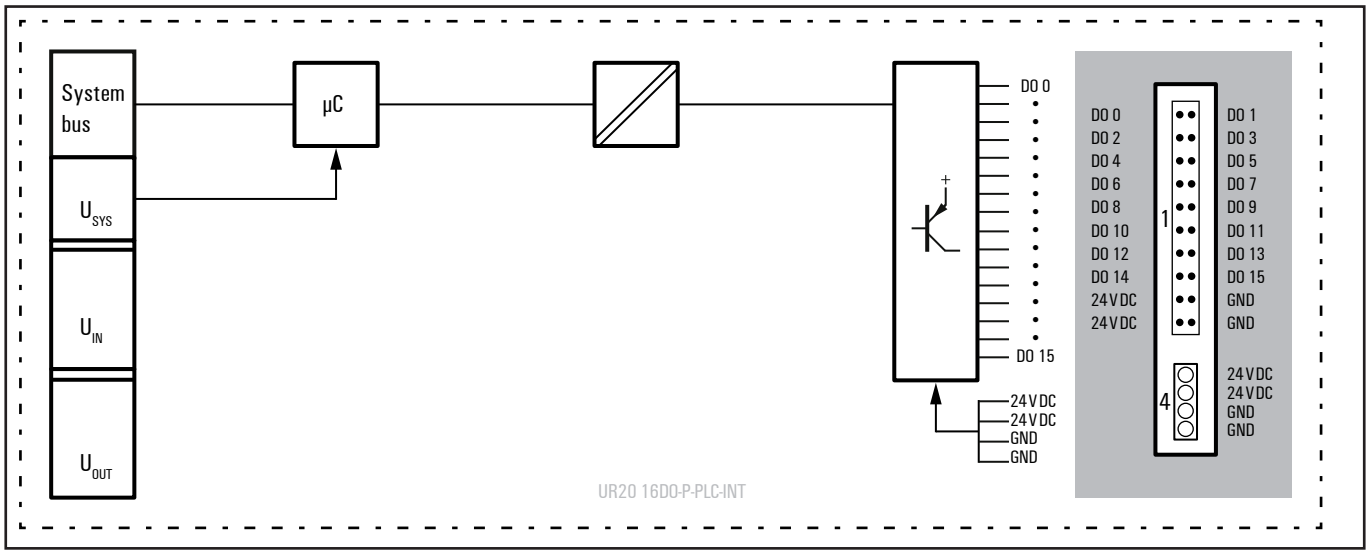
For the PLC connection, the following applies: a maximum current of 2 A (with a max. of 1 A per contact) can be taken from the +24 V connections or fed through the 0 V connections.

The power supply of the peripherals connected has to be calculated for each individual installation situation. When using a flat ribbon cable, please regard its higher internal resistance!



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
0	Yellow: Output 0 active
1	Yellow: Output 1 active
to	to
15	Yellow: Output 15 active
4.1	Green: Supply voltage feed-in plug > 18 V DC
4.2	Red: Error on the supply voltage of the feed-in plug

LED indicators UR20-16DO-P-PLC-INT, error messages see Chapter 13



Block diagram UR20-16DO-P-PLC-INT

Technical data UR20-16DO-P-PLC-INT (Order No. 1315270000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	16	
Type	P-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	8 A (2 A with power supply via a flat ribbon cable)
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	1 kHz
Actuator connection	PLC interface unit	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	25 mA + load, power supply via feed-in plug or PLC connection	
Connection data		
Type of connection	"PUSH IN"	
Line connection cross-section	Single-wired	0.14 – 1.5 mm² (AWG 16 – 26)
	Fine-wired	0.14 – 1.5 mm² (AWG 16 – 26)
I/O connector	20-pole PLC connection	
General data		
Weight (operational status)	82 g	
For additional general data, see Section 3.4		

Diagnostic data UR20-16DO-P-PLC-INT

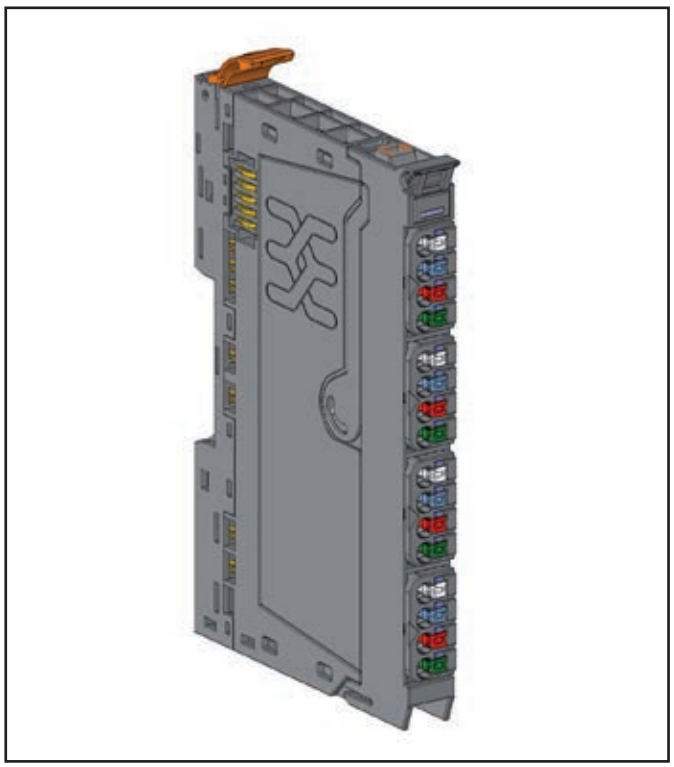
Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] outputs UR20-16DO-P-PLC-INT

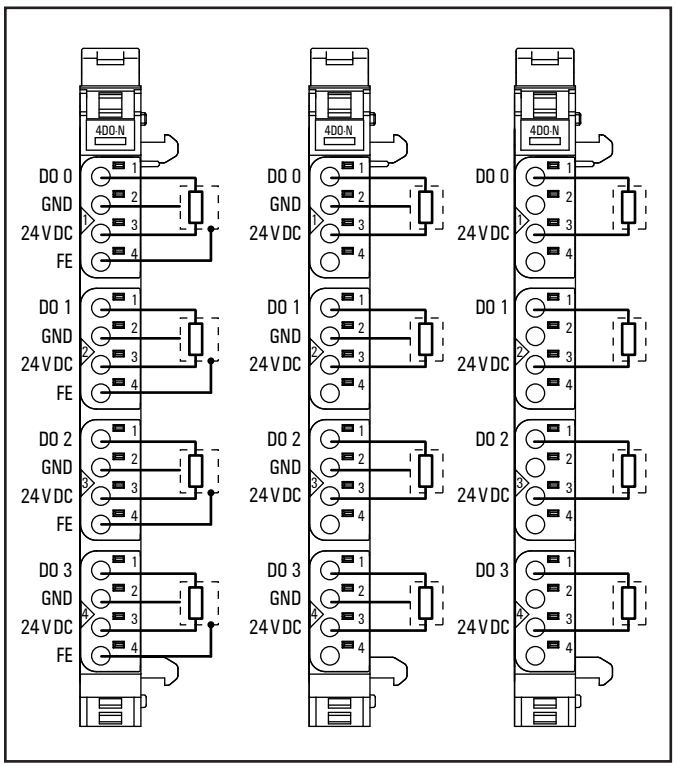
Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	DO4
	QX0.5	DO5
	QX0.6	DO6
	QX0.7	DO7
QB1	QX1.0	DO8
	QX1.1	DO9
	QX1.2	DO10
	QX1.3	DO11
	QX1.4	DO12
	QX1.5	DO13
	QX1.6	DO14
	QX1.7	DO15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.22 Digital output module UR20-4DO-N

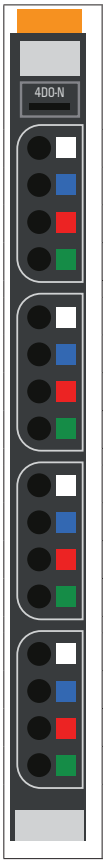


Digital output module UR20-4DO-N (Order No. 1315410000)



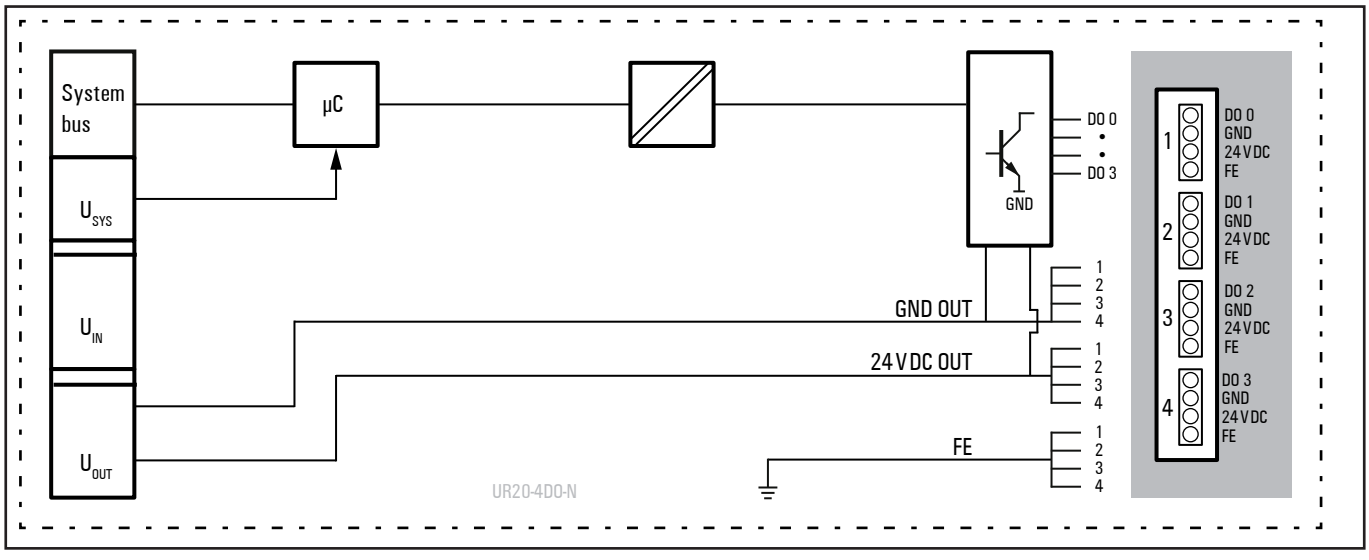
Connection diagram UR20-4DO-N

The UR20-4DO-N digital output module can control up to 4 actuators each with a maximum of 0.5 A. One actuator can be connected to each connector using a 2-wire, 3-wire or 3-wire connection + FE. The outputs are N-switching (sinking). A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
2.1	Yellow: Output 1 active
3.1	Yellow: Output 2 active
4.1	Yellow: Output 3 active

LED indicators UR20-4DO-N, error messages see Chapter 13



Block diagram UR20-4DO-N

Technical data UR20-4DO-N (Order No. 1315410000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	4	
Type	N-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	2 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	10 Hz
Actuator connection	2-wire, 3-wire, 3-wire + FE	
Actuator supply	max. 2 A per plug, total max. 8 A	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	10 mA + load	
General data		
Weight (operational status)	87 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-4DO-N

Channel	Description	Options[1)]	Default
0 ... 3	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

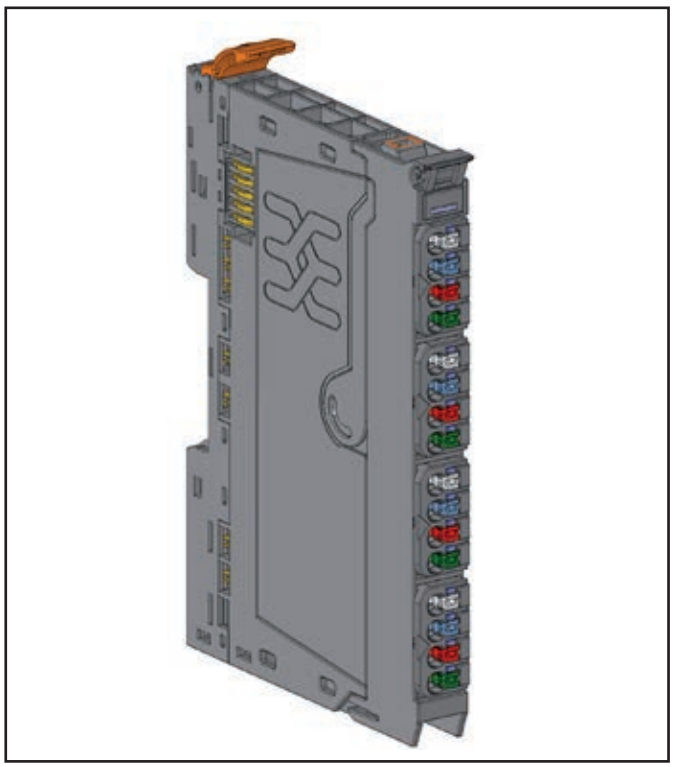
Diagnostic data UR20-4DO-N

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		Time stamp [µs] (32 bit)	

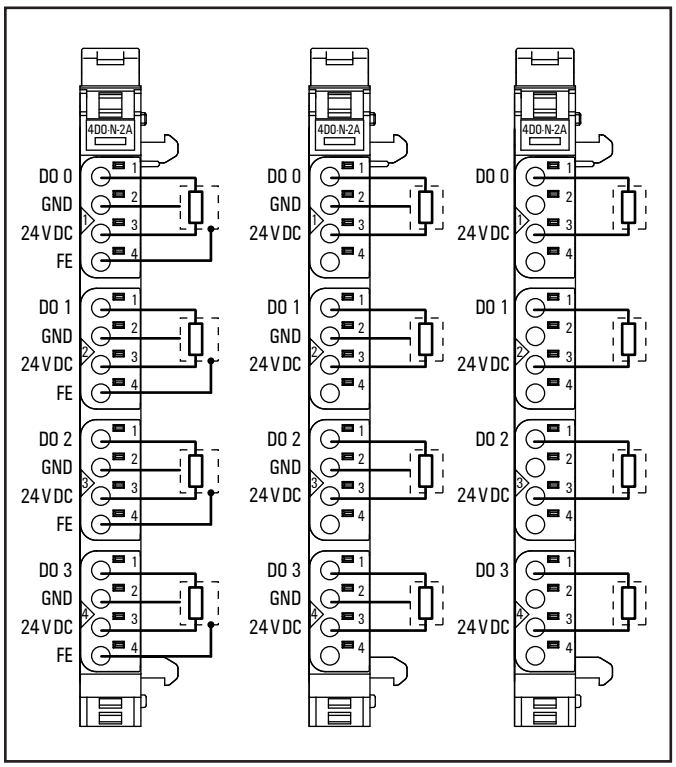
Process data outputs UR20-4DO-N

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	Reserved
	QX0.5	Reserved
	QX0.6	Reserved
	QX0.7	Reserved

6.23 Digital output module UR20-4DO-N-2A

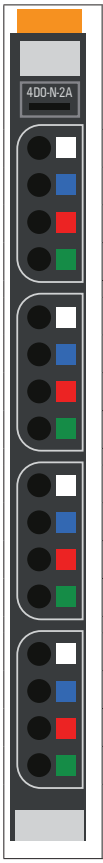


Digital output module UR20-4DO-N-2A (Order No. 1315420000)



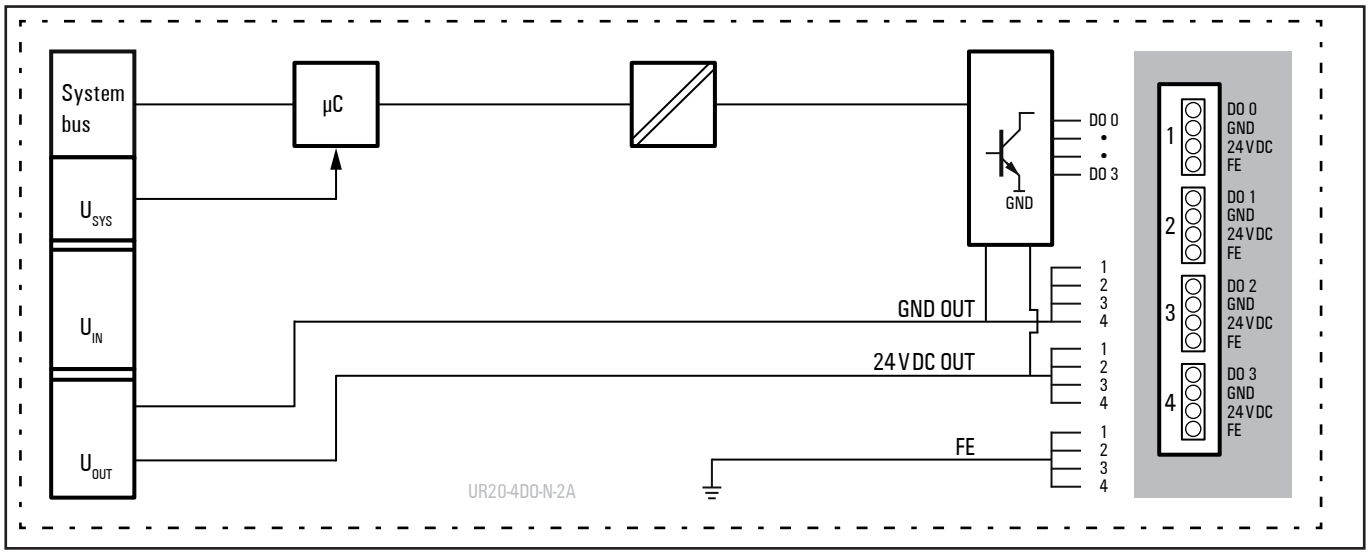
Connection diagram UR20-4DO-N-2A

The digital output module UR20-4DO-N-2A can control up to 4 actuators, each with a maximum of 2 A. One actuator can be connected to each connector using a 2-wire, 3-wire or 3-wire connection + FE. The outputs are N-switching (sinking). A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
2.1	Yellow: Output 1 active
3.1	Yellow: Output 2 active
4.1	Yellow: Output 3 active

LED indicators UR20-4DO-P-2A, error messages see Chapter 13



Block diagram UR20-4DO-P-2A

Technical data UR20-4DO-N-2A (Order No. 1315420000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	4	
Type	N-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	2 A
	per module	8 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (48 W)	10 Hz
Actuator connection	2-wire, 3-wire, 3-wire + FE	
Actuator supply	max. 2 A per plug, total max. 8 A	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	10 mA + load	
General data		
Weight (operational status)	89 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-4DO-N-2A

Channel	Description	Options[1)]	Default
0 ... 3	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

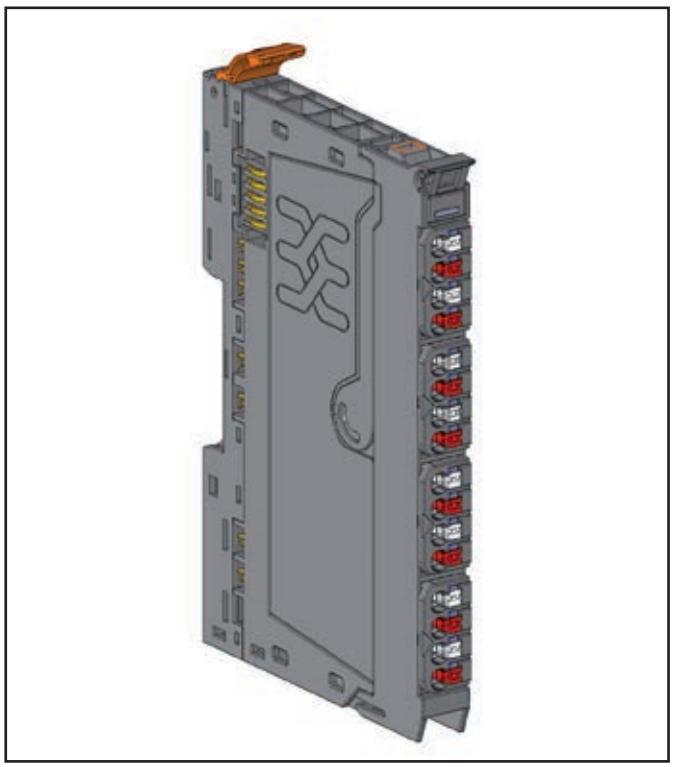
Diagnostic data UR20-4DO-N-2A

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 to 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		Time stamp [µs] (32 bit)	

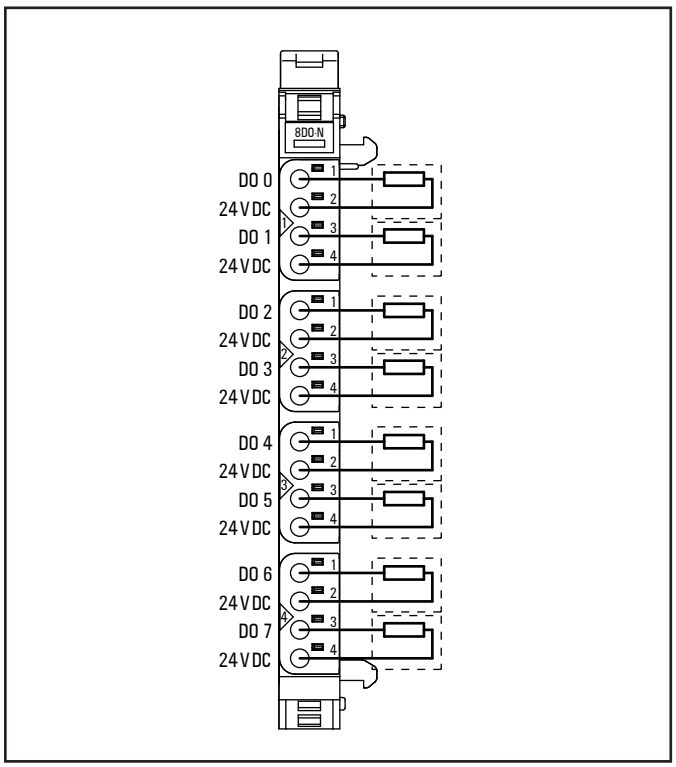
Process data outputs UR20-4DO-N-2A

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	Reserved
	QX0.5	Reserved
	QX0.6	Reserved
	QX0.7	Reserved

6.24 Digital output module UR20-8DO-N

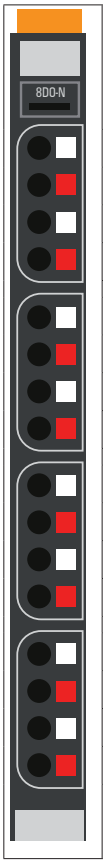


Digital output module UR20-8DO-N (Order No. 1315430000)



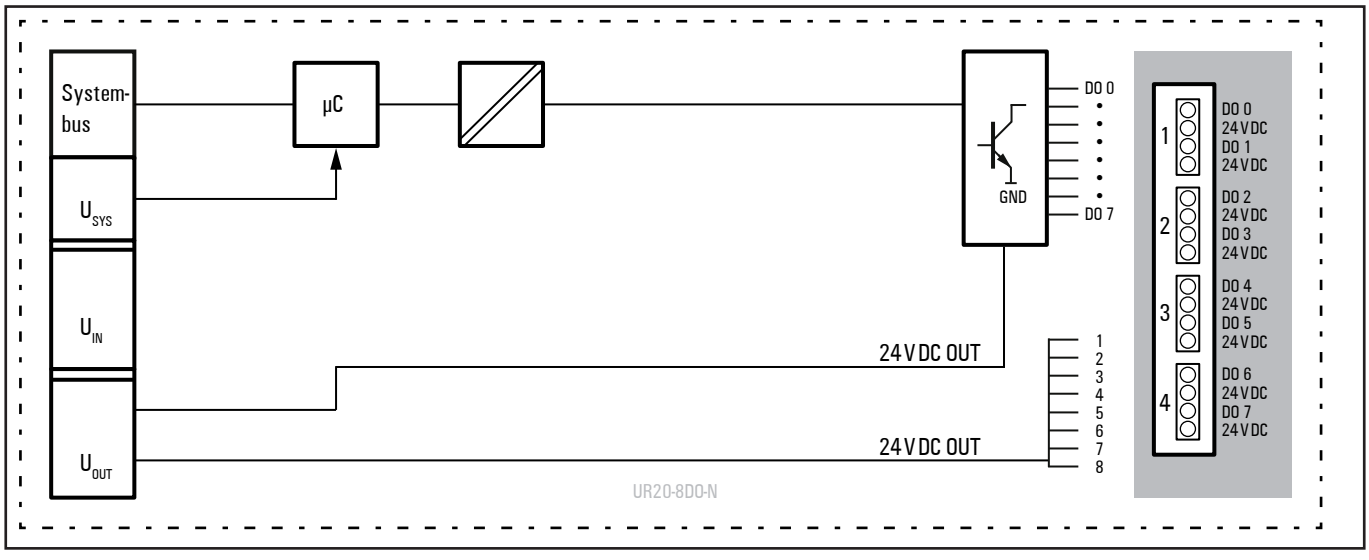
Connection diagram UR20-8DO-N

The UR20-8DO-N digital output module can control up to 8 actuators each with a maximum of 0.5 A. One actuator can be connected to each connector using a 2-wire connection. The outputs are N-switching (sinking). A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
1.3	Yellow: Output 1 active
2.1	Yellow: Output 2 active
2.3	Yellow: Output 3 active
3.1	Yellow: Output 4 active
3.3	Yellow: Output 5 active
4.1	Yellow: Output 6 active
4.3	Yellow: Output 7 active

LED indicators UR20-8DO-N, error messages see Chapter 13



Block diagram UR20-8DO-N

Technical data UR20-8DO-N (Order No. 1315430000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	8	
Type	N-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	4 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	10 Hz
Actuator connection	2-wire	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	15 mA + load	
General data		
Weight (operational status)	87 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-8DO-N

Channel	Description	Options[1)]	Default
0 ... 7	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

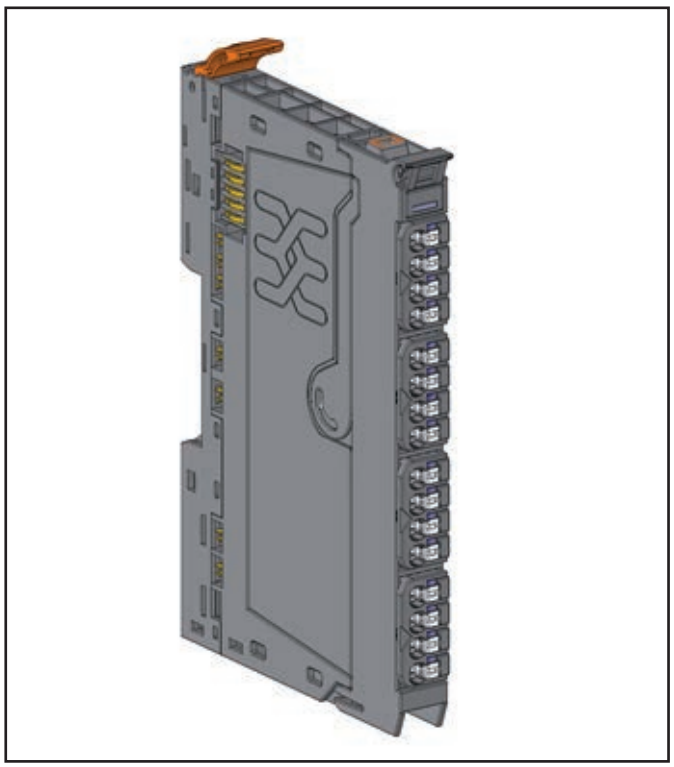
Diagnostic data UR20-8DO-N

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

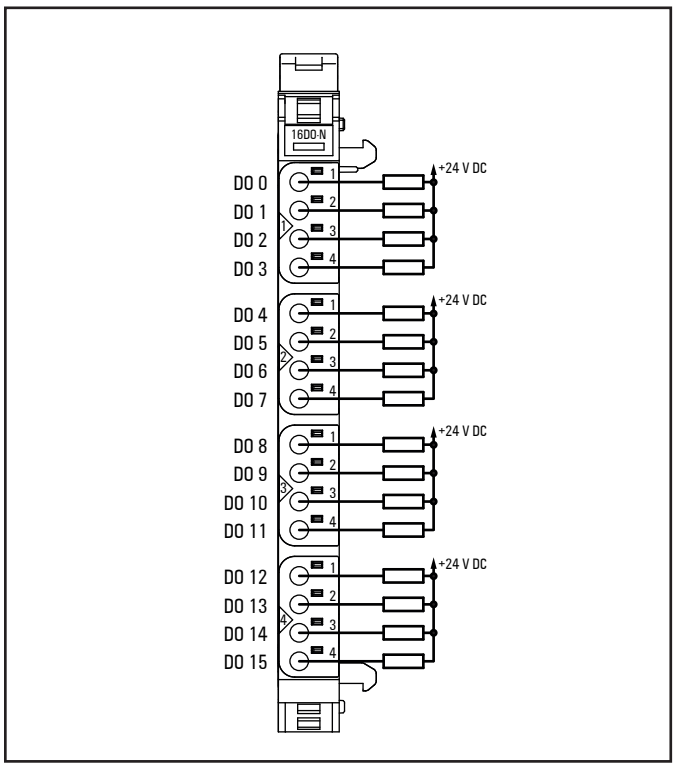
Process data outputs UR20-8DO-N

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	DO4
	QX0.5	DO5
	QX0.6	DO6
	QX0.7	DO7

6.25 Digital output module UR20-16DO-N

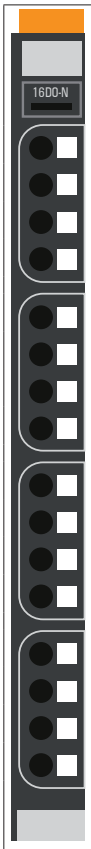


Digital output module UR20-16DO-N (Order No. 1315440000)



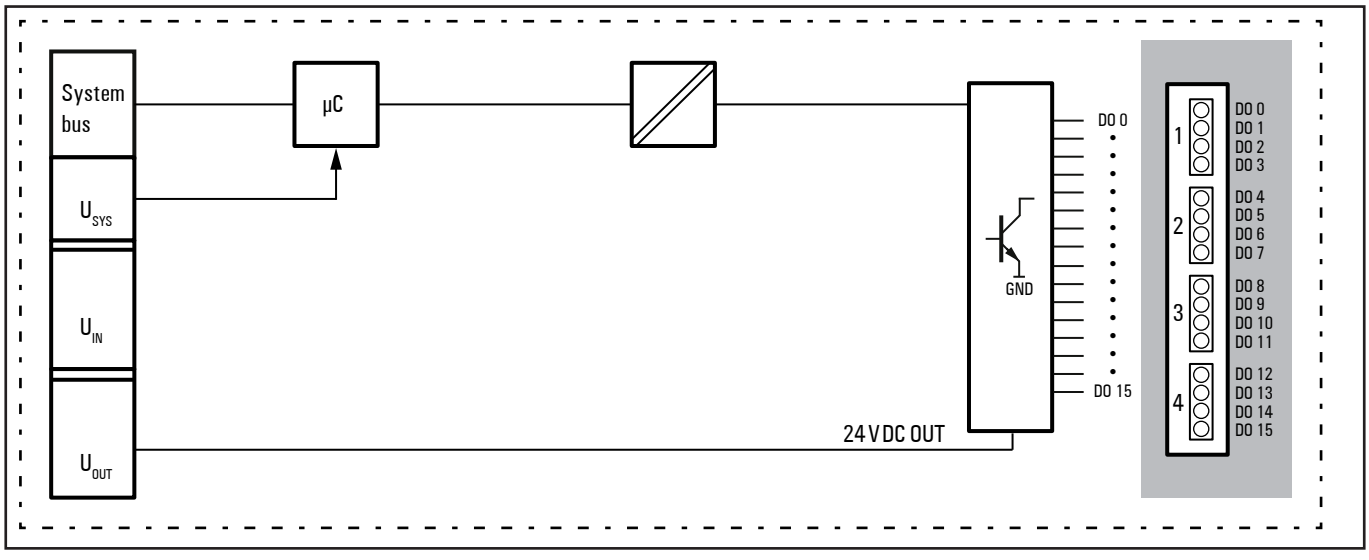
Connection diagram UR20-16DO-N

The UR20-16DO-N digital output module can control up to 16 actuators each with a maximum of 0.5 A. Four actuators can be connected to each connector. The outputs are N-switching. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}).



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
1.2	Yellow: Output 1 active
1.3	Yellow: Output 2 active
1.4	Yellow: Output 3 active
2.1	Yellow: Output 4 active
2.2	Yellow: Output 5 active
2.3	Yellow: Output 6 active
2.4	Yellow: Output 7 active
3.1	Yellow: Output 8 active
3.2	Yellow: Output 9 active
3.3	Yellow: Output 10 active
3.4	Yellow: Output 11 active
4.1	Yellow: Output 12 active
4.2	Yellow: Output 13 active
4.3	Yellow: Output 14 active
4.4	Yellow: Output 15 active

LED indicators UR20-16DO-N, error messages see Chapter 13



Block diagram UR20-16DO-N

Technical data UR20-16DO-N (Order No. 1315440000)

System data		
Data	Prozess-, Parameter- und Diagnosedaten sind abhängig vom eingesetzten Koppler, siehe Tabelle in Abschnitt 4.10.	
Interface	u-remote-Systembus	
System bus transfer rate	48 MBit/s	
Outputs		
Number	16	
Type	N-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	8 A
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	10 Hz
Actuator connection	1-wire	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	< 100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	30 mA + load	
General data		
Weight (operational status)	89 g	
For additional general data, see Section 3.4		

Diagnostic data UR20-16DO-N

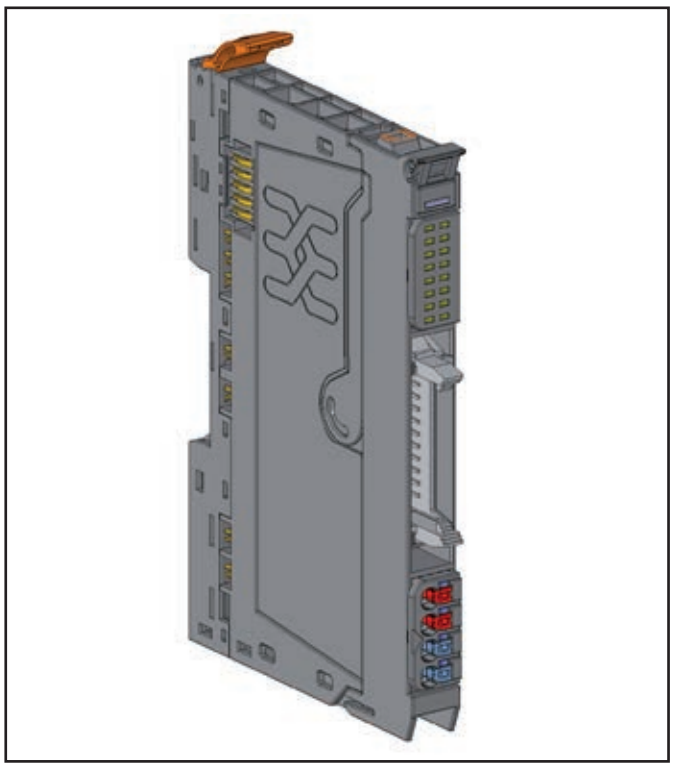
Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] outputs UR20-16DO-N

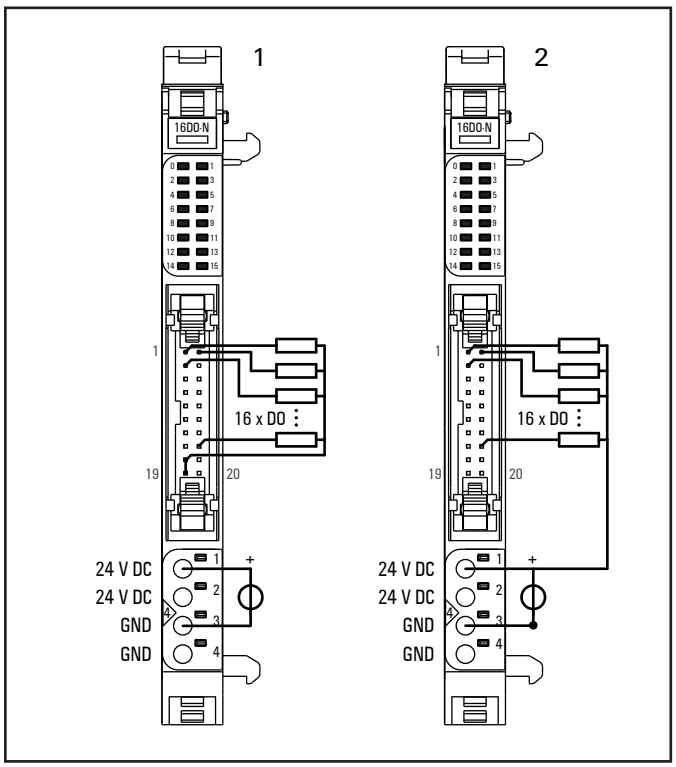
Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	DO4
	QX0.5	DO5
	QX0.6	DO6
	QX0.7	DO7
QB1	QX1.0	DO8
	QX1.1	DO9
	QX1.2	DO10
	QX1.3	DO11
	QX1.4	DO12
	QX1.5	DO13
	QX1.6	DO14
	QX1.7	DO15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.26 Digital output module UR20-16DO-N-PLC-INT



Digital output module UR20-16DO-N-PLC-INT (Order No. 1315450000)



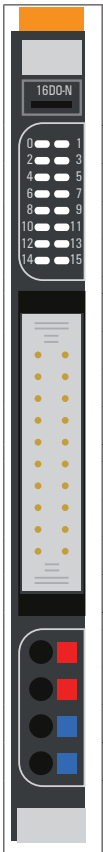
Connection diagram UR20-16DO-N-PLC-INT

The digital output module UR20-16DO-N-PLC-INT can control up to 16 actuators each with a maximum of 0.5 A. The actuators are connected via a standard PLC connection (20-pole). The outputs are N-switching. A status LED is assigned to each channel in a separate block. The module electronics can supply the actors with power from the 4-pole feed-in plug (connector 4) via the PLC connection. Vice versa the module can be supplied via the PLC connection.

For the PLC connection, the following applies: a maximum current of 2 A (with a max. of 1 A per contact) can be taken from the +24 V connections or fed through the 0 V connections.

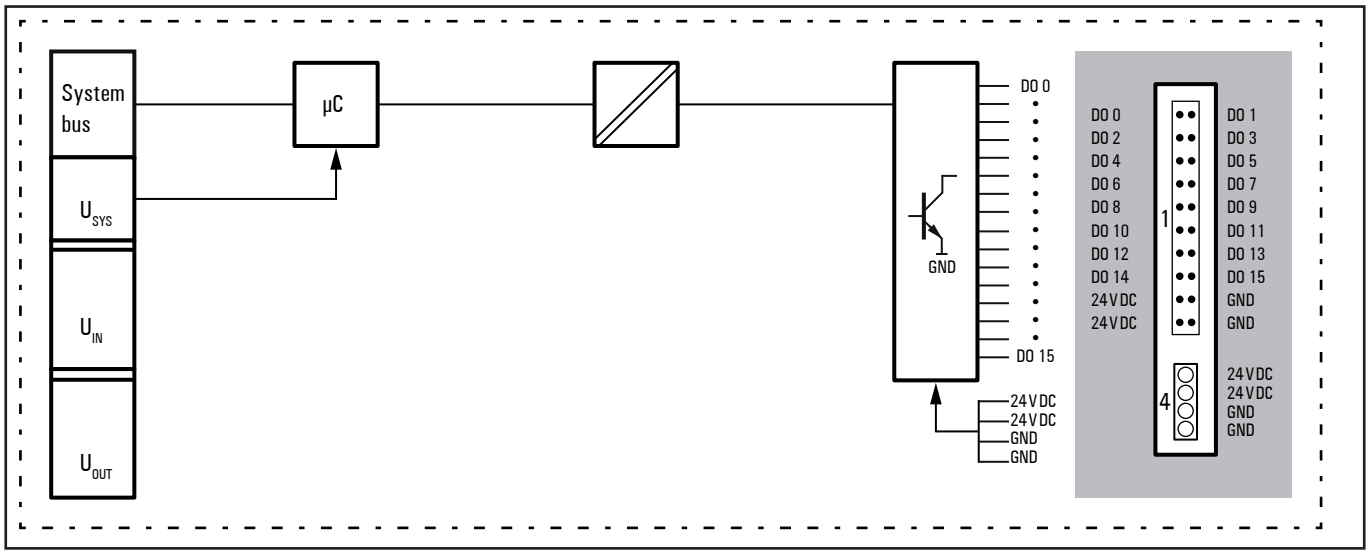
The power supply of the peripherals connected has to be calculated for each individual installation situation. When using a flat ribbon cable, please regard its higher internal resistance!

3 Total current < 2 A
4 Total current > 2 A



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
0	Yellow: Output 0 active
1	Yellow: Output 1 active
...	to
15	Yellow: Output 15 active
4.1	Green: Supply voltage feed-in plug > 18 V DC
4.2	Red: Error on the supply voltage of the feed-in plug

LED indicators UR20-16DO-N-PLC-INT, error messages see Chapter 13



Block diagram UR20-16DO-N-PLC-INT

Technical data UR20-16DO-N-PLC-INT (Order No. 1315450000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	16	
Type	N-switching	
Type of load	ohmic, inductive, lamp load	
Response time	low » high max. 100 µs; high » low max. 250 µs	
Max. output current	per channel	0.5 A
	per module	8 A (2 A with power supply via a flat ribbon cable)
Breaking energy (inductive)	150 mJ per channel	
Switching frequency	Ohmic load (min. 47 Ω)	1 kHz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 1 kHz with suitable free-wheeling diode
	Lamp load (12 W)	10 Hz
Actuator connection	PLC interface unit	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off and automatic restart	
Response time of the current limiting circuit	< 100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	30 mA + load, power supply via feed-in plug or PLC connection	
Connection data		
Type of connection	„PUSH IN“	
Line connection cross-section	Single-wired	0.14 … 1.5 mm² (AWG 16 … 26)
	Fine-wired	0.14 … 1.5 mm² (AWG 16 … 26)
I/O connector	20-pole PLC connection	
General data		
Weight (operational status)	83 g	
For additional general data, see Section 3.4		

Diagnostic data UR20-16DO-N-PLC-INT

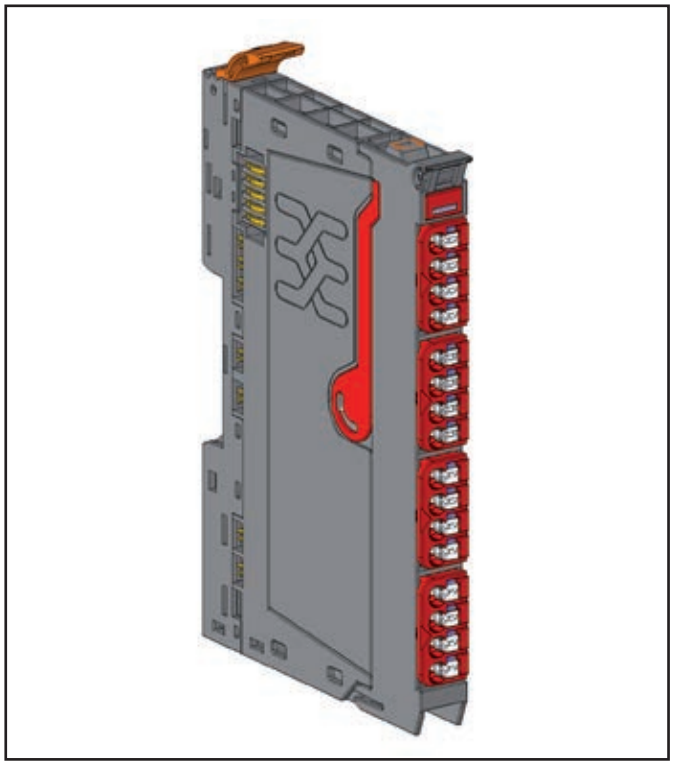
Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	0
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		Time stamp [µs] (32bit)	

Process data[1] outputs UR20-16DO-N-PLC-INT

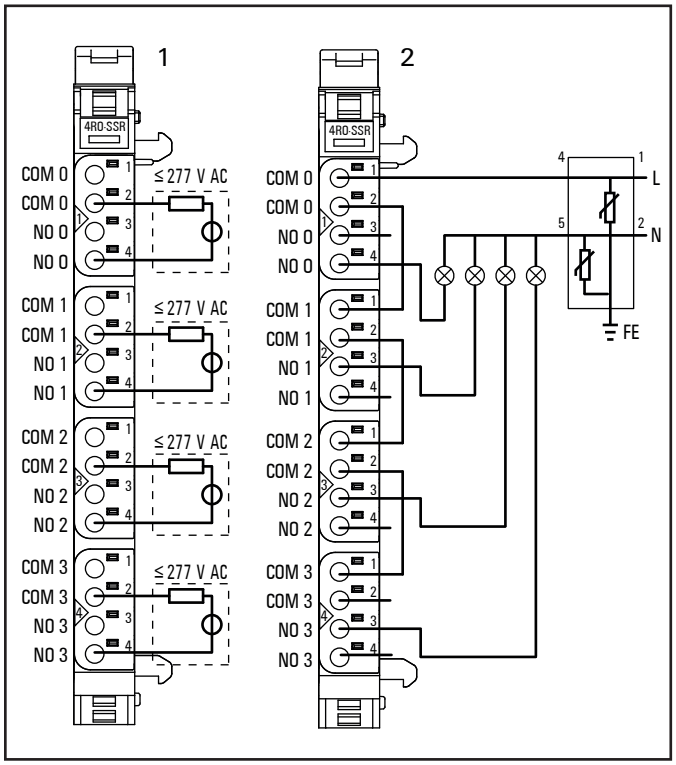
Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	DO4
	QX0.5	DO5
	QX0.6	DO6
	QX0.7	DO7
QB1	QX1.0	DO8
	QX1.1	DO9
	QX1.2	DO10
	QX1.3	DO11
	QX1.4	DO12
	QX1.5	DO13
	QX1.6	DO14
	QX1.7	DO15

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.27 Digital output module UR20-4RO-SSR-255



Digital output module UR20-4RO-SSR-255 (Order No. 1315540000)



Connection diagram UR20-4RO-SSR-255

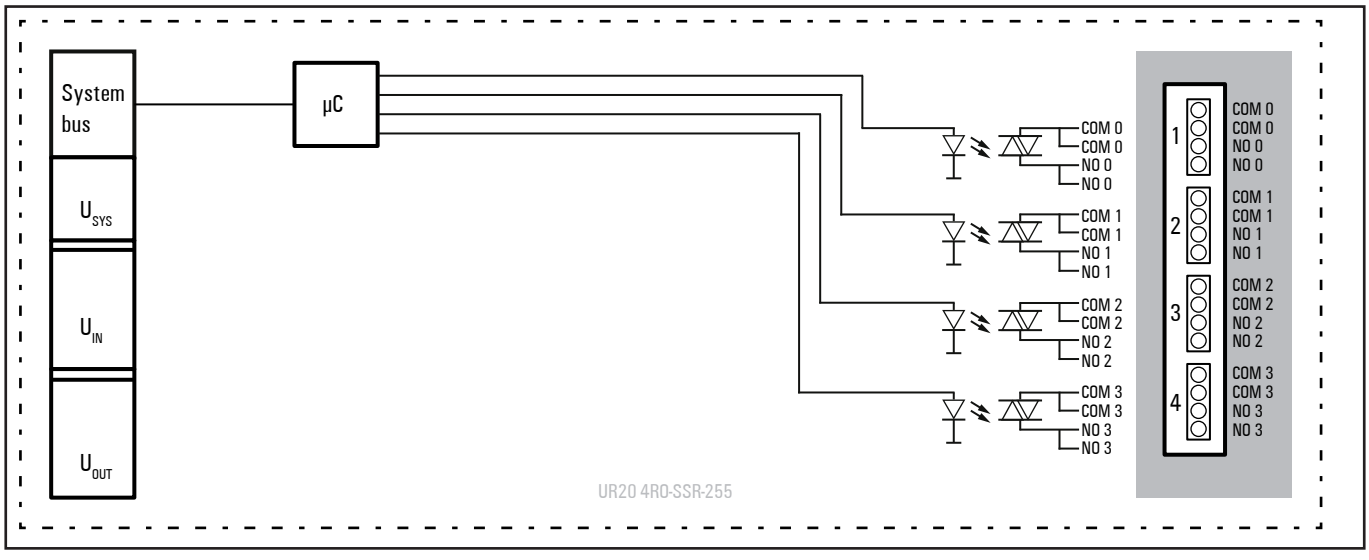
The digital output module UR20-4RO-SSR-255 uses four semiconductor switches to control up to 4 actuators, each with a maximum of 1 A at 255 V AC. The switching characteristics of the semiconductor switch have it as being closed when the voltage crosses zero and open when the current crosses zero. Each connector features a potential-free NO contact (Normally Open). A status LED is assigned to each channel.

For the protection against extreme disturbance level use surge protection terminals with varistor (see connection diagram 2), e.g. VSSC6 MOV 240 V AC/DC, order no. 1064630000.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: Output 0 active
2.1	Yellow: Output 1 active
3.1	Yellow: Output 2 active
4.1	Yellow: Output 3 active

LED indicators UR20-4RO-SSR-255, error messages see Chapter 13



Block diagram UR20-4RO-SSR-255

Technical data UR20-4RO-SSR-255 (Order No. 1315540000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	4	
Type	SSR / triac	
Switching characteristic	closing when the voltage crosses zero, opening when the current crosses zero	
Response time	10 ms	
Minimum switching current	per channel	50 mA
Maximum switching current	per channel	1 A
	per module	4 A
Holding current	25 mA	
Installation	external surge voltage protection circuit recommended for overvoltage category II and III	
Switching frequency	up to 20 Hz	
Short-circuit-proof	no	
Defined trip behaviour of the prescribed external fuse	1 A super quick-acting	
Module diagnosis	yes	
Individual channel diagnosis	no	
Max. switching voltage	250 V AC, UL: 277 AC	
Reactionless	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
General data		
Weight (operational status)	83 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-4RO-SSR-255

Channel	Description	Options[1)]	Default
0 ... 3	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

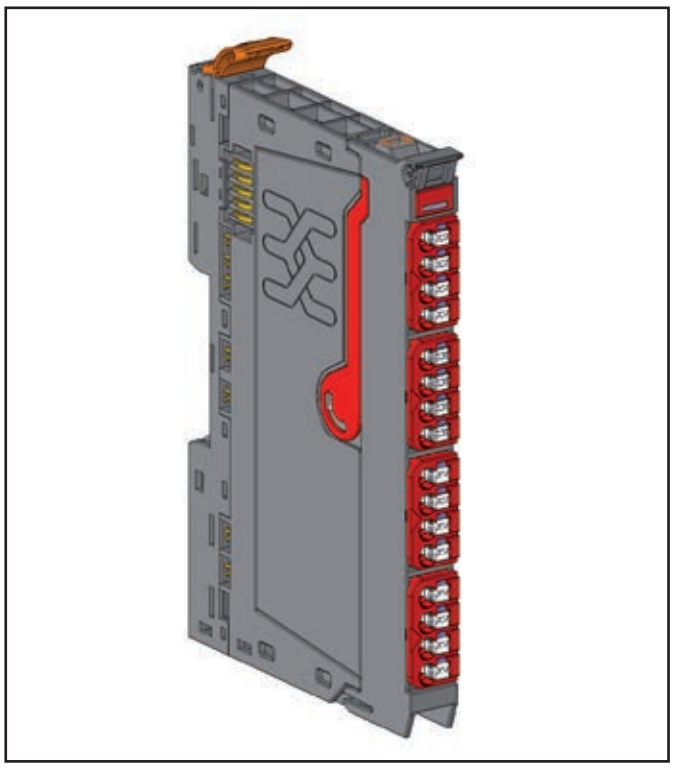
Diagnostic data UR20-4RO-SSR-255

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

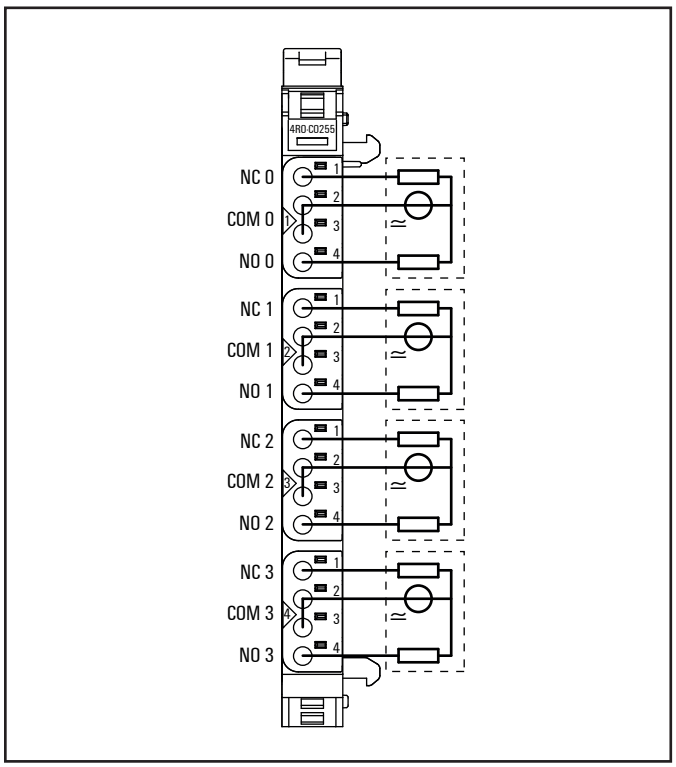
Process data outputs UR20-4RO-SSR-255

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	Reserved
	QX0.5	Reserved
	QX0.6	Reserved
	QX0.7	Reserved

6.28 Digital relay output module UR20-4RO-CO-255



Digital relay output module UR20-4RO-CO-255 (Order No. 1315550000)



Connection diagram UR20-4RO-CO-255

The digital relay output module UR20-4 RO-CO-255 can control up to 4 actuators each with a maximum of 6 A. Each connector features a potential-free changeover contact. A status LED is assigned to each channel. The relay coils are supplied with power from the output current path (I_{OUT}).

ATTENTION

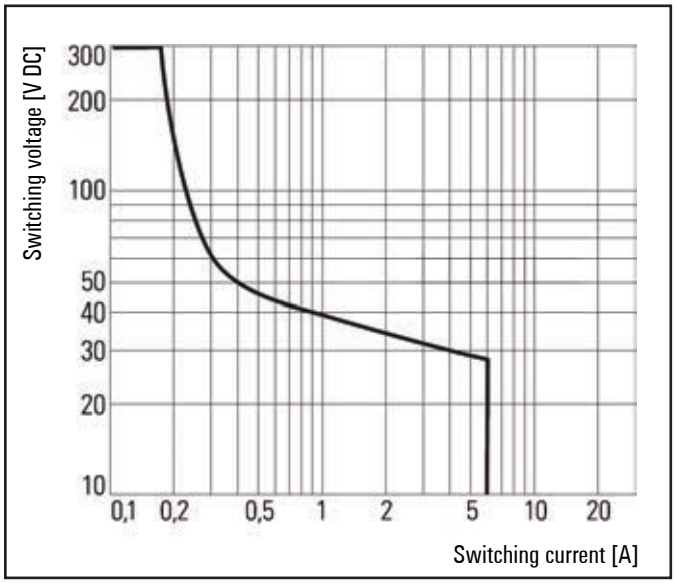
When using relay modules UR20-4RO-CO-255 in explosive atmosphere:

- Condensation shall be avoided.
- If the switching voltage exceeds 63 V, a transient protection device shall be provided that limits the transients to a peak voltage of 497 V or less.

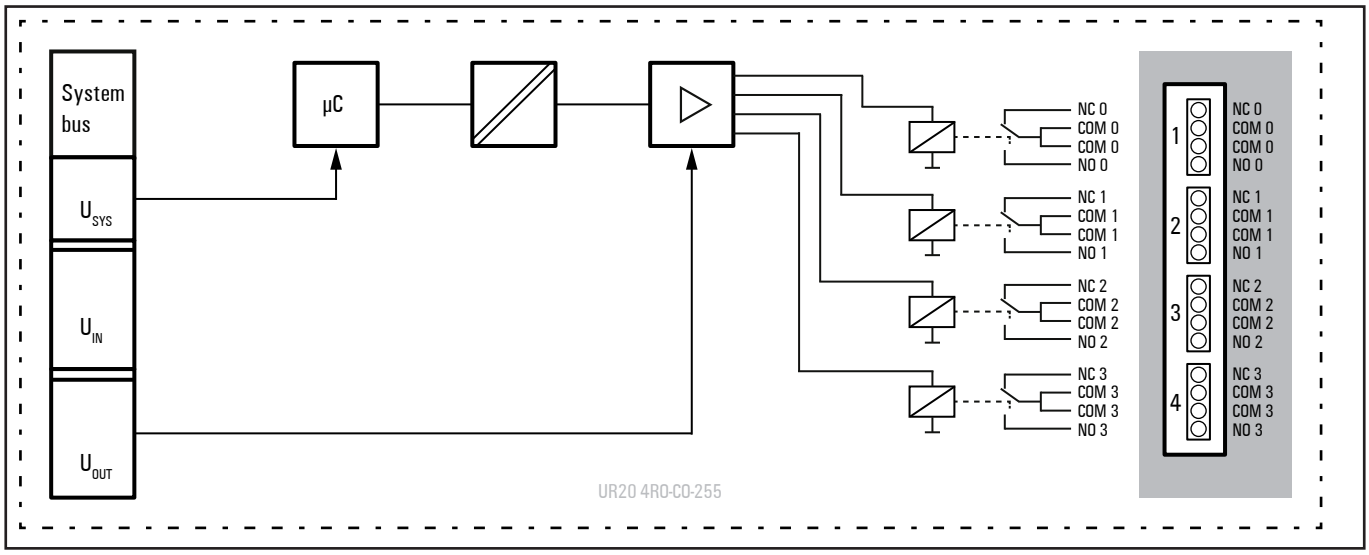


	Status LED module Green: Communication on system bus Red: No communication on system bus or diagnostic message displayed
1.1	Yellow: Output 0 active
2.1	Yellow: Output 1 active
3.1	Yellow: Output 2 active
4.1	Yellow: Output 3 active

LED indicators UR20-4RO-CO-255, error messages see Chapter 13



Derating curve: Maximum Switching voltage with resitive load



Block diagram UR20-4RO-CO-255

Technical data UR20-4RO-CO-255 (Order No. 1315550000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	4	
Type	CO contact	
Material for power and data contacts	Ni-Au, 3 µm	
Response time	20 ms	
Max. output current	per channel	5 A at 60 °C / 6 A at 55 °C
	per module	20 A at 60 °C / 24 A at 55 °C
Switching frequency	max. 5 Hz	
Short-circuit-proof	no	
Protective circuit	External fusing with 6 A prescribed	
Service life with AC-15 load and 1-A switching current	> 300.000 switching cycles	
Module diagnosis	yes	
Individual channel diagnosis	no	
Max. switching voltage	255 V AC, UL: 277 V AC, DC corresponding to the derating curve	
Reactionless	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	4 mA + 4 mA per active relay	
General data		
Weight (operational status)	83 g	
For additional general data, see Section 3.4		

Overview of the editable parameter UR20-4RO-CO-255

Channel	Description	Options[1)]	Default
0 ... 3	Substitute value	Off (0) / On (1)	Off

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

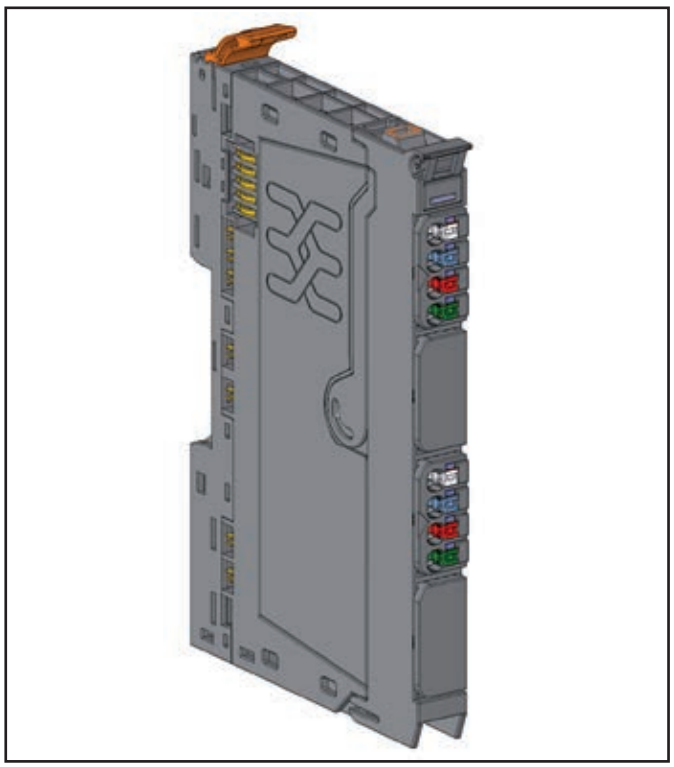
Diagnostic data UR20-4RO-CO-255

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

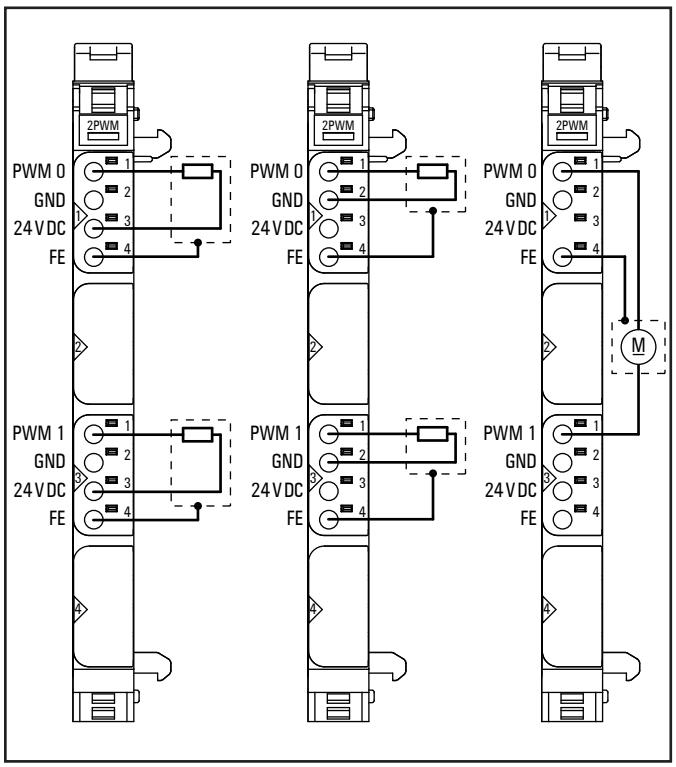
Process data outputs UR20-4RO-CO-255

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3
	QX0.4	Reserved
	QX0.5	Reserved
	QX0.6	Reserved
	QX0.7	Reserved

6.29 Digital pulse width modulation output module UR20-2PWM-PN-0.5A



Digital pulse width modulation output module UR20-2PWM-PN-0.5A (Order No. 1315600000)



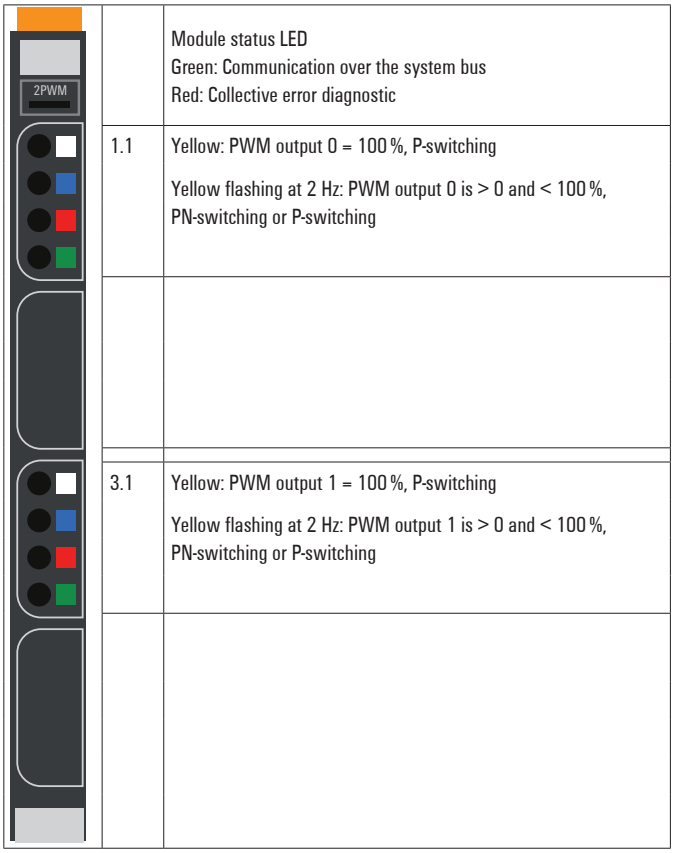
Connection diagram UR20-2PWM-PN-0.5A

The digital pulse width modulation module UR20-2PWM-PN-0.5A can control up to 2 actuators each with a maximum of 0.5 A. The period duration for each channel can be parameterised from 25 µs to approx. 175 ms (input values from 1202 to 8388607 based on a factor 0.02083 µs).

Via an output double word in the process data the pulse duration is defined from 0 µs to approx. 175 ms for each channel (input values from 0 to 8388607 based on a factor 0.02083 µs). If the pulse duration is equal or exceeds the duration of the period, the output is set permanently.

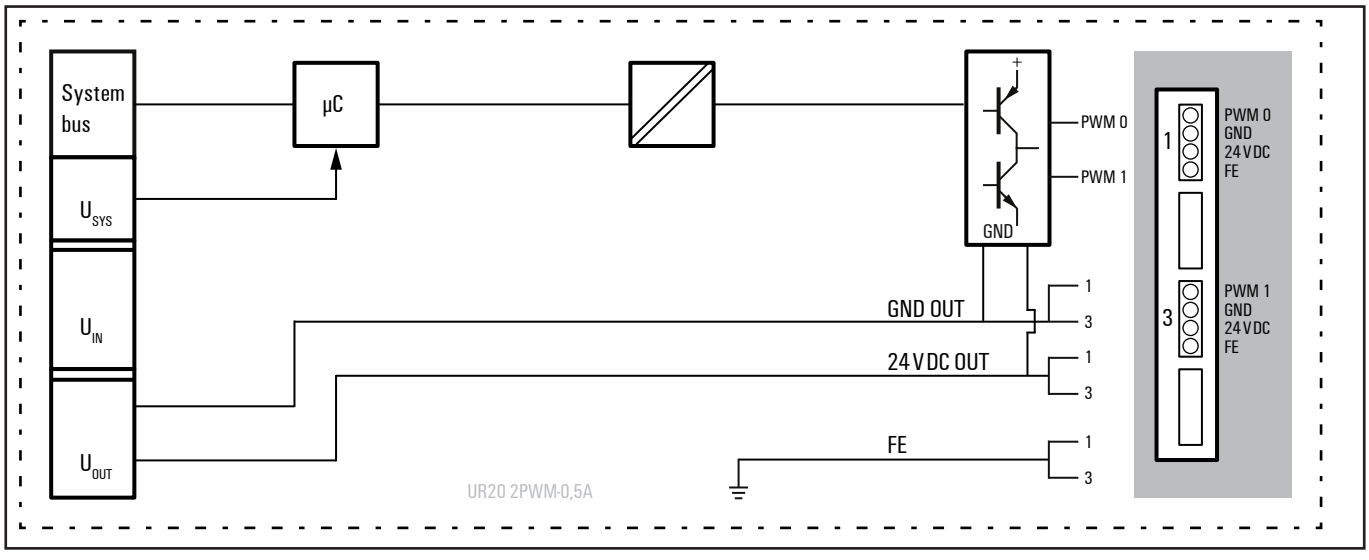
In another output word the output mode is switched and the output is being started and stopped. Deactivated outputs are set to GND.

For each channel the current status can be read in an status word. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}). The module is protected against external voltages between 0 V and the operating voltage.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: PWM output 0 = 100 %, P-switching Yellow flashing at 2 Hz: PWM output 0 is > 0 and < 100 %, PN-switching or P-switching
3.1	Yellow: PWM output 1 = 100 %, P-switching Yellow flashing at 2 Hz: PWM output 1 is > 0 and < 100 %, PN-switching or P-switching

LED indicators UR20-2PWM-PN-0.5A, error messages see Chapter 13



Block diagram UR20-2PWM-PN-0.5A

Technical data UR20-2PWM-PN-0.5A (Order No. 1315600000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	2	
Type	PN output stage	
Response time	< 0.1 µs	
Period duration	25 µs to 175 ms (≙ 40 kHz to 6 Hz)	
Max. output current	per channel	0.5 A
	per module	1 A
Switching frequency	Ohmic load (min. 47 Ω)	static, 6 Hz to 40 kHz
	Inductive load (DC 13)	static, 6 Hz to 40 kHz
	Lamp load (12 W)	static, 6 Hz to 40 kHz
Actuator connection	2-wire, 3-wire, 3-wire + FE	
Actuator supply	max. 2 A per plug, total max. 5 A plus output current of channels	
Pulse/period ratio	0–100 % PN-switching or P-switching, adjustable	
Short-circuit-proof	yes	
Response time of the protective circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption (from output current path I_{OUT})	40 mA	
General data		
Weight (operational status)	89 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-2PWM-PN-0.5A

Channel	Description	Options[1)]	Default
0 ... 1	Period duration = n*0.02083 µs	1202 ... 8388607	1202

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-2PWM-PN-0.5A

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	2
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-2PWM-PN-0.5A

Byte	Format	Name	Bit	Function, if active	Remarks
IB0	Word	Channel 0: Status word	IX0.0	reserved	
			IX0.1	Status PWM output	0: disabled, 1: enabled
			IX0.2	reserved	
			IX0.3	Output mode	0: PN-switching 1: P-switching
			IX0.4 ... 0.7	reserved	
IB1			IX1.0 ... 1.7	reserved	
IB2	Word	Channel 1: Status word	IX2.0	reserved	
			IX2.1	Status PWM output	0: disabled, 1: enabled
			IX2.2	reserved	
			IX2.3	Output mode	0: PN-switching 1: P-switching
			IX02.4 ... 2.7	reserved	
IB3			IX3.0 ... 3.7	reserved	

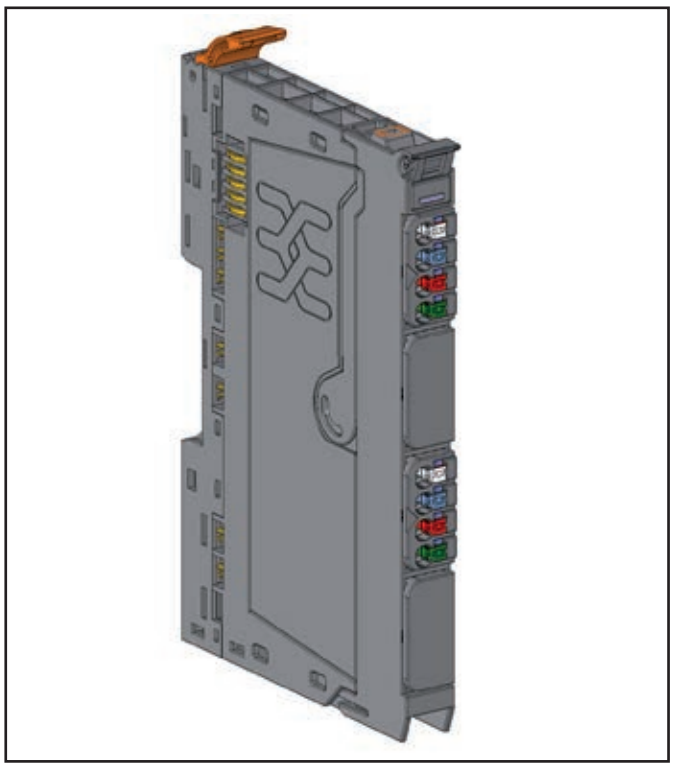
1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process data[1] outputs UR20-2PWM-PN-0.5A

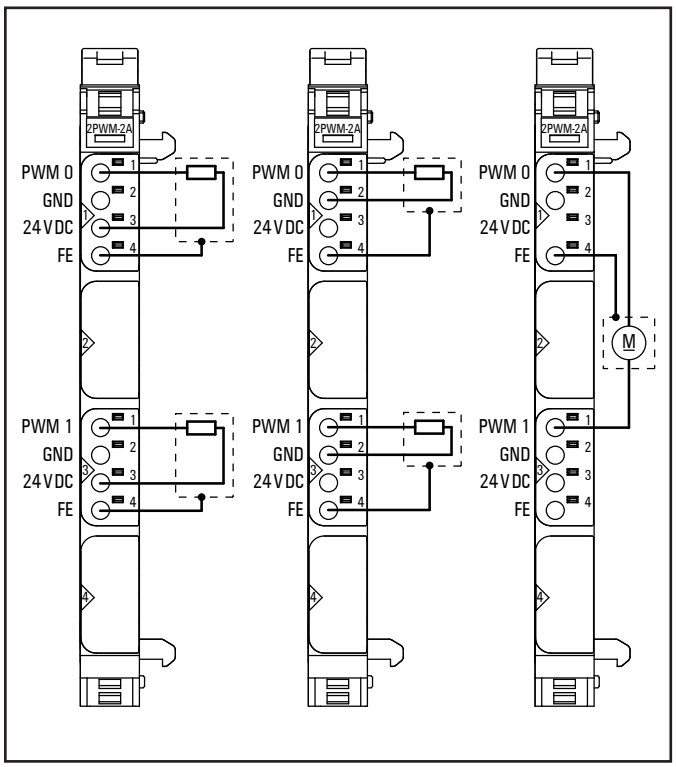
Byte	Format	Name	Bit	Function, if set	Remarks
QB0	Double Word	Channel 0: Pulse duration			Input value * 0.02083 µs Input range: 0 ... 8388607
QB1					
QB2					
QB3					
QB4	Double Word	Channel 1: Pulse duration			Input value * 0.02083 µs Input range: 0 ... 8388607
QB5					
QB6					
QB7					
QB8	Word	Channel 0: Control word	QX8.0 ... QX8.1	reserved	
			QX8.2	Output mode	0: PN-switching 1: P-switching
			QX8.3 ... QX8.7	reserved	
QB9			QX9.0	starts output	Setting with edge 0-1, dominates stop bit
			QX9.1	stops output	Setting with edge 0-1, start bit must be resetted
			QX9.2 ... QX9.7	reserved	
QB10	Word	Channel 1: Control word	QX10.0 ... QX10.1	reserved	
			QX10.2	Output mode	0: PN-switching 1: P-switching
			QX10.3 ... QX10.7	reserved	
QB11			QX11.0	starts output	Setting with edge 0-1, dominates stop bit
			QX11.1	stops output	Setting with edge 0-1, start bit must be resetted
			QX11.2 ... QX11.7	reserved	

1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.30 Digital pulse width modulation output module UR20-2PWM-PN-2A



Digital pulse width modulation output module UR20-2PWM-PN-2A (Order No. 1315610000)



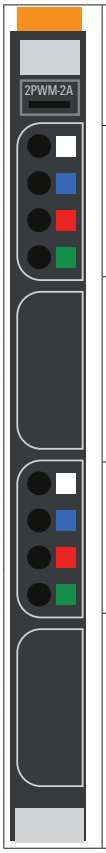
Connection diagram UR20-2PWM-PN-2A

The digital pulse width modulation module UR20-2PWM-PN-2A can control up to 2 actuators each with a maximum of 2 A. The period duration for each channel can be parameterised from 25 µs to approx. 175 ms (input values from 1202 to 8388607 based on a factor 0.02083 µs).

Via an output double word in the process data the pulse duration is defined from 0 µs to approx. 175 ms for each channel (input values from 0 to 8388607 based on a factor 0.02083 µs). If the pulse duration is equal or exceeds the duration of the period, the output is set permanently.

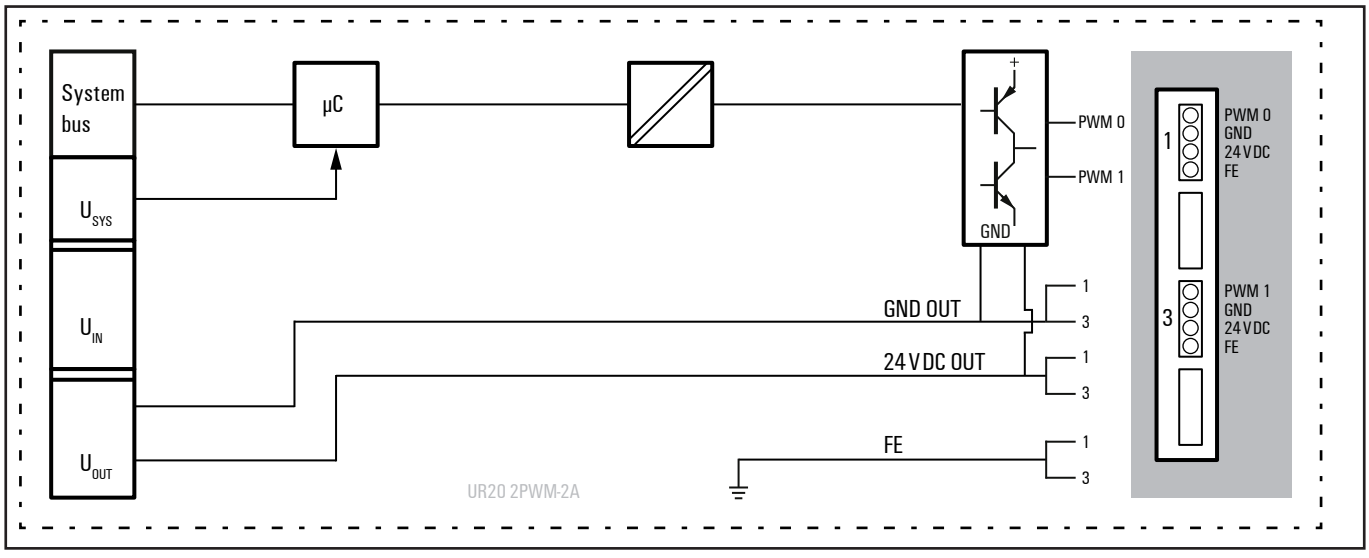
In another output word the output mode is switched and the output is being started and stopped. Deactivated outputs are set to GND.

For each channel the current status can be read in an status word. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}). The module is protected against external voltages between 0 V and the operating voltage.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Yellow: PWM output 0 = 100 %, P-switching Yellow flashing at 2 Hz: PWM output 0 is > 0 and < 100 %, PN-switching or P-switching
3.1	Yellow: PWM output 1 = 100 %, P-switching Yellow flashing at 2 Hz: PWM output 1 is > 0 and < 100 %, PN-switching or P-switching

LED indicators UR20-2PWM-PN-2A, error messages see Chapter 13



Block diagram UR20-2PWM-PN-2A

Technical data UR20-2PWM-PN-2A (Order No. 1315610000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Outputs		
Number	2	
Type	PN output stage	
Response time	< 0.1 µs	
Period duration	25 µs to 175 ms (≙ 40 kHz to 6 Hz)	
Max. output current	per channel	2 A
	per module	4 A
Switching frequency	Ohmic load (min. 12 Ω)	6 Hz to 40 kHz
	Inductive load (DC 13)	6 Hz to 40 kHz
	Lamp load (48 W)	6 Hz to 40 kHz
Actuator connection	2-wire, 3-wire, 3-wire + FE	
Actuator supply	max. 2 A per plug, total max. 8 A	
Pulse/period ratio	0–100 % PN-switching or P-switching, adjustable	
Short-circuit-proof	yes	
Response time of the protective circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	no	
Reactionless	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	40 mA	
General data		
Weight (operational status)	89 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-2PWM-PN-2A

Channel	Description	Options[1)]	Default
0 ... 1	Period duration = n*0.02083 µs	1202 ... 8388607	1202

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-2PWM-PN-2A

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x0F
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x72
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	2
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-2PWM-PN-2A

Byte	Format	Name	Bit	Function, if active	Remarks
IB0	Word	Channel 0: Status word	IX0.0	reserved	
			IX0.1	Status PWM output	0: disabled, 1: enabled
			IX0.2	reserved	
			IX0.3	Output mode	0: PN-switching 1: P-switching
			IX0.4 ... 0.7	reserved	
IB1			IX1.0 ... 1.7	reserved	
IB2	Word	Channel 1: Status word	IX2.0	reserved	
			IX2.1	Status PWM output	0: disabled, 1: enabled
			IX2.2	reserved	
			IX2.3	Output mode	0: PN-switching 1: P-switching
			IX02.4 ... 2.7	reserved	
IB3			IX3.0 ... 3.7	reserved	

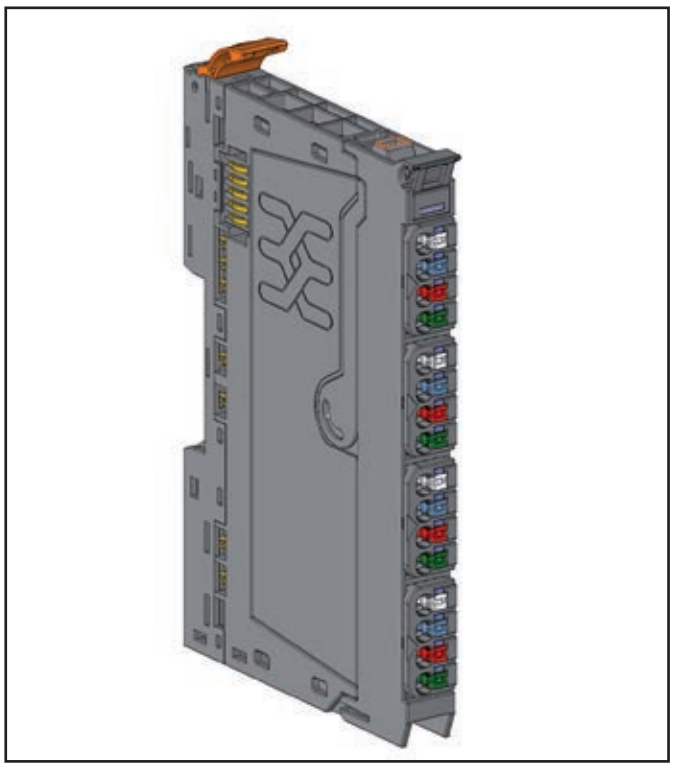
1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process data[1] outputs UR20-2PWM-PN-2A

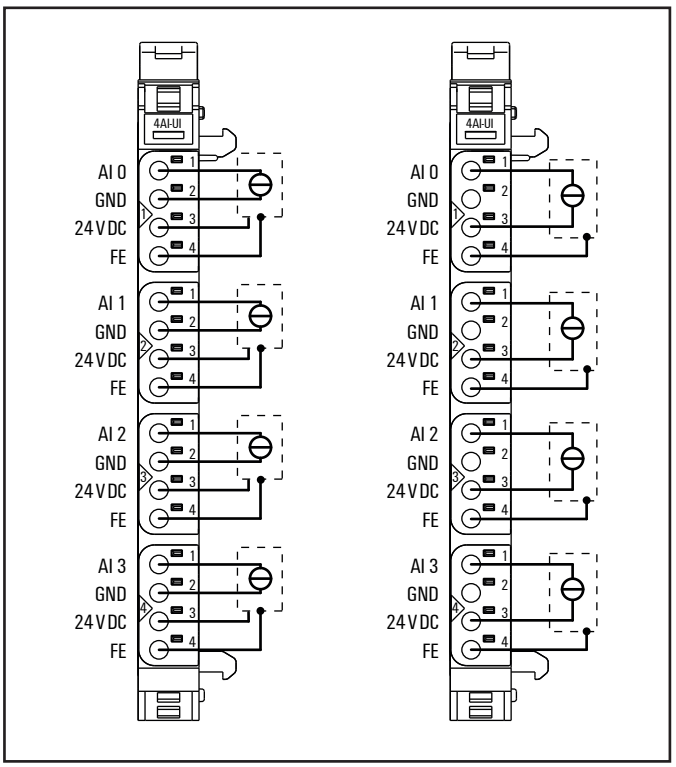
Byte	Format	Name	Bit	Function, if set	Remarks
QB0	Double Word	Channel 0: Pulse duration			Input value * 0.02083 µs Input range: 0 ... 8388607
QB1					
QB2					
QB3					
QB4	Double Word	Channel 1: Pulse duration			Input value * 0.02083 µs Input range: 0 ... 8388607
QB5					
QB6					
QB7					
QB8	Word	Channel 0: Control word	QX8.0 ... QX8.1	reserved	
			QX8.2	Output mode	0: PN-switching 1: P-switching
			QX8.3 ... QX8.7	reserved	
QB9			QX9.0	starts output	Setting with edge 0-1, dominates stop bit
			QX9.1	stops output	Setting with edge 0-1, start bit must be resetted
			QX9.2 ... QX9.7	reserved	
QB10	Word	Channel 1: Control word	QX10.0 ... QX10.1	reserved	
			QX10.2	Output mode	0: PN-switching 1: P-switching
			QX10.3 ... QX10.7	reserved	
QB11			QX11.0	starts output	Setting with edge 0-1, dominates stop bit
			QX11.1	stops output	Setting with edge 0-1, start bit must be resetted
			QX11.2 ... QX11.7	reserved	

1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.31 Analogue input module UR20-4AI-UI-16



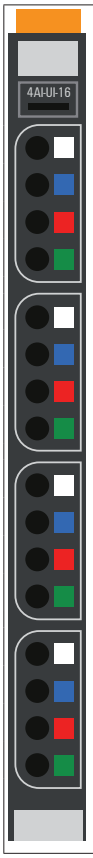
Analogue input module UR20-4AI-UI-16 (Order No. 1315620000)



Connection diagram UR20-4AI-UI-16 (left 3/4-wire sensor with sensor wiring via electronics, right: 2-wire sensor with sensor wiring via electronics)

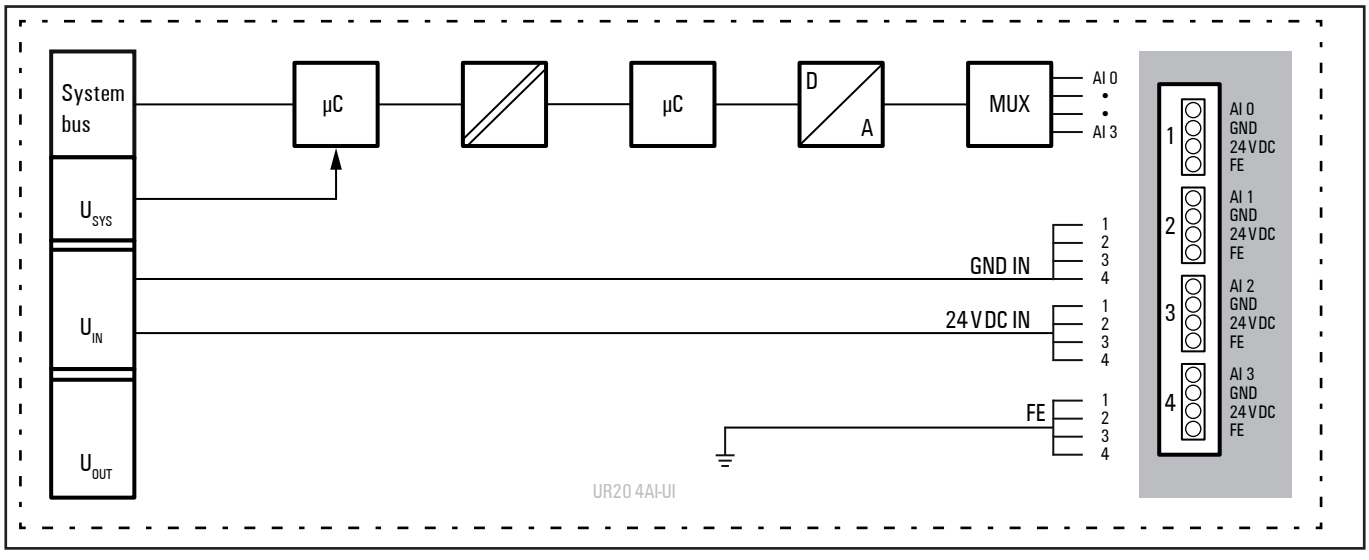
The UR20-4AI-UI-16 analogue input module can record up to 4 analogue sensors with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE. The measurement range is defined using parameterisation. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. As a protection against overcurrent, the module temporarily switches to voltage mode.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: channel error
2.1	Red: channel error
3.1	Red: channel error
4.1	Red: channel error

LED indicators UR20-4AI-UI-16, error messages see Chapter 13



Block diagram UR20-4AI-UI-16

Technical data UR20-4AI-UI-16 (Order No. 1315620000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	4	
Input values	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Resolution	16 bits	
Accuracy	0.1 % max. ±50 ppm/K max. max. -10 mV/A	at 25 °C Temperature coefficient additional inaccuracy in the voltage mode due to sensor power supply current
Sensor supply	max. 2 A per plug, total max. 8 A	
Sensor connection	2-wire, 3-wire, 3-wire + FE	
Conversion time	1 ms	
Internal resistance	U: 100 kΩ; I: approx. 42 Ω	
Reverse polarity protection	yes	
Short-circuit-proof	yes	
Response time of the protective circuit	< 50 ms	
Module diagnosis	yes	
Individual channel diagnosis	no	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from input current path I_{IN}	25 mA + sensor supply current	
General data		
Weight (operational status)	96 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AI-UI-16

Channel	Description	Options[1)]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 V to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AI-UI-16

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-4AI-UI-12

Byte	Format	Description	Remarks
IB0	Word	AI0	
IB1			
IB2	Word	AI1	
IB3			
IB4	Word	AI2	
IB5			
IB6	Word	AI3	
IB7			

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Measurement range UR20-4AI-UI-16

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

Measurement range UR20-4AI-UI-16

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		

Measurement range UR20-4AI-UI-16

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5

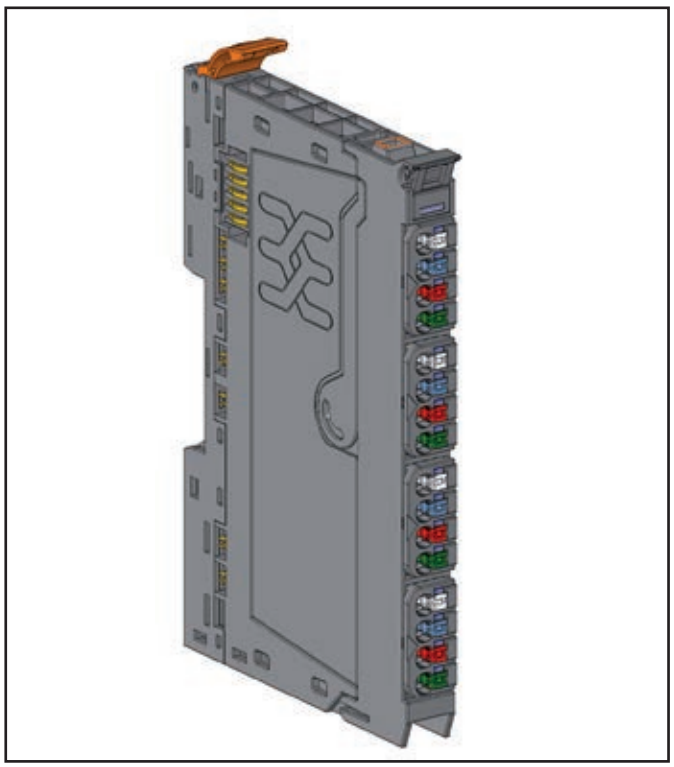
Digital measured value representation in Siemens S5 format

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

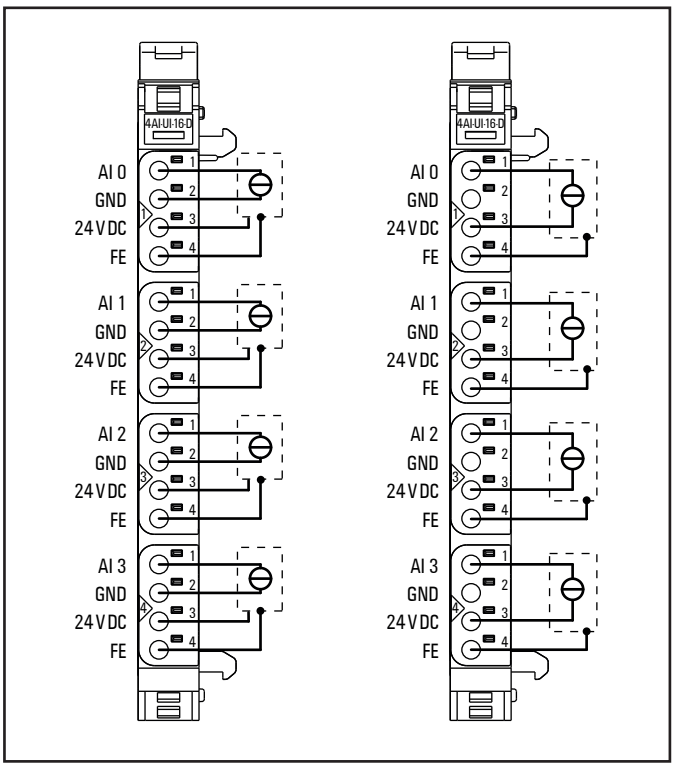
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.32 Analogue input module UR20-4AI-UI-16-DIAG



Analogue input module UR20-4AI-UI-16-DIAG (Order No. 1315690000)

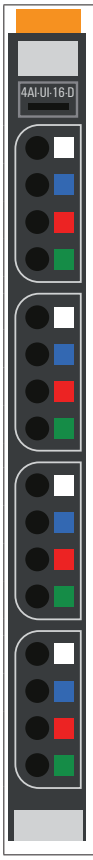


Connection diagram UR20-4AI-UI-16-DIAG (left 3/4-wire sensor with sensor wiring via electronics, right: 2-wire sensor with sensor wiring via electronics)

The UR20-4AI-UI-16-DIAG analogue input module can record up to 4 analogue sensors with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE. The measurement range is defined using parameterisation. Two status LED are assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

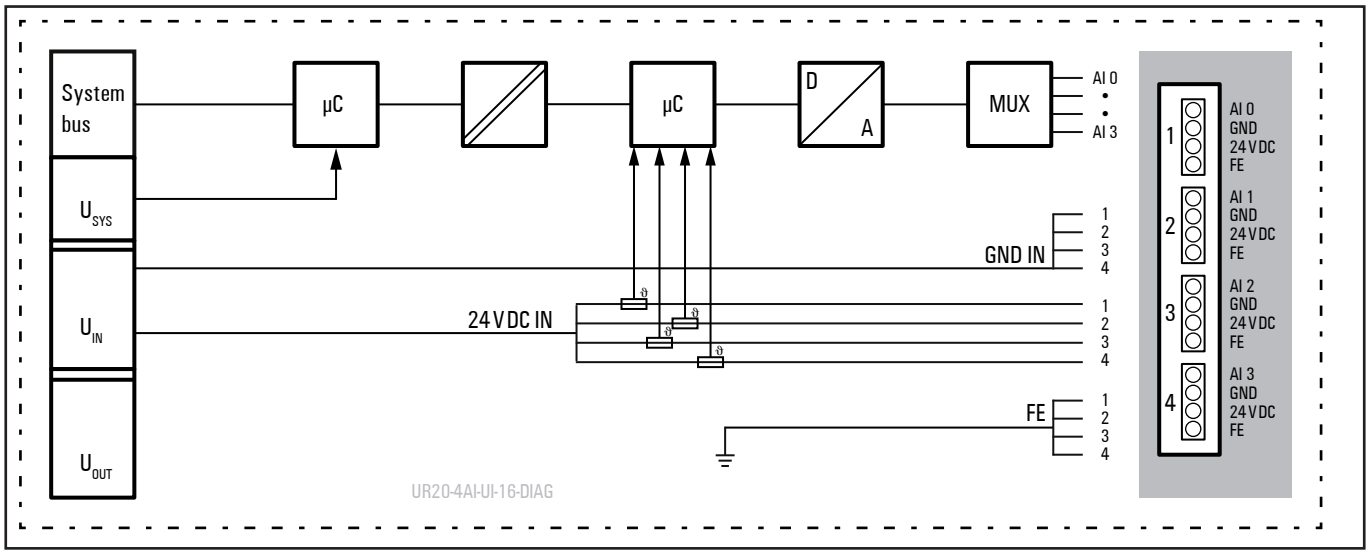
Each sensor output is loadable with 500 mA and protected agains overcurrent. The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. As a protection against overcurrent, the module temporarily switches to voltage mode.

The module provides individual channel diagnosis with channel related error messages.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: channel error
1.3	Red: +24 V short circuit or line break (with current < 1 mA)
2.1	Red: channel error
2.3	Red: +24 V short circuit or line break (with current < 1 mA)
3.1	Red: channel error
3.3	Red: +24 V short circuit or line break (with current < 1 mA)
4.1	Red: channel error
4.3	Red: +24 V short circuit or line break (with current < 1 mA)

LED indicators UR20-4AI-UI-16-DIAG , error messages see Chapter 13



Block diagram UR20-4AI-UI-16-DIAG

Technical data UR20-4AI-UI-16-DIAG (Order No. 1315690000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	4	
Input values	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Resolution	16 bits	
Accuracy	0.1 % max. ±50 ppm/K max. max. -10 mV/A	at 25 °C Temperature coefficient additional inaccuracy in the voltage mode due to sensor power supply current
Sensor supply	max. 0,5 A per plug	
Sensor connection	2-wire, 3-wire, 3-wire + FE	
Conversion time	1 ms	
Internal resistance	U: 100 kΩ; I: approx. 42 Ω	
Reverse polarity protection	yes	
Short-circuit-proof	yes	
Response time of the protective circuit	< 50 ms	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from input current path I_{IN}	25 mA + sensor supply current	
General data		
Weight (operational status)	96 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AI-UI-16-DIAG

Channel	Description	Options[1)]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 3	Channel diagnosis	disabled (0) / enabled (1)	disabled
0 ... 3	Diag short circiut 24 V	disabled (0) / enabled (1)	disabled
0 ... 3	Diag line break 24 V	disabled (0) / enabled (1)	disabled
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 V to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AI-UI-16-DIAG

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Error	
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module type	0x05
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4 ... 7	Reserved	0
Channel error	8	8 ... 15	Reserved	0
Channel error	9	16 ... 23	Reserved	0
Channel error	10	24 ... 31	Reserved	0
Channel 0 error	11	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	

Diagnostic data UR20-4AI-UI-16-DIAG

Name	Byte	Bit	Description	Default
Channel 1 error	12	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 2 error	13	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 3 error	14	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 4 error to Channel 31 error	15 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-4AI-UI-16-DIAG

Byte	Format	Description	Remarks
IB0	Word	AI0	
IB1			
IB2	Word	AI1	
IB3			
IB4	Word	AI2	
IB5			
IB6	Word	AI3	
IB7			

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Measurement range UR20-4AI-UI-16-DIAG

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

Measurement range UR20-4AI-UI-16-DIAG

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		

Measurement range UR20-4AI-UI-16-DIAG

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5

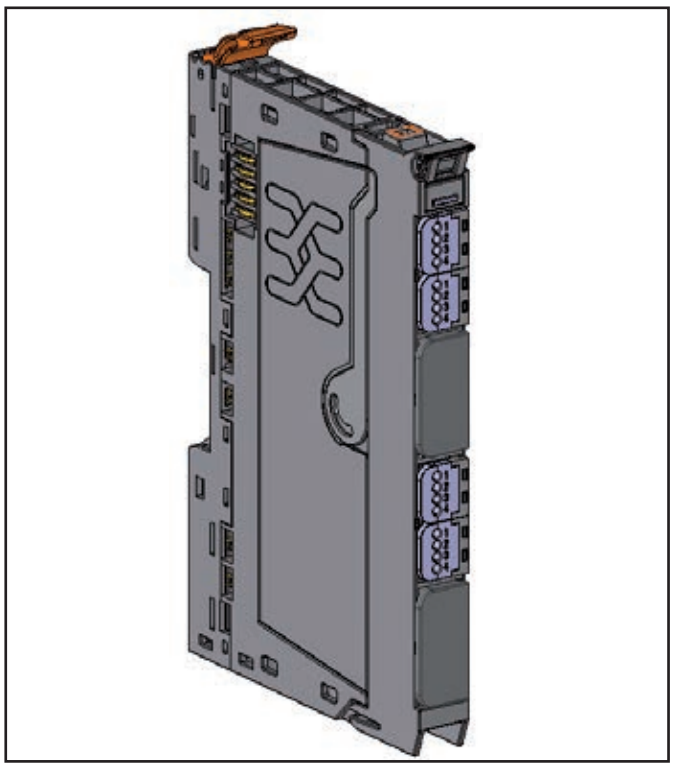
Digital measured value representation in Siemens S5 format

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

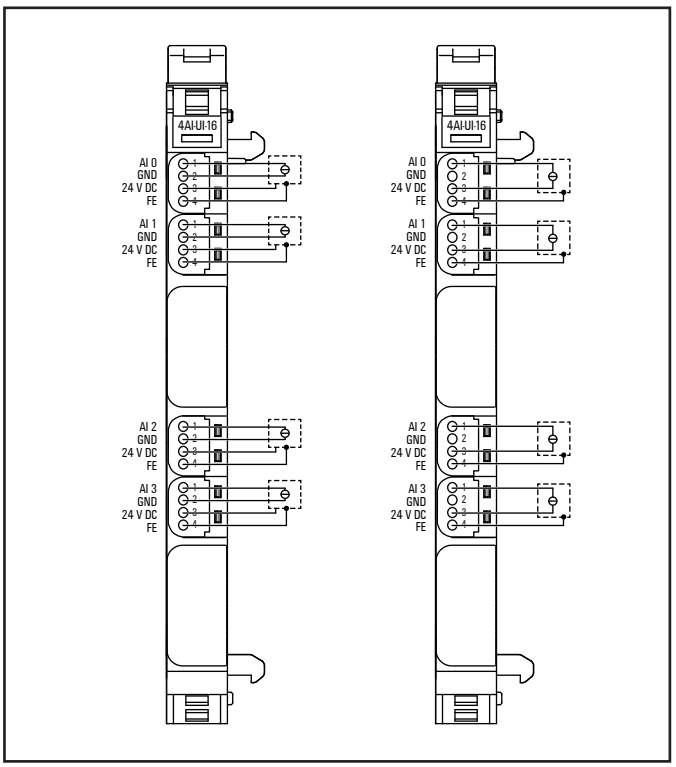
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.33 Analogue input module UR20-4AI-UI-16-HD



Analogue input module UR20-4AI-UI-16-HD (Order No. 1506920000)



Connection diagram UR20-4AI-UI-16-HD (left 3/4-wire sensor with sensor wiring via electronics, right: 2-wire sensor with sensor wiring via electronics)

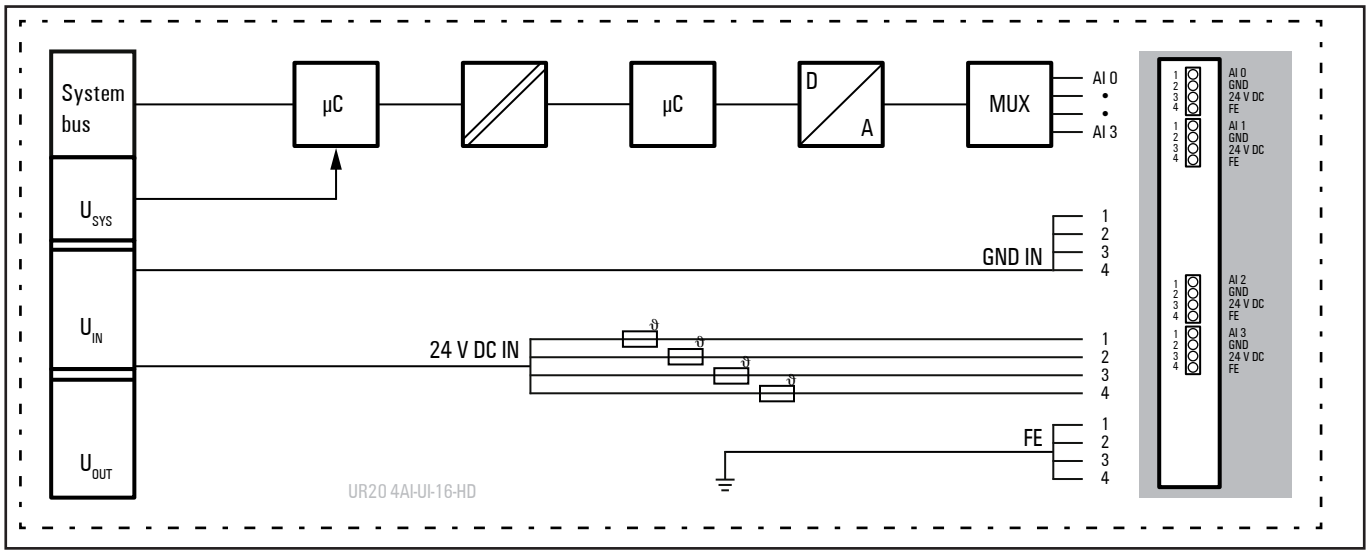
The UR20-4AI-UI-16-HD analogue input module can record up to 4 analogue sensors with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE (IDC). The measurement range is defined using parameterisation. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

Each sensor output is loadable with 500 mA and protected agains overcurrent. The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. As a protection against overcurrent, the module temporarily switches to voltage mode.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: channel error
2.1	Red: channel error
5.1	Red: channel error
6.1	Red: channel error

LED indicators UR20-4AI-UI-16-HD, error messages see Chapter 13



Block diagram UR20-4AI-UI-16-HD

Technical data UR20-4AI-UI-16-HD (Order No. 1506920000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	4	
Input values	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Resolution	16 bits	
Accuracy	0.1 % max. ±50 ppm/K max. max. -10 mV/A	at 25 °C Temperature coefficient additional inaccuracy in the voltage mode due to sensor power supply current
Sensor supply	max. 0.5 A per plug	
Sensor connection	2-wire, 3-wire, 3-wire + FE	
Conversion time	1 ms	
Internal resistance	U: 100 kΩ; I: approx. 45 Ω	
Reverse polarity protection	yes	
Short-circuit-proof	yes	
Response time of the protective circuit	< 50 ms	
Module diagnosis	yes	
Individual channel diagnosis	no	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from input current path I_{IN}	25 mA + sensor supply current	
General data		
Weight (operational status)	89 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AI-UI-16-HD

Channel	Description	Options[1)]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 V to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AI-UI-16-HD

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-4AI-UI-16-HD

Byte	Format	Description	Remarks
IB0	Word	AI0	
IB1			
IB2	Word	AI1	
IB3			
IB4	Word	AI2	
IB5			
IB6	Word	AI3	
IB7			

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Measurement range UR20-4AI-UI-16

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

Measurement range UR20-4AI-UI-16

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		

Measurement range UR20-4AI-UI-16

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5

Digital measured value representation in Siemens S5 format

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

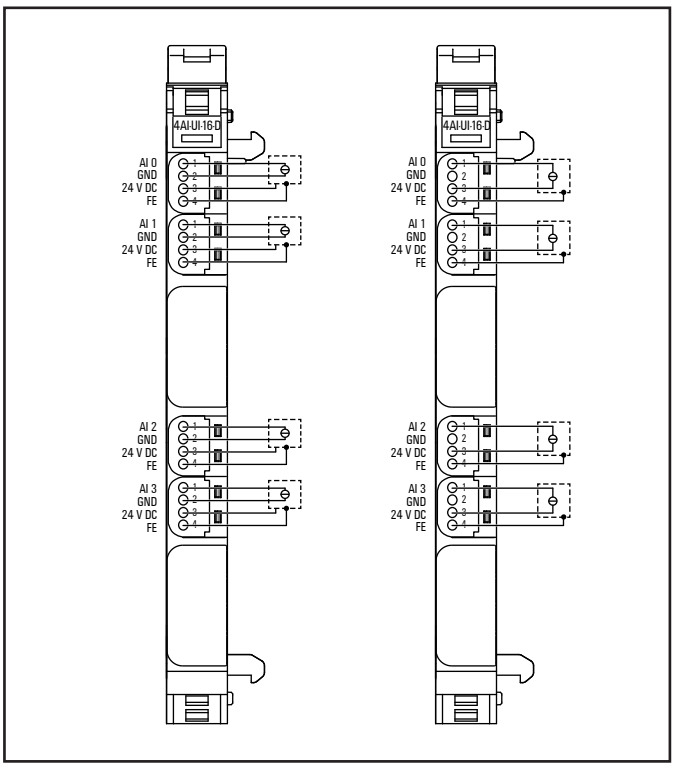
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.34 Analogue input module UR20-4AI-UI-16-DIAG-HD



Analogue input module UR20-4AI-UI-16-DIAG-HD (Order No. 1506910000)



Connection diagram UR20-4AI-UI-16-DIAG-HD (left 3/4-wire sensor with sensor wiring via electronics, right: 2-wire sensor with sensor wiring via electronics)

The UR20-4AI-UI-16-DIAG-HD analogue input module can record up to 4 analogue sensors with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE (IDC). The measurement range is defined using parameterisation. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

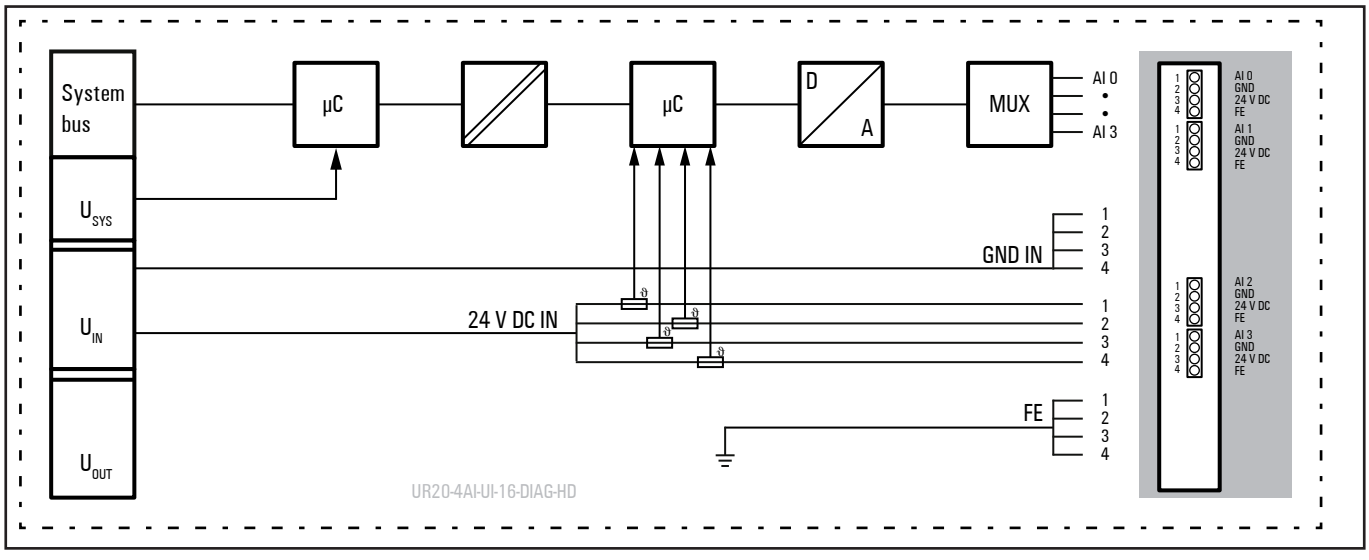
Each sensor output is loadable with 500 mA and protected agains overcurrent. The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. As a protection against overcurrent, the module temporarily switches to voltage mode.

The module provides individual channel diagnosis with channel related error messages.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: channel error
1.2	Red: +24 V short circuit or line break (with current < 1 mA)
2.1	Red: channel error
2.2	Red: +24 V short circuit or line break (with current < 1 mA)
5.1	Red: channel error
5.2	Red: +24 V short circuit or line break (with current < 1 mA)
6.1	Red: channel error
6.2	Red: +24 V short circuit or line break (with current < 1 mA)

LED indicators UR20-4AI-UI-16-DIAG-HD, error messages see Chapter 13



Block diagram UR20-4AI-UI-16-DIAG-HD

Technical data UR20-4AI-UI-16-DIAG-HD (Order No. 1506910000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	4	
Input values	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Resolution	16 bits	
Accuracy	0.1 % max. ±50 ppm/K max. max. -10 mV/A	at 25 °C Temperature coefficient additional inaccuracy in the voltage mode due to sensor power supply current
Sensor supply	max. 0.5 A per plug	
Sensor connection	2-wire, 3-wire, 3-wire + FE	
Conversion time	1 ms	
Internal resistance	U: 100 kΩ; I: approx. 45 Ω	
Reverse polarity protection	yes	
Short-circuit-proof	yes	
Response time of the protective circuit	< 50 ms	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from input current path I_{IN}	25 mA + sensor supply current	
General data		
Weight (operational status)	89 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AI-UI-16-DIAG-HD

Channel	Description	Options[1)]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 V to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AI-UI-16-DIAG-HD

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Error	
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module type	0x05
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4 ... 7	Reserved	0
Channel error	8	8 ... 15	Reserved	0
Channel error	9	16 ... 23	Reserved	0
Channel error	10	24 ... 31	Reserved	0
Channel 0 error	11	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	

Diagnostic data UR20-4AI-UI-16-DIAG-HD

Name	Byte	Bit	Description	Default
Channel 1 error	12	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 2 error	13	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 3 error	14	0	Parameter Error	
		1	Overload	
		2	Line break sensor supply	
		3	Fuse blown	
		4	Line break signal	
		5	Reserved	0
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 4 error to Channel 31 error	15 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-4AI-UI-16-DIAG-HD

Byte	Format	Description
IB0	Word	AI0
IB1		
IB2	Word	AI1
IB3		
IB4	Word	AI2
IB5		
IB6	Word	AI3
IB7		

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Measurement range UR20-4AI-UI-16-DIAG-HD

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

Measurement range UR20-4AI-UI-16-DIAG-HD

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		

Measurement range UR20-4AI-UI-16-DIAG-HD

Measurement range	Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5

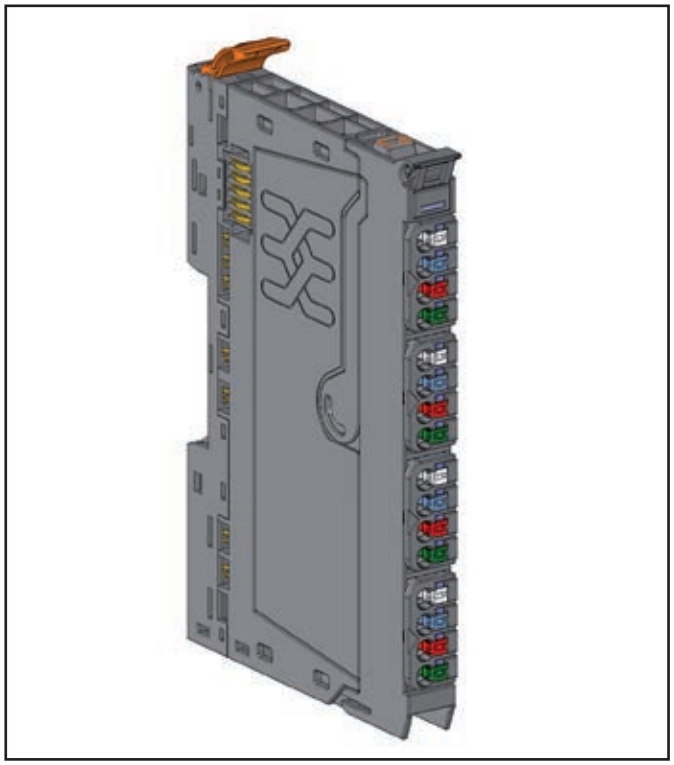
Digital measured value representation in Siemens S5 format

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

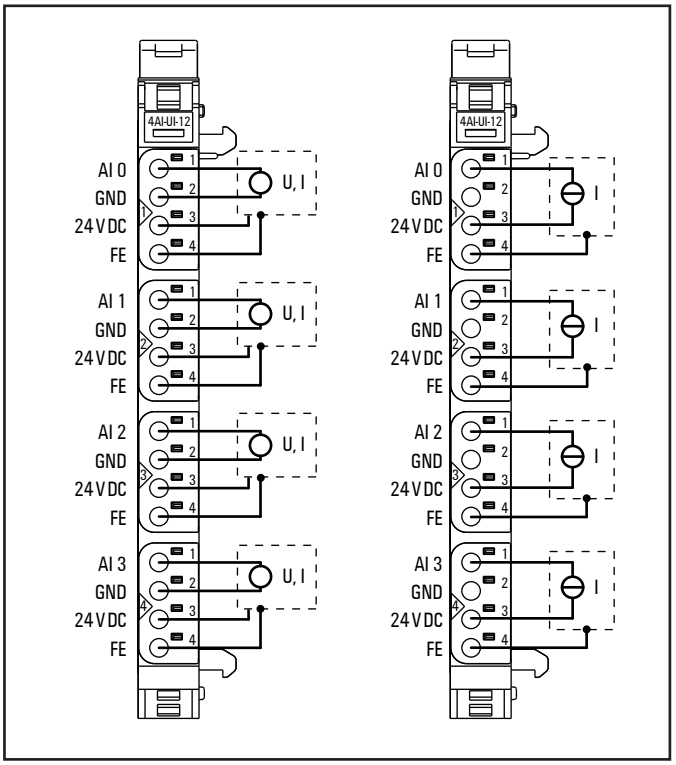
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.35 Analogue input module UR20-4AI-UI-12



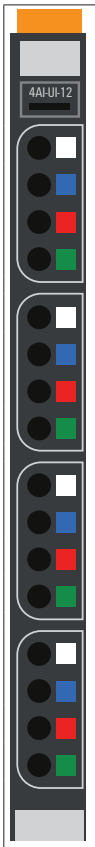
Analogue input module UR20-4AI-UI-12 (Order No. 1394390000)



Connection diagram UR20-4AI-UI-12 (left 3/4-wire sensor with sensor wiring via electronics, right: 2-wire sensor with sensor wiring via electronics)

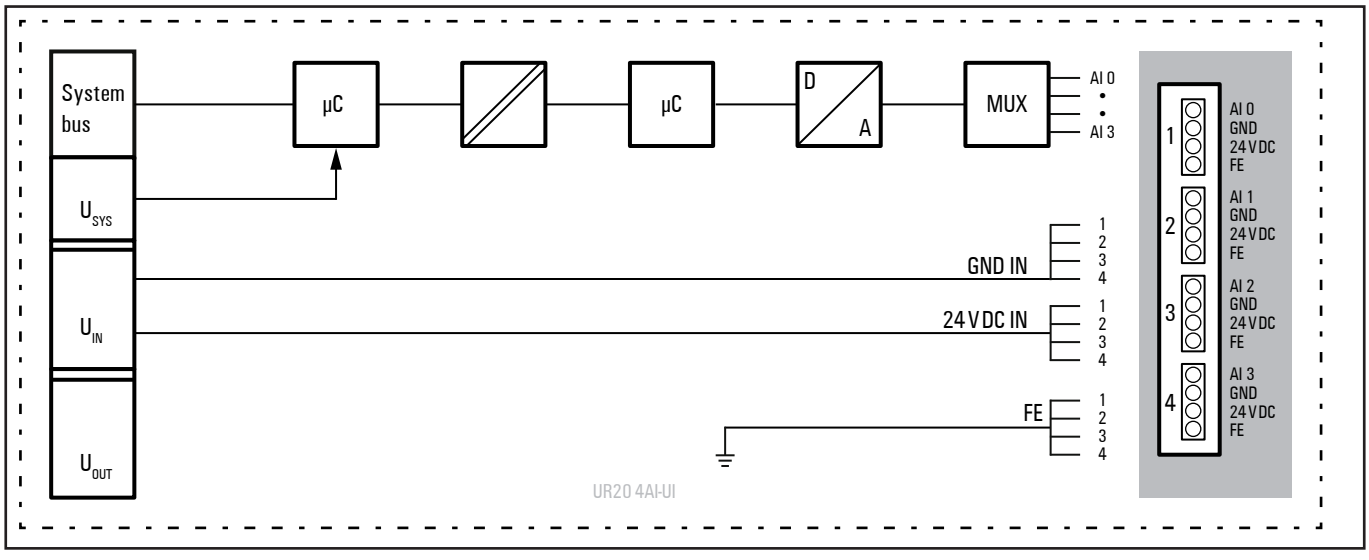
The analogue input module UR20-4AI-UI-12 can record up to 4 analogue sensors with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 12 bit per channel. Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE. The measurement range is defined using parameterisation. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. As a protection against overcurrent, the module temporarily switches to voltage mode.



	Status LED module Green: Communication over the system bus Red: No communication on system bus or diagnostic message displayed
1.1	Red: channel error input 0
2.1	Red: channel error input 1
3.1	Red: channel error input 2
4.1	Red: channel error input 3

LED indicators UR20-4AI-UI-12, error messages see Chapter 13



Block diagram UR20-4AI-UI-12

Technical data UR20-4AI-UI-12 (Order No. 1394390000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	4	
Input values	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ...10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Resolution	12 bits	
Accuracy	0,25 % max. ±50 ppm/K max. max. –10 mV/A	at 25 °C Temperature coefficient additional inaccuracy in the voltage mode due to sensor power supply current
Sensor supply	max. 2 A per plug, total max. 8 A	
Sensor connection	2-wire, 3-wire, 3-wire + FE	
Conversion time	1 ms	
Internal resistance	U: 100 kΩ; I: approx. 42 Ω	
Reverse polarity protection	yes	
Short-circuit-proof	yes	
Response time of the protective circuit	< 50 ms	
Module diagnosis	yes	
Individual channel diagnosis	no	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from input current path I_{IN}	25 mA + sensor supply current	
General data		
Weight (operational status)	87 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AI-UI-12

Channel	Description	Options[1)]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 V to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) / disabled (8)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AI-UI-12

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-4AI-UI-12

Byte	Format	Description
IB0	Word	AI0
IB1		
IB2	Word	AI1
IB3		
IB4	Word	AI2
IB5		
IB6	Word	AI3
IB7		

1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Measurement range UR20-4AI-UI-12

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

Measurement range UR20-4AI-UI-12

Measurement range	Voltage (U)	Decimal (D)	Hexadezimal	Range	Conversion
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		

Measurement range UR20-4AI-UI-12

Measurement range	Voltage (U)	Decimal (D)	Hexadezimal	Range	Conversion
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5

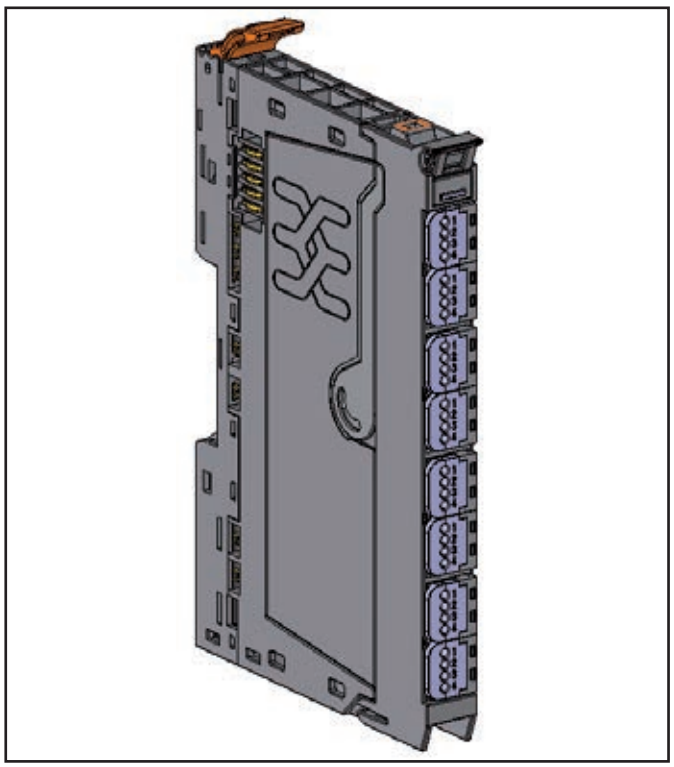
Digital measured value representation in Siemens S5 format

Data bit	7	6	5	4	3	2	1	0
Byte 0 (high byte)	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}
Byte 1 (low byte)	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	A	F	O

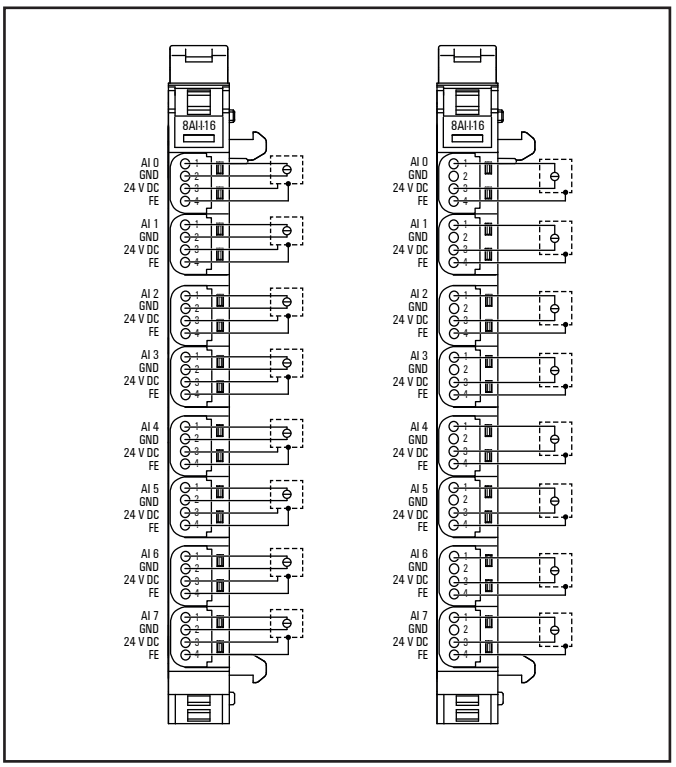
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.36 Analogue input module UR20-8AI-I-16-HD



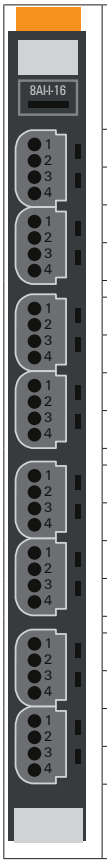
Analogue input module UR20-8AI-I-16-HD (Order No. 1315650000)



Connection diagram UR20-8AI-I-16-HD

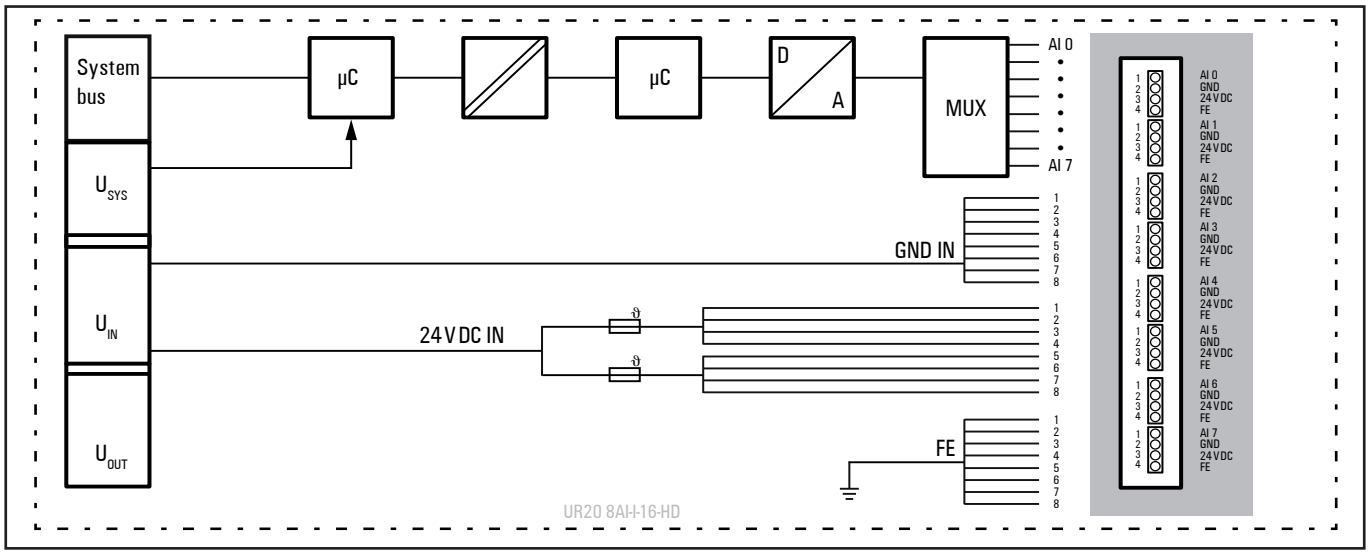
The analogue input module UR20-8AI-I-16-HD can detect up to 8 analogue sensors with 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE (IDC). The measurement range is defined using parameterisation. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. The inputs are protected against overcurrent by a self-resetting fuse.



	Status LED module Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: Channel error
2.1	Red: Channel error
3.1	Red: Channel error
4.1	Red: Channel error
5.1	Red: Channel error
6.1	Red: Channel error
7.1	Red: Channel error
8.1	Red: Channel error

LED indicators UR20-8AI-I-16-HD, error messages see Chapter 13



Block diagram UR20-8AI-I-16-HD

Technical data UR20-8AI-I-16-HD (Order No. 1315650000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	8	
Input values	Current input (0 ... 20 mA, 4 ... 20 mA)	
Resolution	16 bits	
Accuracy	max. 0.1 % FSR ±50 ppm/K max.	at 25 °C temperature coefficient
Sensor supply	max. 125 mA per channel; channel 0 ... 3 and 4 ... 7 respectively are fused in combination	
Sensor connection	2-wire, 3-wire, 3-wire + FE	
Conversion time	1 ms	
Internal resistance	approx. 45 Ω	
Reverse polarity protection	yes	
Short-circuit protection	yes	
Response time	< 0.1 s with short-circuit to +24 V	
Reset time	Temperature-dependent (< 30 s at 20 °C)	
Module diagnosis	yes	
Individual channel diagnosis	no	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from the system current path I_{SYS}	8 mA	
Current consumption from the input current path I_{IN}	20 mA + load	
Connection data		
Type of connection	Insulation Displacement Connection (IDC)	
Line connection cross-section	Single-wired, fine-wired	0.14 ... 0.35 mm²
General data		
Weight (operational status)	90 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-8AI-I-16-HD

Channel	Description	Options[1]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 7	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 7	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / disabled (2)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-8AI-I-16-HD

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4	Power supply fault	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-8AI-I-16-HD

Byte	Format	Description
IB0	Word	AI0
IB1		
IB2	Word	AI1
IB3		
IB4	Word	AI2
IB5		
IB6	Word	AI3
IB7		
IB8	Word	AI4
IB9		
IB10	Word	AI5
IB11		
IB12	Word	AI6
IB13		
IB14	Word	AI7
IB15		

1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Measurement range UR20-8AI-I-16-HD

Measurement range	Current (I)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 20 mA Siemens S7-Format	23,52 mA	32511	0x7EFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648
	20 mA	27648	0x6C00	Nominal range	
	10 mA	13824	0x3600		
	0 mA	0	0x0000		
0 ... 20 mA Siemens S5-Format	23,52 mA	19268	0x4B44	Overloading	D = 16384 x I / 20 I = D x 20 / 16384
	20 mA	16384	0x4000	Nominal range	
	10 mA	8192	0x2000		
	0 mA	0	0x0000		
4 ... 20 mA Siemens S7-Format	22,81 mA	32511	0x7EFF	Overloading	D = 27648 x (I - 4) / 16 I= D x 16 / 27648 + 4
	20 mA	27648	0x6C00	Nominal range	
	12 mA	13824	0x3600		
	4 mA	0	0x0000		
	1,19 mA	-4864	0xED00	Underloading	
4 ... 20 mA Siemens S5-Format	22,82 mA	19268	0x4B44	Overloading	D = 16384 x (I - 4) / 16 I = D x 16 / 16384 + 4
	20 mA	16384	0x4000	Nominal range	
	12 mA	8192	0x2000		
	4 mA	0	0x0000		
	0,8 mA	-3277	0xF333	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5.

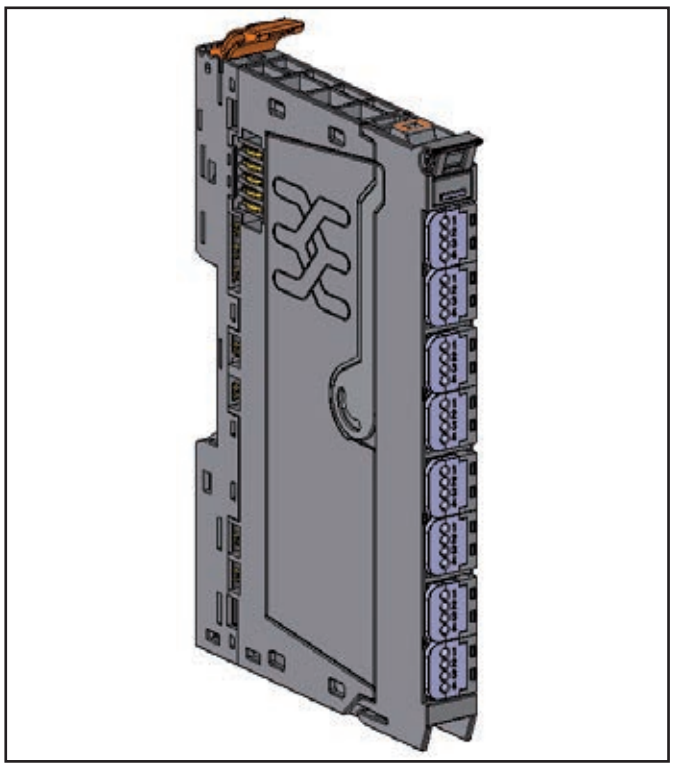
Digital measured value representation in Siemens S5 format

Data bit	7	6	5	4	3	2	1	0
Byte 0 (high byte)	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}
Byte 1 (low byte)	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	A	F	O

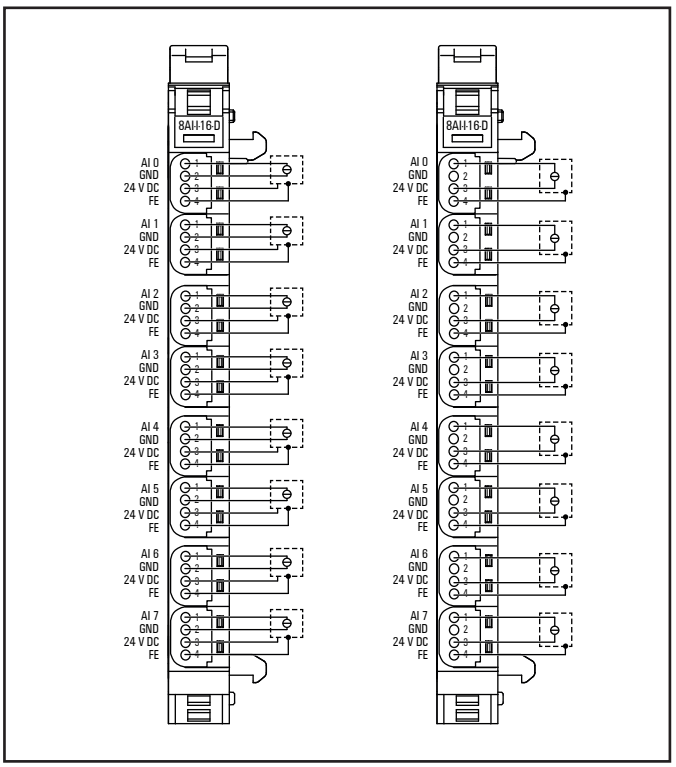
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.37 Analogue input module UR20-8AI-I-16-DIAG-HD



Analogue input module UR20-8AI-I-16-DIAG-HD (Order No. 1315720000)

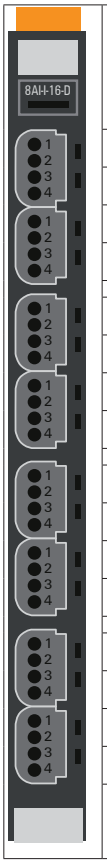


Connection diagram UR20-8AI-I-16-DIAG-HD

The analogue input module UR20-8AI-I-16-DIAG-HD can detect up to 8 analogue sensors with 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. Sensors can be connected to each connector in a 2-wire, 3-wire or 3-wire connection + FE (IDC). The measurement range is defined using parameterisation. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

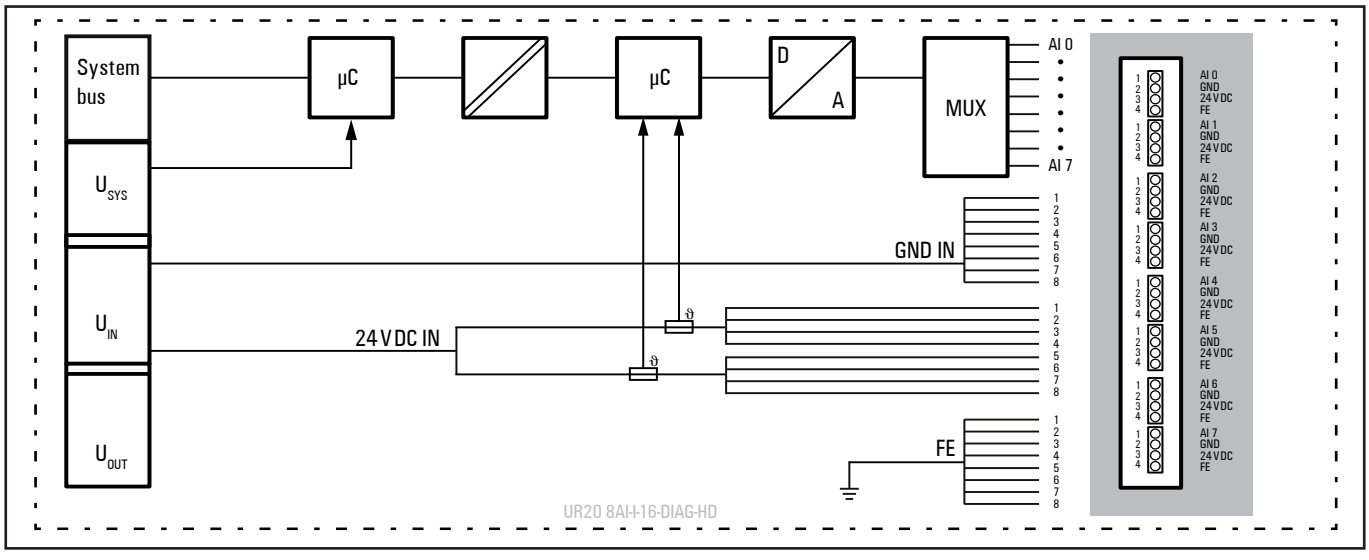
The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. The inputs are protected against overcurrent by a self-resetting fuse.

The module provides individual channel diagnosis with channel related error messages.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: channel error
2.1	Red: channel error
3.1	Red: channel error
4.1	Red: channel error
5.1	Red: channel error
6.1	Red: channel error
7.1	Red: channel error
8.1	Red: channel error

LED indicators UR20-8AI-I-16-DIAG-HD, error messages see Chapter 13



Block diagram UR20-8AI-I-16-DIAG-HD

Technical data UR20-8AI-I-16-DIAG-HD (Order No. 1315720000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	8	
Input values	Current input (0 ... 20 mA, 4 ... 20 mA)	
Resolution	16 bits	
Accuracy	max. 0.1 % FSR ±50 ppm/K max.	at 25 °C temperature coefficient
Sensor supply	max. 125 mA per channel; channel 0 ... 3 and 4 ... 7 respectively are fused in combination	
Sensor connection	2-wire, 3-wire, 3-wire + FE	
Conversion time	1 ms	
Internal resistance	approx. 45 Ω	
Reverse polarity protection	yes	
Short-circuit protection	yes	
Response time	< 0.1 s with short-circuit to +24 V	
Reset time	Temperature-dependent (< 30 s at 20 °C)	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from the system current path I_{SYS}	8 mA	
Current consumption from tne input current path I_{IN}	20 mA + load	
Connection data		
Type of connection	Insulation Displacement Connection (IDC)	
Line connection cross-section	Single-wired, fine-wired	0.14 ... 0.35 mm²
General data		
Weight (operational status)	90 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-8AI-I-16-DIAG-HD

Channel	Description	Options[1)]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 7	Channel diagnostics	disabled (0) / enabled (1)	disabled
0 ... 7	Diag short circuit 24 V	disabled (0) / enabled (1)	disabled
0 ... 7	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 7	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / disabled (2)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Process data[1)] inputs UR20-8AI-I-16-DIAG-HD

Byte	Format	Description
IB0	Word	AI0
IB1		
IB2	Word	AI1
IB3		
IB4	Word	AI2
IB5		
IB6	Word	AI3
IB7		
IB8	Word	AI4
IB9		
IB10	Word	AI5
IB11		
IB12	Word	AI6
IB13		
IB14	Word	AI7
IB15		

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Diagnostic data UR20-8AI-I-16-DIAG-HD

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Power supply fault	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	8
Channel error	7	0	Error at channel 0	0
		1	Error at channel 1	0
		2	Error at channel 2	0
		3	Error at channel 3	0
		4	Error at channel 4	0
		5	Error at channel 5	0
		6	Error at channel 6	0
		7	Error at channel 7	0
	8 ... 10	8 ... 31	Reserved	0
Channel 0 error ... Channel 7 error	11 ... 18	0 ... 7	Parameter Error	0
			Overload	0
			Reserved	0
			Fuse blown	0
			Line break	0
			Reserved	0
			Lower limit exceeded	0
			Upper limit exceeded	0
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Measurement range UR20-8AI-I-16-DIAG-HD

Measurement range	Current (I)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 20 mA Siemens S7 format	23,52 mA	32511	0x7EFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648
	20 mA	27648	0x6C00	Nominal range	
	10 mA	13824	0x3600		
	0 mA	0	0x0000		
0 ... 20 mA Siemens S5 format	23,52 mA	19268	0x4B44	Overloading	D = 16384 x I / 20 I = D x 20 / 16384
	20 mA	16384	0x4000	Nominal range	
	10 mA	8192	0x2000		
	0 mA	0	0x0000		
4 ... 20 mA Siemens S7 format	22,81 mA	32511	0x7EFF	Overloading	D = 27648 x (I - 4) / 16 I= D x 16 / 27648 + 4
	20 mA	27648	0x6C00	Nominal range	
	12 mA	13824	0x3600		
	4 mA	0	0x0000		
	1,19 mA	-4864	0xED00	Underloading	
4 ... 20 mA Siemens S5 format	22,82 mA	19268	0x4B44	Overloading	D = 16384 x (I - 4) / 16 I = D x 16 / 16384 + 4
	20 mA	16384	0x4000	Nominal range	
	12 mA	8192	0x2000		
	4 mA	0	0x0000		
	0,8 mA	-3277	0xF333	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5.

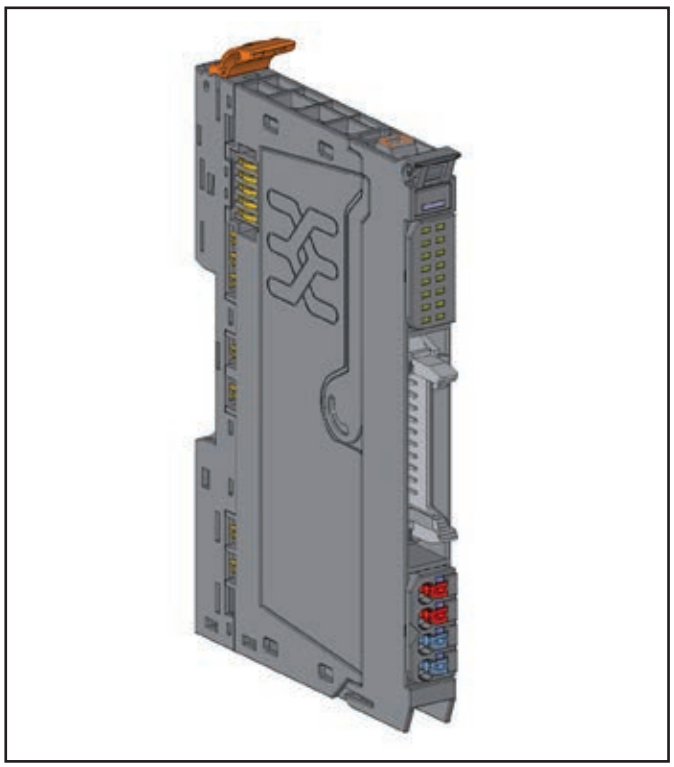
Digital measured value representation in Siemens S5 format

Data bit	7	6	5	4	3	2	1	0
Byte 0 (high byte)	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}
Byte 1 (low byte)	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	A	F	O

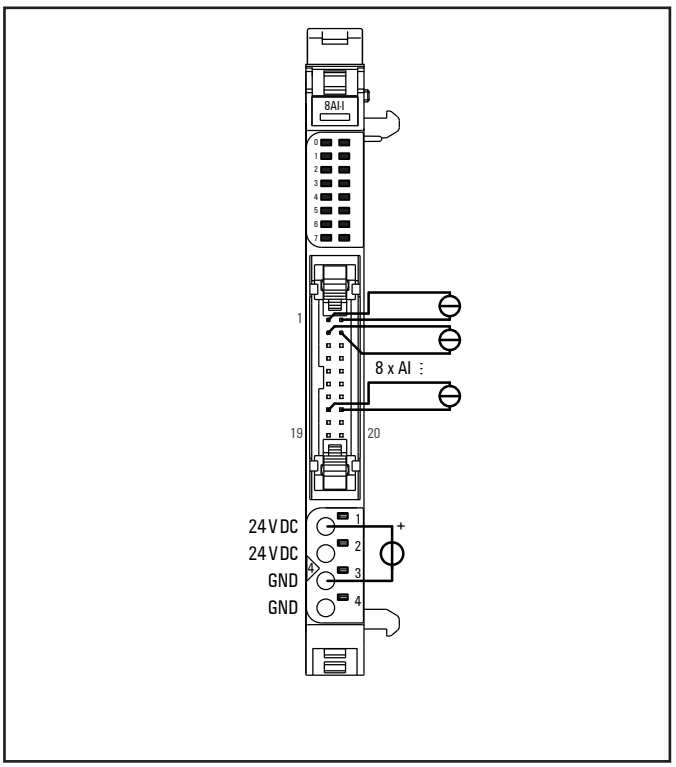
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.38 Analogue input module UR20-8AI-I-PLC-INT



Analogue input module UR20-8AI-I-PLC-INT (Order No. 1315670000)



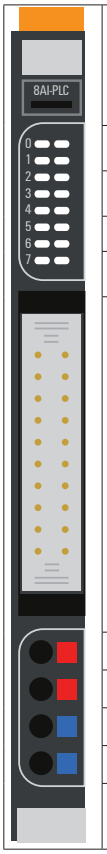
Connection diagram UR20-8AI-I-PLC-INT

The analogue input module UR20-8AI-I-PLC-INT can detect up to 8 analogue sensors with 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. The sensors are connected via a standard PLC connection (20-pole). The measurement range is defined using parameterisation. A status LED is assigned to each channel in a separate block. The module electronics can supply the sensors with power from the 4-pole feed-in plug (connector 4) via the PLC connection. Vice versa the module can be supplied via the PLC connection.

The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module. The inputs are protected against overcurrent by a self-resetting fuse.

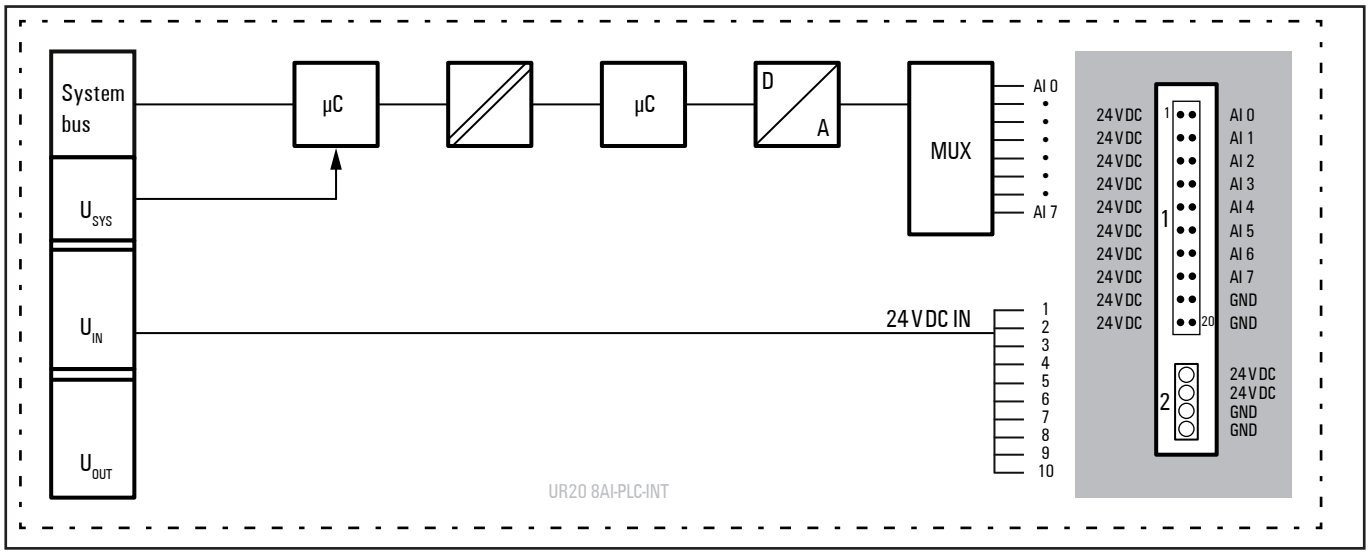
For the PLC connection, the following applies: a maximum current of 2 A (with a max. of 1 A per contact) can be taken from the +24 V connections or fed through the 0 V connections.

The power supply of the peripherals connected has to be calculated for each individual installation situation. When using a flat ribbon cable, please regard its higher internal resistance!



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
0	Red: channel error
1	Red: channel error
...	...
7	Red: channel error
4.1	Green: Supply voltage feed-in plug > 18 V DC
4.2	Red: Error on the supply voltage of the feed-in plug
4.4	Red: Fuse for the sensor supply has been triggered

LED indicators UR20-8AI-I-PLC-INT, error messages see Chapter 13



Block diagram UR20-8AI-I-PLC-INT

Technical data UR20-8AI-I-PLC-INT (Order No. 1315670000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Inputs		
Number	8	
Input values	Current input	
Resolution	16 bits	
Accuracy	max. 0.1 % FSR ±50 ppm/K max.	at 25 °C temperature coefficient
Sensor supply	External	
Sensor connection	PLC interface unit	
Conversion time	1 ms	
Internal resistance	approx. 50 Ω	
Reverse polarity protection	yes	
Short-circuit protection	yes	
Response time	< 0.1 s with short-circuit to +24 V	
Reset time	Temperature-dependent; < 30 s at 20 °C	
Module diagnosis	yes	
Individual channel diagnosis	no	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption (via supply connector at the module)	< 20 mA	
Connection data		
Type of connection	"PUSH IN"	
Line connection cross-section	Single-wired	0.14 … 1.5 mm² (AWG 16 – 26)
	Fine-wired	0.14 … 1.5 mm² (AWG 16 – 26)
I/O connector	20-pole PLC connection	
General data		
Weight (operational status)	73 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-8AI-I-PLC-INT

Channel	Description	Options[1)]	Default
	Frequency suppression	disabled (0) / 50 Hz (1) / 60 Hz (2) / Average over 16 values (3)	disabled
0 ... 7	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 7	Measurement range	0 to 20 mA (0) / 4 to 20 mA (1) / disabled (2)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-8AI-I-PLC-INT

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x74
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	8
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1)] inputs UR20-8AI-I-PLC-INT

Byte	Format	Description
IB0	Word	AI0
IB1		
IB2	Word	AI1
IB3		
IB4	Word	AI2
IB5		
IB6	Word	AI3
IB7		
IB8	Word	AI4
IB9		
IB10	Word	AI5
IB11		
IB12	Word	AI6
IB13		
IB14	Word	AI7
IB15		

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Measurement range UR20-8AI-I-PLC-INT

Measurement range	Current (I)	Decimal (D)	Hexadecimal	Range	Conversion
0 - 20 mA Siemens S7 format	23.52 mA	32511	0x7EFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648
	20 mA	27648	0x6C00	Nominal range	
	10 mA	13824	0x3600		
	0 mA	0	0x0000		
0 - 20 mA Siemens S5 format	23.52 mA	19268	0x4B44	Overloading	D = 16384 x I / 20 I = D x 20 / 16384
	20 mA	16384	0x4000	Nominal range	
	10 mA	8192	0x2000		
	0 mA	0	0x0000		
4 - 20 mA Siemens S7 format	22.81 mA	32511	0x7EFF	Overloading	D = 27648 x (I - 4) / 16 I= D x 16 / 27648 + 4
	20 mA	27648	0x6C00	Nominal range	
	12 mA	13824	0x3600		
	4 mA	0	0x0000		
	1.19 mA	-4864	0xED00	Underloading	
4 - 20 mA Siemens S5 format	22.82 mA	19268	0x4B44	Overloading	D = 27648 x (I - 4) / 16 I = D x 16 / 16384 + 4
	20 mA	16384	0x4000	Nominal range	
	12 mA	8192	0x2000		
	4 mA	0	0x0000		
	0.8 mA	-3277	0xF333	Underloading	

The following applies for all S7 ranges:
input value > overload range = 0x7FFF
input value < underload range = 0x8000

Additional status bits are set for S5.

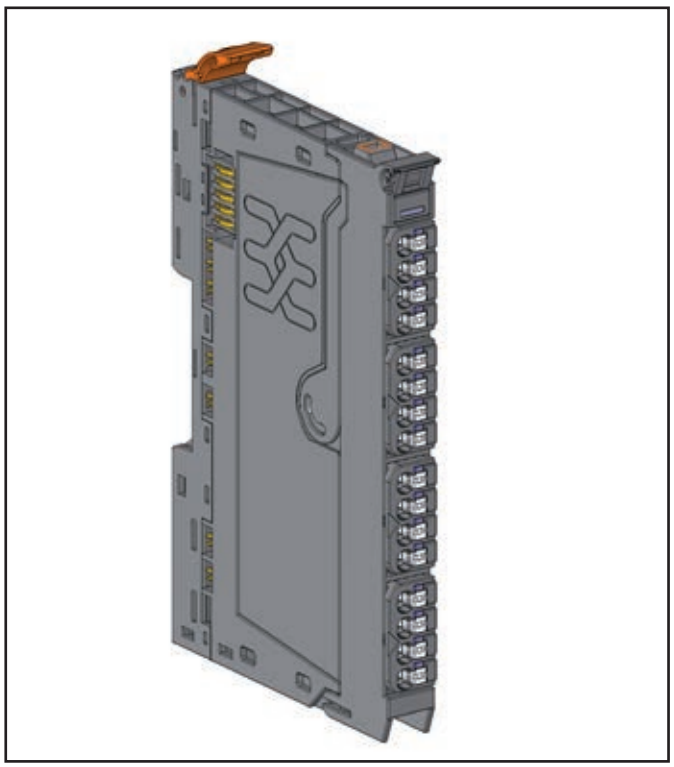
Digital measured value representation in Siemens S5 format

Data bit	7	6	5	4	3	2	1	0
Byte 0 (high byte)	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}
Byte 1 (low byte)	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	A	F	O

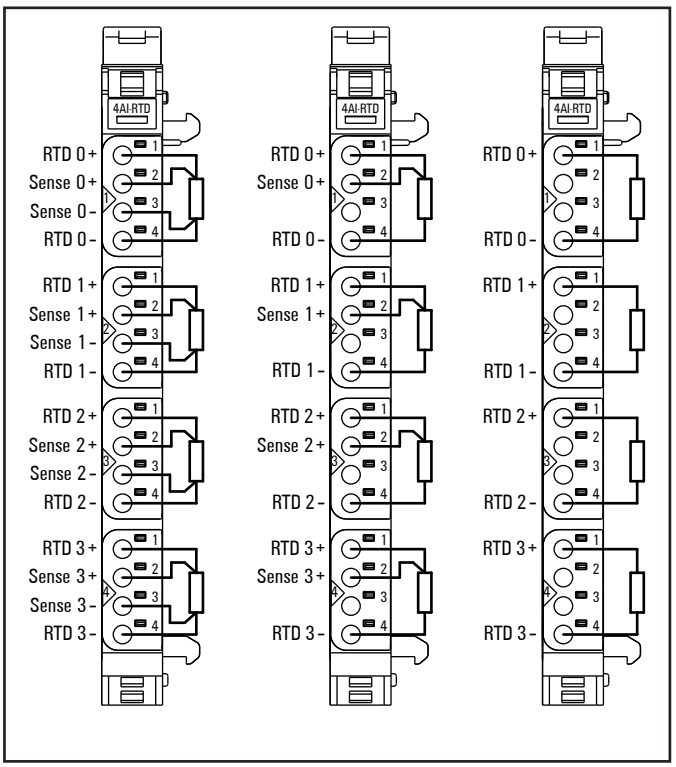
A: 0 = not active
1 = active
F: 0 = no line break
1 = line break
O: 0 = 0 to 4095 units
1 = ±4096 units (overflow)

Representation in two's complement
2^{12} = VZ in representation as amount and signs

6.39 Analogue input module UR20-4AI-RTD-DIAG



Analogue input module UR20-4AI-RTD-DIAG (Order No. 1315700000)

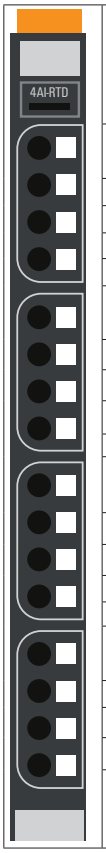


Connection diagram UR20-4AI-RTD-DIAG

The analogue input module UR20-4AI-RTD-DIAG can detect up to 4 analogue resistance thermometers. The resolution is 16 bit per channel. A sensor can be connected to each connector in a 2-wire, 3-wire or 4-wire connection. Mixed operation using different sensors as well as different connection methods is possible. Sensor type and temperature range are set using parameterisation. A status LED is assigned to each channel.

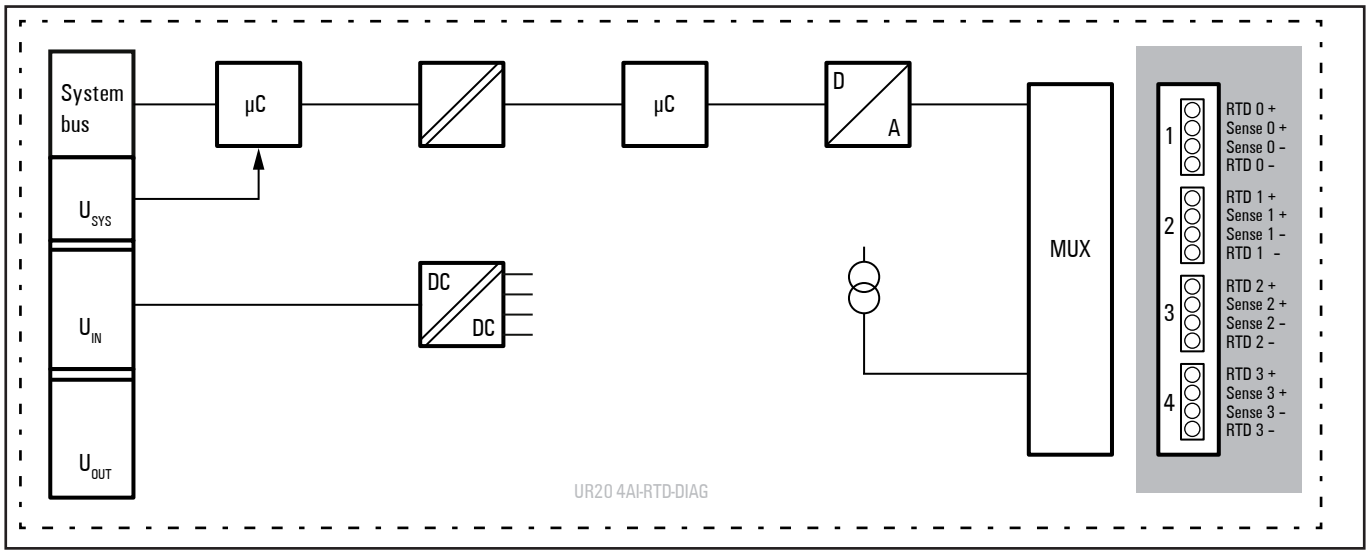
The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module.

The module provides individual channel diagnosis with channel related error messages.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: Signal at input 0 outside the permissible range, line break or short-circuit
2.1	Red: Signal at input 1 outside the permissible range, line break or short-circuit
3.1	Red: Signal at input 2 outside the permissible range, line break or short-circuit
4.1	Red: Signal at input 3 outside the permissible range, line break or short-circuit

LED indicators UR20-4AI-RTD-DIAG, error messages see Chapter 13



Block diagram UR20-4AI-RTD-DIAG

Technical data UR20-4AI-RTD-DIAG (Order No. 1315700000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Potential isolation	Channel/system bus	yes
	Channel/channel	no
Inputs		
Number	4	
Sensor types	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni 200, Ni500, Ni1000, Cu10, 40 Ω, 80 Ω, 150 Ω, 300 Ω, 500 Ω, 1 kΩ, 2 kΩ, 4 kΩ	
Resolution	16 bits	
Accuracy	max. 0.2 % FSR / 0.3 % FSR for Ni sensors / 0.6 % FSR for Cu10	
Sensor connection	2-wire, 3-wire, 4-wire	
Sensor current	depending on the sensor type 0,75 mA (Pt100, Ni100, Ni120, Cu10, 40 Ω, 80 Ω, 150 Ω, 300 Ω) or 0,25 mA (Pt200, Pt500, Pt1000, Ni200, Ni500, Ni1000, 500 Ω, 1 kΩ, 2 kΩ, 4 kΩ)	
Max. wire resistance / measurement range	2.5 Ω / 40 Ω, 5 Ω / 80 Ω, 10 Ω / 150 Ω and Cu10, 25 Ω in all other measuring ranges	
Temperature coefficient	±50 ppm/K max.	
Temperature range	-200 … +850 °C	
Conversion time	36 to 240 ms, adjustable	
Common mode input voltage range	Channel to channel: max. ±2 V	
	Channel to voltage supply: max. ±50 V	
Reverse polarity protection	yes	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from input current path I_{IN}	< 20 mA	
General data		
Weight (operational status)	91 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AI-RTD-DIAG

Channel	Description	Options[1)]	Default
	Temperature unit	Degree Celsius (0) / Degree Fahrenheit (1) / Kelvin (2)	Degree Celsius
0 ... 3	Measurement range	PT100 -200 ... 850 Degree Celsius (0) / PT200 -200 ... 850 Degree Celsius (1) / PT500 -200 ... 850 Degree Celsius (2) / PT1000 -200 ... 850 Degree Celsius (3) / NI100 -60 ... 250 Degree Celsius (4) / NI120 -80 ... 260 Degree Celsius (5) / NI200 -60 ... 250 Degree Celsius (6) / NI500 -60 ... 250 Degree Celsius (7) / NI1000 -60 ... 250 Degree (8) / Cu10 -100 ... 260 Degree Celsius (9) / Resistance 40 Ω (10) / Resistance 80 Ω (11) / Resistance 150 Ω (12) / Resistance 300 Ω (13) / Resistance 500 Ω (14) / Resistance 1000 Ω (15) / Resistance 2000 Ω (16) / Resistance 4000 Ω (17) / disabled (18)	disabled
0 ... 3	Connection type	2-wire (0) / 3-wire (1) / 4-wire (2)	2-wire
0 ... 3	Conversion time	240 ms (0) / 130 ms (1) / 80 ms (2) / 55 ms (3) / 43 ms (4) / 36 ms (5)	80 ms
0 ... 3	Channel diagnostics	disabled (0) / enabled (1)	disabled
0 ... 3	Limit value monitoring	disabled (0) / enabled (1)	disabled
0 ... 3	High limit value	-32768 ... 32767	0
0 ... 3	Low limit value	-32768 ... 32767	0

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AI-RTD-DIAG

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Error	
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module type	0x05
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Process alarm lost	
		7	Reserved	0
Channel type	4	0 - 6	Channel type	0x71
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4 - 7	Reserved	0
Channel error	8	8 - 15	Reserved	0
Channel error	9	16 - 23	Reserved	0
Channel error	10	24 - 31	Reserved	0
Channel 0 error	11	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	Reserved	0
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	

Diagnostic data UR20-4AI-RTD-DIAG

Name	Bytes	Bit	Description	Default
Channel 1 error	12	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	Reserved	0
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 2 error	13	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	Reserved	0
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 3 error	14	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	Reserved	0
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 4 error to Channel 31 error	15 - 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-4AI-RTD-DIAG

Byte	Format	Description
IB0	Word	RTD0
IB1		
IB2	Word	RTD1
IB3		
IB4	Word	RTD2
IB5		
IB6	Word	RTD3
IB7		

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Resistance measurement ranges UR20-4AI-RTD-DIAG

Measurement range	Resistance	Decimal	Hexadecimal	Range
40 Ω	> 47.04 Ω	32767	0x7FFF	Overloading or line break
	47.04 Ω	32511	0x7EFF	Overloading
	40 Ω	27648	0x6C00	Nominal range
	0	0	0x0000	
80 Ω	> 94.07 Ω	32767	0x7FFF	Overloading or line break
	94.07 Ω	32511	0x7EFF	Overloading
	80 Ω	27648	0x6C00	Nominal range
	0	0	0x0000	
150 Ω	> 176.4 Ω	32767	0x7FFF	Overloading or line break
	176.4 Ω	32511	0x7EFF	Overloading
	150 Ω	27648	0x6C00	Nominal range
	0	0	0x0000	
300 Ω	> 352.77 Ω	32767	0x7FFF	Overloading or line break
	352.77 Ω	32511	0x7EFF	Overloading
	300 Ω	27648	0x6C00	Nominal range
	0	0	0x0000	
500 Ω	> 587.9 Ω	32767	0x7FFF	Overloading or line break
	587.9 Ω	32511	0x7EFF	Overloading
	500 Ω	27648	0x6C00	Nominal range
	0	0	0x0000	
1 kΩ	> 1.177 kΩ	32767	0x7FFF	Overloading or line break
	1.177 kΩ	32511	0x7EFF	Overloading
	1.0 kΩ	27648	0x6C00	Nominal range
	0	0	0x0000	
2 kΩ	2.352 kΩ	32767	0x7FFF	Overloading or line break
	2.352 kΩ	32511	0x7EFF	Overloading
	2.0 kΩ	27648	0x6C00	Nominal range
	0	0	0x0000	
4 kΩ	> 4.703 kΩ	32767	0x7FFF	Overloading or line break
	4.703 kΩ	32511	0x7EFF	Overloading
	4.0 kΩ	27648	0x6C00	Nominal range
	0	0	0x0000	

Temperature measurement ranges UR20-4AI-RTD-DIAG

Measurement range	Value in °C 0.1 ° resolution	Value in °F 0.1 °/digit	Value in K 0.1 K/digit	Range
Pt100	-2000 to 8500	-3280 to 15620	732 to 11232	-200 °C to +850 °C
	-2040	-3352	692	Underloading
	8540	15692	11272	Overloading
	32767	32767	32767	Line break
Pt200	-2000 to 8500	-3280 to 15620	732 to 11232	-200 °C to +850 °C
	-2040	-3352	692	Underloading
	8540	15692	11272	Overloading
	32767	32767	32767	Line break
Pt500	-2000 to 8500	-3280 to 15620	732 to 11232	-200 °C to +850 °C
	-2040	-3352	692	Underloading
	8540	15692	11272	Overloading
	32767	32767	32767	Line break
Pt1000	-2000 to 8500	-3280 to 15620	732 to 11232	-200 °C to +850 °C
	-2040	-3352	692	Underloading
	8540	15692	11272	Overloading
	32767	32767	32767	Line break
Ni100	-600 to +2500	-760 to 4820	2132 to 5232	-60 °C to 250 °C
	-640	-832	2092	Underloading
	2540	4892	5272	Overloading
	32767	32767	32767	Line break
Ni120	-800 to +2600	-1120 to +5000	1932 to 5332	-80 °C to 260 °C
	-840	-1192	1892	Underloading
	2640	5072	5372	Overloading
	32767	32767	32767	Line break
Ni200	-600 to +2500	-760 to 4820	2132 to 5232	-60 °C to 250 °C
	-640	-832	2092	Underloading
	2540	4892	5272	Overloading
	32767	32767	32767	Line break
Ni500	-600 to +2500	-760 to 4820	2132 to 5232	-60 °C to 250 °C
	-640	-832	2092	Underloading
	2540	4892	5272	Overloading
	32767	32767	32767	Line break

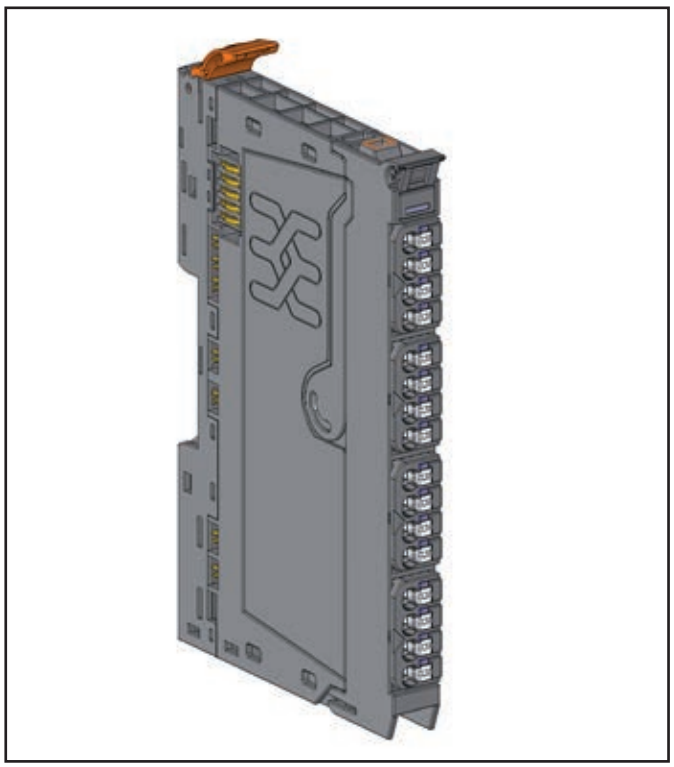
Temperature measurement ranges UR20-4AI-RTD-DIAG

Measurement range	Value in °C 0.1 ° resolution	Value in °F 0.1 °/digit	Value in K 0.1 K/digit	Range
Ni1000	-600 to +2500	-760 to 4820	2132 to 5232	-60 °C to 250 °C
	-640	-832	2092	Underloading
	2540	4892	5272	Overloading
	32767	32767	32767	Line break
Cu10	-1000 to +2600	-1480 to 5000	1732 to 5332	-100 °C to 260 °C
	-1040	-1552	1692	Underloading
	2640	5072	5372	Overloading
	32767	32767	32767	Line break

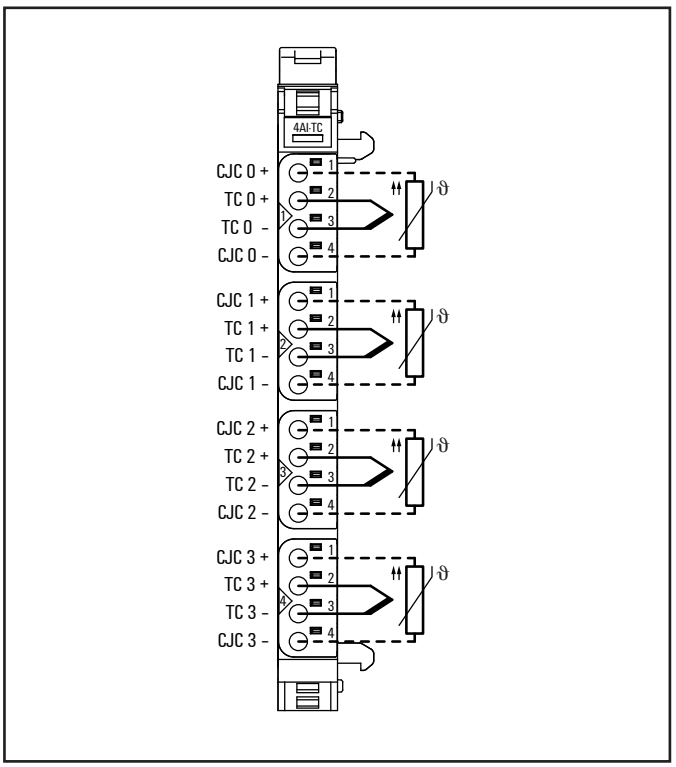
Process alarm UR20-4AI-RTD-DIAG

Name	Number of bytes	Function
High alarm	1	Bit 0: Upper limit exceeded channel 0
		Bit 1: Upper limit exceeded channel 1
		Bit 2: Upper limit exceeded channel 2
		Bit 3: Upper limit exceeded channel 3
		Bit 4 – 7: Reserved
Low Alarm	1	Bit 0: Lower limit underrun channel 0
		Bit 1: Lower limit underrun channel 1
		Bit 2: Lower limit underrun channel 2
		Bit 3: Lower limit underrun channel 3
		Bit 4 – 7: Reserved
Timestamp	2	The two least significant bytes of the internal 32-bit timer

6.40 Analogue input module UR20-4AI-TC-DIAG



Analogue input module UR20-4AI-TC-DIAG (Order No. 1315710000)



Connection diagram UR20-4AI-TC-DIAG

The analogue input module UR20-4AI-TC-DIAG can detect up to 4 analogue thermocouple sensors or voltages between ±15 mV and ±2 V. The resolution is 16 bit per channel. Sensor type and temperature range are set using parameterisation. Mixed operation using different sensors is possible. For each channel, an internal or external cold-junction compensation (CJC) can be parameterized. A status LED is assigned to each channel.

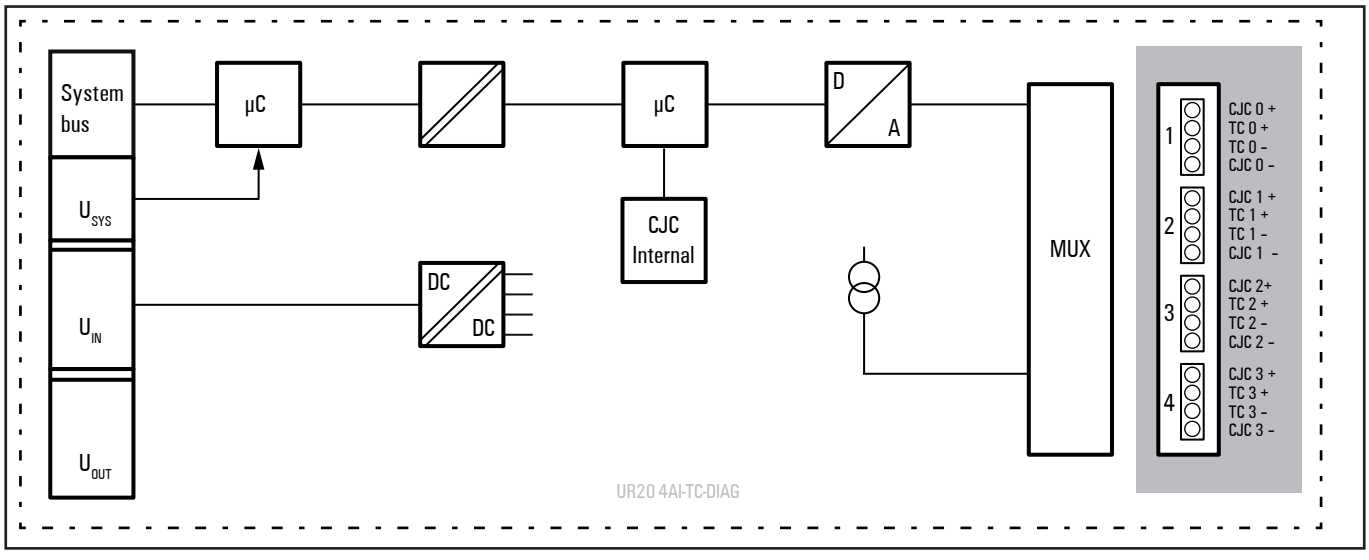
The inputs are protected against voltage surges and overcurrent. Voltages that exceed ±30 V may cause the destruction of the module.

The module provides individual channel diagnosis with channel related error messages.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: Signal at input 0 outside the permissible range, line break or cold-junction compensation error
2.1	Red: Signal at input 1 outside the permissible range, line break or cold-junction compensation error
3.1	Red: Signal at input 2 outside the permissible range, line break or cold-junction compensation error
4.1	Red: Signal at input 3 outside the permissible range, line break or cold-junction compensation error

LED indicators UR20-4AI-TC-DIAG, error messages see Chapter 13



Block diagram UR20-4AI-TC-DIAG

Technical data UR20-4AI-TC-DIAG (Order No. 1315710000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Potential isolation	Channel/system bus	yes
	Channel/channel	no
Inputs		
Number	4	
Sensor types	J, K, T, B, N, E, R, S, L, U, C, mV	
Resolution	16 bits	
Accuracy	Conversion time ≥ 80 ms: 10 µV + 0.1 % of voltage measurement range (without cold-junction measurement error)	
Sensor connection	2-wire	
Sensor current	0,25 mA for the cold-junction compensation with a Pt1000	
Cold-junction compensation	Internal and external (Pt1000), int. accuracy ≤3 K	
Temperature coefficient	±50 ppm/K max.	
Temperature range	-200 °C ... +2315 °C	
Conversion time	36 ... 240 ms, adjustable	
Common mode input voltage range	Channel to channel: max. ±2 V	
	Channel to voltage supply: max. ±50 V	
Internal resistance	> 1 MΩ	
Reverse polarity protection	yes	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from input current path I_{IN}	20 mA	
General data		
Weight (operational status)	86 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AI-TC-DIAG

Channel	Description	Options[1)]	Default
	Temperature unit	Degree Celsius (0) / Degree Fahrenheit (1) / Kelvin (2)	Degree Celsius
0 ... 3	Measurement range	TC Type J (0) / TC Type K (1) / TC Type N (2) / TC Type R (3) / TC Type S (4) / TC Type T (5) / TC Type B (6) / TC Type C (7) / TC Type E (8) / TC Type L (9) / TC Type U (10) / ± 15,625 mV (11) / ± 31,25 mV (12) / ± 62,5 mV (13) / ± 125 mV (14) / ± 250 mV (15) / ± 500 mV (16) / ± 1000 mV (17) / ± 2000 mV (18) / disabled (19)	disabled
0 ... 3	Cold junction compensation	internal (0) / external Channel 0 (1) / external Channel 1 (2) / external Channel 2 (3) / external Channel 3 (4)	internal
0 ... 3	Conversion time	240 ms (0) / 130 ms (1) / 80 ms (2) / 55 ms (3) / 43 ms (4) / 36 ms (5)	80 ms
0 ... 3	Channel diagnostics	disabled (0) / enabled (1)	disabled
0 ... 3	Limit value monitoring	disabled (0) / enabled (1)	disabled
0 ... 3	High limit value	-32768 ... 32767	0
0 ... 3	Low limit value	-32768 ... 32767	0

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AI-TC-DIAG

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Error	
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module types	1	0	Module type	0x05
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 – 7	Reserved	0
Error byte 3	3	0 – 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Process alarm lost	
		7	Reserved	0
Channel type	4	0 – 6	Channel type	0x71
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4 – 7	Reserved	0
Channel error	8	8 – 15	Reserved	0
Channel error	9	16 – 23	Reserved	0
Channel error	10	24 – 31	Reserved	0
Channel 0 error	11	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	CJC error	
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	

Diagnostic data UR20-4AI-TC-DIAG

Name	Bytes	Bit	Description	Default
Channel 1 error	12	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	CJC error	
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 2 error	13	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	CJC error	
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 3 error	14	0	Parameter error	
		1	Reserved	0
		2	Reserved	0
		3	CJC error	
		4	Line break	
		5	Process alarm lost	
		6	Lower limit exceeded	
		7	Upper limit exceeded	
Channel 4 error to Channel 31 error	15 – 42	0 – 7	Reserved	0
Time stamp	43 – 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-4AI-TC-DIAG

Byte	Format	Description
IB0	Word	TC0
IB1		
IB2	Word	TC1
IB3		
IB4	Word	TC2
IB5		
IB6	Word	TC3
IB7		

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Voltage measurement ranges UR20-4AI-TC-DIAG

Measurement range	Voltage	Decimal signal range	Hexadecimal signal range
±15.625 mV	15.625 mV	32767	0x7FFF
	-15.625 mV	-32768	0x8000
±31.25 mV	31.25 mV	32767	0x7FFF
	-31.25 mV	-32768	0x8000
±62.5 mV	62.5 mV	32767	0x7FFF
	-62.5 mV	-32768	0x8000
±125 mV	125 mV	32767	0x7FFF
	-125 mV	-32768	0x8000
±250 mV	250 mV	32767	0x7FFF
	-250 mV	-32768	0x8000
±500 mV	500 mV	32767	0x7FFF
	-500 mV	-32768	0x8000
±1 V	+1 V	32767	0x7FFF
	-1 V	-32768	0x8000
±2 V	+2 V	32767	0x7FFF
	-2 V	-32768	0x8000

Temperature measurement ranges UR20-4AI-TC-DIAG

Measurement range	Value in °C 0.1 ° resolution Bit significance	Value in °F 0.1 °F Bit significance	Value in K 0.1°K Bit significance	Range
Type K	-2000 to 13720	-3280 to 25016	732 to 16452	-200 °C to +1372 °C
	-2040	-3352	692	Underloading
	13760	25088	16492	Overloading
	32767	32767	32767	Line break, cold compensation error
Type J	-2100 to 12000	-3460 to 21920	632 to 14732	-210 °C to +1200 °C
	-2140	-3532	592	Underloading
	12040	21992	14772	Overloading
	32767	32767	32767	Line break, cold compensation error
Type B	500 to 18200	1220 to 32767 (limited range) 3276.7 °F = 1802.6 °C	3232 to 20932	+50 °C to +1820 °C
	460	1148	3192	Underloading
	18240	33152	20972	Overloading
	32767	32767	32767	Line break, cold compensation error
Type N	-2000 to +13000	-3280 to 23720	4732 to 15732	-200 °C to +1300 °C
	-2040	-3352	692	Underloading
	13040	23792	15772	Overloading
	32767	32767	32767	Line break, cold compensation error
Type E	-2000 to +10000	-3280 to 18320	4732 to 12732	-200 °C to +1000 °C
	-2040	-3352	692	Underloading
	10040	18392	12772	Overloading
	32767	32767	32767	Line break, cold compensation error
Type R	-500 to +17680	-580 to +32144	3232 to 20412	-50 °C to +1768 °C
	-540	-652	2192	Underloading
	17720	32216	20452	Overloading
	32767	32767	32767	Line break, cold compensation error
Type S	-500 to +17680	-580 to +32144	3232 to 20412	-50 °C to +1768 °C
	-540	-652	2192	Underloading
	17720	32216	20452	Overloading
	32767	32767	32767	Line break, cold compensation error

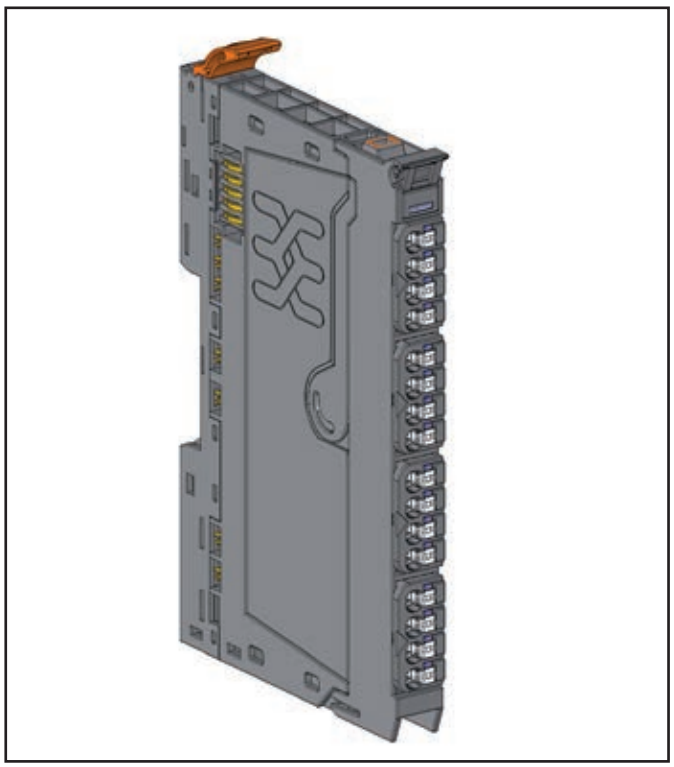
Temperature measurement ranges UR20-4AI-TC-DIAG

Measurement range	Value in °C 0.1 ° resolution Bit significance	Value in °F 0.1 °F Bit significance	Value in K 0.1°K Bit significance	Range
Type T	-2000 to +4000	-3280 to 7520	732 to 6732	-200 °C to +400 °C
	-2040	-3352	692	Underloading
	4040	7592	6772	Overloading
	32767	32767	32767	Line break, cold compensation error
Type L	-2000 to +9000	-3280 to 16520	732 to 11732	-200 °C to +900 °C
	-2040	-3352	692	Underloading
	9040	16592	11772	Overloading
	32767	32767	32767	Line break, cold compensation error
Type U	-2000 to +6000	-3280 to 11120	732 to 8732	-200 °C to +600 °C
	-2040	-3352	692	Underloading
	6040	11192	8772	Overloading
	32767	32767	32767	Line break, cold compensation error
Type C	0 to 23150	320 to 32767 (limited range) 3276.7 °F = 1802.6 °C	2732 to 25882	0 to +2315 °C
	-40	248	2692	Underloading
	23190	32767	25922	Overloading
	32767	32767	32767	Line break, cold compensation error

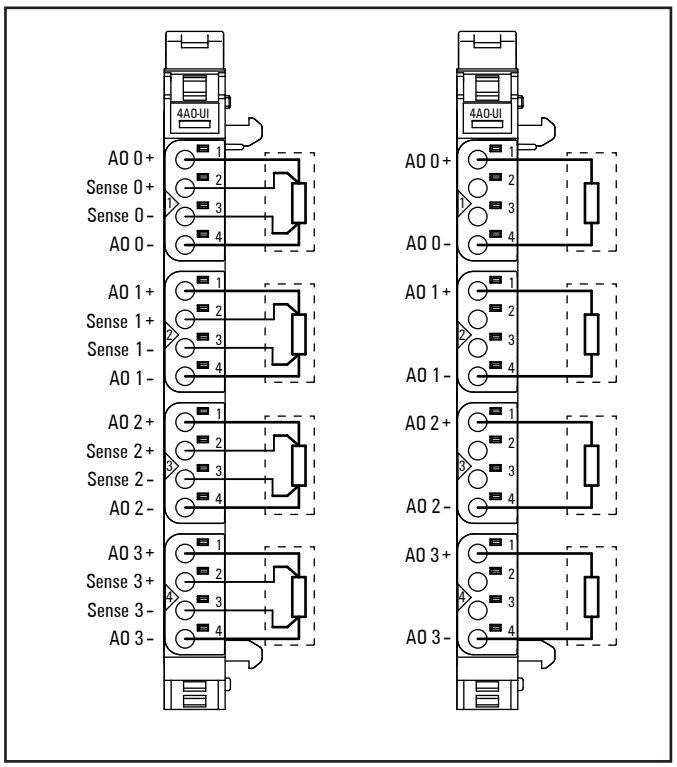
Process alarm UR20-4AI-TC-DIAG

Name	Number of bytes	Function
High alarm	1	Bit 0: Upper limit exceeded channel 0
		Bit 1: Upper limit exceeded channel 1
		Bit 2: Upper limit exceeded channel 2
		Bit 3: Upper limit exceeded channel 3
		Bit 4 ... 7: Reserved
Low alarm	1	Bit 0: Lower limit underrun channel 0
		Bit 1: Lower limit underrun channel 1
		Bit 2: Lower limit underrun channel 2
		Bit 3: Lower limit underrun channel 3
		Bit 4 ... 7: Reserved
Timestamp	2	The two least significant bytes of the internal 32-bit timer

6.41 Analogue output module UR20-4AO-UI-16



Analogue output module UR20-4AO-UI-16 (Order No. 1315680000)



Connection diagram UR20-4AO-UI-16

The analogue output module UR20-4AO-UI-16 can control up to 4 analogue actuators with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. An actuator can be connected to each connector in a 2-wire or 4-wire connection, the internal switching is carried out automatically. The output range is defined using parameterisation. A status LED is assigned to each channel. The outputs are supplied with power from the output current path I_{OUT}. The outputs are decoupled from the system bus I_{SYS}, but there is no potential isolation to the output current path I_{OUT}.

ATTENTION

Product can be destroyed!
The outputs as well as the sense-lines of the AO modules must not be used as power outputs!

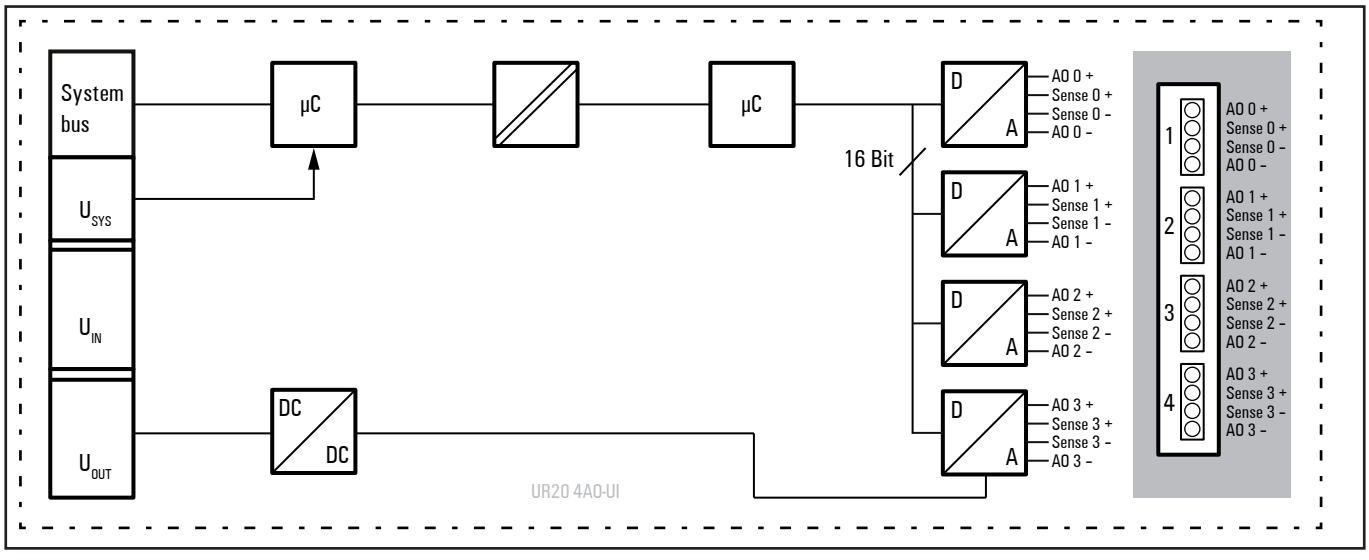
Please regard the following notes when wiring, to avoid perturbation effects and to ensure proper function of the module.

- ► Use shielded analogue lines only and earth them on both ends. In case of potential differences between the ends, you should earth one end only.
- ► Always use shielded twisted pair lines when connecting the actuators.
- ► Shielding: Apply the cable schield to the functional earth directly on entering the cabinet; on applications without cabinet apply it to a shield bus.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: Channel 0 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
2.1	Red: Channel 1 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
3.1	Red: Channel 2 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
4.1	Red: Channel 3 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected

LED indicators UR20-4AO-UI-16, error messages see Chapter 13



Block diagram UR20-4AO-UI-16

Technical data UR20-4AO-UI-16 (Order No. 1315680000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Potential isolation	Channel/system bus	yes
	Channel/channel	no
Outputs		
Number	4	
Output levels	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Response time	1 ms for 4 channels	
Resolution	16 bits	
Accuracy	0.1 % FSR max., 0.05 % FSR typ.	
Temperature coefficient	Voltage ±20 ppm/K; Current ±31 ppm/K	
Max. error between T_{min} and T_{max}	±220 ppm FSR	
Monotony	yes	
Crosstalk between the channels	±0.001 % FSR max.	
Repeat accuracy	< ±1 mV eff.	
Output ripple	max. 0.001 %	
Voltage load resistance	≥ 1 kΩ (at > 50 °C max ambient temperature, total sensor current of 10 mA per channel but 25 mA per module)	
Current load resistance	≤ 600 Ω	
Actuator connection	2-wire (current and voltage; automatic detection), 4-wire (voltage)	
Short-circuit-proof	yes	
Module diagnosis	yes	
Individual channel diagnosis	no	
Substitute value	yes	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	85 mA	
General data		
Weight (operational status)	83 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AO-UI-16

Channel	Description	Options[1)]	Default
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Output range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled
0 ... 3	Substitute value	depending on the channels data format (S5/S7), see Table "Output range"	0

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AO-UI-16

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module typ	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x73
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1)] outputs UR20-4AO-UI-16

Byte	Format	Description
QB0	Word	AO0
QB1		
QB2	Word	AO1
QB3		
QB4	Word	AO2
QB5		
QB6	Word	AI03
QB7		

1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Output range[1] UR20-4AO-UI-16

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

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

Output range[1] UR20-4AO-UI-16

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		

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

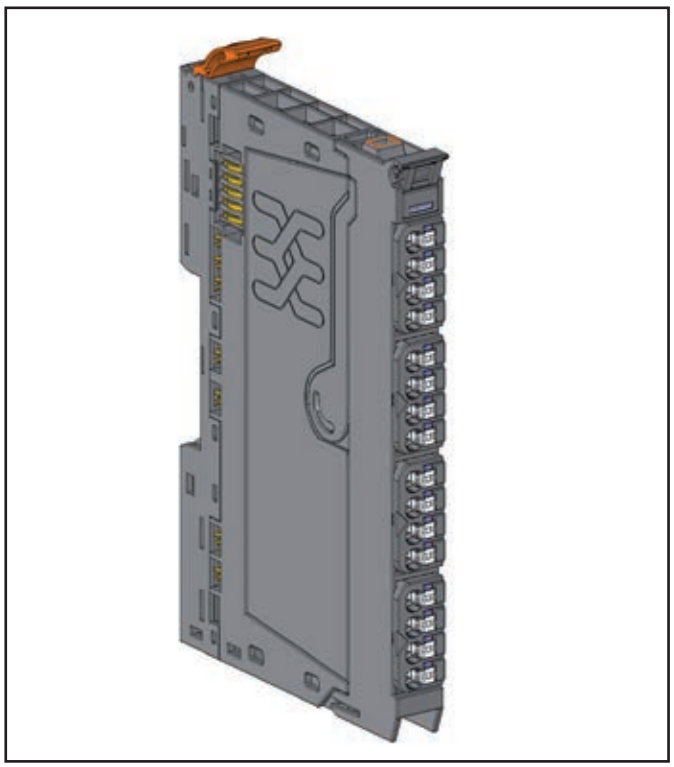
Output range[1] UR20-4AO-UI-16

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

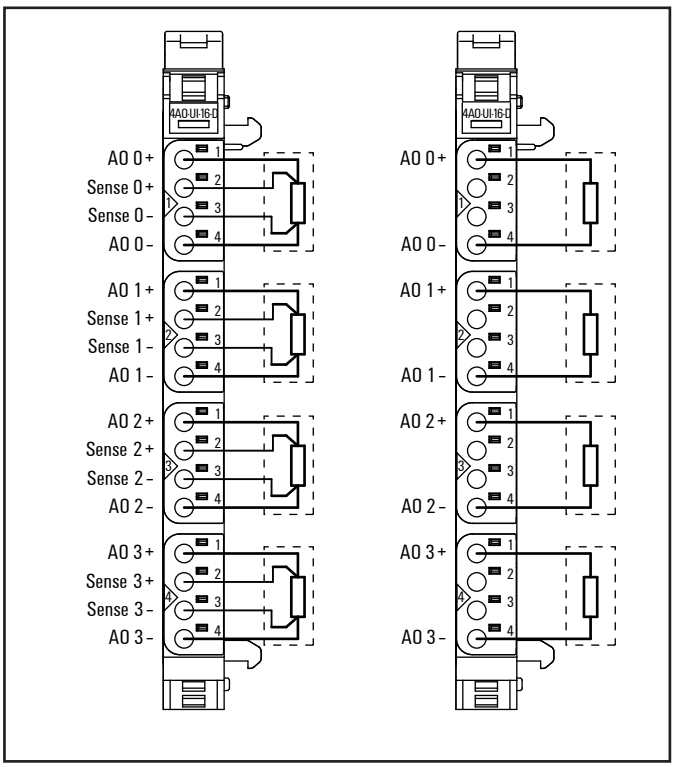
1) If the process value is beyond the valid output range, the corresponding channel releases 0 V and 0 mA respectively.

The following applies for all S5 and S7 ranges:
value > overload range = output deactivated
value < underload range = output deactivated

6.42 Analogue output module UR20-4AO-UI-16-DIAG



Analogue output module UR20-4AO-UI-16-DIAG (Order No. 1315730000)



Connection diagram UR20-4AO-UI-16-DIAG

The analogue output module UR20-4AO-UI-16-DIAG can control up to 4 analogue actuators with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. An actuator can be connected to each connector in a 2-wire or 4-wire connection, the internal switching is carried out automatically. The output range is defined using parameterisation. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}). The outputs are decoupled from the system bus I_{SYS}, but there is no potential isolation to the output current path I_{OUT}.

The module provides individual channel diagnosis with channel related error messages.

ATTENTION

Product can be destroyed!
The outputs as well as the sense-lines of the AO modules must not be used as power outputs!

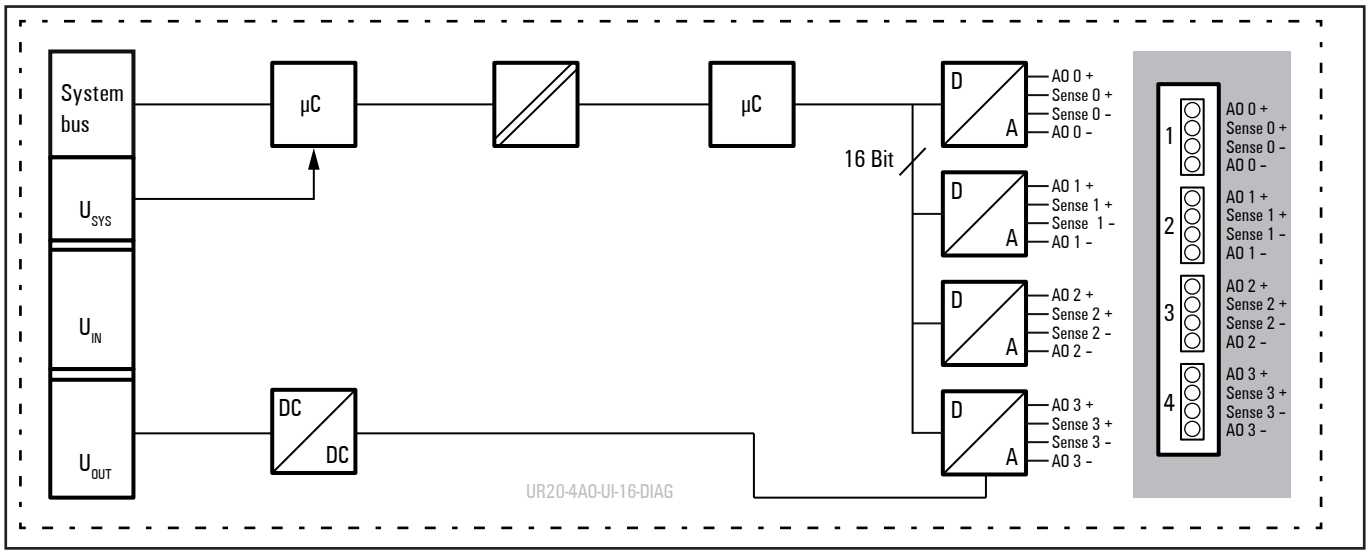
Please regard the following notes when wiring, to avoid perturbation effects and to ensure proper function of the module.

- ► Use shielded analogue lines only and earth them on both ends. In case of potential differences between the ends, you should earth one end only.
- ► Always use shielded twisted pair lines when connecting the actuators.
- ► Shielding: Apply the cable schield to the functional earth directly on entering the cabinet; on applications without cabinet apply it to a shield bus.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.2	Red: Channel 0 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
2.2	Red: Channel 1 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
3.2	Red: Channel 2 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
4.2	Red: Channel 3 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected

LED indicators UR20-4AO-UI-16-DIAG, error messages see Chapter 13



Block diagram UR20-4AO-UI-16-DIAG

Technical data UR20-4AO-UI-16-DIAG (Order No. 1315730000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Potential isolation	Channel/system bus	yes
	Channel/channel	no
Outputs		
Number	4	
Output levels	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Response time	1 ms for 4 channels	
Resolution	16 bits	
Accuracy	0.1 % FSR max., 0.05 % FSR typ.	
Temperature coefficient	Voltage ±20 ppm/K; Current ±31 ppm/K	
Max. error between T_{min} and T_{max}	±220 ppm FSR	
Monotony	yes	
Crosstalk between the channels	±0.001 % FSR max.	
Repeat accuracy	< ±1 mV eff.	
Output ripple	max. 0.001 %	
Voltage load resistance	≥ 1 kΩ (at > 50 °C max ambient temperature, total sensor current of 10 mA per channel but 25 mA per module)	
Current load resistance	≤ 600 Ω	
Actuator connection	2-wire (current and voltage, automatic detection), 4-wire (voltage)	
Short-circuit-proof	yes	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Reactionless	yes	
Substitute value	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current path I_{OUT}	85 mA	
General data		
Weight (operational status)	98 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AO-UI-16-DIAG

Channel	Description	Options[1)]	Default
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Output range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled
0 ... 3	Substitute value	depending on the channels data format (S5/S7), see Table "Output range"	0
0 ... 3	Channel diagnosis	disabled (0) / enabled (1)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AO-UI-16-DIAG

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Reserved	0
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Channel information available	1
		5 - 7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Process alarm lost	
		7	Reserved	0
Channel type	4	0 - 6	Channel type	0x73
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4 ... 7	Reserved	0
	8 ... 10	0 ... 31	Reserved	0
Error Channel 0	11	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0
Error Channel 1	12	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0

Diagnostic data UR20-4AO-UI-16-DIAG

Name	Bytes	Bit	Description	Default
Error Channel 2	13	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0
Error Channel 3	14	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0
Channel 4 error to Channel 31 error	15 - 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

Process data[1] outputs UR20-4AO-UI-16-DIAG

Byte	Format	Description
QB0	Word	AO0
QB1		
QB2	Word	AO1
QB3		
QB4	Word	AO2
QB5		
QB6	Word	AI03
QB7		

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Output range[1] UR20-4AO-UI-16-DIAG

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

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

Output range[1] UR20-4AO-UI-16-DIAG

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S7 format	11.76 V	32511	0x7EFF	Overloading	D = 27648 x U / 10 U = D x 10 / 27648
	10 V	27648	0x6C00	Nominal range	
	5 V	13824	0x3600		
	0 V	0	0x0000		
	-5 V	-13824	0xCA00		
	-10 V	-27648	0x9400		
	-11.76 V	-32511	0x8100	Underloading	
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	

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

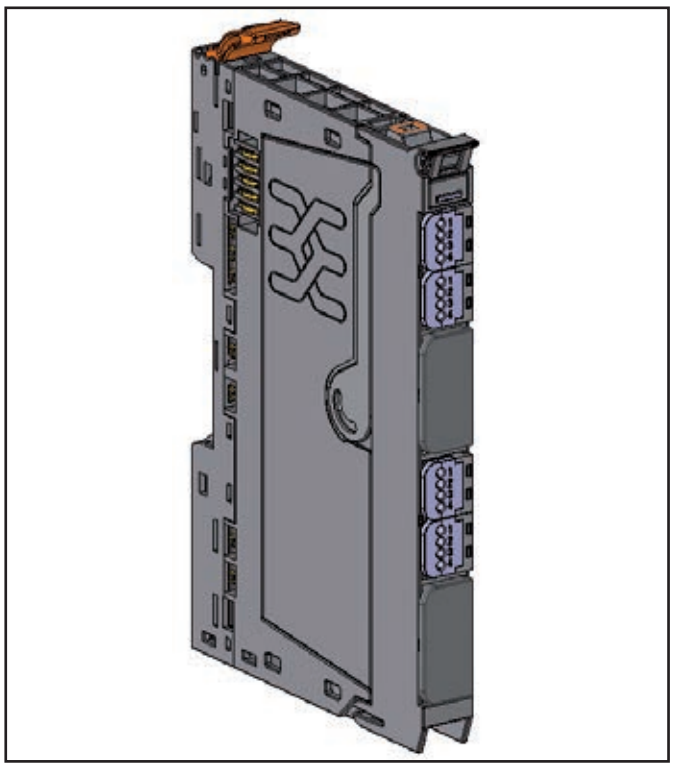
Output range[1] UR20-4AO-UI-16-DIAG

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

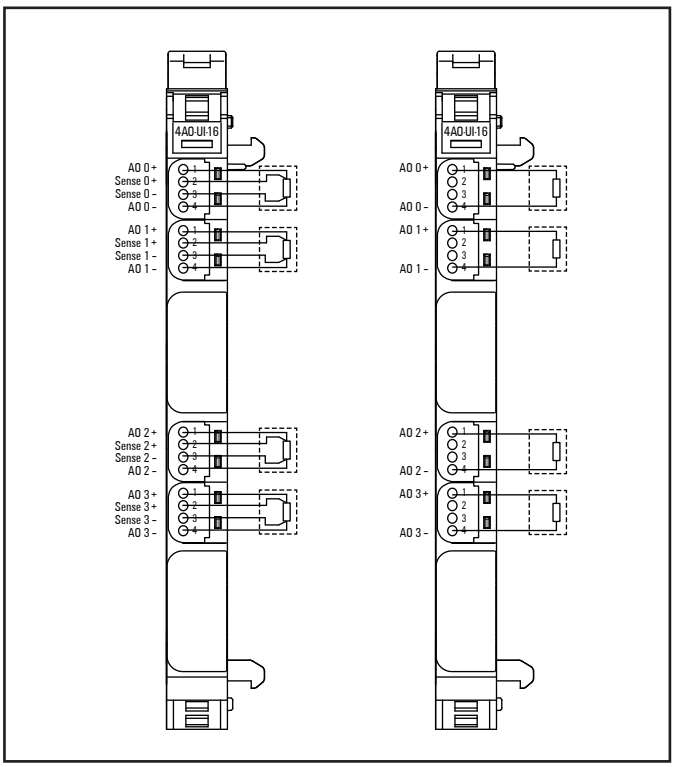
1) If the process value is beyond the valid output range, the corresponding channel releases 0 V and 0 mA respectively.

The following applies for all S5 and S7 ranges:
value > overload range = output deactivated
value < underload range = output deactivated

6.43 Analogue output module UR20-4AO-UI-16-HD



Analogue output module UR20-4AO-UI-16-HD (Order No. 1510690000)



Connection diagram UR20-4AO-UI-16-HD

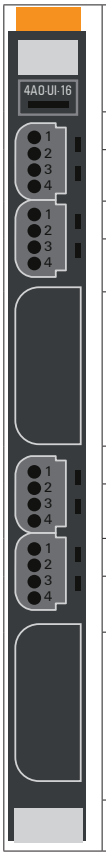
The analogue output module UR20-4AO-UI-16-HD can control up to 4 analogue actuators with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. An actuator can be connected to each connector in a 2-wire or 4-wire connection (IDC), the internal switching is carried out automatically. The output range is defined using parameterisation. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}). The outputs are decoupled from the system bus I_{SYS}, but there is no potential isolation to the output current path I_{OUT}.

ATTENTION

Product can be destroyed!
The outputs as well as the sense-lines of the AO modules must not be used as power outputs!

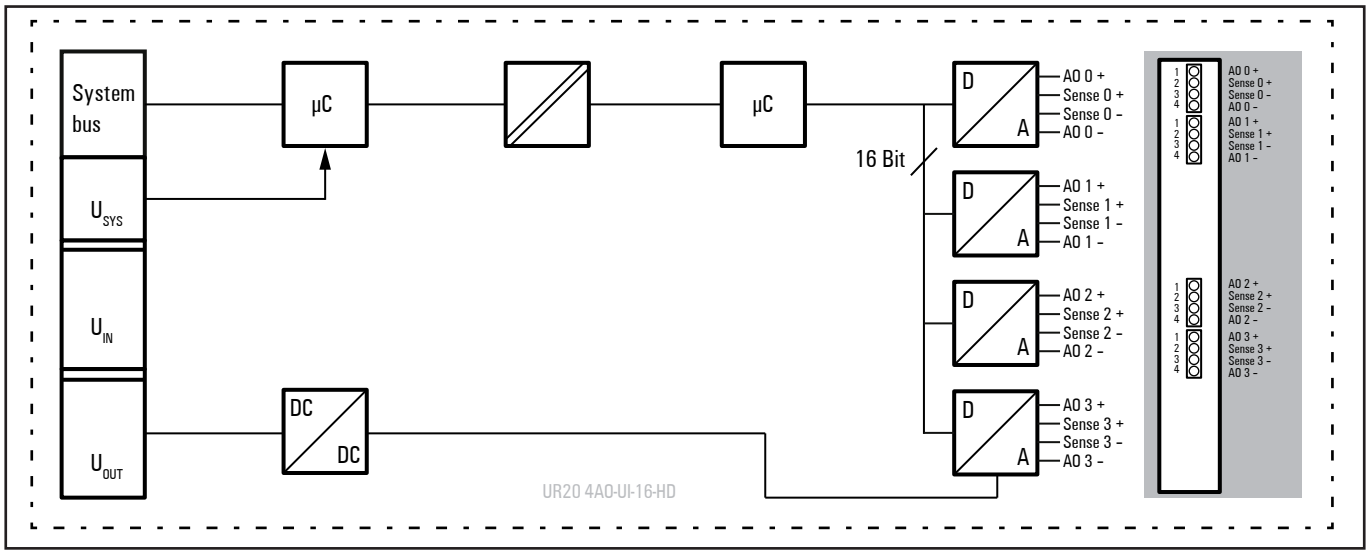
Please regard the following notes when wiring, to avoid perturbation effects and to ensure proper function of the module.

- ► Use shielded analogue lines only and earth them on both ends. In case of potential differences between the ends, you should earth one end only.
- ► Always use shielded twisted pair lines when connecting the actuators.
- ► Shielding: Apply the cable schield to the functional earth directly on entering the cabinet; on applications without cabinet apply it to a shield bus.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: Channel 0 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
2.1	Red: Channel 1 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
5.1	Red: Channel 2 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
6.1	Red: Channel 3 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected

LED indicators UR20-4AO-UI-16-HD, error messages see Chapter 13



Block diagram UR20-4AO-UI-16-HD

Technical data UR20-4AO-UI-16-HD (Order No. 1510690000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Potential isolation	Channel/System bus	yes
	Channel/Channel	no
Outputs		
Number	4	
Output levels	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Response time	1 ms for 4 channels	
Resolution	16 bits	
Accuracy	0.1 % FSR max., 0.05 % FSR typ.	
Temperature coefficient	Voltage ±20 ppm/K; Current ±31 ppm/K	
Max. error between T_{min} and T_{max}	±220 ppm FSR	
Monotony	yes	
Crosstalk between the channels	±0.001 % FSR max.	
Repeat accuracy	< ±1 mV eff.	
Output ripple	max. 0.001 %	
Voltage output load resistance	≥ 1 kΩ (at > 50 °C max ambient temperature, total sensor current of 25 mA and 10 mA per channel)	
Current output load resistance	≤ 600 Ω	
Actuator connection	2-wire (current and voltage, automatic detection), 4-wire (voltage)	
Short-circuit-proof	yes	
Module diagnosis	yes	
Individual channel diagnosis	no	
Substitute value	yes	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{IN}	8 mA	
Current consumption from output current path I_{OUT}	85 mA	
Connection data		
Type of connection	Insulation Displacement Connection (IDC)	
Line connection cross-section	Single-wired, fine-wired	0.14 ... 0.35 mm^2
General data		
Weight (operational status)	98 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AO-UI-16-HD

Channel	Description	Options[1)]	Default
0 ... 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 ... 3	Output range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled
0 ... 3	Substitute value	depending on the channels data format (S5/S7), see Table "Output range"	0

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-4AO-UI-16-HD

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module typ	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x73
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	4
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1)] outputs UR20-4AO-UI-16-HD

Byte	Format	Description
QB0	Word	AO0
QB1		
QB2	Word	AO1
QB3		
QB4	Word	AO2
QB5		
QB6	Word	AO3
QB7		

1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Output range[1] UR20-4AO-UI-16-HD

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 20 mA Siemens S7 format	23,52 mA	32511	0x7EFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648
	20 mA	27648	0x6C00	Nominal range	
	10 mA	13824	0x3600		
	0 mA	0	0x0000		
0 ... 20 mA Siemens S5 format	23,52 mA	19268	0x4B44	Overloading	D = 16384 x I / 20 I = D x 20 / 16384
	20 mA	16384	0x4000	Nominal range	
	10 mA	8192	0x2000		
	0 mA	0	0x0000		
4 ... 20mA Siemens S7 format	22,81 mA	32511	0x7EFF	Overloading	D = 27648 x (I - 4) / 16 I= D x 16 / 27648 + 4
	20 mA	27648	0x6C00	Nominal range	
	12 mA	13824	0x3600		
	4 mA	0	0x0000		
	1,19 mA	-4864	0xED00	Underloading	
4 ... 20 mA Siemens S5 format	22,82 mA	19268	0x4B44	Overloading	D = 16384 x (I - 4) / 16 I = D x 16 / 16384 + 4
	20 mA	16384	0x4000	Nominal range	
	12 mA	8192	0x2000		
	4 mA	0	0x0000		
	0,8 mA	-3277	0xF333	Underloading	
0 ... 10 V Siemens S7 format	11,76 V	32511	0x7EFF	Overloading	D = 27648 x U/10 U = D x 10 / 27648
	10 V	27648	0x6C00	Nominal range	
	5 V	13824	0x3600		
	0 V	0	0x0000		
0 ... 10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		

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

Output range[1] UR20-4AO-UI-16-HD

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S7 format	11,76 V	32511	0x7EFF	Overloading	D = 27648 x U / 10 U = D x 10 / 27648
	10 V	27648	0x6C00	Nominal range	
	5 V	13824	0x3600		
	0 V	0	0x0000		
	-5 V	-13824	0xCA00		
	-10 V	-27648	0x9400		
	-11,76 V	-32511	0x8100	Underloading	
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	

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

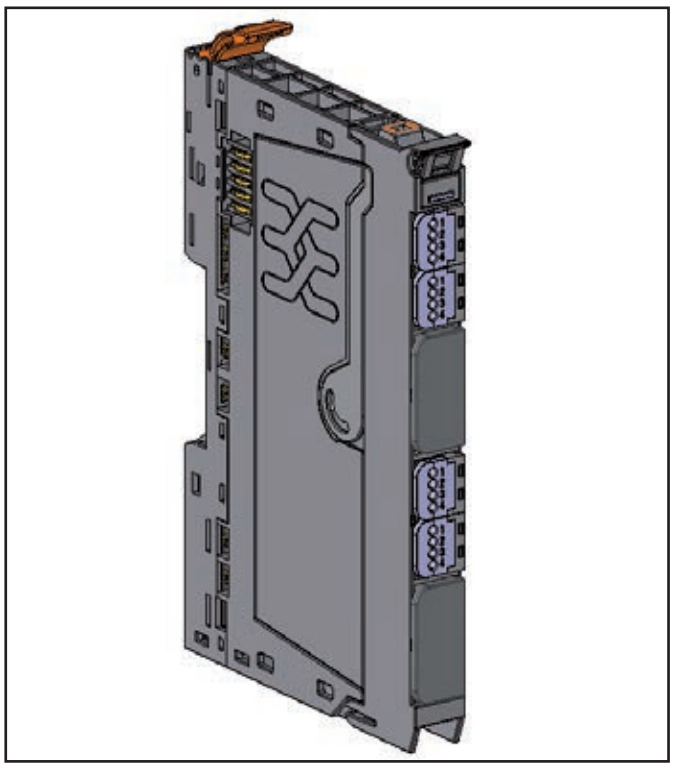
Output range[1] UR20-4AO-UI-16-HD

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

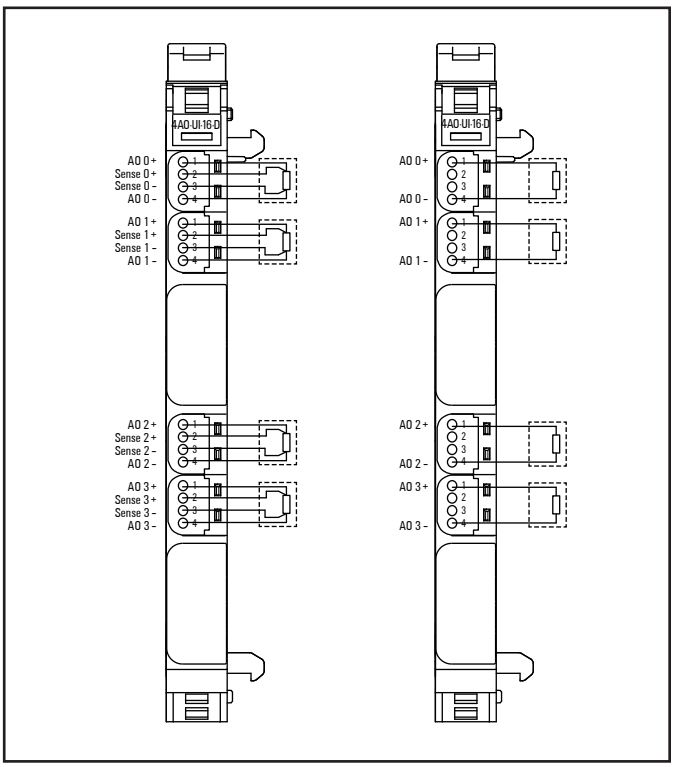
1) If the process value is beyond the valid output range, the corresponding channel releases 0 V and 0 mA respectively.

The following applies for all S5 and S7 ranges:
value > overload range = output deactivated
value < underload range = output deactivated

6.44 Analogue output module UR20-4AO-UI-16-DIAG-HD



Analogue output module UR20-4AO-UI-16-DIAG-HD (Order No. 1506930000)



Connection diagram UR20-4AO-UI-16-DIAG-HD

The analogue output module UR20-4AO-UI-16-DIAG-HD can control up to 4 analogue actuators with ±10 V, ±5 V, 0 ... 10 V, 0 ... 5 V, 2 ... 10 V, 1 ... 5 V, 0 ... 20 mA or 4 ... 20 mA. The resolution is 16 bit per channel. An actuator can be connected to each connector in a 2-wire or 4-wire connection (IDC), the internal switching is carried out automatically. The output range is defined using parameterisation. A status LED is assigned to each channel. The outputs are supplied with power from the output current path (I_{OUT}). The outputs are decoupled from the system bus I_{SYS}, but there is no potential isolation to the output current path I_{OUT}.

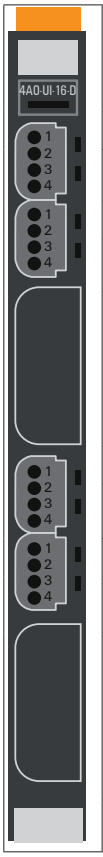
The module provides individual channel diagnosis with channel related error messages.

ATTENTION

Product can be destroyed!
The outputs as well as the sense-lines of the AO modules must not be used as power outputs!

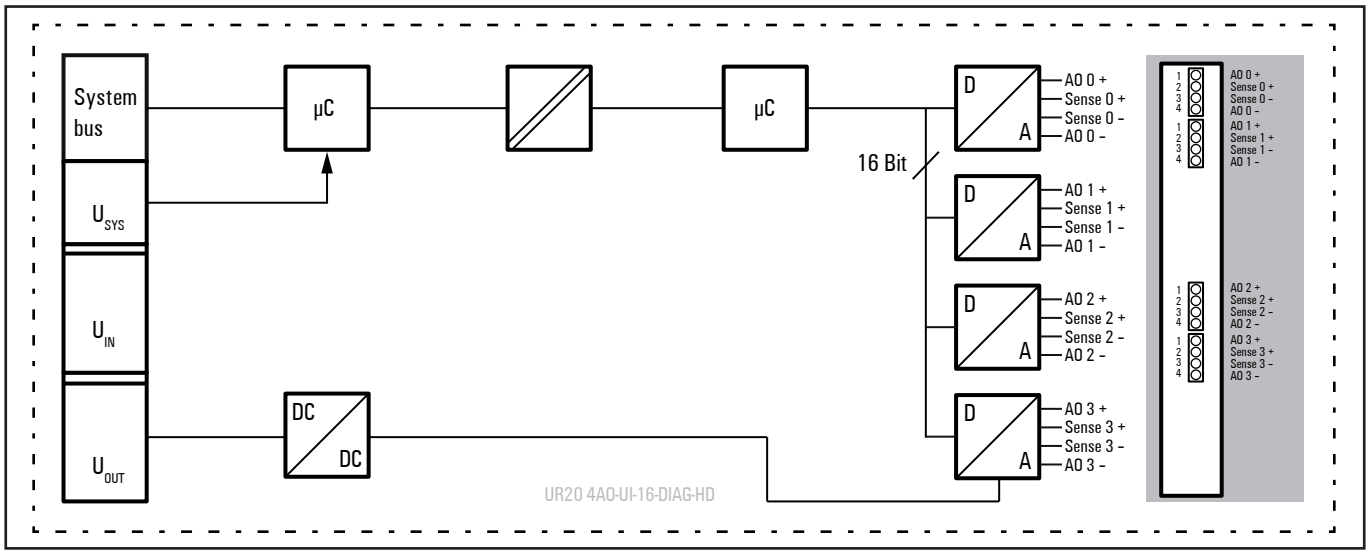
Please regard the following notes when wiring, to avoid perturbation effects and to ensure proper function of the module.

- ► Use shielded analogue lines only and earth them on both ends. In case of potential differences between the ends, you should earth one end only.
- ► Always use shielded twisted pair lines when connecting the actuators.
- ► Shielding: Apply the cable schield to the functional earth directly on entering the cabinet; on applications without cabinet apply it to a shield bus.



	Module status LED Green: Communication over the system bus Red: Collective error diagnostic
1.1	Red: Channel 0 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
2.1	Red: Channel 1 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
5.1	Red: Channel 2 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected
6.1	Red: Channel 3 at voltage output: overload or short circuit, at current output: shunt resistance too high or line break detected

LED indicators UR20-4AO-UI-16-DIAG-HD, error messages see Chapter 13



Block diagram UR20-4AO-UI-16-DIAG-HD

Technical data UR20-4AO-UI-16-DIAG-HD (Order No. 1506930000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Potential isolation	Channel/System bus	yes
	Channel/Channel	no
Outputs		
Number	4	
Output levels	1. Voltage (0 ... 5 V, ±5 V, 0 ... 10 V, ±10 V, 1 ... 5 V, 2 ... 10 V) 2. Current (0 ... 20 mA, 4 ... 20 mA)	
Response time	1 ms for 4 channels	
Resolution	16 bits	
Accuracy	0.1 % FSR max., 0.05 % FSR typ.	
Temperature coefficient	Voltage ±20 ppm/K; Current ±31 ppm/K	
Max. error between T_{min} and T_{max}	±220 ppm FSR	
Monotony	yes	
Crosstalk between the channels	±0.001 % FSR max.	
Repeat accuracy	< ±1 mV eff.	
Output ripple	max. 0.001 %	
Voltage output load resistance	≥ 1 kΩ (at > 50 °C max ambient temperature, total sensor current of 25 mA and 10 mA per channel)	
Current output load resistance	≤ 600 Ω	
Actuator connection	2-wire (current and voltage, automatic detection), 4-wire (voltage)	
Short-circuit-proof	yes	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Substitute value	yes	
Reactionless	yes	
Can be used with PF-O-xDI-SIL	yes	
Supply		
Supply voltage	24 V DC +20 %/-15 %	
Current consumption from system current path I_{SYS}	8 mA	
Current consumption from output current pat I_{OUT}	85 mA	

Technical data UR20-4AO-UI-16-DIAG-HD (Order No. 1506930000)

Connection data		
Type of connection	Insulation Displacement Connection (IDC)	
Line connection cross-section	Single-wired, fine-wired	0.14 … 0.35 mm²
General data		
Weight (operational status)	98 g	
For additional general data, see Section 3.4		

Overview of the editable parameters UR20-4AO-UI-16-DIAG-HD

Channel	Description	Options[1)]	Default
0 … 3	Data format	S5 Data format (0) / S7 Data format (1)	S7 Data format
0 … 3	Output range	0 to 20 mA (0) / 4 to 20 mA (1) / 0 to 10 V (2) / -10 to 10 V (3) / 0 to 5 V (4) / -5 to 5 V (5) / 1 to 5 V (6) / 2 to 10 V (7) /disabled (8)	disabled
0 … 3	Substitute value	depending on the channels data format (S5/S7), see Table "Output range"	0
0 … 3	Channel diagnosis	disabled (0) / enabled (1)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Process data[1)] outputs UR20-4AO-UI-16-DIAG-HD

Byte	Format	Description
QB0	Word	AO0
QB1		
QB2	Word	AO1
QB3		
QB4	Word	AO2
QB5		
QB6	Word	AO3
QB7		

1) Internal process data mapping with data format "Standard". Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Diagnostic data UR20-4AO-UI-16-DIAG-HD

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	Reserved	0
		5	Power supply fault	
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x05
		1		
		2		
		3		
		4	Channel information available	1
		5 ... 7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Power supply fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x73
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	4
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4 ... 7	Reserved	0
	8 ... 10	0 ... 31	Reserved	0
Channel 0 error	11	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0
Channel 1 error	12	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0

Diagnostic data UR20-4AO-UI-16-DIAG-HD

Name	Byte	Bit	Description	Default
Channel 2 error	13	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0
Channel 3 error	14	0	Parameter Error	
		1	Overtemperature	
		2	Overload	
		3	Error	
		4	Line break	
		5 ... 7	Reserved	0
Channel 4 error... Channel 31 error	15 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		time stamp [µs] (32bit)	

Output range[1] UR20-4AO-UI-16-DIAG-HD

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
0 ... 20 mA Siemens S7 format	23,52 mA	32511	0x7EFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648
	20 mA	27648	0x6C00	Nominal range	
	10 mA	13824	0x3600		
	0 mA	0	0x0000		
0 ... 20 mA Siemens S5 format	23,52 mA	19268	0x4B44	Overloading	D = 16384 x I / 20 I = D x 20 / 16384
	20 mA	16384	0x4000	Nominal range	
	10 mA	8192	0x2000		
	0 mA	0	0x0000		
4 ... 20mA Siemens S7 format	22,81 mA	32511	0x7EFF	Overloading	D = 27648 x (I - 4) / 16 I= D x 16 / 27648 + 4
	20 mA	27648	0x6C00	Nominal range	
	12 mA	13824	0x3600		
	4 mA	0	0x0000		
	1,19 mA	-4864	0xED00	Underloading	
4 ... 20 mA Siemens S5 format	22,82 mA	19268	0x4B44	Overloading	D = 16384 x (I - 4) / 16 I = D x 16 / 16384 + 4
	20 mA	16384	0x4000	Nominal range	
	12 mA	8192	0x2000		
	4 mA	0	0x0000		
	0,8 mA	-3277	0xF333	Underloading	
0 ... 10 V Siemens S7 format	11,76 V	32511	0x7EFF	Overloading	D = 27648 x U/10 U = D x 10 / 27648
	10 V	27648	0x6C00	Nominal range	
	5 V	13824	0x3600		
	0 V	0	0x0000		
0 ... 10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		

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

Output range[1] UR20-4AO-UI-16-DIAG-HD

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
±10 V Siemens S7 format	11,76 V	32511	0x7EFF	Overloading	D = 27648 x U / 10 U = D x 10 / 27648
	10 V	27648	0x6C00	Nominal range	
	5 V	13824	0x3600		
	0 V	0	0x0000		
	-5 V	-13824	0xCA00		
	-10 V	-27648	0x9400		
	-11,76 V	-32511	0x8100	Underloading	
±10 V Siemens S5 format	11,76 V	19268	0x4B44	Overloading	D = 16384 x U / 10 U = D x 10 / 16384
	10 V	16384	0x4000	Nominal range	
	5 V	8192	0x2000		
	0 V	0	0x0000		
	-5 V	-8192	0xE000		
	-10 V	-16384	0xC000		
	-11,76 V	-19268	0xB4BC	Underloading	
2 ... 10 V Siemens S7 format	11,41 V	32511	0x7EFF	Overloading	D = 27648 x (U – 2) / 8 U = D x 8 / 27648 + 2
	10 V	27648	0x6C00	Nominal range	
	6 V	13824	0x3600		
	2 V	0	0x0000		
	0,59 V	-4864	0xED00	Underloading	
2 ... 10 V Siemens S5 format	11,41 V	19268	0x4B44	Overloading	D = 16384 x (U – 2) / 8 U = D x 8 / 16384 + 2
	10 V	16384	0x4000	Nominal range	
	6 V	8192	0x2000		
	2V	0	0x0000		
	0,40 V	-3277	0xF333	Underloading	
1 ... 5 V Siemens S7 format	5,7 V	32511	0x7EFF	Overloading	D = 27648 x (U – 1) / 4 U = D x 4 / 27648 + 1
	5 V	27648	0x6C00	Nominal range	
	3 V	13824	0x3600		
	1 V	0	0x0000		
	0,30 V	-4864	0xED00	Underloading	

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

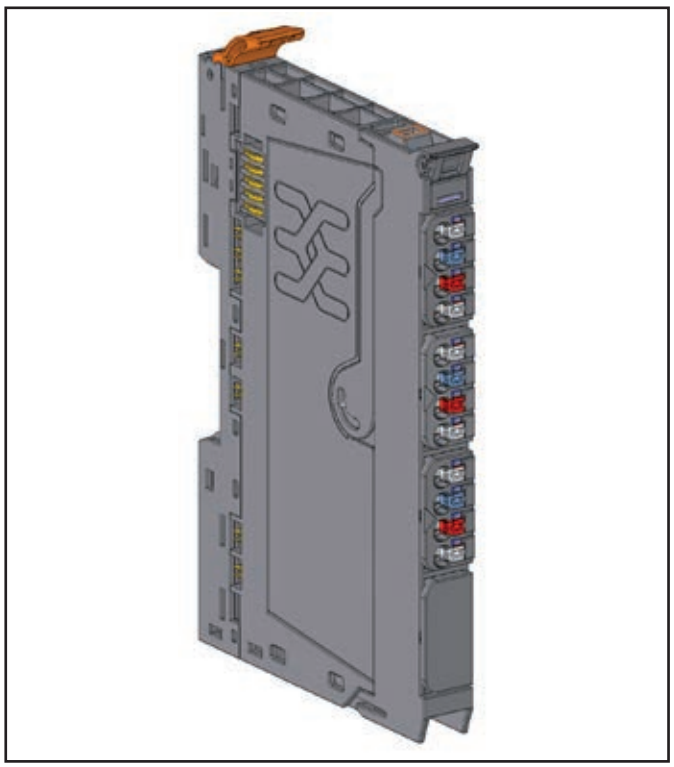
Output range[1] UR20-4AO-UI-16-DIAG-HD

Output range	Current (I) / Voltage (U)	Decimal (D)	Hexadecimal	Range	Conversion
1 ... 5 V Siemens S5 format	5,7 V	19268	0x4B44	Overloading	D = 16384 x (U – 1) / 4 U = D x 4 / 16384 + 1
	5 V	16384	0x4000	Nominal range	
	3 V	8192	0x2000		
	1 V	0	0x0000		
	0,20 V	-3277	0xF333	Underloading	
0 ... 5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5 V	13824	0x3600		
	0 V	0	0x0000		
0 ... 5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5 V	8192	0x2000		
	0 V	0	0x0000		
±5 V Siemens S7 format	5,88 V	32511	0x7EFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648
	5 V	27648	0x6C00	Nominal range	
	2,5	13824	0x3600		
	0 V	0	0x0000		
	-2,5 V	-13824	0xCA00		
	-5 V	-27648	0x9400		
	-5,88 V	-32511	0x8100	Underloading	
±5 V Siemens S5 format	5,88 V	19268	0x4B44	Overloading	D = 16384 x U / 5 U = D x 5 / 16384
	5 V	16384	0x4000	Nominal range	
	2,5	8192	0x2000		
	0 V	0	0x0000		
	-2,5 V	-8192	0xE000		
	-5 V	-16384	0xC000		
	-5,88 V	-19268	0xB4BC	Underloading	

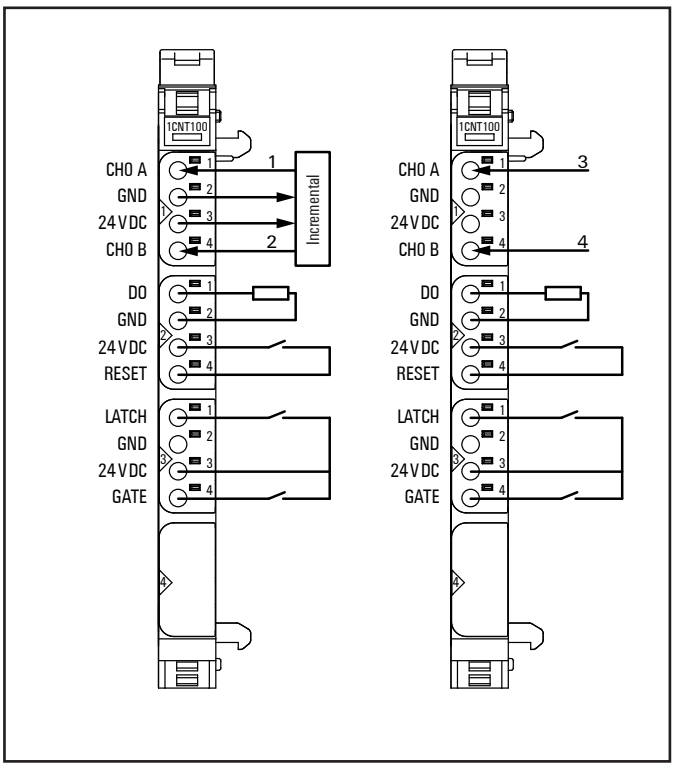
1) If the process value is beyond the valid output range, the corresponding channel releases 0 V and 0 mA respectively.

The following applies for all S5 and S7 ranges:
value > overload range = output deactivated
value < underload range = output deactivated

6.45 Digital counter module UR20-1CNT-100-1DO



Counter module UR20-1CNT-100-1DO (Order No. 1315570000)



Connection diagram UR20-1CNT-100-1DO

The counter module UR20-1CNT-100-1DO can read square-wave signals (e.g. from an rotary encoder) with a maximum input frequency of 100 kHz. The 32-bit counter can count up or down within a predetermined range of values. The counter's basic functions are controlled by the coupler. In addition the counting behaviour can be influenced via the latch, gate and reset inputs.

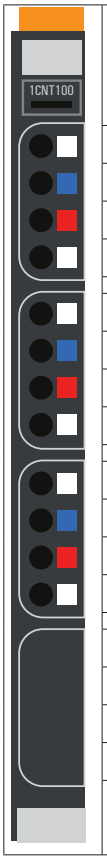
A digital output can be parameterised to be activated immediatly upon either dropping below, meeting or exceeding the set comparison value. An overrun time can be provided with the parameter **Pulse duration**. Thus even a comparison condition that exists only for a very short time can be evaluated at the output. Moreover the output can be set back early in case the comparison condition is being met during a longer period.

In signal mode **Pulse and Direction**, channel CH0 A is used as the input and channel CH0 B as a direction-determining input. In **incremental** mode, an rotary encoder with track A and B can be connected.

A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

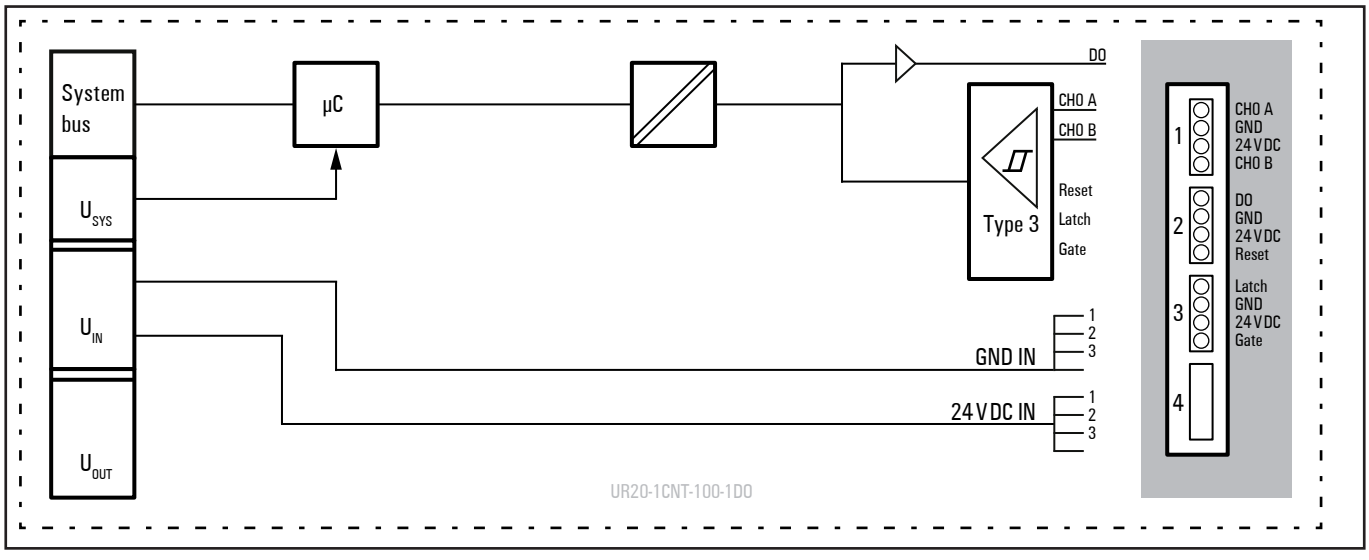
1 Track A
2 Track B
3 Cycle
4 Direction 0/1 (24 V)

- One 32-bit counter, 24 V DC
- Counting frequency 100 kHz max (A/B channel, 1/2/4-times sampling or pulse and direction, invertible)
- Input filter (parameterisable)
- Latch value (triggered via separate input), comparision value, set value
- Gate input (hardware gate, HW gate), reset input, digital output controlled by an internal comparator
- Alarm and diagnostic function with µs time stamp
- µs time stamp for counting value (e.g. for speed measurements)



	Module status LED Green: communication over system bus Red: Collective error diagnostic
1.1	Yellow: A / pulse controlled
1.4	Yellow: B / direction controlled
2.1	Yellow: output set
2.4	Yellow: reset input controlled
3.1	Yellow: latch input controlled
3.4	Yellow: gate input (HW gate) controlled

LED indicators UR20-1CNT-100-1DO, error messages see Chapter 13



Block diagram UR20-1CNT-100-1DO

Technical data UR20-1CNT-100-1DO (Order No. 1315570000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Digital inputs	
Number of counter inputs	1
Input type	Input characteristics for sensor types 1 and 3 are in accordance with EN 61131-2, suitable for incremental encoders and others
Input filter	Filter time adjustable from 0.01 to 1 ms
Low input voltage	< 5 V
High input voltage	> 11 V
Max. input current per channel	3.5 mA
Sensor supply	yes
Sensor connection	2-wire, 3-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	yes
Counter width	32 bits
Maximum input frequency	100 kHz
Latch, gate, reset input	yes
Mode of operation	Pulse and direction / AB mode with 1-, 2-, 4-times sampling
Status, alarm, diagnostics	
Status indicator	yes
Process alarm	yes, parameterisable
Diagnostic alarm	yes
Outputs	
Number	1
Output current	0.5 A
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	yes
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	35 mA (plus output current for the digital output)

Technical data UR20-1CNT-100-1DO (Order No. 1315570000)

General data	
Weight (operational status)	83 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-1CNT-100-1DO

Channel	Description	Options[1)]	Default
	Diagnostic alarm	disabled (0) / enabled (1)	disabled
0	Filter time signal A	0.010 ms [100 kHz] (0) / 0.020 ms [50 kHz] (1) / 0.033 ms [30 kHz] (2) / 0.1 ms [10 kHz] (3) / 0.2 ms [5 kHz] (4) / 0.5 ms [2 kHz] (5) / 1 ms [1 kHz] (6)	0,010 ms [100 kHz]
0	Filter time signal B		
0	Filter time latch		
0	Filter time gate		
0	Filter time reset		
0	Process alarm HW gate open	disabled (0) / enabled (1)	disabled
0	Process alarm HW gate closed	disabled (0) / enabled (1)	disabled
0	Process alarm overflow	disabled (0) / enabled (1)	disabled
0	Process alarm underflow	disabled (0) / enabled (1)	disabled
0	Process alarm comp. value	disabled (0) / enabled (1)	disabled
0	Process alarm end value	disabled (0) / enabled (1)	disabled
0	Process alarm latch value	disabled (0) / enabled (1)	disabled
0	Counting mode	count endless (0) / once - forward (1) / once - backwards (2) / once - no main direction (3) / periodic - forward (4) / periodic - backwards (5) / periodic - no main direction (6)	count endless
0	Condition for DO	disabled (0) / higher equal comparison value (1) / lower equal comparison value (2)/ equal comparison value (3)	disabled
0	Counter dir. signal B inv.	disabled (0) / enabled (1)	disabled
0	Reset	disabled (0) / high level (1) / rising edge 0-1 (2)/ rising edge once 0-1 (3)	disabled
0	Signal mode	Rotary transducer - single (0) / Rotary transducer - double (1) / Rotary transducer - quadruple (2) / Pulse and Direction (3) / Counter disabled (4)	Counter disabled
0	HW gate	disabled (0) / enabled (1)	disabled
0	Counter behaviour internal gate	Interrupt counting (0) / Cancel counting (1)	Cancel counting
0	End value	-2147483648 ... 2147483647	2147483647
0	Load value	-2147483648 ... 2147483647	0
0	Hysteresis	0 ... 255	0
0	Pulse duration	0 ... 255 [Input value x 2 = output time in ms; corresponds to 0 ... 510 ms]	0

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

The parameter setting in the coupler for the **Output behaviour on fieldbus error** affects the control word and thus the behaviour of the UR20-1CNT-100-1DO:

- The **Hold last value** setting
  The output continues working or switches as prametrized respectively.
  The counter continues to count during the error. Once normal operating conditions have been restored, the counter continues to count starting at the previous value.
- The **Enable substitute value** setting
  The output is switched off.
  The counter value is frozen. Once normal operating conditions have been restored, the counter value is reset to the parameterised load value.
- **All outputs off** setting
  The output is switched off.
  The counter behaves in the same way as for **Hold last value**.

Diagnostic data UR20-1CNT-100-1DO

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	External auxiliary supply error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x08
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Reserved	0
		5	Reserved	0
		6	Process alarm lost	
		7	Reserved	0
Channel type	4	0 - 6	Channel type	0x76
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	1
Channel error	7	0	Error at channel 0	
		1 - 7	Reserved	0
Channel error	8	8 - 15	Reserved	0
Channel error	9	16 - 23	Reserved	0
Channel error	10	24 - 31	Reserved	0
Channel 0 error	11	0	Hardware gate opened	
		1	Hardware gate closed	
		2	Overflow/underflow/end value	
		3	Comparison value reached	
		4	Latch value saved	
		5 - 7	Reserved	0
Channel 1 error to Channel 31 error	12 to 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-1CNT-100-1DO

Byte	Format	Name	Bit	Function when active	Remark
IB0 ... IB3	Double word	Counter value			current count value
IB4 ... IB7	Double word	Latch value			Count value image at the point of edge 0-1 at latch input
IB8	Word	Counter status	IX8.0	Reset was active	remains until reset mode is disabled
			IX8.1	DO released	
			IX8.2	SW gate active	
			IX8.3	Reset input active	depending only of the parameter „reset“ but not of the reset mode
			IX8.4	HW gate active	
			IX8.5	internal gate active	
			IX8.6	DO set	
			IX8.7	Counter direction down	
IB9			IX9.0	Counter direction up	
			IX9.1	Comparison condition met	remains until reset of the status bits
			IX9.2	End value reached	remains until reset of the status bits
			IX9.3	Overflow performed	remains until reset of the status bits
			IX9.4	Underflow performed	remains until reset of the status bits
			IX9.5	Zero crossing performed	remains until reset of the status bits
			IX9.6	Latch input active	
			IX9.7	reserved	
IB10	Word	Time stamp			0 ... 65535 µs rotating, updated when counter value changes
IB11					

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process data[1] outputs UR20-1CNT-100-1DO

Byte	Format	Name	Bit	Function, when edge 0-1	Remark
QB0 ... QB3	Double word	Comparison value			depending on parametrization for triggering of process alarm or setting the DO, as soon as the condition is met
QB4 ... QB7	Double word	Set value			this value is copied into counter value in the event of edge 0-1 at bit 5 of the control word
QB8	Word	Control word	QX8.0	Activate reset mode	
			QX8.1	Release DO	
			QX8.2	Set SW gate	
			QX8.3 - 8.4	reserved	
			QX8.5	Load set value	loads set value into counter value
			QX8.6	Reset status bits	counter status bits 9.1 - 9.5
			QX8.7	reserved	
			QX9.0	Deactivate reset mode	
QB9			QX9.1	Block DO	
			QX9.2	Reset SW gate	
			QX9.3 - 9.7	reserved	

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process alarm data UR20-1CNT-100-1DO

Byte	Bit	Function
B0	X0.0	HW gate activated
	X0.1	HW gate deactivated
	X0.2	Overflow, underflow or end value reached
	X0.3	Comparison value reached
	X0.4	Latch value reached
	X0.5 - 0.7	reserved
B1	X1.0	Status input channel 0 A (track A)
	X1.1	Status input channel 0 B (track B)
	X1.2	Status input "Latch"
	X1.3	Status input "Gate"
	X1.4	Status input "Reset"
	X1.5 - 1.7	reserved
B2		16 bit time stamp 0 ... 65535µs, rotating
B3		

Setting up the counter

To start a counting process at least the signal mode needs to be parameterised and a rising flank at the bit QX8.2 (“Set SW gate”) of the control word is required.
You can define the counter functions by parameterising: the counting mode, a primary direction (counting up or down), the counting behaviour and the hardware gate’s function (input „gate“). In addition you can parameterise output setting options (comparison function, hysteresis) as well as producing a process alarm (see section „additional counter features").

Counting range, count limits

The maximum count limits are predetermined by the register size and cannot be changed.

Maximum counting range

Limit	Value
Lower count limit	-2 147 483 648 (-2^{31})
Upper count limit	+2 147 483 647 ($2^{31}-1$)

Counter functions

Counting mode

Depending on the application you can chose the counting mode:
- Endless counting, e.g. for position detection with a rotary encoder
- 1-time counting with or without primary direction, e.g. for counting products up to a maximum limit
- Periodic counting with or without primary direction, e.g. repeated identical pick-and-place operations

For both counting modes “1-time counting” and “periodic counting” you can parameterise the counting range with load value and end value.

Via bit QX8.5 of the control word you can load a set value into the counting value. You can define the set value in the second double word of the process data outputs.

Counting direction

No primary direction

The entire counting range is available when using a counting mode without primary direction.

Primary direction up

The counting range is limited at the top by a parameterised end value. Starting from 0, a set value or a parameterised load value, the counter counts until the end value -1 and is reset to the load value with the next encoder pulse.

Primary direction down

The counting range is limited at the bottom by a parameterised end value. Starting from 0, a set value or a parameterised load value, the counter counts until the end value +1 and is reset to the load value with the next encoder input.

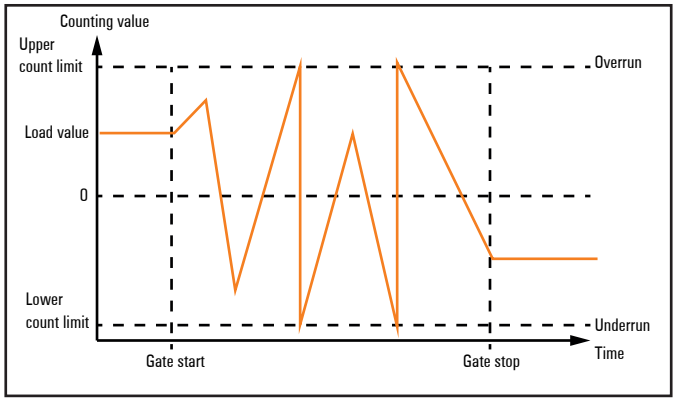
Gate function: activate/deactivate counter

The counter is activated and deactivated using an internal gate. If the hardware gate (HW gate) is deactivated in the parameters, the internal gate is identical to the software gate (SW gate).
With activated hardware gate, there is a logic AND connection of SW gate and HW gate, so that the gate functions operate exclusively on the HW gate. In this case, opening and closing of the SW gate has an interrupting effect only.
The software gate is activated using a 0-1 edge at the bit “Set SW gate” in the control word and deactivated with a 0-1 edge at the bit “Reset SW gate” in the control word (see table “Process data outputs”).

Counting behaviour: cancel/interrupt counting

You can parameterise the counting behaviour after a new gate start: Using “Interrupt counting”, the counter continues from the last counting value. Using “Cancel counting”, counting starts again from the load value.

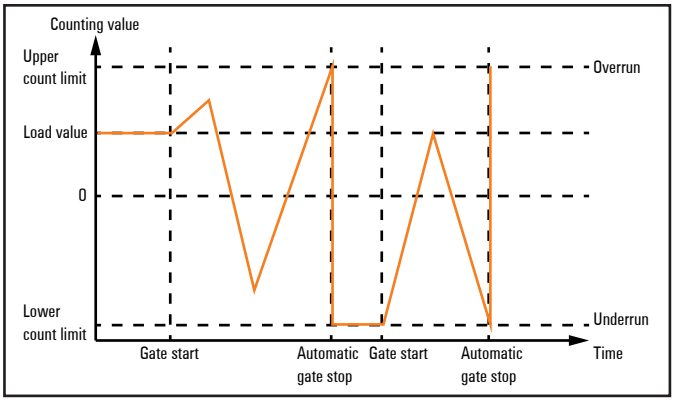
Endless counting



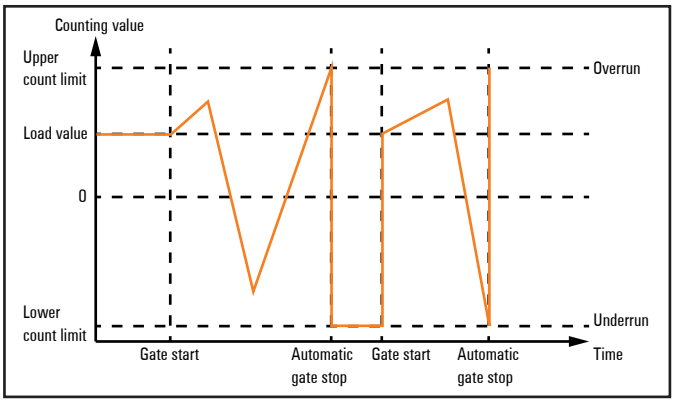
Continous counting

- Counting starts at the load value, the entire counting range is used.
- If the upper count limit is reached during up-counting, an additional counting pulse in the positive direction leads to a jump to the lower count limit. Counting continues from there.
- If the lower count limit is reached during down-counting, an additional counting pulse in the negative direction leads to a jump to the upper count limit. Counting continues from there.
- Upon exceeding the upper or lower counting limit, the status bit “Overflow performed” or “Underflow performed” is set and a process alarm is triggered if it is parameterised. The status bits remain set until they are reset with the bit “Reset status bits” in the control word.

1-time counting / no primary direction



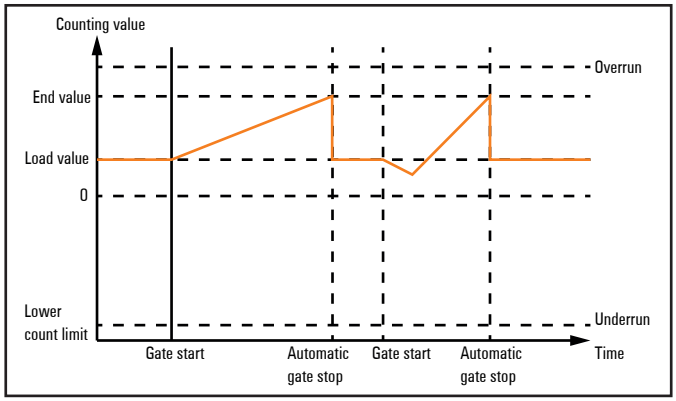
1-time counting, interrupted counting



1-time counting, cancelled counting

- Counting (up and down) starts at the load value, the entire counting range is used.
- Upon exceeding the upper or lower count limit, the counter jumps to the other count limit respectively. The internal gate is automatically closed, the status bit “Overflow performed” or “Underflow performed” is set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Depending on the parameters set, counting continues from the current counting value (“Interrupt counting”) or it starts again from the load value (“Cancel counting”).

1-time counting / primary direction up



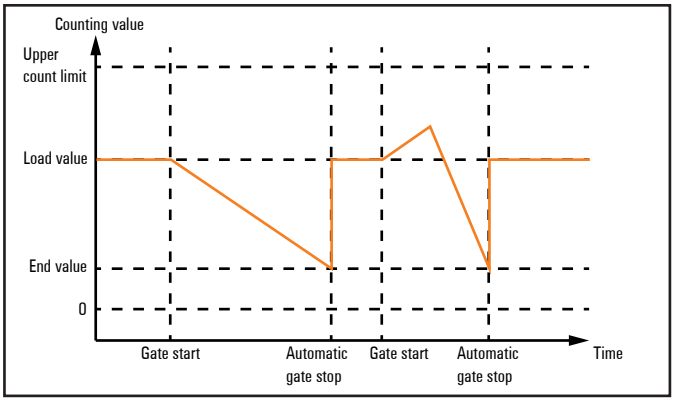
1-time counting, primary counting direction up

- Up-counting starts at the load value.
- If the parametrerised end value -1 is reached during counting in the positive direction, the counter jumps back to the load value at the next positive count pulse. The internal gate is automatically closed, the status bit "End value reached" ist set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Counting starts again at the load value.
- Upon reaching the lower count limit the counter jumps to the upper count limit to continue counting from there. The status bit "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	–2 147 483 647 ($-2^{31}+1$) to +2 147 483 647 ($2^{31}-1$)
Lower count limit	+2 147 483 648 (-2^{31})

1-time counting / primary direction down



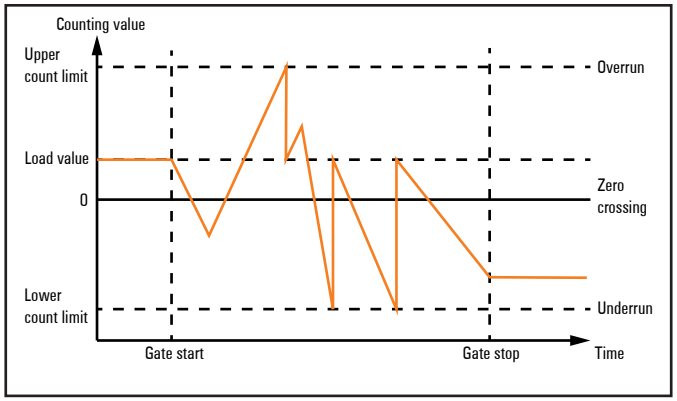
1-time counting, primary count direction down.

- Down-counting starts at the load value.
- If the parametrerised end value +1 is reached during counting in the negative direction, the counter jumps back to the load value at the next count pulse. The internal gate is automatically closed, the status bit "End value reached" ist set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Counting starts again at the load value.
- Upon reaching the upper count limit the counter jumps to the lower count limit to continue counting from there. The status bit "Overflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	–2 147 483 648 (-2^{31}) to +2 147 483 647 ($2^{31}-2$)
Upper count limit	+2 147 483 647 ($2^{31}-1$)

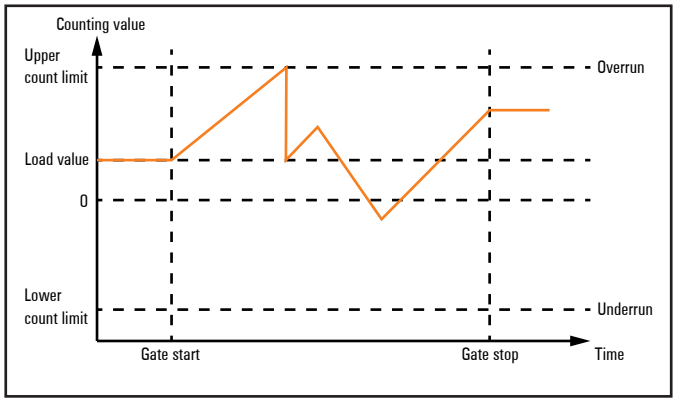
Periodic counting / no primary direction



Periodic counting, no primary counting direction

- Counting (up or down) starts at the load value, the entire counting range is used.
- Upon reaching a count limit, the counter jumps to the load value and starts counting again from there. The status bit "Overflow performed" or "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Periodic counting / primary direction up



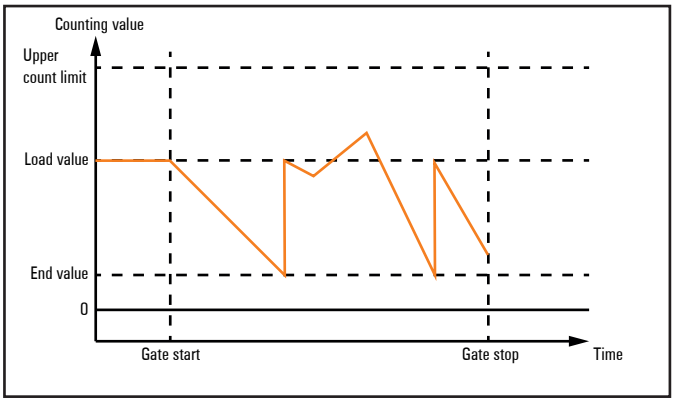
Periodic counting, primary counting direction up.

- Up-counting starts at the load value.
- If the parametrerised end value -1 is reached during counting in the positive direction, the counter jumps back to the load value at the next positive count pulse and continues counting from there. The status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- Upon reaching the lower count limit the counter jumps to the upper count limit to continue counting from there. The status bit "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	-2 147 483 647 (-2^{31} +1) to +2 147 483 647 (2^{31} -1)
Lower count limit	+2 147 483 648 (-2^{31})

Periodic counting / primary direction down



Periodic counting, primary counting direction down.

- Down-counting starts at the load value.
- If the parametrerised end value +1 is reached during counting in the negative direction, the counter jumps back to the load value at the next count pulse and continues counting from there. The status bit "Endvalue reached" is set and a process alarm will be triggered if it is parameterised.
- Upon reaching the upper count limit the counter jumps to the lower count limit to continue counting from there. The status bit "Overflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

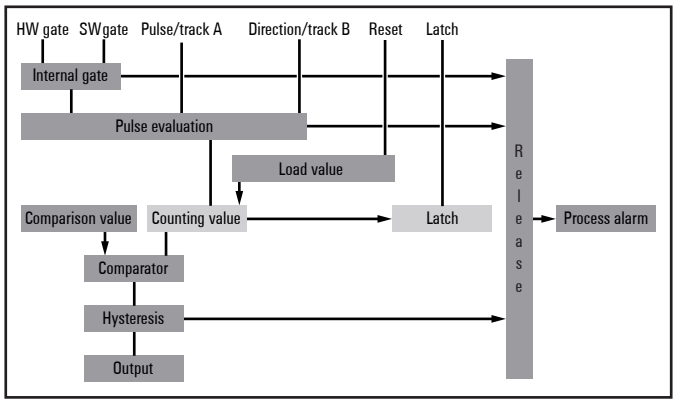
Counting range

Limits	Valid range of values
End value	-2 147 483 647 (-2^{31}) to +2 147 483 646 (2^{31} -2)
Upper count limit	+2 147 483 647 (2^{31} -1)

Additional counter features

You can define the additional features for the counter listed below by parameterising or via the process data outputs:

- Reset: resets the counting value to the load value during counting.
- Latch function: stores the current counting value in the latch register.
- Comparator: Upon meeting the comparison condition, the digital output is activated or a process alarm is triggered.
- Hysteresis: reduces frequent switching of the output and/or excessive triggering of process alarms, e.g. when the value of a sensor signal fluctuates around the comparison value.



Additional counter functions.

Reset

The load value will be load into the counting value once there is a signal at the reset input. To use this feature you have to release the reset mode in the control word (bit QX8.0) in addition to the parameterisation.
The status bit IX8.3 indicates that there is a signal at the reset input. Once a reset is done, the status bit IX8.0 is set. This bit will be reset by deactivating the reset mode (control bit QX9.0).

Latch function

If a 0-1 edge appears at the latch input, the current counter value is stored in the latch register. The latch register is accessed through the process data inputs. With every activation of the counter the latch value is set to 0.

Comparison function

Via the parameter „Condition for DO" you can deactivate the output („never switching") or define a comparison condition for the output's switching:

- Counter value higher or equal comparison value
- Counter value lower or equal comparison value
- Counter value equal comparison value

To use the comparison function, you have to preset the comparison value in the first double word of the process data outputs and release the digital output via the control word (bit QX8.1).

The bit IX9.1 "Comparison condition met" of the status word is activated as soon as the comparison condition is met. The output switches and remains set as long as the comparison condition is met accordingly to the parameterised hysteresis and pulse duration.

When using „Counter value equal comparison value" the output remains set during the pulse duration parameterised. With pulse duration = 0, the output remains set until the comparison condition is not met any more. When using a counting mode with primary direction, the output will be switched only upon reaching the comparison value from the primary direction.

Pulse duration

Via the parameter "Pulse duration" you can determine how long the digital output should remain set. The pulse duration can be preselected between 0 and 510 ms with an inaccuracy of less than 2.048 ms. With pulse duration = 0 the output behaves exclusively according to the comparison conditions.

If the comparison value is left during a pulse output and is reached again, there is no post-triggering of the pulse duration.

The bit "Comparison condition met" is activated together with the bit "DO set" of the status word. In contrast to the "DO set" bit it remains active until it is reset with the bit "Reset status bits" of the control word.

Hysteresis

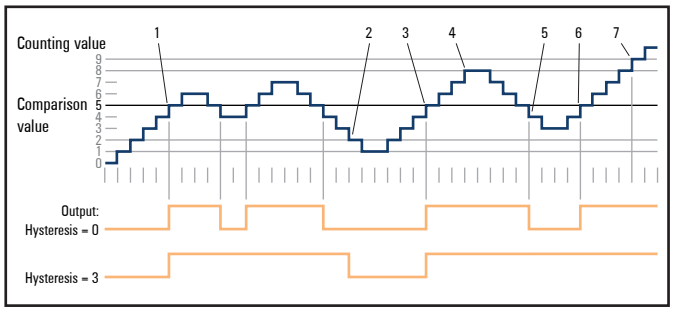
It is possible to reduce frequent switching of the output and/or triggering of a process alarm, e.g. if the value of a sensor signal fluctuates around the comparison value, by setting the hysteresis. Thereby you define a range above and below a reference value (zero crossing, overflow/underflow or comparison value), within which the output will not be reset.

A limit value between 0 and 255 can be parameterised for the hysteresis. With hysteresis = 3 for example, all values differing less than 3 from the reference value are smoothed. Hysteresis is deactivated with the values 0 and 1.

The hysteresis is activated upon reaching the comparison condition. The comparison result remains unchanged during active hysterersis until the counting value reaches the predetermined hysteresis limit. After leaving the hysteresis range, hysteresis is reactivated only upon reaching the comparison condition again.

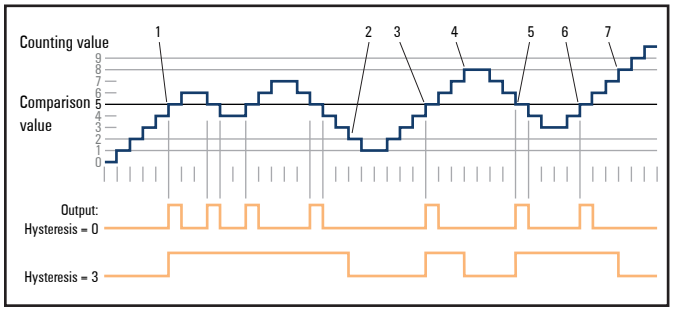
After changing the hysteresis value, an active hysteresis remains active. The new hysteresis value is actived during the next hysteresis event.

The behaviour of the output for hysteresis = 0 (hysteresis deactivated) and hysteresis = 3 is shown in the following diagrams (legends describe the behaviour for hysteresis = 3):



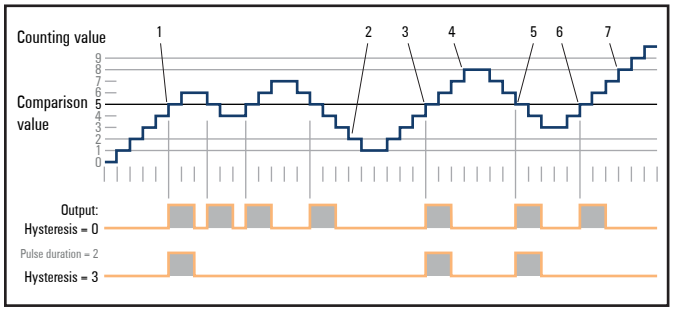
Operating principle of the hysteresis when counter value ≥ comparison value, pulse duration 0

1 Comparison condition met → output is set and hysteresis activated
2 Comparison condition not met, leaving the hysteresis range → output is reset
3 Comparison condition met → output is set and hysteresis activated
4 Leaving the hysteresis range, the output remains set because the comparison condition is still met
5 Comparison condition no longer met but hysteresis still active → output remains set
6 Comparison condition met, hysteresis still active → output remains set
7 Leaving the hysteresis range and comparison condition met → output remains set



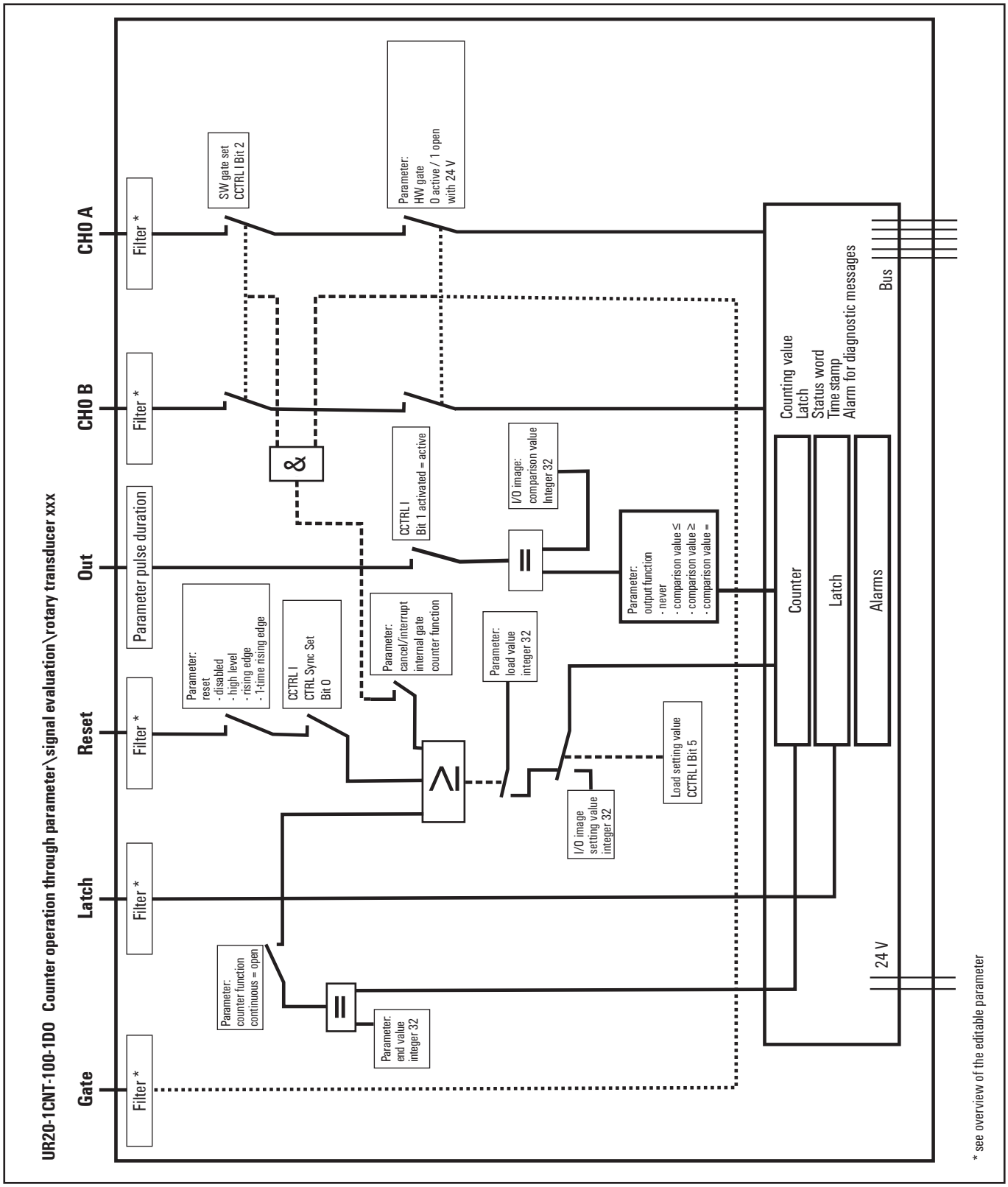
Operating principle of the hysteresis when counter value = comparison value, pulse duration 0

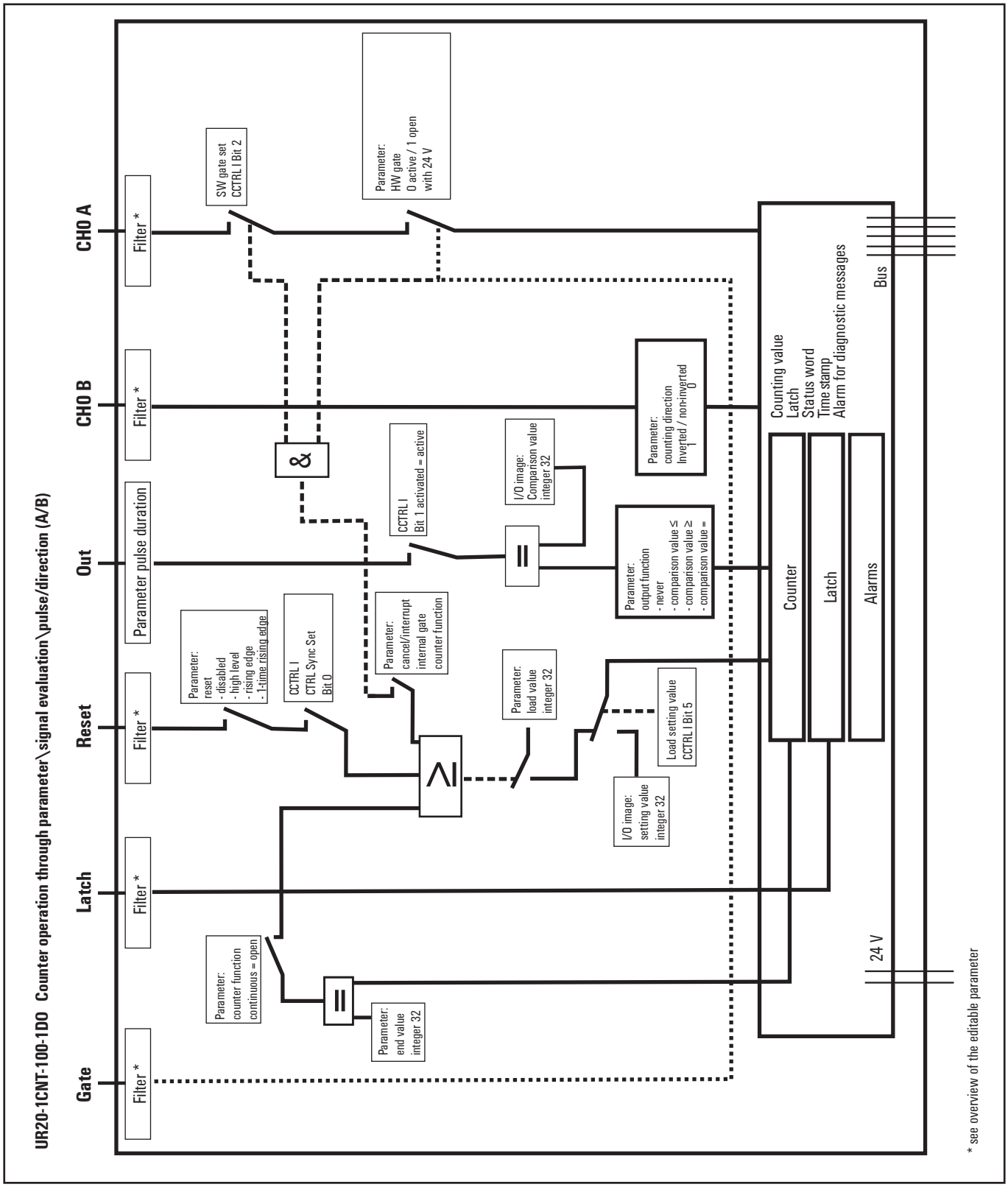
1 Comparison condition met → output is set and hysteresis activated
2 Comparison condition not met, leaving the hysteresis range → output is reset
3 Comparison condition met → output is set and hysteresis activated
4 Leaving the hysteresis range and comparison condition not met → output is reset
5 Comparison condition met → output is set and hysteresis activated
6 Comparison condition met and hysteresis active → output remains set
7 Leaving the hysteresis range and comparison condition no longer met → output is reset



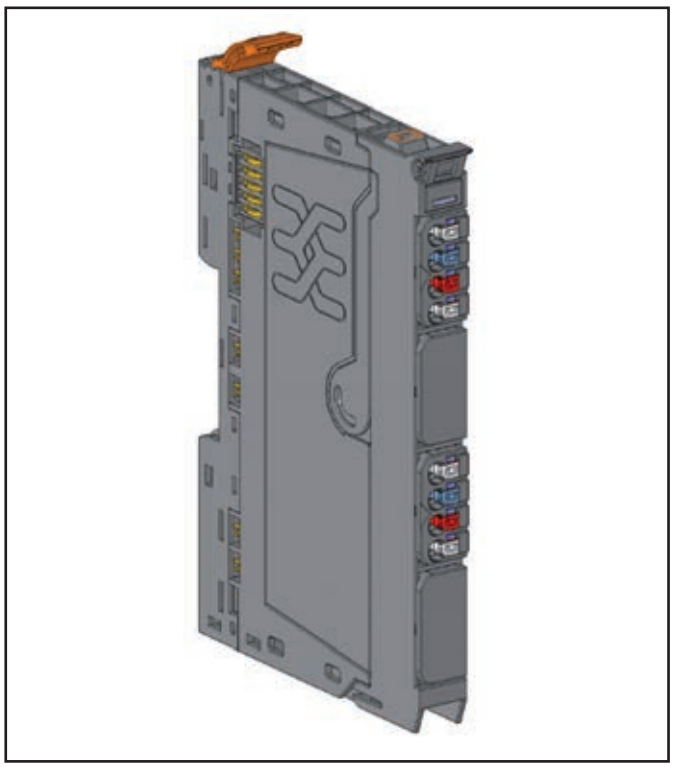
Operating principle of the hysterersis when counter value = comparison value, pulse duration 2

1 Comparison condition met → pulse of the parameterised duration is output, hysteresis activated
2 Leaving the hysteresis range → hysteresis deactivated
3 Comparison condition met → pulse of the parameterised duration is output, hysteresis activated
4 Leaving the hysteresis range → hysteresis deactivated
5 Comparison condition met → pulse of the parameterised duration is output, hysteresis activated
6 Comparison condition met and hysteresis active → no pulse
7 Comparison condition not met, leaving the hysteresis range → hysteresis deactivated

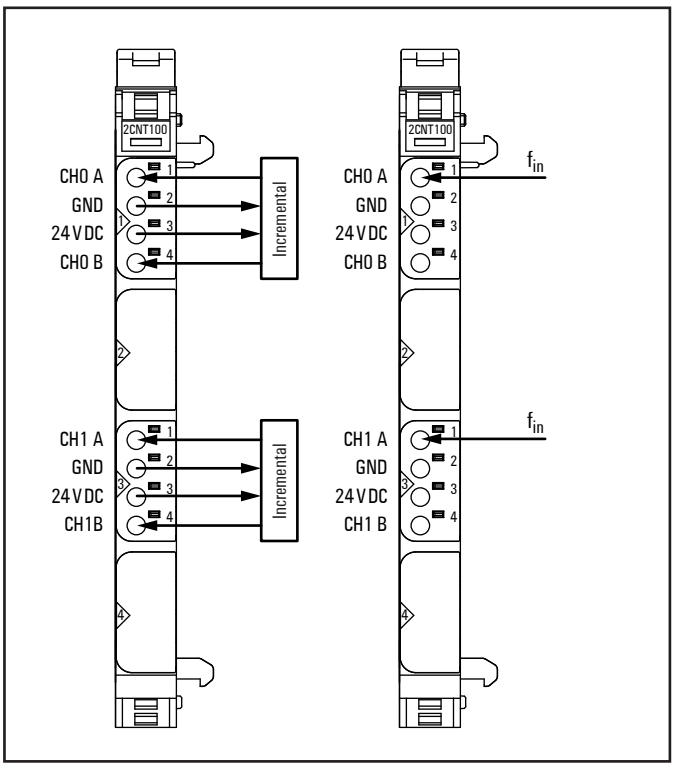

UR20-1CNT-100-1DO Counter operation through parameter\signal evaluation\rotary transducer xxx
Gate
Latch
Reset
Out
CH0 B
CH0 A
Filter *
Parameter pulse duration
SW gate set
CCTRL I Bit 2
Parameter:
HW gate
0 active / 1 open
with 24 V
&
CCTRL I
Bit 1 activated = active
I/O image:
comparison value
Integer 32
=
Parameter:
output function
- never
- comparison value ≤
- comparison value ≥
- comparison value =
Parameter:
reset
- disabled
- high level
- rising edge
- 1-time rising edge
CCTRL I
CTRL Sync Set
Bit 0
Parameter:
cancel/interrupt
internal gate
counter function
Parameter:
load value
integer 32
Load setting value
CCTRL I Bit 5
I/O image
setting value
integer 32
Parameter:
counter function
continuous = open
Parameter:
end value
integer 32
Counting value
Latch
Status word
Time stamp
Alarm for diagnostic messages
Bus
Counter
Latch
Alarms
24 V
* see overview of the editable parameter


UR20-1CNT-100-1DO Counter operation through parameter\signal evaluation\pulse/direction (A/B)
Gate
Latch
Reset
Out
CH0 B
CH0 A
Filter *
SW gate set
CCTRL I Bit 2
Parameter:
HW gate
0 active / 1 open
with 24 V
&
Parameter pulse duration
CCTRL I
Bit 1 activated = active
I/O image:
Comparison value
integer 32
Parameter:
counting direction
Inverted / non-inverted
0
1
Parameter:
reset
- disabled
- high level
- rising edge
- 1-time rising edge
CCTRL I
CTRL Sync Set
Bit 0
Parameter:
cancel/interrupt
internal gate
counter function
Parameter:
output function
- never
- comparison value ≤
- comparison value ≥
- comparison value =
Counting value
Latch
Status word
Time stamp
Alarm for diagnostic messages
Bus
Counter
Latch
Alarms
Parameter:
load value
integer 32
Load setting value
CCTRL I Bit 5
I/O image:
setting value
integer 32
Parameter:
counter function
continuous = open
Parameter:
end value
integer 32
24 V
* see overview of the editable parameter

6.46 Digital counter module UR20-2CNT-100



Digital counter module UR20-2CNT-100 (Order No. 1315590000)



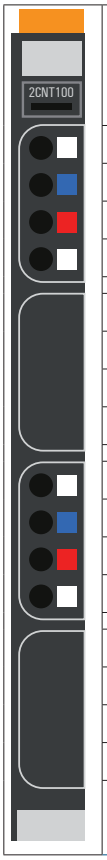
Connection diagram UR20-2CNT-100

The digital counter module UR20-2CNT-100 can read square-wave signals (e.g. from an rotary encoder) with a maximum input frequency of 100 kHz. Depending on the operating mode, both 32-bit counters can count up or down independent of each other in a preset range of values.

In signal mode **Pulse and Direction**, channel CH0 A and CH1 A respectively is used as the input, channel CH0 B and CH1 B respectively is used as a direction-determining input. In **incremental** mode, an incremental encoder with track A and B can be connected.

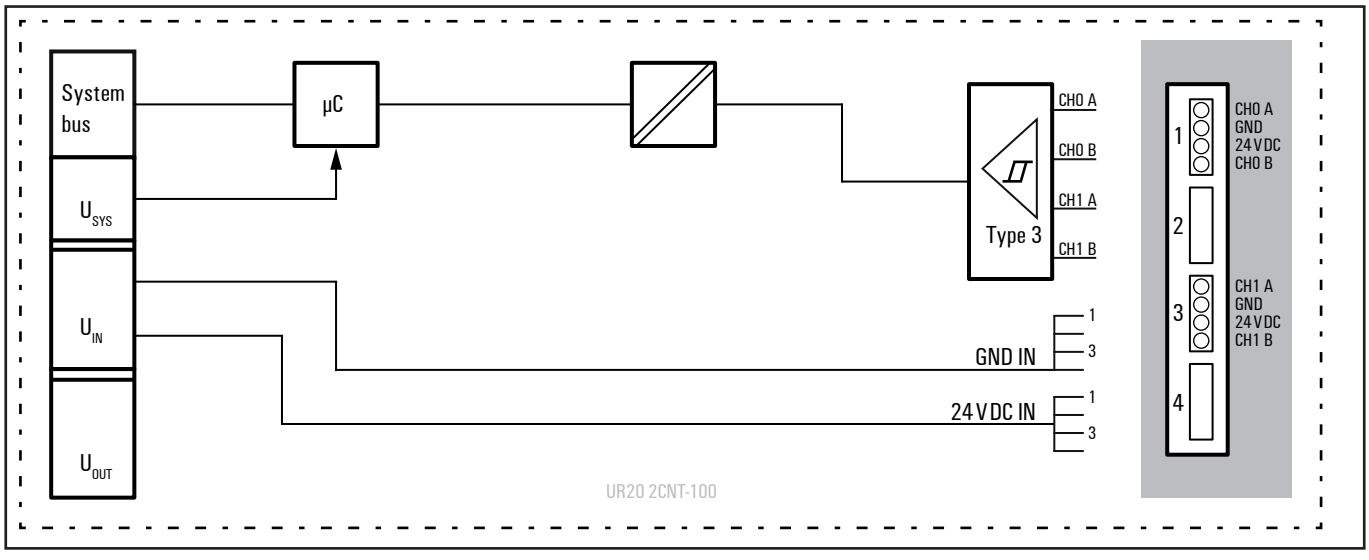
A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN}).

- Two 32-bit counters, 24 V DC
- Counting frequency 100 kHz max (A/B channel, 1/2/4-times sampling or pulse and direction, invertible)
- Input filter (parameterisable)
- Comparison value, set value,
- Alarm and diagnostic function with µs time stamp



	Module status LED Green: Communication on system bus Red: Collective error diagnostic
1.1	Yellow: CH0 A pulse controlled
1.4	Yellow: CH0 B direction controlled
3.1	Yellow: CH1 A pulse controlled
3.4	Yellow: CH1 B direction controlled

LED indicators UR20-2CNT-100, error messages see Chapter 13



Block diagram UR20-2CNT-100

Technical data UR20-2CNT-100 (Order No. 1315590000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Digital inputs	
Number of counter inputs	2
Input type	Input characteristics for sensor types 1 and 3 are in accordance with EN 61131-2, suitable for incremental encoders and others
Input filter	Filter time adjustable from 0.01 to 1 ms
Low input voltage	< 5 V
High input voltage	> 11 V
Max. input current per channel	3.5 mA
Sensor supply	yes
Sensor connection	2-wire, 3-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	yes
Counter width	32 bits
Maximum input frequency	100 kHz
Mode of operation	Pulse and direction / AB mode with 1-, 2-, 4-times sampling
Status, alarm, diagnostics	
Status indicator	yes
Process alarm	yes, parameterisable
Diagnostic alarm	yes
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	35 mA
General data	
Weight (operational status)	79 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-2CNT-100

Channel	Description	Options[1)]	Default
	Diagnostic alarm	disabled (0) / enabled (1)	disabled
0 ... 1	Filter time signal A	0.010 ms [100 kHz] (0) / 0.020 ms [50 kHz] (1) / 0.033 ms [30 kHz] (2) / 0.1 ms [10 kHz] (3) / 0.2 ms [5 kHz] (4) / 0.5 ms [2 kHz] (5) / 1 ms [1 kHz] (6)	0.010 ms [100 kHz]
0 ... 1	Filter time signal B		
0 ... 1	Process alarm overflow	disabled (0) / enabled (1)	disabled
0 ... 1	Process alarm underflow	disabled (0) / enabled (1)	disabled
0 ... 1	Process alarm comp. value	disabled (0) / enabled (1)	disabled
0 ... 1	Process alarm end value	disabled (0) / enabled (1)	disabled
0 ... 1	Counting mode	count endless (0) / once - forward (1) / once - backwards (2) / once - no main direction (3) / periodic - forward (4) / periodic - backwards (5) / periodic - no main direction (6)	count endless
0 ... 1	Comparison function	disabled (0) / higher equal comparison value (1) / lower equal comparison value (2)/ equal comparison value (3)	disabled
0 ... 1	Counter dir. signal B inv.	disabled (0) / enabled (1)	disabled
0 ... 1	Signal mode	Rotary transducer - single (0) / Rotary transducer - double (1) / Rotary transducer - quadruple (2) / Pulse and Direction (3) / Counter disabled (4)	Counter disabled
0 ... 1	Counter behaviour internal gate	Interrupt counting (0) / Cancel counting (1)	Cancel counting
0 ... 1	Setting value	-2147483648 ... 2147483647	0
0 ... 1	End value	-2147483648 ... 2147483647	2147483647
0 ... 1	Load value	-2147483648 ... 2147483647	0
0 ... 1	Hysteresis	0 ... 255	0

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

The parameter setting in the coupler for the **Output behaviour on fieldbus error** affects the control word and thus the behaviour of the UR20-2CNT-100:

- The **Hold last value** setting
  The counter continues to count during the error. Once normal operating conditions have been restored, the counter continues to count starting at the previous value.
- The **Enable substitute value** setting
  The counter value is frozen. Once normal operating conditions have been restored, the counter value is reset to the parameterised load value.
- **All outputs off** setting
  The counter behaves in the same way as for **Hold last value**.

Diagnostic data UR20-2CNT-100

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	External auxiliary supply error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x08
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Reserved	0
		5	Reserved	0
		6	Process alarm lost	
		7	Reserved	0
Channel type	4	0 - 6	Channel type	0x76
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	2
Channel error	7	0	Error at channel group 0	
		1	Error at channel group 1	
		2 - 7	Reserved	0
Channel error	8	8 - 15	Reserved	0
Channel error	9	16 - 23	Reserved	0
Channel error	10	24 - 31	Reserved	0
Channel 0 error	11	0 - 1	Reserved	0
		2	Overflow/underflow/end value	
		3	Comparison value reached	
		4 - 7	Reserved	0
Channel 1 error	12	0 - 1	Reserved	0
		2	Overflow/underflow/end value	
		3	Comparison value reached	
		4 - 7	Reserved	0
Channel 2 error to Channel 31 error	13 - 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-2CNT-100

Byte	Format	Name	Bit	Function when active	Remark
IB0 ...IB3	Double word	Counter 0: Counter value			Counter 0: current count value
IB4 ...IB7	Double word	Counter 1: Counter value			Counter 1: current count value
IB8	Word	Counter 0: Counter status	IX8.0	reserved	
			IX8.1	Comparison bit released	
			IX8.2	SW gate active	
			IX8.3 - 8.4	reserved	
			IX8.5	internal gate active	
			IX8.6	Comparison bit active	
			IX8.7	Counter direction down	
			IX9.0	Counter direction up	
			IX9.1	Comparison condition met	
			IX9.2	End value reached	
IB9			IX9.3	Overflow performed	
			IX9.4	Underflow performed	
			IX9.5	Zero crossing performed	
			IX9.6 - 9.7	reserved	
IB10	Word	Counter 1: Counter status	IX10.0	reserved	
			IX10.1	Comparison bit released	
			IX10.2	SW gate active	
			IX10.3 - 10.4	reserved	
			IX10.5	internal gate active	
			IX10.6	Comparison bit active	
			IX10.7	Counter direction down	
			IX11.0	Counter direction up	
			IX11.1	Comparison condition met	
			IX11.2	End value reached	
IB11			IX11.3	Overflow performed	
			IX11.4	Underflow performed	
			IX11.5	Zero crossing performed	
			IX11.6 - 11.7	reserved	

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process data[1] outputs UR20-2CNT-100

Byte	Format	Name	Bit	Function, when edge 0-1	Remark
QB0 ... QB3	Double word	Counter 0: Comparison value			
QB4 ... QB7	Double word	Counter 1: Comparison value			
QB8	Word	Counter 0: Control word	QX8.0	reserved	
			QX8.1	Release comparison bit	
			QX8.2	Set SW gate	
			QX8.3 - 8.4	reserved	
			QX8.5	Load set value	loads set value into counter value
			QX8.6	Reset status bits	Counter 0: status bits 9.1 - 9.5
QB9			QX8.7 - 9.0	reserved	
			QX9.1	Deactivate comparison bit	
			QX9.2	Reset SW gate	
			QX9.3 - 9.7	reserved	
QB10	Word	Counter 1: Control word	QX10.0	reserved	
			QX10.1	Release comparison bit	
			QX10.2	Set SW gate	
			QX10.3 - 10.4	reserved	
			QX10.5	Load set value	loads set value into counter value
			QX10.6	Reset status bits	Counter 1: status bits 11.1 - 11.5
QB11			QX10.7 - 11.0	reserved	
			QX11.1	Deactivate comparison bit	
			QX11.2	Reset SW gate	
			QX11.3 - 11.7	reserved	

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process alarm data UR20-2CNT-100

Byte	Bit	Function
B0	X0.0 - 0.1	reserved
	X0.2	Counter 0: Overflow, underflow or end value reached
	X0.3	Counter 0: Comparison value reached
	X0.4 - 0.5	reserved
	X0.6	Counter 1: Overflow, underflow or end value reached
	X0.7	Counter 1: Comparison value reached
B1	X1.0	Status Counter 0: Input channel 0 A (track A)
	X1.1	Status Counter 0: Input channel 0 B (track B)
	X1.2	Status Counter 1: Input channel 0 A (track A)
	X1.3	Status Counter 1: Input channel 0 B (track B)
	X1.4 - 1.7	reserved
B2	16 Bit Time stamp 0 ... 65535µs, rotating	
B3		

Setting up the counter

To start a counting process at least the signal mode needs to be parameterised and a rising flank at the bit QX8.2 or QX10.2 respectively ("Set SW gate") of the control word is required.
You can define the counter functions by parameterising: the counting mode, a primary direction (counting up or down), and the counting behaviour. In addition you can parameterise options for setting a comparison bit (conditions, hysteresis) as well as producing a process alarm (see section „additional counter features").

Counting range, count limits

The maximum count limits are predetermined by the register size and cannot be changed.

Maximum counting range

Limit	Value
Lower count limit	-2 147 483 648 (-2^{31})
Upper count limit	+2 147 483 647 ($2^{31}-1$)

Counter functions

Counting mode

Depending on the application you can chose the counting mode:
- Endless counting, e.g. for detecting the position with a rotary encoder
- 1-time counting with or without primary direction, e.g. for counting products up to a maximum limit
- Periodic counting with or without primary direction, e.g. repeated identical pick-and-place operations

For both counting modes "1-time counting" and "periodic counting" you can parameterise the counting range with load value and end value.

Via bit QX8.5 or QX10.5 respectively of the control word you can load a set value into the counting value. You can define the set value in the module parameters.

Counting direction

No primary direction

The entire counting range is available when using a counting mode without primary direction.

Primary direction up

The counting range is limited at the top by a parameterised end value. Starting from 0, a set value or a parameterised load value, the counter counts until the end value -1 and is reset to the load value with the next encoder pulse.

Primary direction down

The counting range is limited at the bottom by a parameterised end value. Starting from 0, a set value or a parameterised load value, the counter counts until the end value +1 and is reset to the load value with the next encoder pulse.

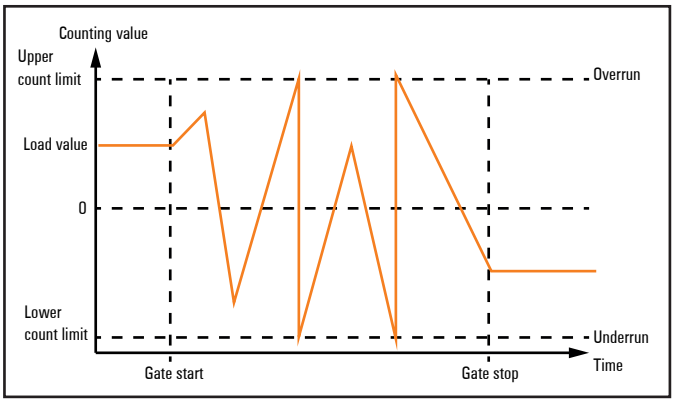
Gate function: activate / deactivate counter

The counter is activated and deactivated using an internal gate. The internal gate is identical to the software gate (SW gate), it is activated using a 0-1 edge at the bit "Set SW gate" in the control word and deactivated with a 0-1 edge at the bit "Reset SW gate" in the control word (see table "Process data outputs").

Counting bahaviour: interrupt / cancel counting

You can parameterise the counting behaviour after a new gate start: Using "Interrupt counting", the counter continues from the last counting value. Using "Cancel counting", counting starts again from the load value.

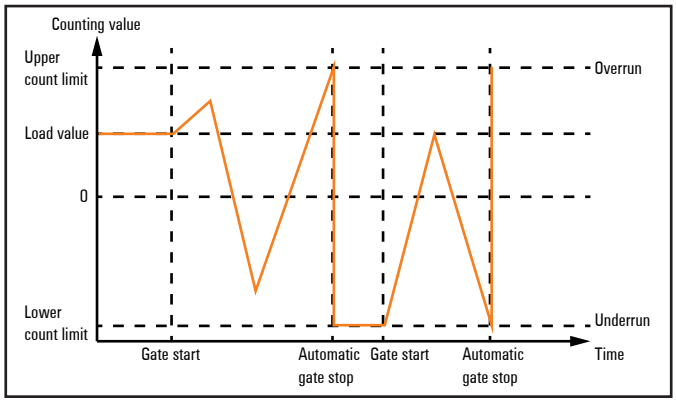
Endless counting



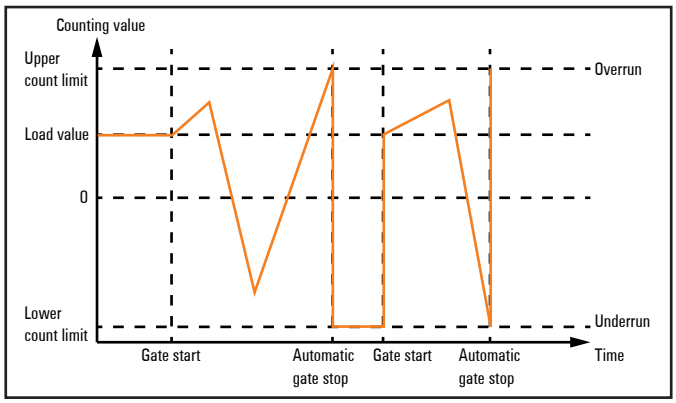
Continous counting

- Counting starts at the load value, the entire counting range is used.
- If the upper count limit is reached during up-counting, an additional counting pulse in the positive direction leads to a jump to the lower count limit. Counting continues from there.
- If the lower count limit is reached during down-counting, an additional counting pulse in the negative direction leads to a jump to the upper count limit. Counting continues from there.
- Upon exceeding the upper or lower counting limit, the status bit "Overflow performed" or "Underflow performed" is set and a process alarm is triggered if it is parameterised. The status bits remain set until they are reset with the bit "Reset status bits" in the control word.

1-time counting / no primary direction



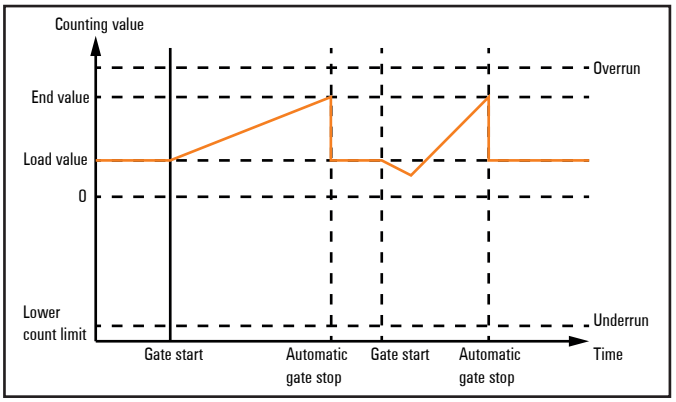
1-time counting, interrupted counting



1-time counting, cancelled counting

- Counting (up and down) starts at the load value, the entire counting range ist used.
- Upon exceeding the upper or lower count limit, the counter jumps to the other count limit respectively. The internal gate is automatically closed, the status bit “Overflow performed” or “Underflow performed” is set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Depending on the parameters set, counting continues from the current counting value (“Interrupt counting”) or it starts again from the load value (“Cancel counting”).

1-time counting / primary direction up



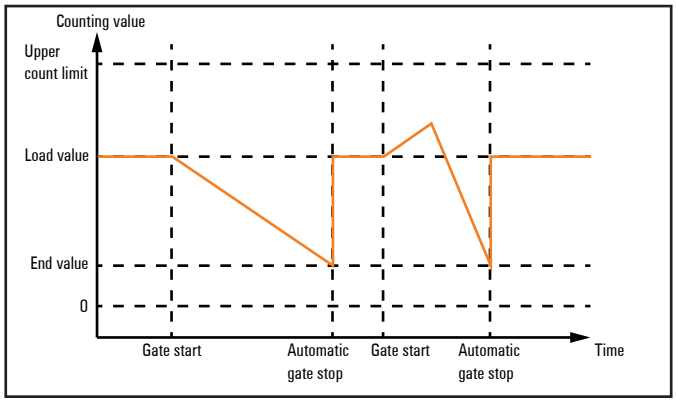
1-time counting, primary direction up

- Up-counting starts at the load value.
- If the parametrerised end value -1 is reached during counting in the positive direction, the counter jumps back to the load value at the next positive count pulse. The internal gate is automatically closed, the status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Counting starts again at the load value.
- Upon reaching the lower count limit the counter jumps to the upper count limit to continue counting from there. The status bit "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	-2 147 483 647 ($-2^{31}+1$) to +2 147 483 647 ($2^{31}-1$)
Lower count limit	+2 147 483 648 (-2^{31})

1-time counting / primary direction down



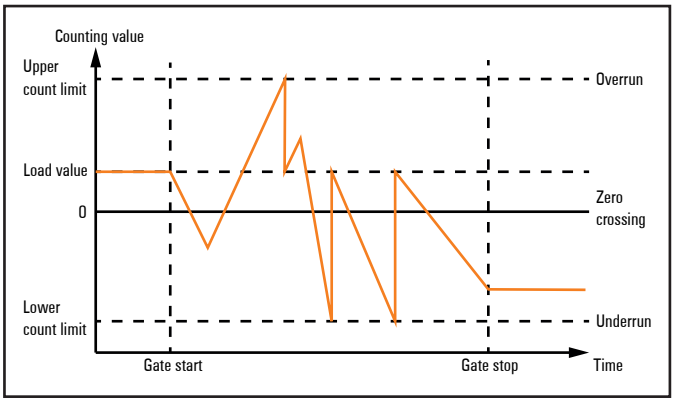
1-time counting, primary count down.

- Down-counting starts at the load value.
- If the parametrerised end value +1 is reached during counting in the negative direction, the counter jumps back to the load value at the next count pulse. The internal gate is automatically closed, the status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Counting starts again at the load value.
- Upon reaching the upper count limit the counter jumps to the lower count limit to continue counting from there. The status bit "Overflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	–2 147 483 648 (-2^{31}) to +2 147 483 647 ($2^{31}-2$)
Upper count limit	+2 147 483 647 ($2^{31}-1$)

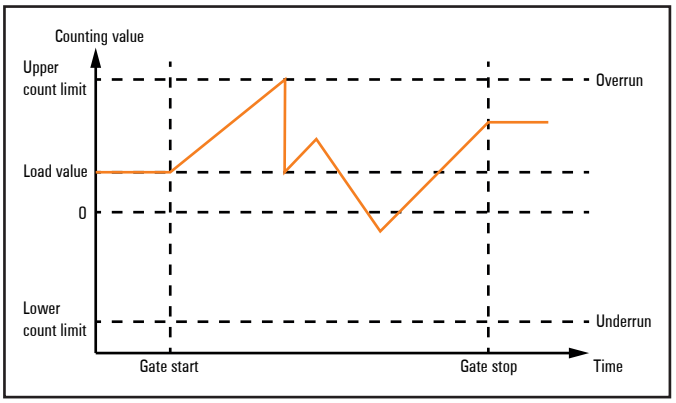
Periodic counting / no primary direction



Periodic counting, no primary direction

- Counting (up or down) starts at the load value, the entire counting range is used.
- Upon reaching a count limit, the counter jumps back to the load value and starts counting again from there. The status bit "Overflow performed" or "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Periodic counting / primary direction up



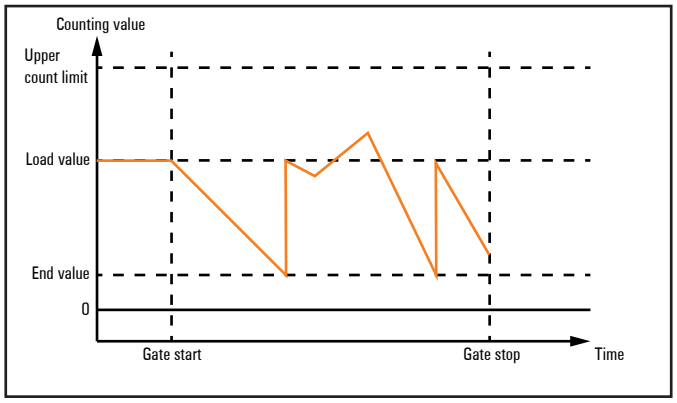
Periodic counting, primary direction up.

- Up-counting starts at the load value.
- If the parameterised end value -1 is reached during counting in the positive direction, the counter jumps back to the load value at the next positive count pulse and continues counting from there. The status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- Upon reaching the lower count limit the counter jumps to the upper count limit to continue counting from there. The status bit "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	-2 147 483 647 (-2^{31} +1) to +2 147 483 647 (2^{31}-1)
Lower count limit	+2 147 483 648 (-2^{31})

Periodic counting / primary direction down



Periodic counting, primary direction down.

- Down-counting starts at the load value.
- If the parameterised end value +1 is reached during counting in the negative direction, the counter jumps back to the load value at the next count pulse and continues counting from there. The status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- Upon reaching the upper count limit the counter jumps to the lower count limit to continue counting from there. The status bit "Overflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

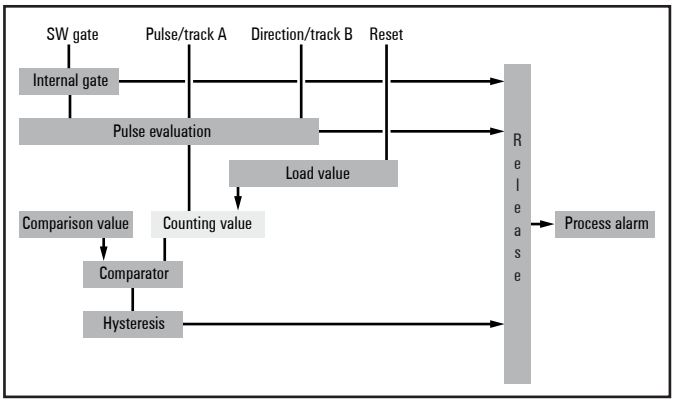
Counting range

Limits	Valid range of values
End value	-2 147 483 647 (-2^{31}) to +2 147 483 646 (2^{31}-2)
Upper count limit	+2 147 483 647 (2^{31}-1)

Additional counter features

You can define the additional features for the counter listed below by parametrising or via the process data outputs:

- Reset: resets the counting value to the load value during counting.
- Comparator: Upon meeting the comparison condition, the comparison bit is activated or a process alarm is triggered.
- Hysteresis: reduces frequent toggling of the comparison bit and/or excessive triggering of a process alarm, e.g. when the value of a sensor signal fluctuates around the comparison value.



Additional counter functions.

Comparison function

Via the parameter „Comparison function“ you can deactivate the comparison function or define a comparison condition:

- Counter value higher or equal comparison value
- Counter value lower or equal comparison value
- Counter value equal comparison value

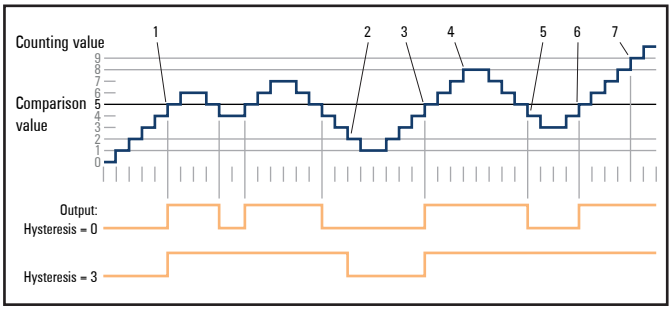
To use the comparison function, you have to preset the comparison values for both counting channels in the respective first double word of the process data outputs and to set the bit QX8.1 and QX10.1 respectively ("Comparison bit released") in each control word.

As soon as the counting value meets the corresponding comparison condition, the bits "Comparison bit active" and "Comparison condition met" are activated. The bit "Comparison bit active" remains set as long as the comparison condition is being met (respectively the parameterised hysteresis). The bit "Comparison condition met" remains active until it will be reset with the bit "Reset of the status bits" in the control word.

When using a counting mode with primary direction, the comparison bit will be set only upon reaching the comparison value from the primary direction.

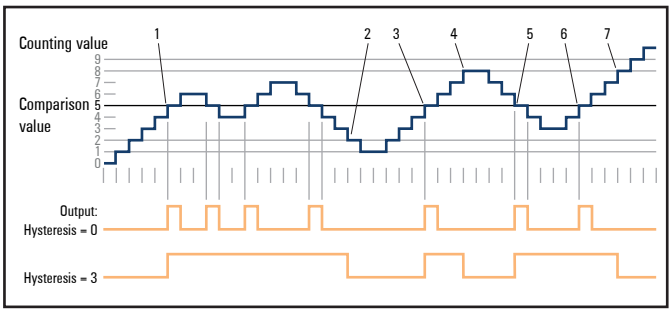
Hysteresis

It is possible to reduce frequent triggering of a process alarm and toggling of the comparison bit (e.g. if the value of a sensor signal fluctuates around the comparison value), by setting the hysteresis. Thereby you define a range above and below a reference value (zero crossing, overflow/underflow and comparison value), within which the status bit will not be reset.
A limit value between 0 and 255 can be parameterised for the hysteresis. With hysteresis = 3 for example, all values differing less than 3 from the reference value are smoothed. Hysteresis is deactivated with the values 0 and 1.
The hysteresis is activated upon reaching the comparison condition. The comparison result remains unchanged during active hysterersis until the counting value reaches the predetermined hysteresis limit. After leaving the hysteresis range, hysteresis is reactivated only upon reaching the comparison condition again.
After changing the hysteresis value, an active hysteresis remains active. The new hysteresis value is actived during the next hysteresis event.
The behaviour of the status bit for hysteresis = 0 (hysteresis deactivated) and hysteresis = 3 is shown in the following diagrams (legends describe the behaviour for hysteresis = 3)::



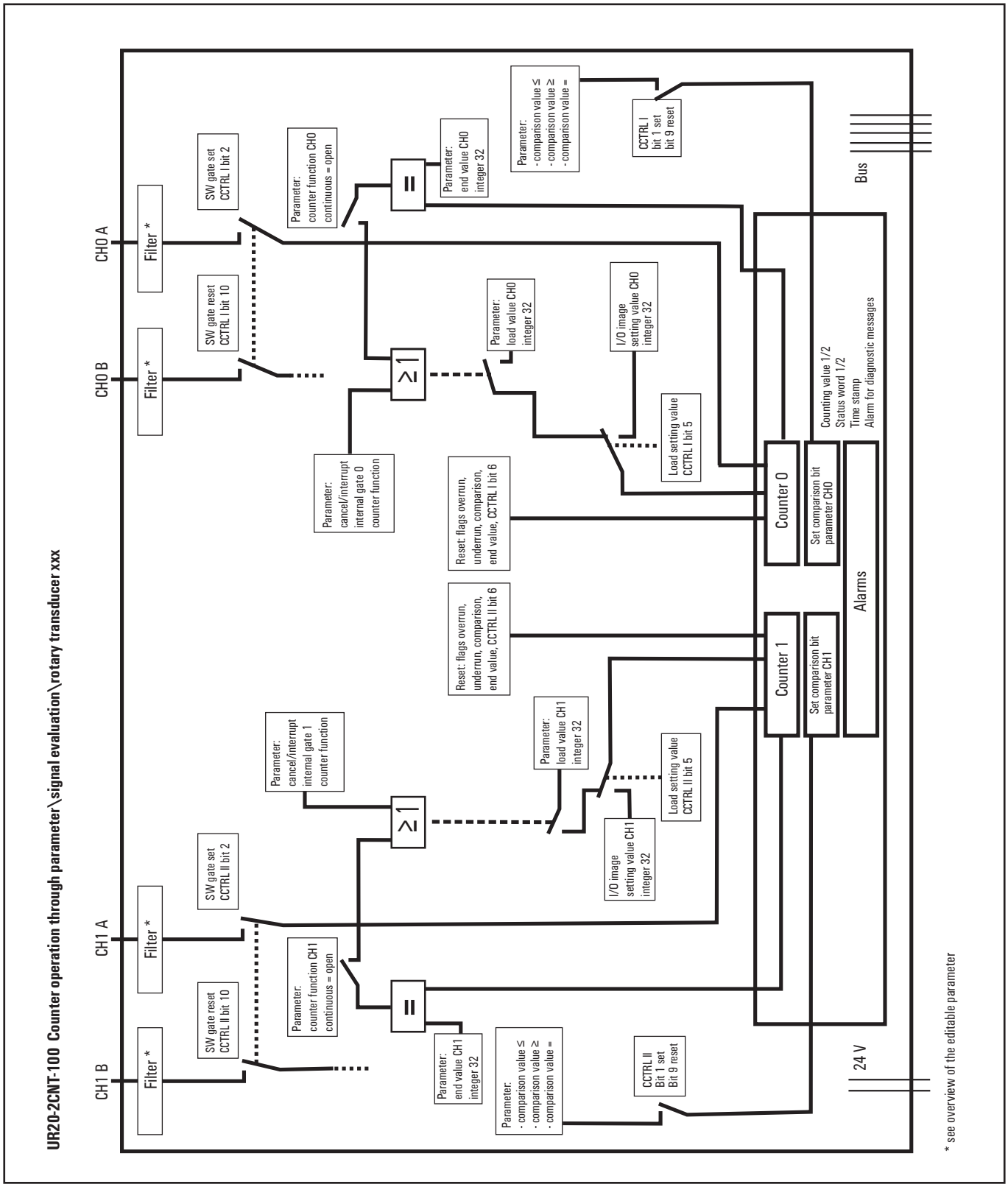
Operating principle of the hysteresis with counter value ≥ comparison value

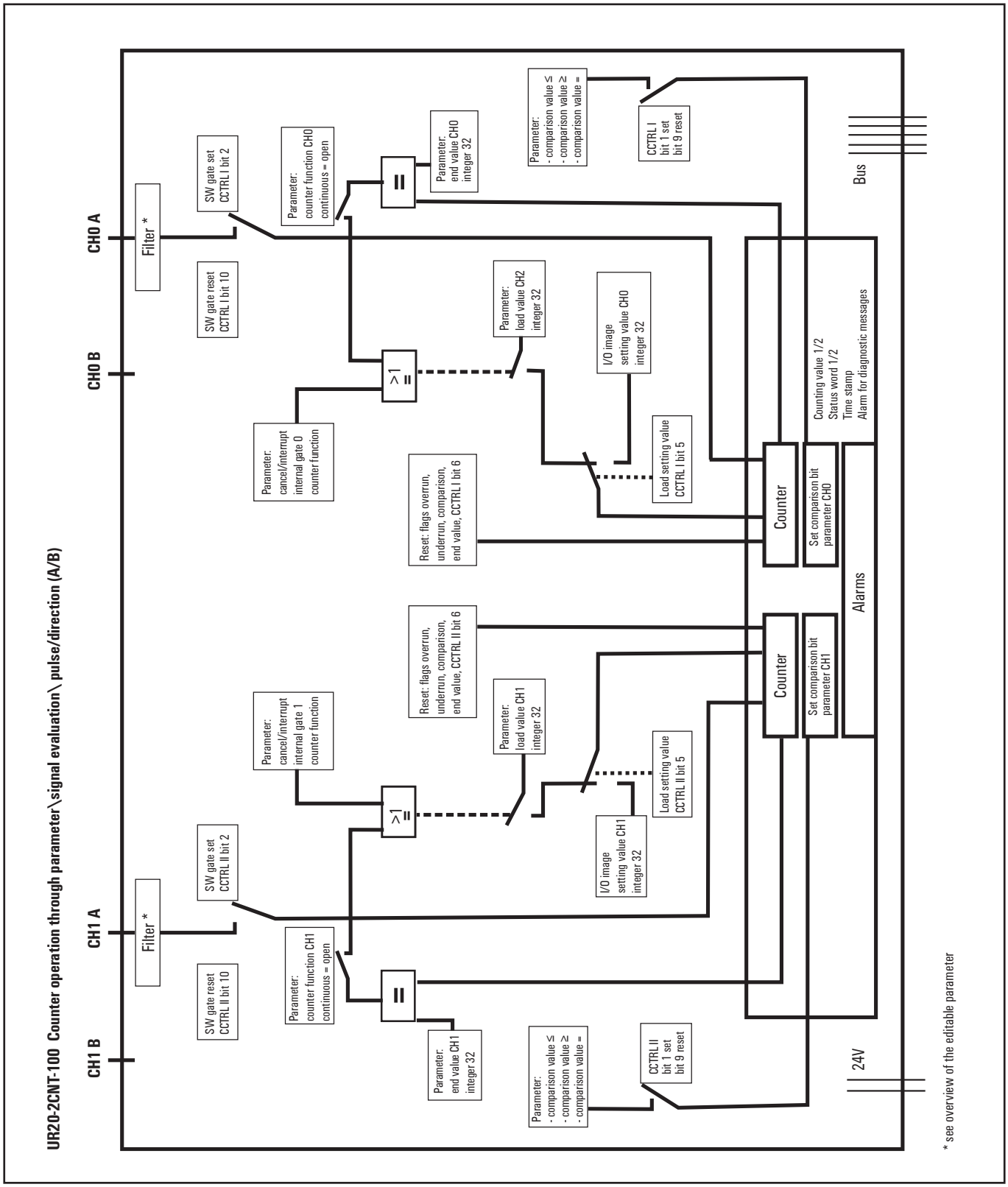
1 Comparison condition met → status bit is set and hysteresis activated
2 Comparison condition not met, leaving the hysteresis range → status bit is reset
3 Comparison condition met → status bit is set and hysteresis activated
4 Leaving the hysteresis range, the status bit remains set because the comparison condition is still met
5 Comparison condition no longer met but hysteresis still active → status bit remains set
6 Comparison condition met, hysteresis still active → status bit remains set
7 Leaving the hysteresis range and comparison condition met → status bit remains set



Operating principle of the hysteresis whit counter value = comparison value

1 Comparison condition met → status bit is set and hysteresis activated
2 Comparison condition not met, leaving the hysteresis range → status bit is reset
3 Comparison condition met → status bit is set and hysteresis activated
4 Leaving the hysteresis range and comparison condition not met → status bit is reset
5 Comparison condition met → status bit is set and hysteresis activated
6 Comparison condition met and hysteresis active → status bit remains set
7 Leaving the hysteresis range and comparison condition no longer met → status bit is reset

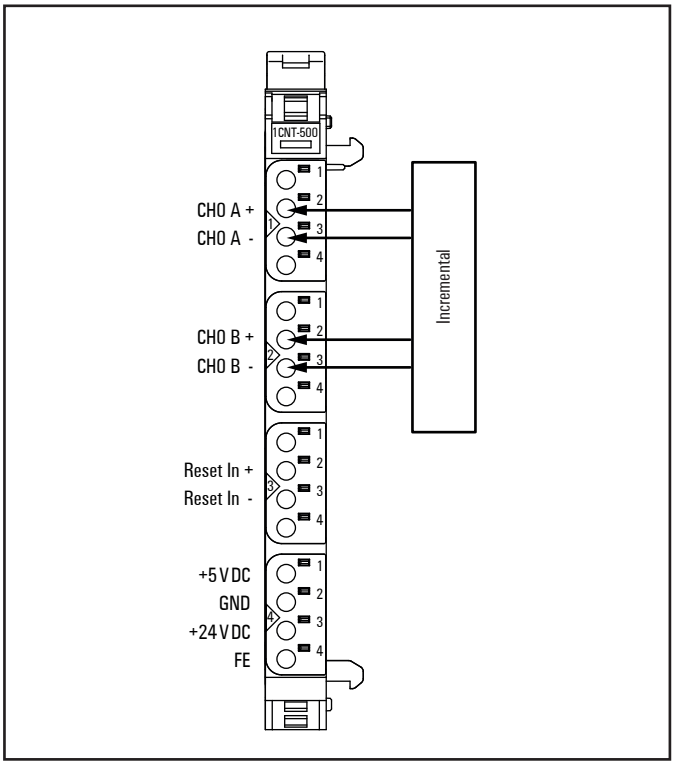

UR20-2CNT-100 Counter operation through parameter\signal evaluation\rotary transducer xxx
CH0 A
CH0 B
CH1 A
CH1 B
Filter *
SW gate set CCTRL I bit 2
SW gate reset CCTRL I bit 10
SW gate set CCTRL II bit 2
SW gate reset CCTRL II bit 10
Parameter: counter function CH0 continuous = open
Parameter: counter function CH1 continuous = open
=
≥1
Parameter: end value CH0 integer 32
Parameter: end value CH1 integer 32
Parameter: - comparison value ≤ - comparison value ≥ - comparison value =
Parameter: load value CH0 integer 32
Parameter: load value CH1 integer 32
Parameter: cancel/interrupt internal gate 0 counter function
Parameter: cancel/interrupt internal gate 1 counter function
I/O image setting value CH0 integer 32
I/O image setting value CH1 integer 32
Load setting value CCTRL I bit 5
Load setting value CCTRL II bit 5
CCTRL I bit 1 set bit 9 reset
CCTRL II Bit 1 set Bit 9 reset
Reset: flags overrun, underrun, comparison, end value, CCTRL I bit 6
Reset: flags overrun, underrun, comparison, end value, CCTRL II bit 6
Counter 0
Counter 1
Set comparison bit parameter CH0
Set comparison bit parameter CH1
Counting value 1/2
Status word 1/2
Time stamp
Alarm for diagnostic messages
Alarms
Bus
24 V
* see overview of the editable parameter


UR20-2CNT-100 Counter operation through parameter\signal evaluation\ pulse/direction (A/B)
CH0 A
CH0 B
CH1 A
CH1 B
Filter *
SW gate set CCTRL I bit 2
SW gate reset CCTRL I bit 10
Parameter: counter function CH0 continuous = open
=
Parameter: end value CH0 integer 32
Parameter: - comparison value ≤ - comparison value ≥ - comparison value =
CCTRL I bit 1 set bit 9 reset
Bus
Parameter: load value CH2 integer 32
I/O image setting value CH0 integer 32
≥1
=
Parameter: cancel/interrupt internal gate 0 counter function
Load setting value CCTRL I bit 5
Reset: flags overrun, underrun, comparison, end value, CCTRL I bit 6
Counter
Counting value 1/2
Status word 1/2
Time stamp
Alarm for diagnostic messages
Set comparison bit parameter CH0
Alarms
Reset: flags overrun, underrun, comparison, end value, CCTRL II bit 6
Counter
Set comparison bit parameter CH1
Parameter: load value CH1 integer 32
Load setting value CCTRL II bit 5
Parameter: cancel/interrupt internal gate 1 counter function
≥1
=
I/O image setting value CH1 integer 32
SW gate set CCTRL II bit 2
SW gate reset CCTRL II bit 10
Parameter: counter function CH1 continuous = open
=
Parameter: end value CH1 integer 32
Parameter: - comparison value ≤ - comparison value ≥ - comparison value =
CCTRL II bit 1 set bit 9 reset
24V
* see overview of the editable parameter

6.47 Digital counter module UR20-1CNT-500



Digital counter module UR20-1CNT-500 (Order No. 1315580000)



Connection diagram UR20-1CNT-500

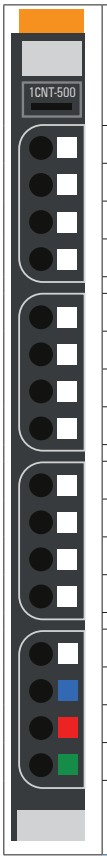
The digital counter module UR20-1CNT-500 includes a RS422 interface for recording difference signals (e.g. from an differential rotary encoder) with a maximum frequency of 500 kHz. The 32-bit counter can count up or down in a preset range of values. The counter's basic functions are controlled by the coupler. Via a reset the counitng value can be set to zero.

In signal mode **Pulse and Direction**, channel CH0 A is used as the input, channel CH0 B is used as a direction-determining input. In **incremental** mode, an rotary encoder with track A and B can be connected.

A status LED is assigned to each channel. The module electronics supply the connected sensors with 5 V DC or 24 V DC from the input current path (I_{IN}).

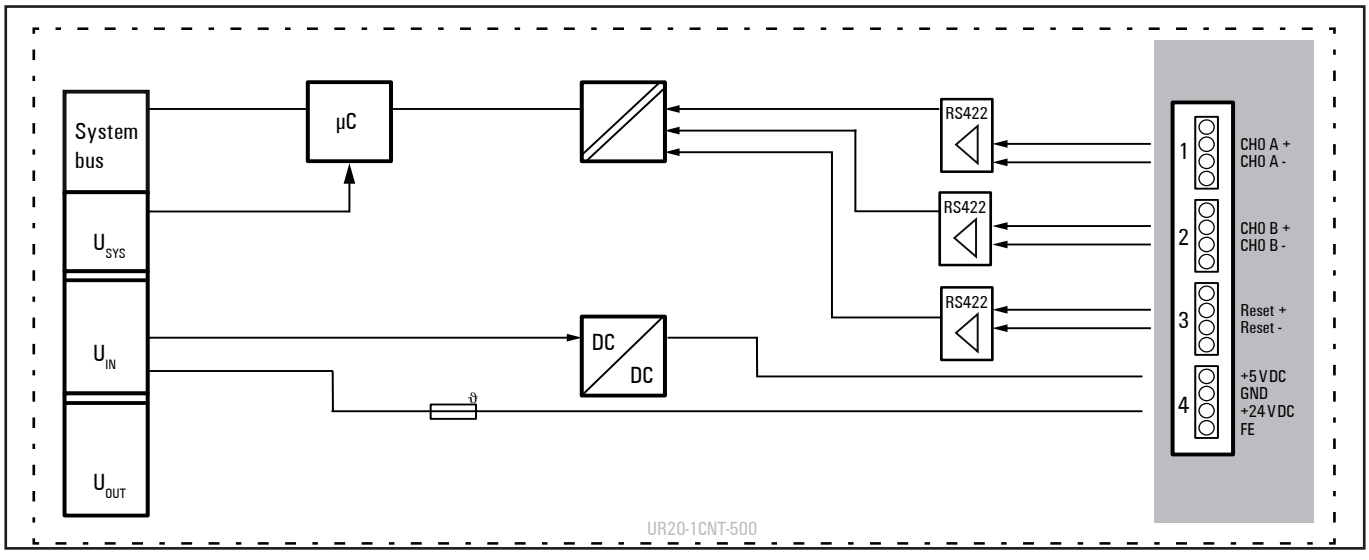
- One 32-bit counter, invertible, RS422, max. 25 V DC
- Counting frequency 500 kHz max. (A/B channel, 1/2/4-times sampling or pulse and direction)
- input filter (parametrisable)
- Comparison value, set value
- Alarm and diagnostic function with µs time stamp
- µs time stamp for value counting (e.g. for speed measurements)

Twisted-pair cables with additional foilscreen (SF/UTP) have to be used to connect the rotary transducer.



	Module status LED Green: Communication on system bus Red: Collective error diagnostic
1.1	Yellow: CH0 A active
2.1	Yellow: CH0 B active
3.1	Yellow: Reset In active
4.1	Green: sensor supply + 5 V
4.3	Green: sensor supply + 24 V

LED indicators UR20-1CNT-500, error messages see Chapter 13



Block diagram UR20-1CNT-500

Technical data UR20-1CNT-500 (Order No. 1315580000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Digital inputs	
Number of counter inputs	1
Input type	RS422, suitable for diffential rotary encoders
Input filter	Filter time adjustable from 1.3 µs to 1 ms
Maximum input voltage	25 V DC
Dielectric strength	up to 30 V DC max.
Sensor supply	500 mA max. (feed-in 24 V); 400 mA max. (feed-in 5 V)
Short-circuit-proof	yes
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Counter width	32 bits
Maximum input frequency	500 kHz
Mode of operation	Pulse and direction / AB mode with 1-, 2-, 4-times sampling
Status, alarm, diagnostics	
Status indicator	yes
Process alarm	yes, parameterisable
Diagnostic alarm	yes
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	20 mA
General data	
Weight (operational status)	72 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-1CNT-500

Channel	Description	Options[1)]	Default
	Diagnostic alarm	disabled (0) / enabled (1)	disabled
0	Filter time signal A	0.0013 ms [750 kHz] (0) / 0.0026 ms [375 kHz] (1) / 0.010 ms [100 kHz] (2) / 0.020 ms [50 kHz] (3) / 0.033 ms [30 kHz] (4) / 0.1 ms [10 kHz] (5) / 0.2 ms [5 kHz] (6) / 0.5 ms [2 kHz] (7) / 1 ms [1 kHz] (8)	0.0013 ms [750 kHz]
0	Filter time signal B		
0	Filter time reset		
0	Process alarm overflow	disabled (0) / enabled (1)	disabled
0	Process alarm underflow	disabled (0) / enabled (1)	disabled
0	Process alarm comp. value	disabled (0) / enabled (1)	disabled
0	Process alarm end value	disabled (0) / enabled (1)	disabled
0	Counting mode	count endless (0) / once - forward (1) / once - backwards (2) / once - no main direction (3) / periodic - forward (4) / periodic - backwards (5) / periodic - no main direction (6)	count endless
0	Comparison function	disabled (0) / higher equal comparison value (1) / lower equal comparison value (2)/ equal comparison value (3)	disabled
0	Counter dir. signal B inv.	disabled (0) / enabled (1)	disabled
0	Reset	disabled (0) / high level (1) / rising edge 0-1 (2)/ rising edge once 0-1 (3)	disabled
0	Signal mode	Rotary transducer - single (0) / Rotary transducer - double (1) / Rotary transducer - quadruple (2) / Pulse and Direction (3) / Counter disabled (4)	Counter disabled
0	Counter behaviour internal gate	Interrupt counting (0) / Cancel counting (1)	Cancel counting
0	Setting value	-2147483648 ... 2147483647	0
0	End value	-2147483648 ... 2147483647	2147483647
0	Load value	-2147483648 ... 2147483647	0
0	Hysteresis	0 ... 255	0

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

The parameter setting in the coupler for the **Output behaviour on fieldbus error** affects the control word and thus the behaviour of the UR20-1CNT-500:

- The **Hold last value** setting
  The counter continues to count during the error. Once normal operating conditions have been restored, the counter continues to count starting at the previous value.
- The **Enable substitute value** setting
  The counter value is frozen. Once normal operating conditions have been restored, the counter value is reset to the parameterised load value.
- **All outputs off** setting
  The counter behaves in the same way as for **Hold last value**.

Diagnostic data UR20-1CNT-500

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	
		4	External auxiliary supply error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x08
		1		
		2		
		3		
		4	Reserved	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 - 7	Reserved	0
Error byte 3	3	0 - 2	Reserved	0
		3	Internal diagnostic FIFO full	
		4	Reserved	0
		5	Process alarm lost	0
		6	Reserved	0
		7	Reserved	0
Channel type	4	0 - 6	Channel type	0x76
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	1
Channel error	7	0	Error at channel 0	
		1 - 7	Reserved	0
Channel error	8	8 - 15	Reserved	0
Channel error	9	16 - 23	Reserved	0
Channel error	10	24 - 31	Reserved	0
Channel 0 error	11	0 - 1	Reserved	0
		2	Overflow/underflow/end value	
		3	Comparison value reached	
		4 - 7	Reserved	0
Channel 1 error to Channel 31 error	12 - 42	0 - 7	Reserved	0
Time stamp	43 - 46		Time stamp [µs] (32 bit)	

Process data[1] inputs UR20-1CNT-500

Byte	Format	Name	Bit	Function when active	Remark
IB0 ...IB3	Double word	Counter value			current counter value
IB4	Word	Counter status	IX4.0	Reset was active	remains until reset mode is deactivated
			IX4.1	Comparison bit released	is set when comparison bit is activated
			IX4.2	status SW gate	is set when SW gate active
			IX4.3	Reset input active	depending only of the parameter „reset“ but not of the reset mode
			IX4.4	reserved	
			IX4.5	status internal gate	is set when internal gate active
			IX4.6	status comparison bit	
IB5			IX4.7	Counter direction down	
			IX5.0	Counter direction up	
			IX5.1	Comparison condition met	remains until reset of the status bits
			IX5.2	End value reached	remains until reset of the status bits
			IX5.3	Overflow performed	remains until reset of the status bits
			IX5.4	Underflow performed	remains until reset of the status bits
			IX5.5	Zero crossing performed	remains until reset of the status bits
			IX5.6	reserved	
			IX5.7	reserved	
IB6	Word	Time stamp	16 Bit		0 ... 65535 µs rotating, updated when counter value changes
IB7					

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process data[1] outputs UR20-1CNT-500

Byte	Format	Name	Bit	Function, when edge 0-1	Remark
QB0 ... QB3	Double word	Comparison value			-2147483648 (-2^{31}) ... +2147483647 (2^{31} -1)
QB4 ... QB7	Double word	Set value			-2147483648 (-2^{31}) ... +2147483647 (2^{31} -1)
QB8	Word	Control word	QX8.0	Activate reset mode	
			QX8.1	Release comparison bit	
			QX8.2	Set SW gate	
			QX8.3 - 8.4	reserved	
			QX8.5	Load set value	loads set value into counter value
			QX8.6	Reset status bits	Reset of Bits 5.1 to 5.5 of the process data inputs (Comparison condition met, End value reached, Overflow performed, Underflow performed, Zero-crossing performed)
			QX8.7	reserved	
QB9			QX9.0	Deactivate reset mode	
			QX9.1	Disable comparison bit	
			QX9.2	Reset SW gate	
			QX9.3 - 9.7	reserved	

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process alarm data UR20-1CNT-500

Byte	Bit	Function
B0	X0.0 - 0.1	reserved
	X0.2	Overflow, underflow or end value reached
	X0.3	Comparison value reached
	X0.4 - 0.7	reserved
B1	X1.0	Status Input channel 0 A (track A)
	X1.1	Status Input channel 0 B (track B)
	X1.2	Status Input Reset
	X1.3 - 1.7	reserved
B2		16 Bit Time stamp 0 ... 65535µs, rotating
B3		

Setting up the counter

To start a counting process at least the signal mode needs to be parameterised and a rising flank at the bit QX8.2 (“Set SW gate”) of the control word is required.
You can define the counter functions by parameterising: the counting mode, a primary direction (counting up or down), and the counting behaviour. In addition you can parameterise options for setting a comparison bit (conditions, hysteresis) as well as producing a process alarm (see section „additional counter features").

Counting range, count limits

The maximum count limits are predetermined by the register size and cannot be changed.

Maximum counting range

Limit	Value
Lower count limit	-2 147 483 648 (-2^{31})
Upper count limit	+2 147 483 647 ($2^{31}-1$)

Counter functions

Counting mode

Depending on the application you can chose the counting mode:
- Endless counting, e.g. for detecting the position with a rotary encoder
- 1-time counting with or without primary direction, e.g. for counting products up to a maximum limit
- Periodic counting with or without primary direction, e.g. repeated identical pick-and-place operations

For both counting modes “1-time counting” and “periodic counting” you can parameterise the counting range with load value and end value.

Via bit QX8.5 of the control word you can load a set value into the counting value. You can define the set value in the module parameters.

Counting direction

No primary direction

The entire counting range is available when using a counting mode without primary direction.

Primary direction up

The counting range is limited at the top by a parameterised end value. Starting from 0, a set value or a parameterised load value, the counter counts until the end value -1 and is reset to the load value with the next encoder pulse.

Primary direction down

The counting range is limited at the bottom by a parameterised end value. Starting from 0, a set value or a parameterised load value, the counter counts until the end value +1 and is reset to the load value with the next encoder pulse.

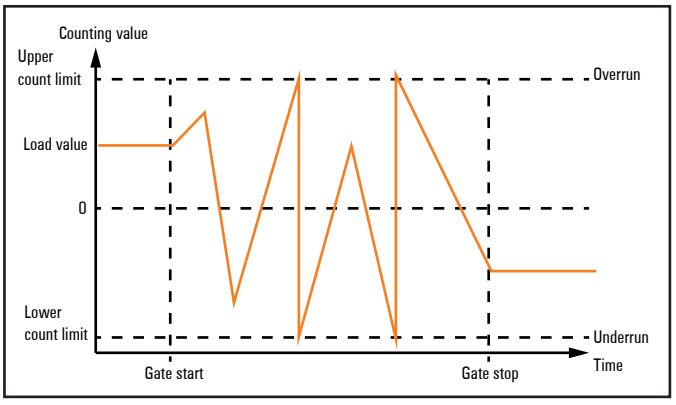
Gate function: activate / deactivate counter

The counter is activated and deactivated using an internal gate. The internal gate is identical to the software gate (SW gate), it is activated using a 0-1 edge at the bit “Set SW gate” in the control word and deactivated with a 0-1 edge at the bit “Reset SW gate” in the control word (see table “Process data outputs”).

Counting bahaviour: interrupt / cancel counting

You can parameterise the counting behaviour after a new gate start: Using “Interrupt counting”, the counter continues from the last counting value. Using “Cancel counting”, counting starts again from the load value.

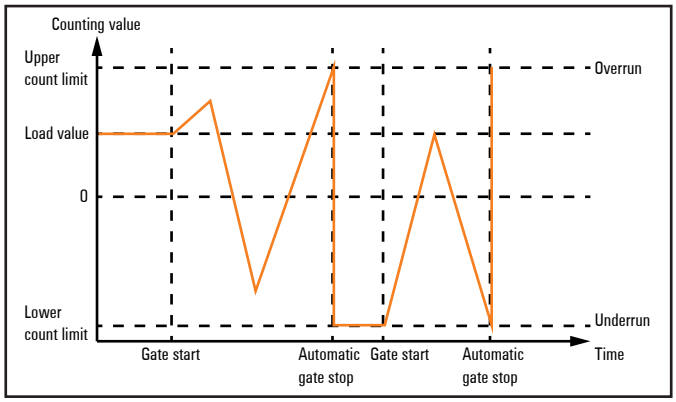
Endless counting



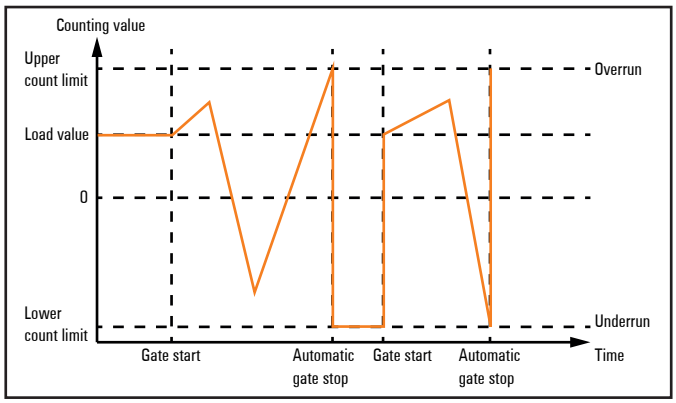
Continous counting

- Counting starts at the load value, the entire counting range is used.
- If the upper count limit is reached during up-counting, an additional counting pulse in the positive direction leads to a jump to the lower count limit. Counting continues from there.
- If the lower count limit is reached during down-counting, an additional counting pulse in the negative direction leads to a jump to the upper count limit. Counting continues from there.
- Upon exceeding the upper or lower counting limit, the status bit “Overflow performed” or “Underflow performed” is set and a process alarm is triggered if it is parameterised. The status bits remain set until they are reset with the bit “Reset status bits” in the control word.

1-time counting / no primary direction



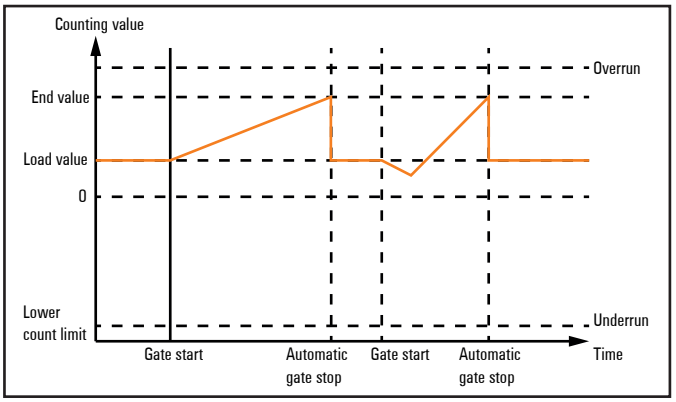
1-time counting, interrupted counting



1-time counting, cancelled counting

- Counting (up and down) starts at the load value, the entire counting range ist used.
- Upon exceeding the upper or lower count limit, the counter jumps to the other count limit respectively. The internal gate is automatically closed, the status bit “Overflow performed” or “Underflow performed” is set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Depending on the parameters set, counting continues from the current counting value (“Interrupt counting”) or it starts again from the load value (“Cancel counting”).

1-time counting / primary direction up



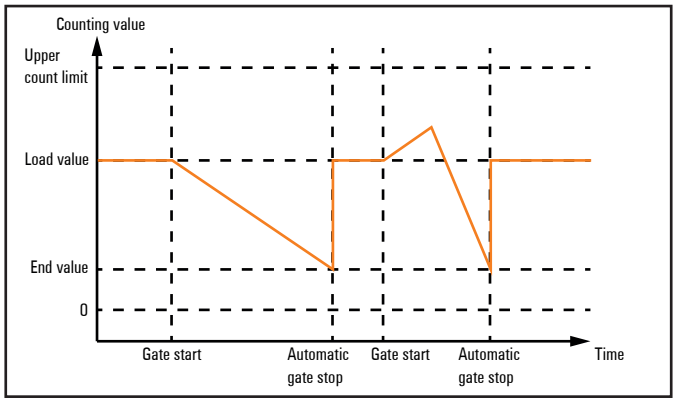
1-time counting, primary direction up

- Up-counting starts at the load value.
- If the parametrerised end value -1 is reached during counting in the positive direction, the counter jumps back to the load value at the next positive count pulse. The internal gate is automatically closed, the status bit "End value reached" is set, and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Counting starts again at the load value.
- Upon reaching the lower count limit the counter jumps to the upper count limit to continue counting from there. The status bit "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	-2 147 483 647 ($-2^{31}+1$) to +2 147 483 647 ($2^{31}-1$)
Lower count limit	+2 147 483 648 (-2^{31})

1-time counting / primary direction down



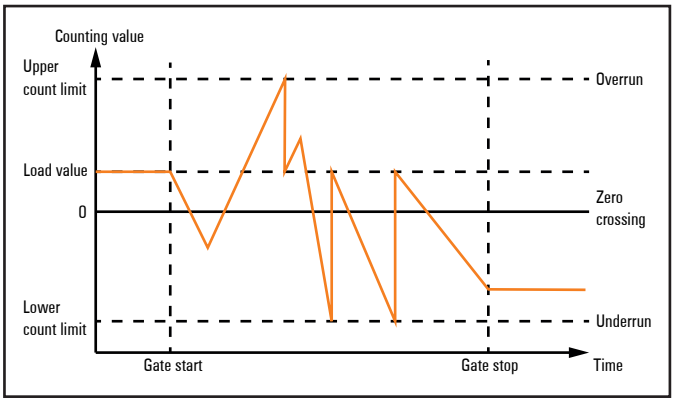
1-time counting, primary direction down.

- Down-counting starts at the load value.
- If the parameterised end value +1 is reached during counting in the negative direction, the counter jumps back to the load value at the next count pulse. The internal gate is automatically closed, the status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- To restart counting, the internal gate must be reopened. Counting starts again at the load value.
- Upon reaching the upper count limit the counter jumps to the lower count limit to continue counting from there. The status bit "Overflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word

Counting range

Limits	Valid range of values
End value	–2 147 483 648 (-2^{31}) to +2 147 483 647 ($2^{31}-2$)
Upper count limit	+2 147 483 647 ($2^{31}-1$)

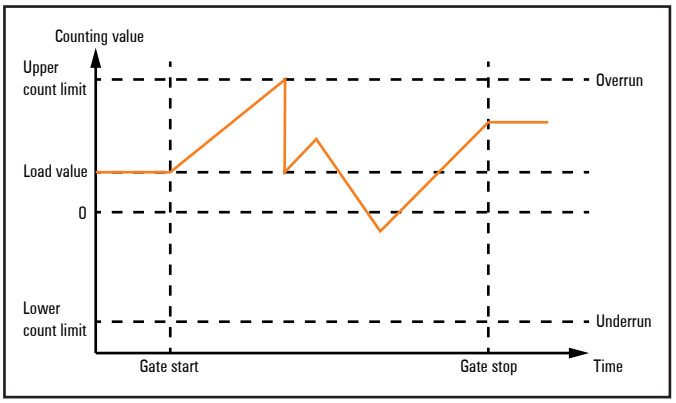
Periodic counting / no primary direction



Periodic counting, no primary direction

- Counting (up or down) starts at the load value, the entire counting range is used.
- Upon reaching a count limit, the counter jumps back to the load value and starts counting again from there. The status bit "Overflow performed" or "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Periodic counting / primary direction up



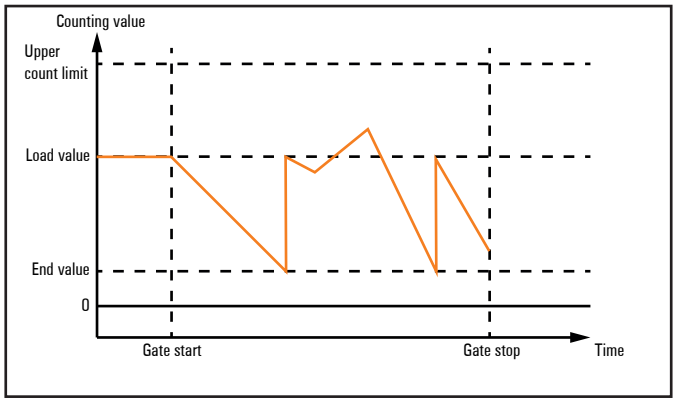
Periodic counting, primary direction up.

- Up-counting starts at the load value.
- If the parameterised end value -1 is reached during counting in the positive direction, the counter jumps back to the load value at the next positive count pulse and continues counting from there. The status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- Upon reaching the lower count limit the counter jumps to the upper count limit to continue counting from there. The status bit "Underflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

Counting range

Limits	Valid range of values
End value	-2 147 483 647 (-2^{31} +1) to +2 147 483 647 (2^{31}-1)
Lower count limit	+2 147 483 648 (-2^{31})

Periodic counting / primary direction down



Periodic counting, primary direction down.

- Down-counting starts at the load value.
- If the parameterised end value +1 is reached during counting in the negative direction, the counter jumps back to the load value at the next count pulse and continues counting from there. The status bit "End value reached" is set and a process alarm will be triggered if it is parameterised.
- Upon reaching the upper count limit the counter jumps to the lower count limit to continue counting from there. The status bit "Overflow performed" is set and a process alarm will be triggered if it is parameterised. All status bits remain set until they are reset with the bit "Reset status bits" in the control word.

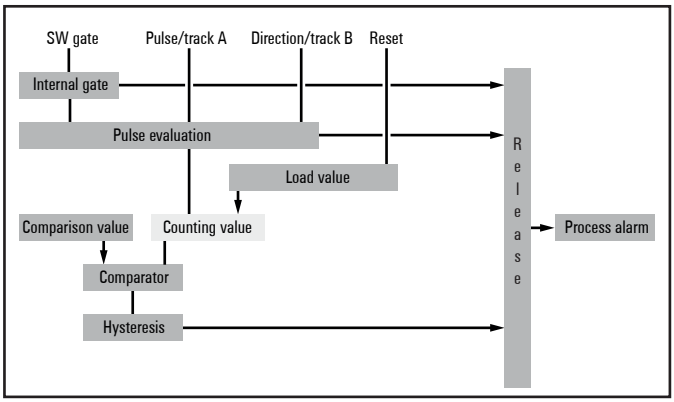
Counting range

Limits	Valid range of values
End value	-2 147 483 647 (-2^{31}) to +2 147 483 646 (2^{31}-2)
Upper count limit	+2 147 483 647 (2^{31}-1)

Additional counter features

You can define the additional features for the counter listed below by parametrising or via the process data outputs:

- Reset: resets the counting value to the load value during counting.
- Comparator: Upon meeting the comparison condition, the comparison bit is activated or a process alarm is triggered.
- Hysteresis: reduces frequent toggling of the comparison bit and/or excessive triggering of a process alarm, e.g. when the value of a sensor signal fluctuates around the comparison value.



Additional counter functions.

Reset

The load value will be load into the counting value once there is a signal at the reset input. To use this feature you have to release the reset mode in the control word (bit QX8.0) in addition to the parameterisation.
The status bit IX4.3 indicates that there is a signal at the reset input. Once a reset is done, the status bit IX4.0 is set. This bit will be reset by deactivating the reset mode (control bit QX9.0).

Comparison function

Via the parameter „Comparison function“ you can deactivate the comparison function or define a comparison condition:

- Counter value higher or equal comparison value
- Counter value lower or equal comparison value
- Counter value equal comparison value

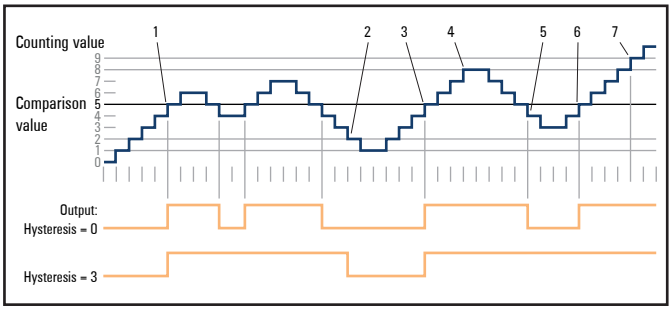
To use the comparison function, you have to preset the comparison value in the first double word of the process data outputs and to set the bit QX8.1 ("Comparison bit released") in the control word.

As soon as the counting value meets the corresponding comparison condition, the bits "Comparison bit active" and "Comparison condition met" are activated. The bit "Comparison bit active" remains set as long as the comparison condition is being met (respectively the parameterised hysteresis). The bit "Comparison condition met" remains active until it will be reset with the bit "Reset of the status bits" in the control word.

When using a counting mode with primary direction, the comparison bit will be set only upon reaching the comparison value from the primary direction.

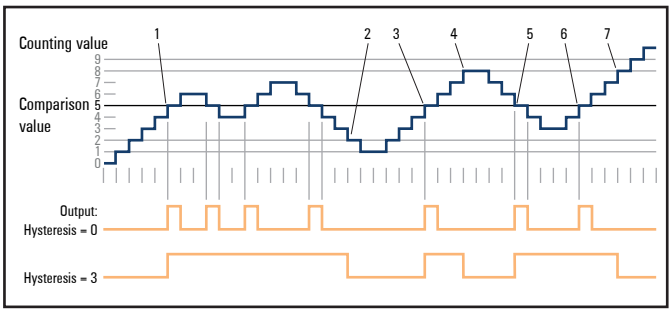
Hysteresis

It is possible to reduce frequent triggering of a process alarm and toggling of the comparison bit (e.g. if the value of a sensor signal fluctuates around the comparison value), by setting the hysteresis. Thereby you define a range above and below a reference value (zero crossing, overflow/underflow and comparison value), within which the status bit will not be reset.
A limit value between 0 and 255 can be parameterised for the hysteresis. With hysteresis = 3 for example, all values differing less than 3 from the reference value are smoothed. Hysteresis is deactivated with the values 0 and 1.
The hysteresis is activated upon reaching the comparison condition. The comparison result remains unchanged during active hysterersis until the counting value reaches the predetermined hysteresis limit. After leaving the hysteresis range, hysteresis is reactivated only upon reaching the comparison condition again.
After changing the hysteresis value, an active hysteresis remains active. The new hysteresis value is actived during the next hysteresis event.
The behaviour of the status bit for hysteresis = 0 (hysteresis deactivated) and hysteresis = 3 is shown in the following diagrams (legends describe the behaviour for hysteresis = 3):



Operating principle of the hysteresis when counter value ≥ comparison value

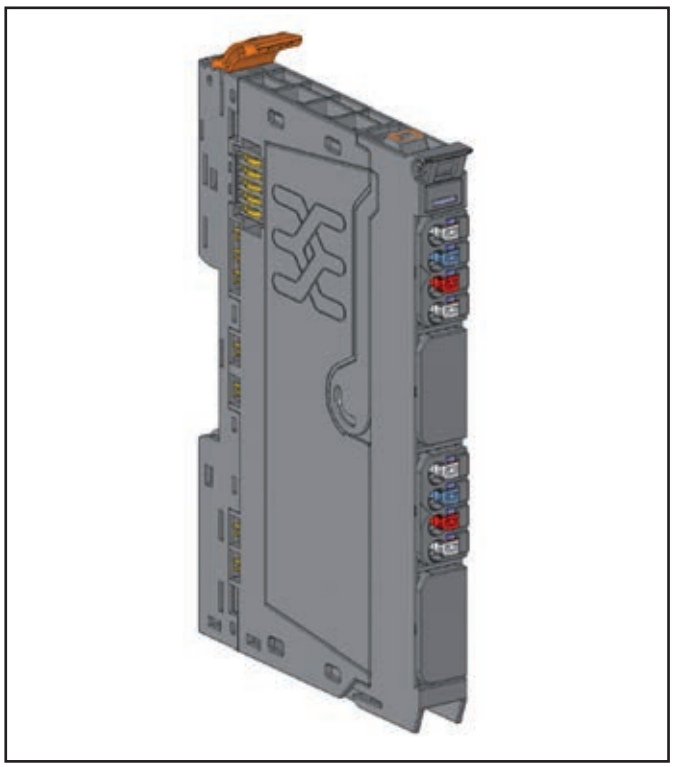
1 Comparison condition met → status bit is set and hysteresis activated
2 Comparison condition not met, leaving the hysteresis range → status bit is reset
3 Comparison condition met → status bit is set and hysteresis activated
4 Leaving the hysteresis range, the status bit remains set because the comparison condition is still met
5 Comparison condition no longer met but hysteresis still active → status bit remains set
6 Comparison condition met, hysteresis still active → status bit remains set
7 Leaving the hysteresis range and comparison condition met → status bit remains set



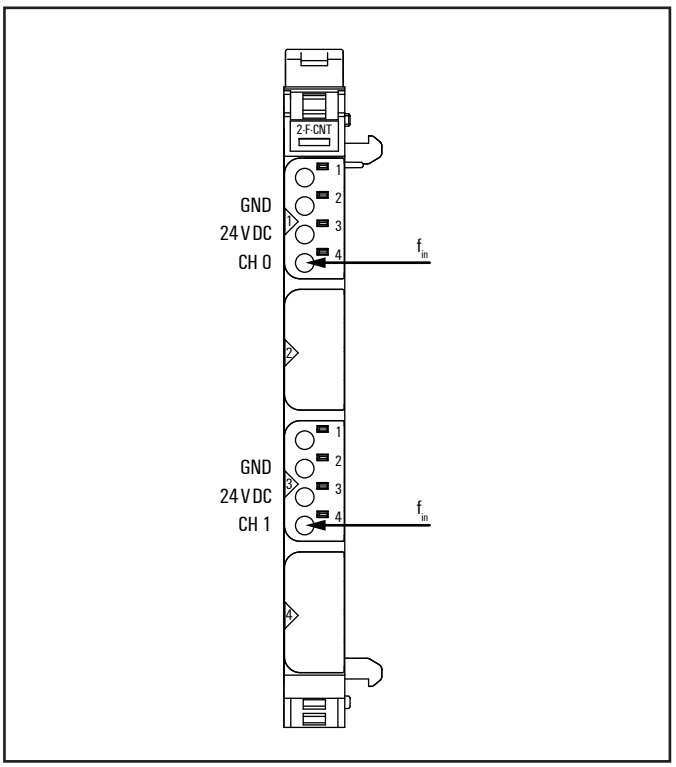
Operating principle of the hysteresis when counter value = comparison value

1 Comparison condition met → status bit is set and hysteresis activated
2 Comparison condition not met, leaving the hysteresis range → status bit is reset
3 Comparison condition met → status bit is set and hysteresis activated
4 Leaving the hysteresis range and comparison condition not met → status bit is reset
5 Comparison condition met → status bit is set and hysteresis activated
6 Comparison condition met and hysteresis active → status bit remains set
7 Leaving the hysteresis range and comparison condition no longer met → status bit is reset

6.48 Digital frequency counter module UR20-2FCNT-100



Digital frequency counter module UR20-2FCNT-100 (Order No. 1508080000)



Connection diagram UR20-2FCNT-100

The digital frequency counter module UR20-2FCNT-100 can read square-wave signals from one or two external sensors with a maximum input frequency of 100 kHz. Frequencys to be counted are applied to channel CH0 and/or channel CH1.

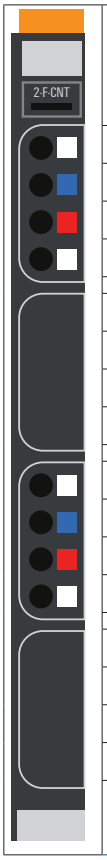
The measurement will be started via control word 1 or 2 respectively in the process data. Measuring cycles can be defined in µs via an output double word. The longer the measuring cycle the more exactly the measurement.

A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input voltage path (U_{IN}).

- Two counter inputs 24 V DC
- Counting frequency 100 kHz max
- Digitally adjustable input filter to suppress interferences (17 filter frequencies gradually adjustable between 3 Hz and 187 kHz)

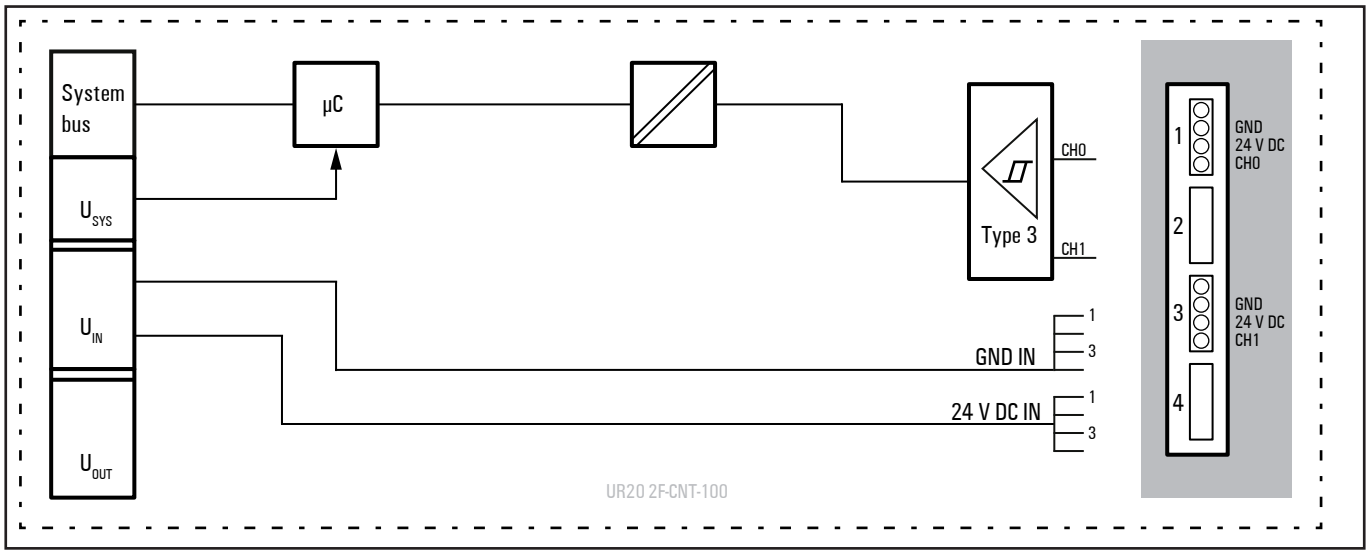
If the measuring cycle time will be zero (e.g. as an initial process value) the edge value will remain zero and the current period duration reaches its maximum. In this case please procede as follows:

► Stopp the measurement via the control word.
► Start the measurement again using a valid measuring cycle time value.



	Module status LED Green: Communication on system bus Red: Collective error diagnostic
1.4	Yellow: CH0 active (1-level)
3.4	Yellow: CH1 active (1-level)

LED indicators UR20-2FCNT-100, error messages see Chapter 13



Block diagram UR20-2FCNT-100

Technical data UR20-2FCNT-100 (Order No. 1508080000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Digital inputs	
Number of counter inputs	2
Input filter	adjustable between 3 Hz and 187 kHz (333 ms and 5 µs)
Low input voltage	< 5 V
High input voltage	> 11 V
Max. input current per channel	3.5 mA
Sensor supply	yes
Sensor connection	2- and 3-wire
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Counter width	32 bits
Maximum input frequency	100 kHz
Mode of operation	Pulse (rising edges)
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	35 mA + sensor supply current
General data	
Weight (operational status)	82 g
For additional general data, see Section 3.4	

Overview of the editable parameter UR20-2FCNT-100

Channel	Description	Options[1)]	Default
0 ... 1	Input filter	5 µs [187 kHz] (0) / 11 µs [94 kHz] (1) / 21 µs [47 kHz] (2) / 43 µs [23 kHz] (3) / 83 µs [12 kHz] (4) / 167 µs [6 kHz] (5) / 333 µs [3 kHz] (6) / 667 µs [1,5 kHz] (7) / 1 ms [732 Hz] (8) / 3 ms [366 Hz] (9) / 5 ms [183 Hz] (10) / 11 ms [92 Hz] (11) / 22 ms [46 Hz] (12) / 43 ms [23 Hz] (13) / 91 ms [11 Hz] (14) / 167 ms [6 Hz] (15) / 333 ms [3 Hz] (16)	5 µs [187 kHz]

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Input filter UR20-2FCNT-100

Limiting frequency	Filter time, real value	Filter time
187 kHz	5,35 µs	5 µs
94 kHz	10,64 µs	11 µs
47 kHz	21,28 µs	21 µs
23 kHz	43,47 µs	43 µs
12 kHz	83,33 µs	83 µs
6 kHz	166,67 µs	167 µs
3 kHz	333,33 µs	333 µs
1,5 kHz	666,67 µs	667 µs
732 Hz	1,36 ms	1 ms
366 Hz	2,73 ms	3 ms
183 Hz	5,46 ms	5 ms
92 Hz	10,87 ms	11 ms
46 Hz	21,74 ms	22 ms
23 Hz	43,47 ms	43 ms
11 Hz	90,90 ms	91 ms
6 Hz	166,67 ms	167 ms
3 Hz	333,33 ms	333 ms

Diagnostic data UR20-2FCNT-100

Name	Bytes	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type	0x08
		1		
		2		
		3		
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	2 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0 ... 6	Channel type	0x76
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	2
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error to Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data[1] inputs UR20-2FCNT-100

Byte	Format	Name	Bit	Function, when active	Remark
IB0 ... IB3	Double Word	Channel 0: Current measured period			Channel 0: Currently measured value of period duration multiplied by 125 ns results in the current period duration in µs
IB4 ... IB7	Double Word	Channel 0: Rising edges in current period			Channel 0: Number of rising edges within the current measurement cycle
IB8 ... IB11	Double Word	Channel 1: Current measured period			Channel 1: Currently measured value of period duration multiplied by 125 ns results in the current period duration in µs
IB12 ... IB15	Double Word	Channel 1: Rising edges in current period			Channel 1: Number of rising edges within the current measurement cycle
IB16	Word	Channel 0: Status	IX16.0 ... 16.7	reserved	
IB17			IX17.0	Measurement active	
			IX17.1 ... 17.7	reserved	
IB18	Word	Channel 1: Status	IX18.0 ... 18.7	reserved	
IB19			IX19.0	Measurement active	
			IX19.1 ... 19.7	reserved	

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Process data[1] outputs UR20-2FCNT-100

Byte	Format	Name	Bit	Function, when active	Remark
QB0 ... QB3	Double Word	Channel 0: Measurement cycle period			Channel 0: Preset value of the measurement cycle period (23 Bit)
QB4 ... QB7	Double Word	Channel 1: Measurement cycle period			Channel 1: Preset value of the measurement cycle period (23 Bit)
QB8	Word	Channel 0: Control word	QX8.0 - QX8.7	reserved	
QB9			QX9.0	Measurement start	
			QX9.1	Measurement stop	
			QX9.2 - 9.7	reserved	
QB10	Word	Channel 1: Control word	QX10.0 - QX10.7	reserved	
QB11			QX11.0	Measurement start	
			QX11.1	Measurement stop	
			QX11.2 - 11.7	reserved	

1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

Function frequency counting

Defining the measurement cycle period

You can define the length of the measurement cycle period for each channel within the output process data. As the 23 bit value has a resolution of 1 µs, values between 1 µs and 8.388.607 µs can be defined. The measurement cycle period must be long enough to detect at least one rising edge.

Setting of input filter

In order to suppress any distrubances you can parameterise a digital input filter for each channel (filter frequencies and respective pulse widths see "Overview of editable parameter").

Start measurement

To start the cyclic measurement, you have to set the Bit "Measurement start" in the control word of each channel (QX9.0 and QX11.0 respectively).

Calcuation of results

The input process data **Rising edges** register the amount of rising edges for each channel within the referring measurement cycle period. Counting starts with the last rising edge of the previous measurement cycle and ends with the last but one edge of the current measurement cycle. The time between first and last counted edge is defined as measured period. This is a 27-bit value with a resolution of 125 ns and an precision of 1 µs (valid value range between 0x00000008 and 0x7FFFFFF8).

Due to its resolution the value has to be devided by 8 within the control programm in order to get the current period duration in microseconds. This value can be between 1 µs and 16.777.215 µs.

The frequency is being calculated programwise as follows:

$$\text{Frequency } F = \frac{\text{Rising edges in current period}}{\text{Current measured period}}$$

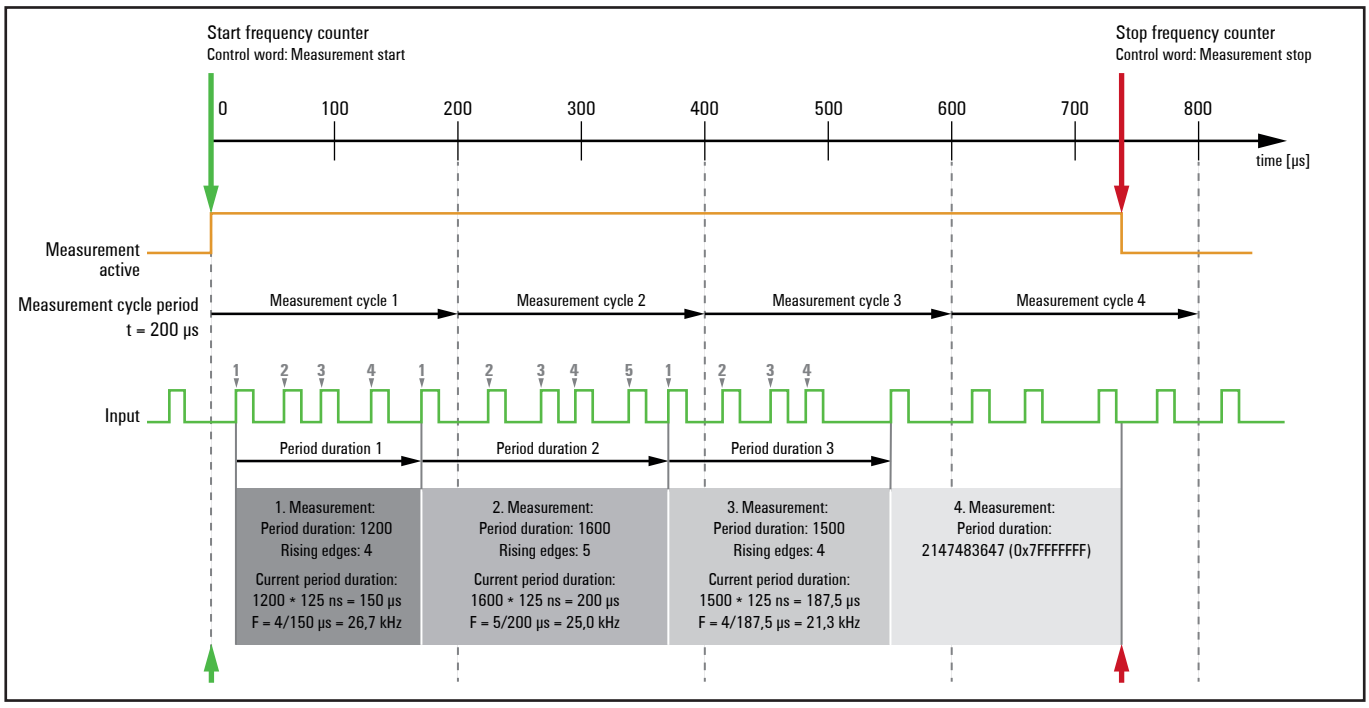
In case there is no rising edge registred within a measurement cycle the current period duration will be set to the maximum value of 16.777.215,875 µs.
If the current period duration as well as the rising edges are registred as zero, the current measured period was too short to register a rising edge.

Modifying the measurement cycle period

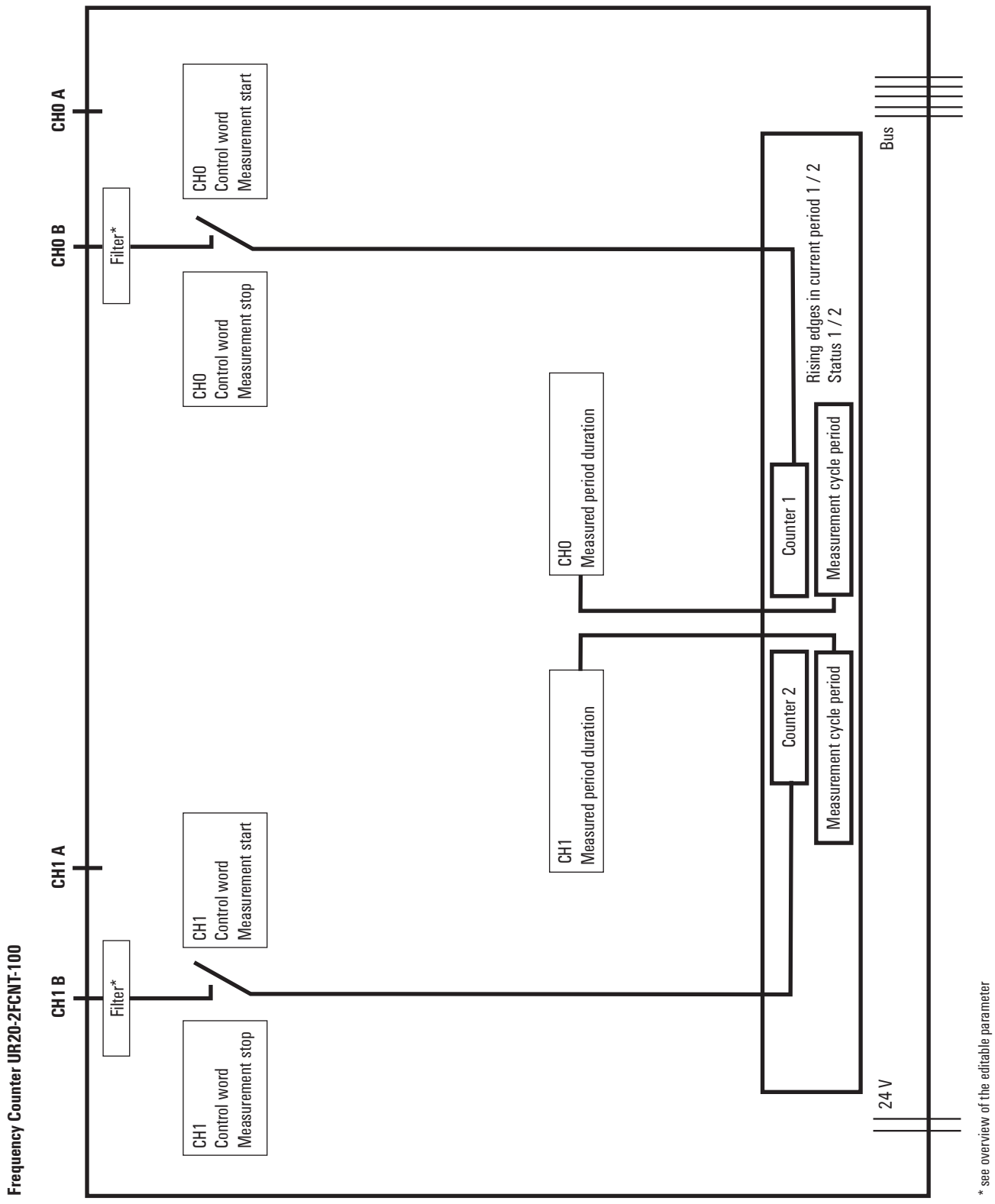
You can modify the measurement cycle period during a running measurement. In this case the new value is not valid until the following measurement cycle, during the current measurement cycle the old value will be kept.

Stop measurement

To stop the cyclic measurement, you have to set the Bit "Measurement stop" in the control word of each channel (QX9.1 and QX11.1 respectively). If the last measurement cycle has not been run through completely, the current measured period will be set to the maximum value of 0x7FFFFFFF, the rising edges will be set to zero.



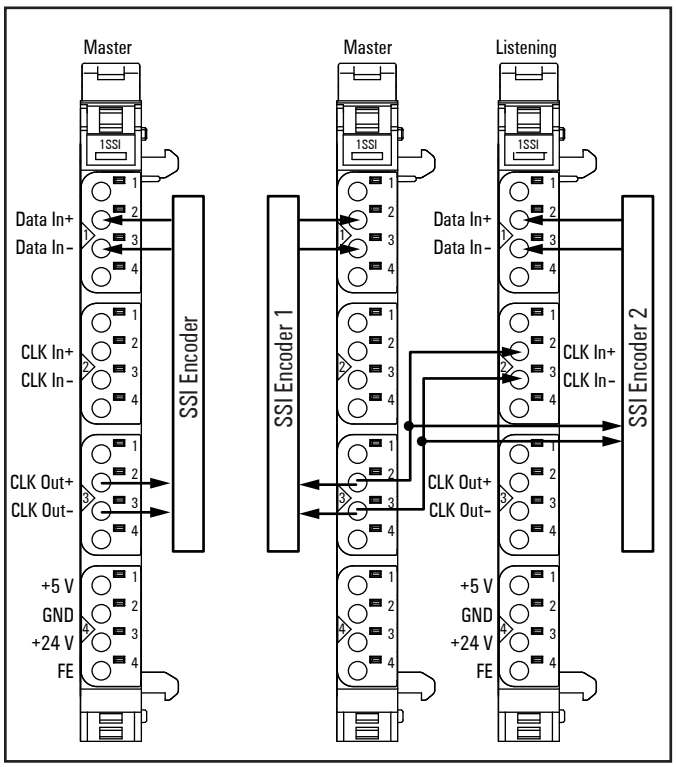
Functional principle frequency counting


Frequency Counter UR20-2FCNT-100
CH0 A
CH0 B
CH1 A
CH1 B
Filter*
Filter*
CH0
Control word
Measurement start
CH0
Control word
Measurement stop
CH1
Control word
Measurement start
CH1
Control word
Measurement stop
CH0
Measured period duration
CH1
Measured period duration
Counter 1
Counter 2
Measurement cycle period
Measurement cycle period
Rising edges in current period 1 / 2
Status 1 / 2
Bus
24 V
* see overview of the editable parameter

6.49 Digital interface module UR20-1SSI



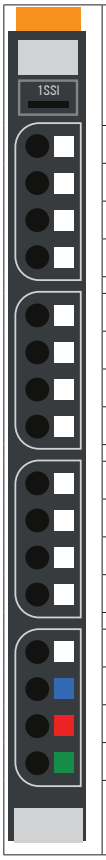
Digital Input module UR20-1SSI (Order No. 1508090000)



Connection diagram UR20-1SSI as a master or in mode „Listening“

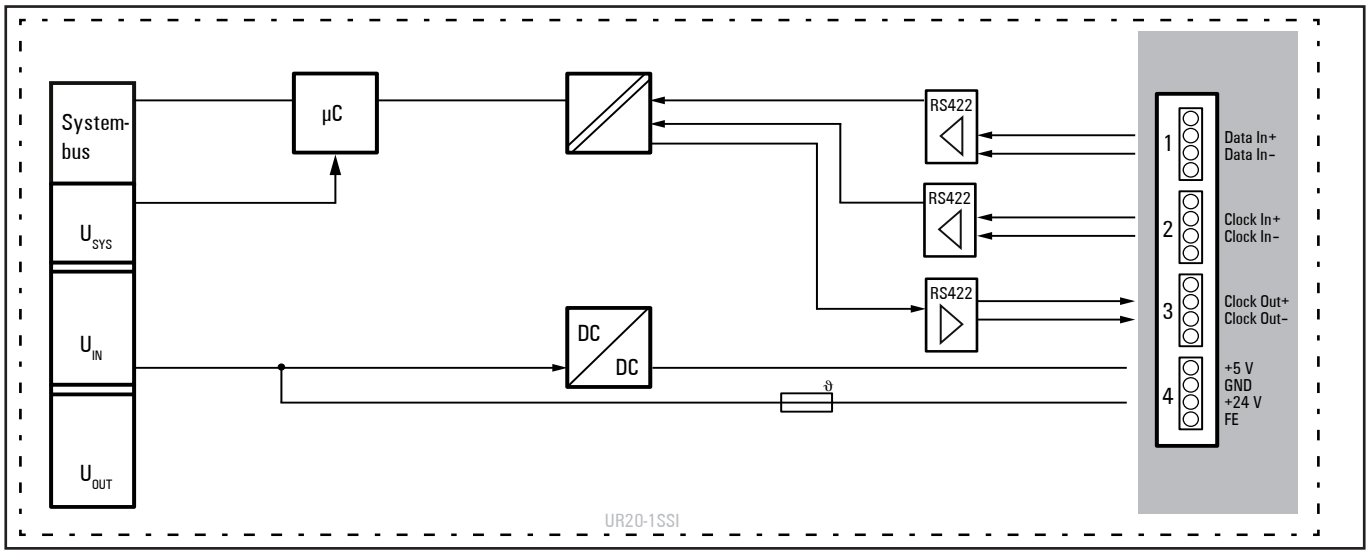
The UR20-1SSI digital interface module can read differential signals (RS422) from a SSI encoder. It can be connected as a master directly to the encoder providing the clock. To synchronise two SSI encoders a second SSI module running in mode "Listening" can be placed between the encoder and a master module from wich it receives the clock.
The data transfer rate might be between 125 kHz and 2 MHz, the data format can be chosen between binary or Gray-Code.
Connected sensors can be delivered either with 5 V DC or 24 V DC. Both supply outputs are protected against overcurrent, they must not be used simultaneously.
The communication status is indicated by three LEDs. The module electronics supply the connected sensor with power from the input current path (I_{IN}).

The SSI encoder must be connected using a shielded wire (maximum length 320 m with 125 kHz)! The shielding has to be designed as described in the chapter „Earthing and shielding“



	Module status LED Green: Communication over system bus Red: Collective error diagnostic
1.1	Yellow: Data In active
2.1	Yellow: Clock In active
3.1	Yellow: Clock Out active
4.1	Green: Power supply sensor +5 V DC
4.3	Green: Power supply sensor +24 V DC

LED indicators UR20-1SSI, error messages see chapter 13



Block diagram UR20-1SSI

Technical data UR20-1SSI (Order No. 1508090000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Number of channels	1
Type	SSI (Differential RS422)
SSI transfer rate	125 kHz ... 2 MHz
Delay time	1 µs ... 64 µs
Data width	8 ... 32 Bit
Data format	Binary / Gray-Code
SSI mode	Listening / Master
Sensor supply	500 mA (24 V DC) / 400 mA (5 V DC)
Reverse polarity protection	yes
Module diagnosis	yes
Individual channel diagnosis	no
Cable length	max. 320 m at 125 kHz; shielded
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	25 mA + sensor supply
General data	
Weight (operational status)	87 g
For additional general data see Section 3.4	

Overview of the editable parameter UR20-1SSI

Channel	Description	Options[1)]	Default
0	Delay time	1 µs (0) / 2 µs (1) / 4 µs (2) / 8 µs (3) / 16 µs (4) / 32 µs (5) / 48 µs (6) / 64 µs (7)	64 µs
0	SSI transfer rate	125 kHz (0) / 250 kHz (1) / 500 kHz (2) / 1 MHz (3) / 1,5 MHz (4) / 2 MHz (5)	125 kHz
0	Number of indicator bits	0 ... 15	0
0	Number of frame data bits	8 Bit (0) / 9 Bit (1) / 10 Bit (2) / ... / 31 Bit (23) / 32 Bit (24)	25 Bit
0	SSI mode	Listening (0) / Master (1)	Master
0	Bit order	MSB first (0) / LSB first (1)	MSB first
0	Data evaluation at edge	1 to 0 (0) / 0 to 1 (1)	1 to 0
0	Data format	Binary (0) / Gray-Code (1)	Gray-Code
0	SSI interface	disabled (0) / enabled (1)	disabled

1) Values in brackets for Modbus-TCP (firmware version 02.00.00 and higher) and EtherCAT

Diagnostic data UR20-1SSI

Name	Byte	Bit	Description	Default
Error indikator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type 0x05	1
		1		0
		2		1
		3		0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0	Channel type 0x79	1
		1		0
		2		0
		3		1
		4		1
		5		1
		6		1
		7		0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	1
Channel error	7 ... 10	0 ... 31	Reserved	0
Channel 0 error ... Channel 31 error	11 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		Time stamp [µs] (32bit)	

Process data[1] inputs UR20-1SSI

Byte	Format	Description
QB0	Double word	Encoder value
QB1		
QB2		
QB3		
QB4	Word	16 Bit time stamp
QB5		

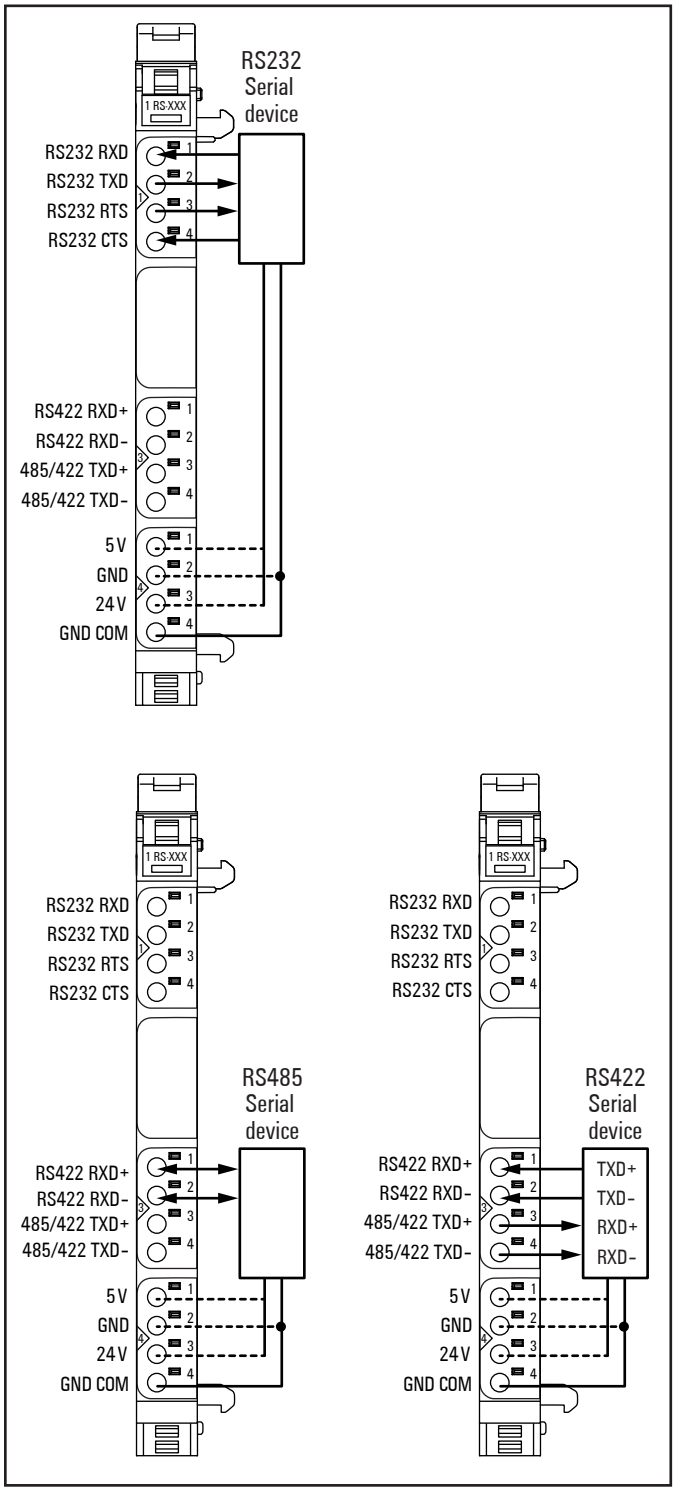
1) Internal process data mapping with data format “Standard”. Depending on the fieldbus specification and the data format of the communicating fieldbus components the bytes and/or words can be reversed during data transfer.

6.50 Serial communication module UR20-1COM-232-485-422

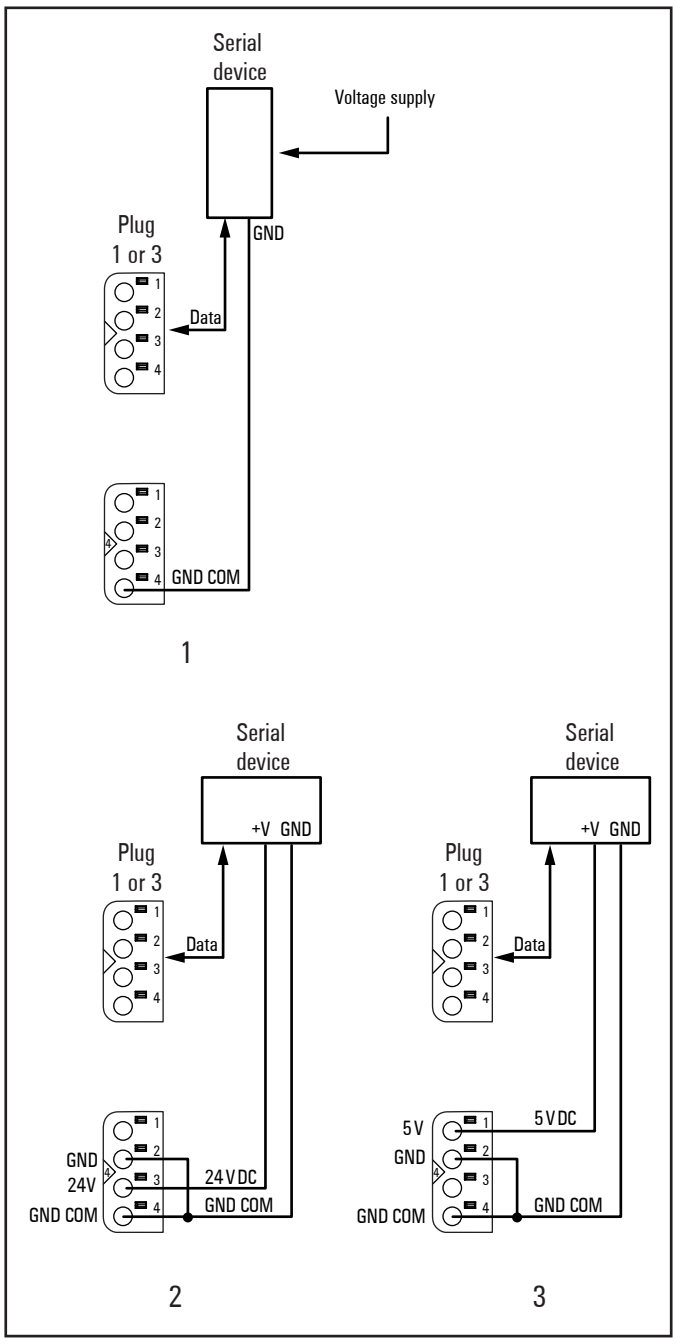


Serial communication module UR20-1COM-232-485-422 (Order No. 1315750000)

Serial data can be exchanged between the PLC and a data terminal device using the UR20-1COM-232-485-422 communication module. The device (e.g. barcode scanner, printer) can be connected via an interface type RS232, RS485 or RS422. The data transfer rate can be parameterised between 300 and 115200 bps. The process data length can be parameterised to be 8 byte or 16 byte. A terminating resistor can be parameterised for the RS485 and RS422 interface respectively.
The communication status is indicated by two LEDs on the respective plug.
The module electronics supply the connected data terminal device with power from the input current path (I_{IN}) either with 5 V DC or 24 V DC (parameterisable). Both supply voltage outputs are protected against overcurrent.



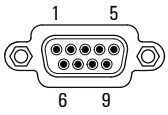
Connection diagram UR20-1COM-232-485-422

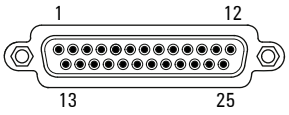


Connection variants for the voltage supply

8 Device with independent voltage supply
9 Supply with +24 V DC
10 Supply with +5 V DC

Pin assignment of the Sub-D plug (RS232 only)





UR20	Name	Signal	UR20 direction	Cable colour[1)]	RS232 Pin
Assignment of the 9-pole plug (male)					
1.1	RXD	Receive data	in	brown	2
1.2	TXD	Transmit data	out	green	3
1.3	RTS	Request to send	out	blue	7
1.4	CTS	Clear to send	in	red	8
4.2	GND	Signal Ground		grey	5
Assignment of the 25-pole plug (male)					
1.1	RXD	Receive data	in	green	3
1.2	TXD	Transmit data	out	brown	2
1.3	RTS	Request to send	out	yellow	4
1.4	CTS	Clear to send	in	grey	5
4.2	GND	Signal Ground		blue	7

1) Colour coding for Weidmüller cables

Connection cables for the serial device

Please use shielded cables, because electromagnetic interferences from the surroundings have to be assumed. The maximum permissable cable length depends on the cable capacitance and the baud rate.

Connecting a RS232 device

Maximum cable length RS232

Cable capacitance	Max. cable length
≤ 2500 pF	15 m (49 ft), shielded
55 pF/m	45 m (147 ft)

Recommended cable type:
LIYCY 0.14 mm² or 0.34 mm² (e.g. Weidmüller PAC-UNIV-D9M-F-1M5, Order No. 1350400015)

Connecting a RS485 or RS 422 device

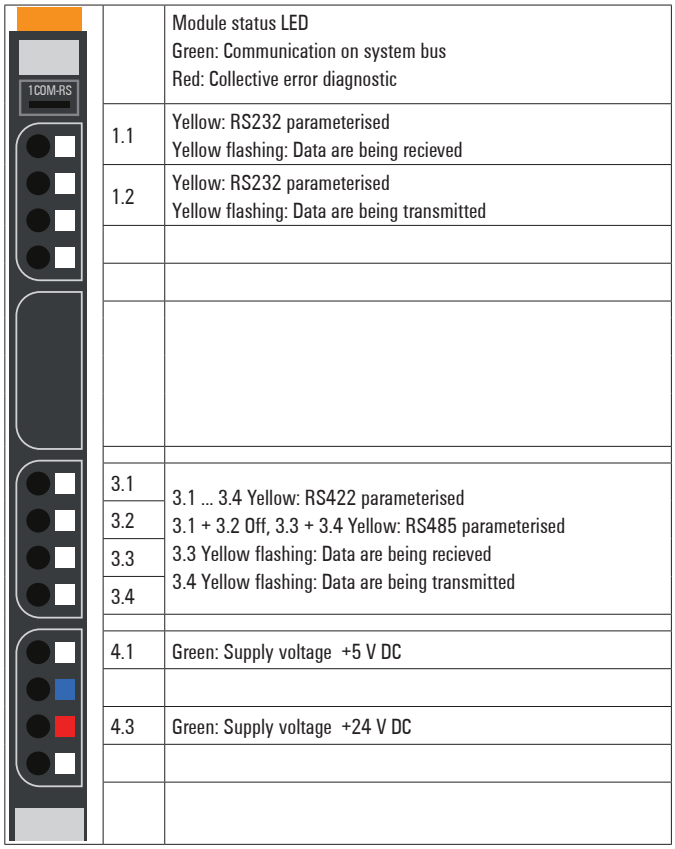
The serial device has to be connected using a twisted pair cable (U/UTP, Type Cat- 3 or J-2YY-2x2x0,6).

Maximum cable length RS422/485

Baud rate in kbps	Max. cable length
≤19200	1200 m (3937 ft), shielded
38400	500 m (1640 ft)
57600	250 m (820 ft)
115200	200 m (656 ft)

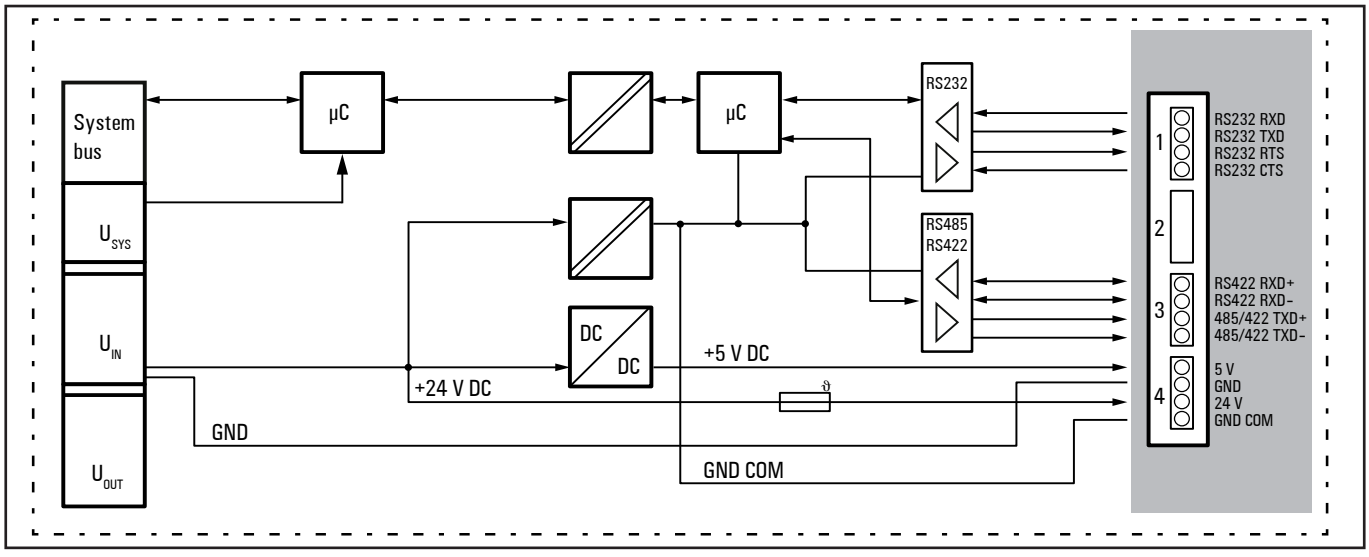
Recommended cable type for RS422/485:
LIYCY or LiYY, 0,25 mm². Both ends of the cable must be terminated.

- ► RS485: Please use one core pair for Data+/Data–. You can use any wire for the ground singal GND COM. The remaining free wires should be connected to ground.
- ► RS422: Please connect the wires for transmitting signals TXD+/TXD– and those for receiving signals RXD+/RXD– in pairs respectively. You can use any wire for the ground singal GND COM. The remaining free wires should be connected to ground.



	Module status LED Green: Communication on system bus Red: Collective error diagnostic
1.1	Yellow: RS232 parameterised Yellow flashing: Data are being recieved
1.2	Yellow: RS232 parameterised Yellow flashing: Data are being transmitted
3.1 3.2 3.3 3.4	3.1 ... 3.4 Yellow: RS422 parameterised 3.1 + 3.2 Off, 3.3 + 3.4 Yellow: RS485 parameterised 3.3 Yellow flashing: Data are being recieved 3.4 Yellow flashing: Data are being transmitted
4.1	Green: Supply voltage +5 V DC
4.3	Green: Supply voltage +24 V DC

LED indicators UR20-1COM-232-485-422, error messages see Chapter 13



Block diagram UR20-1COM-232-485-422

Technical data UR20-1COM-232-485-422 (Order No. 1315750000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Serial Interface	
Number	1
Type	RS232, RS485, RS422, parameterisable
Transfer rate	300 ... 115200 Bps, parameterisable
Supply voltage	5 V DC or 24 V DC
Current of power supply output	max. 500 mA
Standards RS232	DIN 66020, DIN 66259, EIA-RS232C, CCITT V.24/V.28
Standards RS485/RS422	DIN 66259 part 1 and 3, EIA-RS422/485, CCITT V.11
Terminating resistor RS485/RS422	120 Ω, parameterisable
Short-circuit-proof	yes
Module diagnosis	yes
Individual channel diagnosis	yes
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	16 mA + Load
General data	
Weight (operational status)	92 g
For additional general data see Section 3.4	

Overview of the editable parameter UR20-1COM-232-485-422

Description	Options[1)]	Default
Operating mode	disabled (0) / RS232 (1) / RS485 (2) / RS422 (3)	disabled
Data bits[2)]	7 Bit (0) / 8 Bit (1)	8 Bit
Baud rate	300 (0) / 600 (1) / 1200 (2) / 2400 (3) / 4800 (4) / 9600 (5) / 14400 (6) / 19200 (7) / 28800 (8) / 38400 (9) / 57600 (10) / 115200 (11)	9600
Stop bit	1 Bit (0) / 2 Bit (1)	1 Bit
Parity	None (0) / Even (1) / Odd (2)	None
Flow control	None (0) / CTS/RTS (1) / XON/XOFF (2)	None
XON character	0 ... 255	17
XOFF character	0 ... 255	19
Terminating resistor RS485/422	Off (0) / On (1)	Off
Process data length	8 Byte[3)] (0) / 16 Byte (1)	16 Byte

1) Values in brackets for EtherCAT and Modbus-TCP (firmware version 02.00.00 and higher)
2) The option “7 Bit“ works only in combination with a parity ("even" or "odd")
3) CANopen and DeviceNet only

Diagnostic data UR20-1COM-232-485-422

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Reserved	0
		6	Reserved	0
		7	Parameter error	
Module type	1	0	Module Type 0x05	1
		1		0
		2		1
		3		0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 2	Reserved	0
		3	Internal diagnostic FIFO full	0
		4 ... 7	Reserved	0
Channel type	4	0	Channel type 0x79	1
		1		0
		2		0
		3		1
		4		1
		5		1
		6		1
		7		0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	0
Number of channels	6		Number of similar channels per module	1
Time stamp	43-46		Time stamp [µs] (32bit)	

Data transfer

The process data length can be parameterised to be 8 or 16 Bytes. Byte 0 is used for status and diagnosis, Byte 1 for the data segment length and the remaining 6 or 14 Bytes are user data.

Process input data: The data sent from the serial device are written into the receive memory of the UR20 module. As soon as the SPS request results in that RX_CNT is not equal RX_CNT_ACK, the data will be sent in segments via the field-bus coupler to the PLC. The successfully data transfer will be acknowledged to the module.
The receive memory can safe a maximum of 255 Bytes. A software handshake (XON/XOFF) or a hardware handshake (RTS/CTS) can be parameterised using the flow control, so that an alarm will warn against a buffer overflow.

Process output data: The data sent from the PLC via the fieldbus coupler are written into the transmission memory of the UR20 module. The module is continously checking whether data are ready to be sent or a data transfer to the device has been finished successfully. Not till then the next data will be transferred.

Process input data UR20-1COM-232-485-422

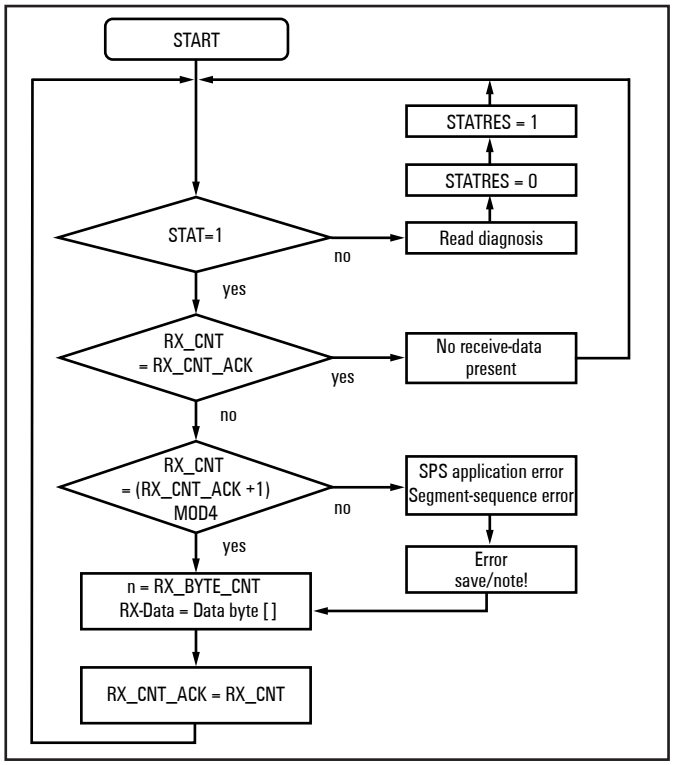
Byte	Format	Name	Bit	Description	Remarks
IB0	Word	Status and diagnosis	IX0.0	Data in the receive memory	RX = 0: Receive memory is empty RX = 1: A telegramm or telegramm segment in the receive memory is ready for transmission.
			IX0.1	Receive memory nearly full	Only 10 characters are left in the receive memory. XOFF will be set if parametrerised.
			IX0.2	Not used	
			IX0.3	RX_CNT	The RX_CNT value is assigned to each data segment of the process input data while transmission. The sequence or the RX_CNT values is: Binary: 00, 01, 10, 11, 00, ... Decimal: 0, 1, 2, 3, 0, ... A faulty data seqence indicates missing data segments.
			IX0.4	RX_CNT	
			IX0.5	TX_CNT_ACK	The TX_CNT_ACK value is a copy of the TX_CNT value, which has been transferred together with the last data segment of the process output data. TX_CNT_ACK acknowledges that the data has been taken over successfully.
			IX0.6	TX_CNT_ACK	
			IX0.7	STAT	STAT = 1: Communication with the device is without fault. STAT = 0: Faulty communication with the device.
IB1		Length of the data segment / of the subsequent diagnosis data		RX	Length of the data/diagnosis data in this frame
IB 2 ... IB 7 or IB 2 ... IB 15		Received data		User data of the transferred telegramm segment	

Process output data UR20-1COM-232-485-422

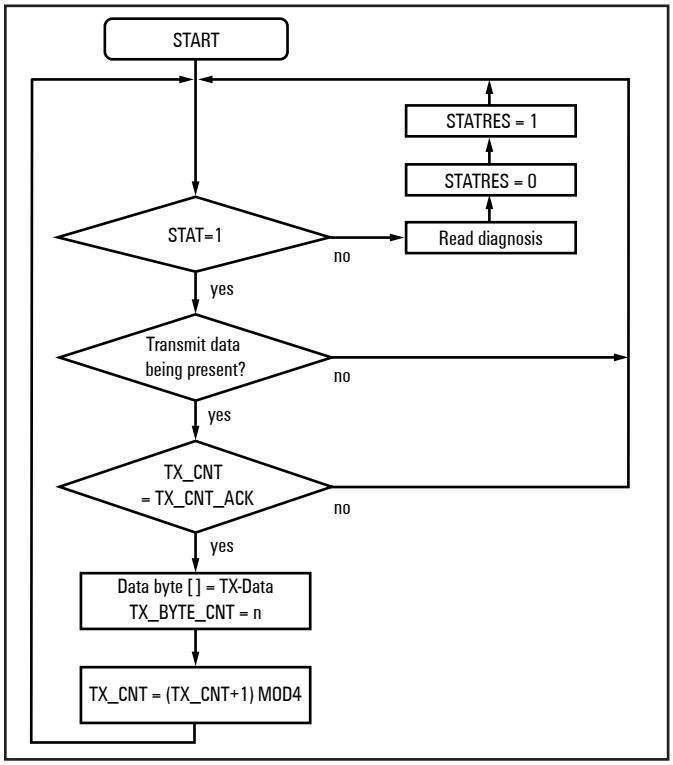
Byte	Format	Name	Bit	Description	Remarks
QB0	Word	Status and diagnosis	IX0.0	RXBUF FLUSH	Bit 0: RXBUF FLUSH The receive memory can be scrubbed using this bit. STATRES = 1: A requirement with RXBUF FLUSH = 1 will be ignored. STATRES = 0: The receive memory will be scrubbed with RXBUF FLUSH = 1.
			IX0.1	TXBUF FLUSH	Bit 1: TXBUF FLUSH The emission memory can be scrubbed using this bit. STATRES = 1: A requirement with TXBUF FLUSH = 1 will be ignored. STATRES = 0: The emission memory will be scrubbed with TXBUF FLUSH = 1.
			IX0.2	RX_HWBUFFER	Bit 2: DisableSend_TX_HWBUFFER This bit controls the hardware emission memory: DisableSend_TX_HWBUFFER = 0: The hardware emission memory is released. A character (Byte) will be sent as soon as it reaches the buffer. DisableSend_TX_HWBUFFER = 1: The hardware emission memory is locked. Characters (Bytes) will only be sent, when DisableSend_TX_HWBUFFER is set to 0 again.
			IX0.3	TX_CNT	The TX_CNT value is assigned to each data segment of the process output data. The sequence or the TX_CNT values is: Binary: 00->01->10->11->00... Decimal: 0->1->2->3->0... A faulty data sequence indicates missing data segments.
			IX0.4	TX_CNT	
			IX0.5	RX_CNT_ACK	RX_CNT_ACK must include a copy of the RX_CNT value. The RX_CNT value has been transferred together with the last data segment of the process input data.
			IX0.6	RX_CNT_ACK	RX_CNT_ACK must be set in analogy with RX_CNT (in the status byte). It indicates that the data segment has been transferred successfully by using RX_CNT and enables to receive new data.
			IX0.7	Communication status	The input data status bit STAT will be reset using this bit. When changing from 1 to 0 (falling edge) STAT will be reset from 0 to 1. STAT = 0: All changes in the data fields TX_BYTE_CNT, TX_CNT and RX_CNT_ACK will be ignored. The receive or emission memory can be scrubbed using RXBUF FLUSH or TXBUF FLUSH respectively. STAT = 1 or changing from 0 to 1: The buffers cannot be scrubbed.
QB1		Length of the data segment			
QB 2 ... QB 7 or QB 2 ... QB 15		Transmission data		User data of the transferred telegramm segment	

Enabling the data transfer

There are different ways to announce the communication module to the control. Using the test mode you only copy the input data into the output data of the module so that the received data will be sent again. Or you choose one of the function blocks provided by your engineering tool.
For your own programming please regard the following schemes showing the sequences for receiving and transmission.



Scheme of the receiving sequence

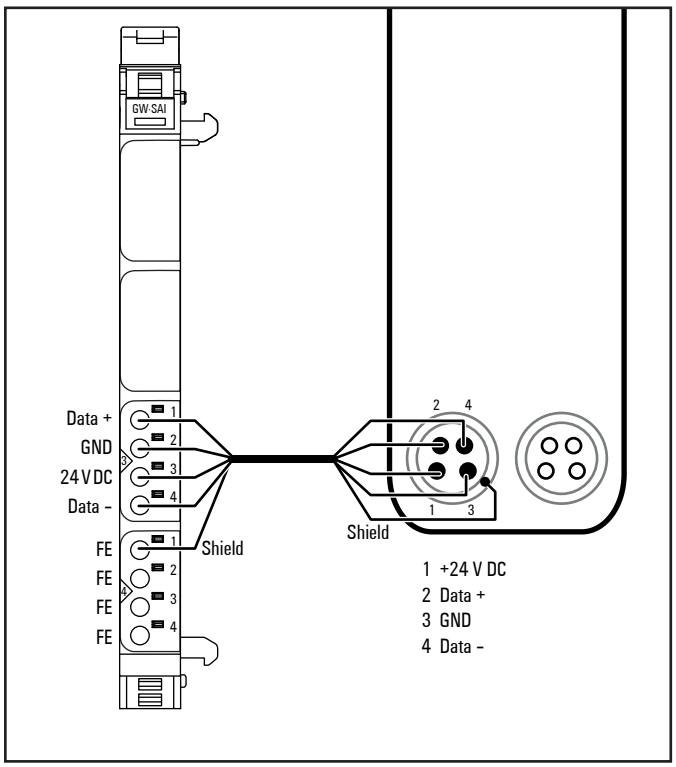


Scheme of the transmission sequence

6.51 Communication module UR20-1COM-SAI-PRO



Communication module UR20-1COM-SAI-PRO (Order No. 2007430000)



Connection diagram UR20-1COM-SAI-PRO

Up to 15 subbus modules type SAI Active Universal Pro can be connected to the u-remote station via the UR20-1COM-SAI-PRO communication module. The subbus modules can be placed in a IP67 surrounding. The distance between the UR20 communication module and the last connected subbus module should not exceed 50 metres (164 ft). A maximum of three UR20-1COM-SAI-PRO modules can be placed within a u-remote station.
The module electronics of the communication module supply the connected SAI subbus modules with 24 V DC (max. 3 A) from the input current path (I_{IN}). The communication status is indicated by two LEDs. The SAI subbus modules as well as the UR20 modules are visible on the web server.
The first subbus module is connected with its input (4-pole plug M8 or M12) to the number 3 connector of the communication module (see connection diagramm and pin assignment). The shielding is placed at the FE connections on number 4 plug of the communication module and the body of the subbus module.
The output of the last module of the subbus chain has to be covered with a terminating resistor (Order No. 1955340000).

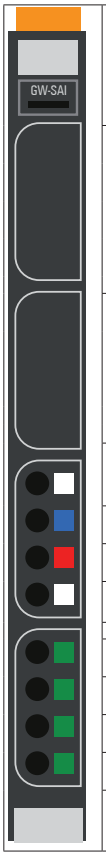
Pin assignment 4-pole connector (male) on SAI-PRO subbus

UR20	SAI IN Pin	Cable colour	Function
3.1	2	brown	Data +
3.2	3	green	GND
3.3	1	white	+24 V DC
3.4	4	yellow	Data -

The subbus modules have to be connected using shielded cables (e.g. Weidmüller Order No. 198191xxxx)! The maximum cable length depends on the subbus structure (see documentation of the subbus modules).
Shielding has to be designed as described in the chapter “Earthing and Shielding”.

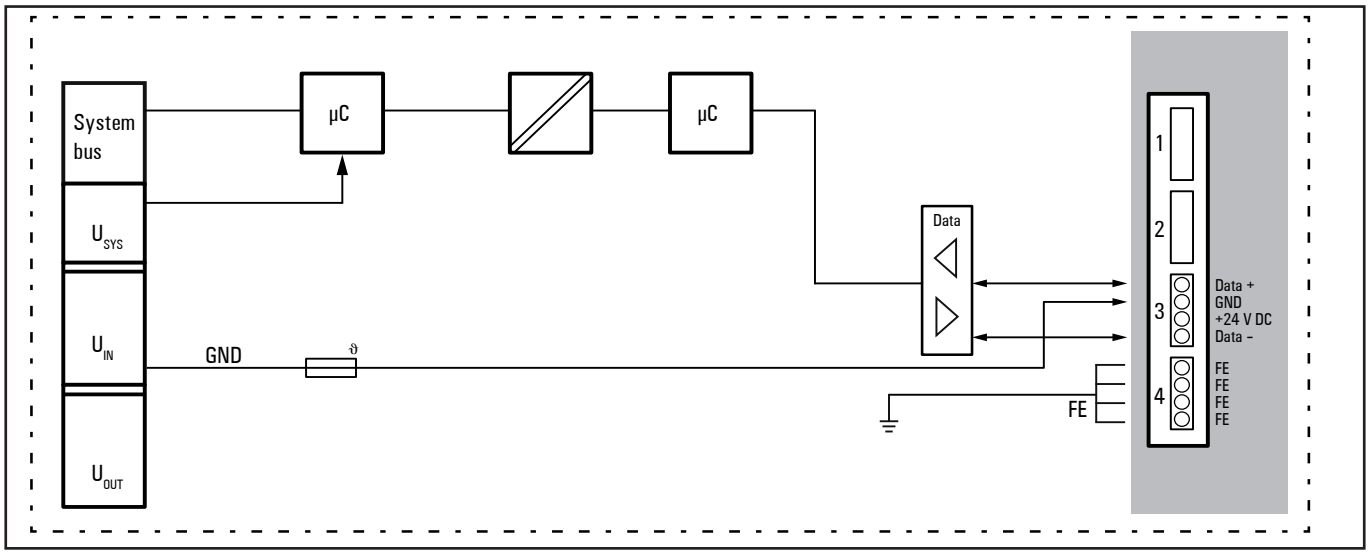
Connectable subbus modules

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



	Module status LED Green: Communication on system bus Red: Collective error diagnostic
3.1	Yellow flashing (0.5 Hz): Subbus communication is being initialised Yellow: Subbus communication OK
3.2	Red: Supply voltage error
3.3	Green: Supply voltage OK
3.4	Red: Subbus communication error

LED indicators UR20-1COM-SAI-PRO, error messages see Chapter 13



Block diagram UR20-1COM-SAI-PRO

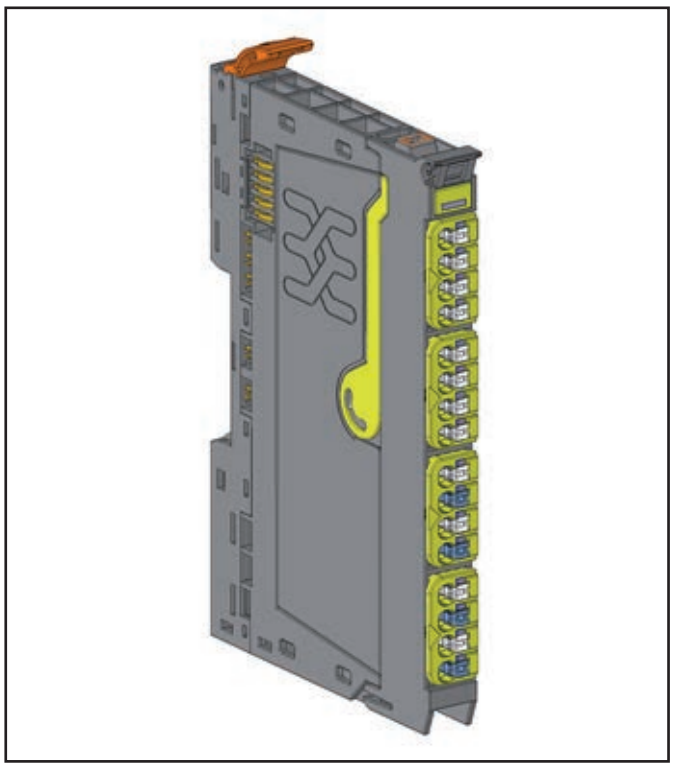
Technical data UR20-1COM-SAI-PRO (Order No. 2007430000)

System data	
Data	Process, parameter and diagnostic data depend on the coupler used, see the table in Section 4.10.
Interface	u-remote system bus
System bus transfer rate	48 Mbps
SAI Interface	
Number	1
Type	SAI-PRO Subbus
Transfer rate	250 Bps
Supply voltage	+24 V DC
Current of power supply output	max. 3 A
Short-circuit-proof	yes
Module diagnosis	yes
Individual channel diagnosis	Diagnosis of the subbus modules
Supply	
Supply voltage	24 V DC +20 %/-15 %
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	17 mA + SAI supply current
General data	
Weight (operational status)	87 g
For additional general data see Section 3.4	

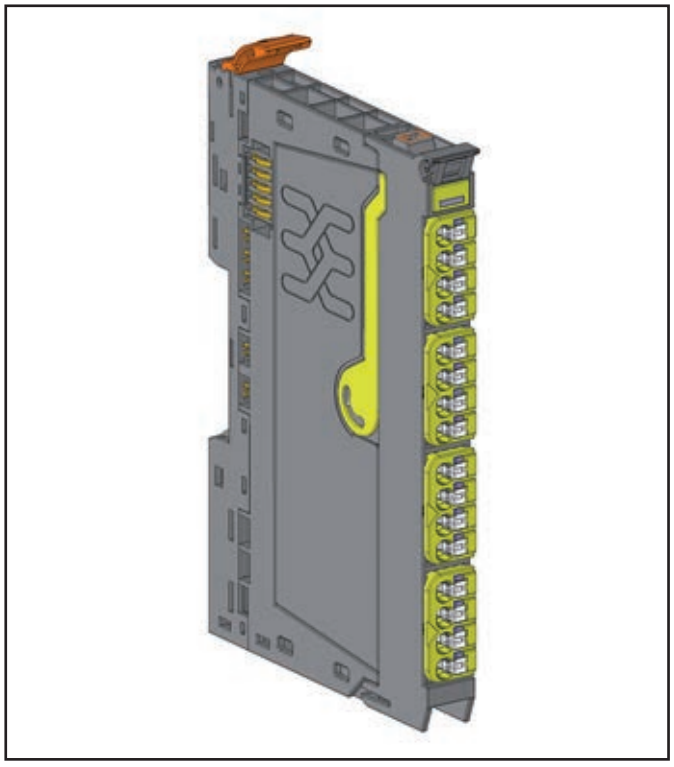
Diagnostic data UR20-1COM-SAI-PRO

Name	Byte	Bit	Description	Default
Error indikator	0	0	Module error	
		1	Internal error	
		2	External error	
		3	Channel error	0
		4	Error	
		5	Power supply fault	0
		6	Reserved	0
		7	Reserved	
Module type	1	0	Module Type 0x05	1
		1		0
		2		1
		3		0
		4	Reserved	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Reserved	0
Error byte 3	3	0 ... 3	Reserved	0
		4	Communication fault	0
		5	Hot Plug	0
		5	Reserved	0
		7	New Subbus Diag	0
Channel type	4	0	Channel type 0x79	1
		1		0
		2		0
		3		1
		4		1
		5		1
		6		1
		7		0
Diagnostic bits per channel	5		Number of diagnostic bit per channel	8
Number of channels	6		Number of similar channels per module	1
Channel error	7	0	Error at channel 0	0
	8 ... 10	1 ... 31	Reserved	
Channel 0 error	11	0	Subbus scanning	
		1	Subbus communication error	
		2 ... 5	Reserved	
		6	Subbus over current	
		7	Reserved	
Channel 1 error ... Channel 31 error	12 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		Time stamp [µs] (32bit)	

6.52 Safe I/O modules



Safe input and output module UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSPS



Safe input module UR20-8DI-PN-FSOE, UR20-8DI-PN-FSPS

The u-remote system provides variants of safe I/O modules for the different safety protcols.
For Fail Safe over EtherCAT (FSoE):

- UR20-4DI-4DO-PN-FSOE (Order No. 1529780000): four safe inputs, four safe outputs, two inputs and outputs respectively can be parameterised P- or N-switching
- UR20-8DI-PN-FSOE (Order No. 1529800000): eight inputs, four of which can be parameterised P- or N-switching

For PROFIsafe:

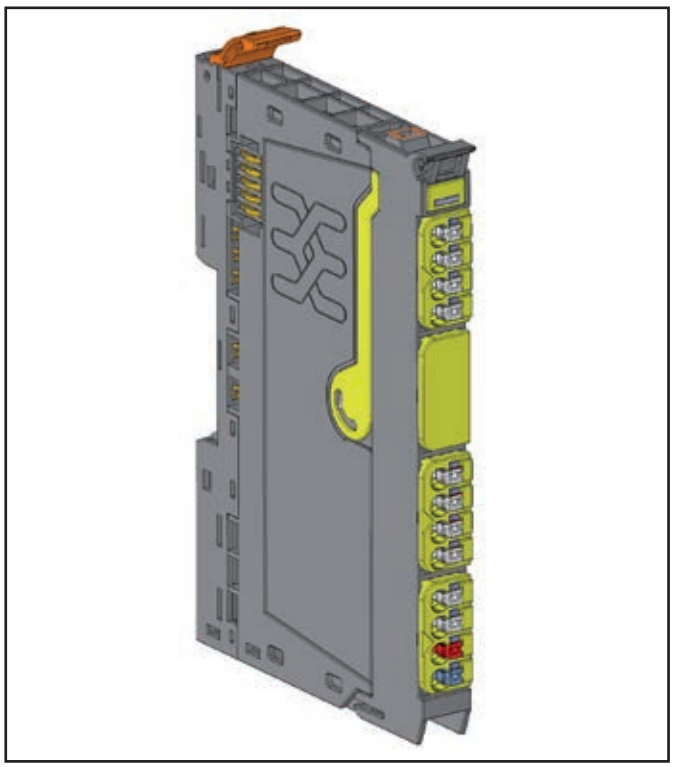
- UR20-4DI-4DO-PN-FSPS (Order No. 1335060000): four safe inputs, four safe outputs, two inputs and outputs respectively can be parameterised P- or N-switching
- UR20-8DI-PN-FSPS (Order No. 1335070000): eight inputs, four of which can be parameterised P- or N-switching

Using safe I/O modules you can realise nearly all safety-related functions via your PLC according to the designed safety architectur, as for example:

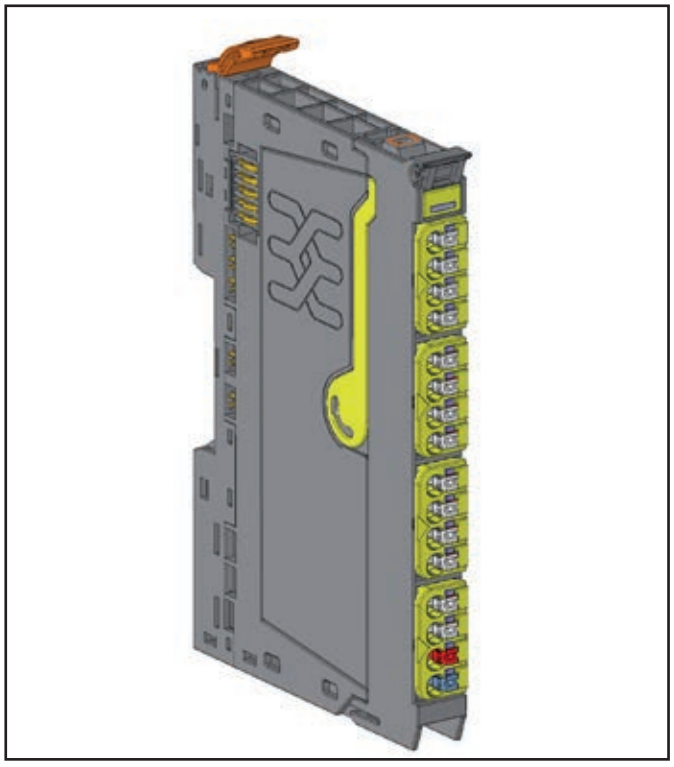
- design up to four 2-channel safety circuits (AND-linked), e.g. for emergency shutdown buttons, safety door contacts and safety light grids
- shutdown up to four actuators safely

All product-specific information and notes on the use of safe I/O modules can be found in the **Modules for functional safety** manual. The manual can be downloaded from the Weidmüller website.

6.53 Safe feed-in modules UR20-PF-O-xDI-SIL



Safe feed-in module UR20-PF-O-1DI-SIL



Safe feed-in module UR20-PF-O-2DI-DELAY-SIL

The u-remote safe feed-in modules PF-O-xDI-SIL are intended for connecting safety-related equipment. The PF-O-xDI-SIL modules are controlled with non-solid-state safety encoders and or safety encoders with OSSD inputs. The safety function consists of the safe interruption of 24 V outputs, the safe status of which is "24 V disconnected" (current path for outputs and the OSSD output are disconnected).
Each PF-O-xDI-SIL module safely disconnects the subsequent UR20 output modules; in each case, the safety segment up to the next following PF-O power-feed module. A safety-oriented input circuit together with pulsed outputs serve for detecting broken lines and short circuits.

Three types of PF-O-xDI-SIL modules are available in the u-remote system:
- UR20-PF-O-1DI-SIL (Order No. 1335030000): one safe input
- UR20-PF-O-2DI-SIL (Order No. 1335050000): two safe inputs
- UR20-PF-O-2DI-DELAY-SIL (Order No. 1335040000): two safe inputs, delayed disconnection possible

With PF-O-xDI-SIL modules, it is possible to implement the following safety functions:
- Up to two 2-channel safety circuits (AND linked), e.g. for emergency shutdown buttons, safety door contacts and safety light grids
- A range of output modules within a u-remote station is supplied with safe power through the switched +24 V OSSD output.
- PF-O-xDI-SIL modules can be cascaded.

In contrast to other power-feed modules the PF-O-xDI-SIL modules are active modules. Therefore they need to be considererd in hardware configuration. Also up to three passive modules can be arranged directly behind.

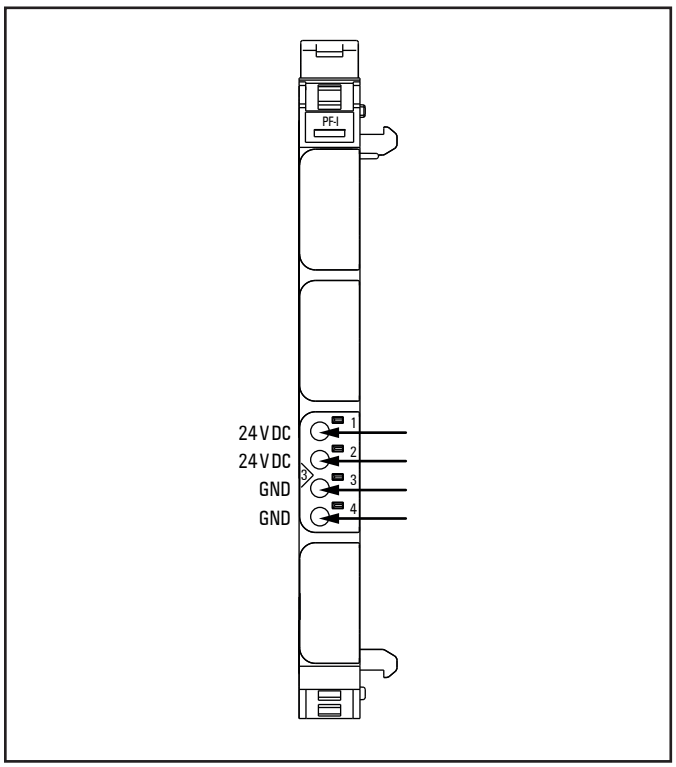
All product-specific information and notes on the use of PF-O-xDI-SIL modules can be found in the **Modules for functional safety** manual.
The manual can be downloaded from the Weidmüller website.

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6.54 Power-feed module for input current path UR20-PF-I



Power-feed module for input current path UR20-PF-I (Order No. 1334710000)



Connection diagram UR20-PF-I

Power-feed modules are used to refresh the current paths and isolate the power supply. The u-remote station's main power supply is always fed in via the coupler. A power-feed module UR20-PF-I must be connected if the current demand of the series of input modules is too large.

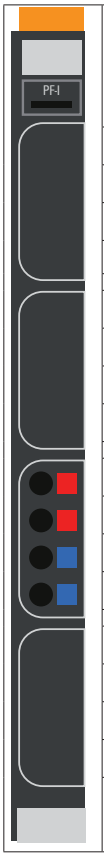
The maximum feed-in current in the input current path via the 4-pole connector is 10 A. Details required to calculate current demand and power supply see section 4.5.

Power-feed modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!

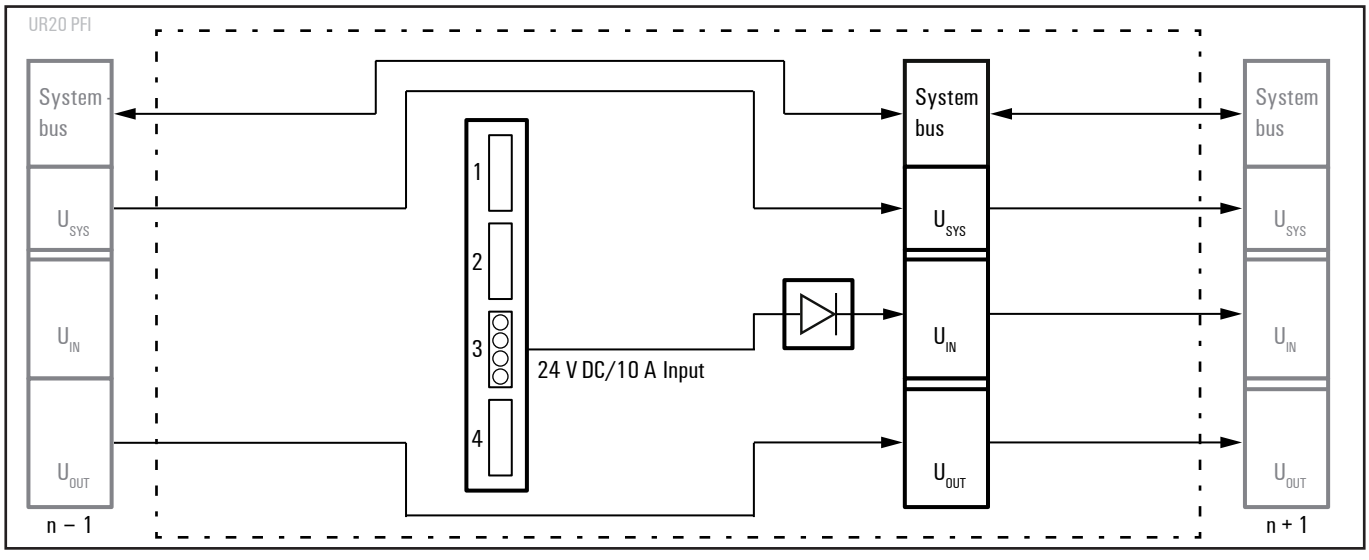
ATTENTION

Risk of material damage!
In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!



	Module status LED Green: voltage applied and is >18 V DC
3.1	Green: Supply voltage for input current path > 18 V DC
3.2	Red: Supply voltage for input current path < 18 V DC
3.4	Red: Internal fuse defective, replace module

LED indicators UR20-PF-I, error messages see Chapter 13



Block diagram UR20-PF-I

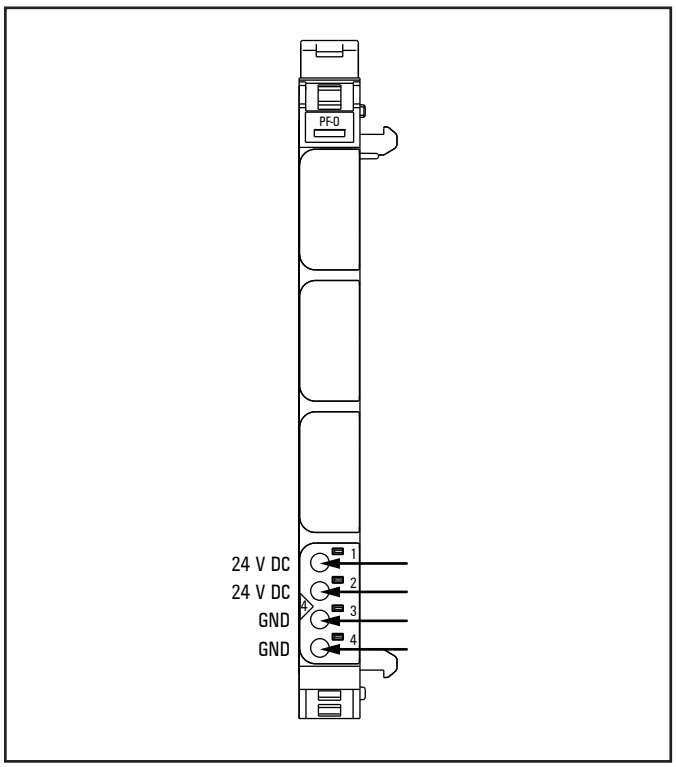
Technical data UR20-PF-I (Order No. 1334710000)

Supply	
Supply voltage for input modules	24 V DC +20 %/-15 %
Maximum feed current for input modules	10 A
Current consumption from input current path I_{IN}	10 mA
General data	
Weight (operational status)	76 g
For additional general data, see Section 3.4	

6.55 Power-feed module for output current path UR20-PF-O



Power-feed module for output current path UR20-PF-O (Order No. 1334740000)



Connection diagram UR20-PF-O

Power-feed modules are used to refresh the current paths and isolate the power supply. The u-remote station's main power supply is always fed in via the coupler. A power-feed module UR20-PF-O must be connected if the current demand of the series of output modules is too large.

The maximum feed-in current in the output current path via the 4-pole connector is 10 A. Details required to calculate current demand and power supply see section 4.5.

Power-feed modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!

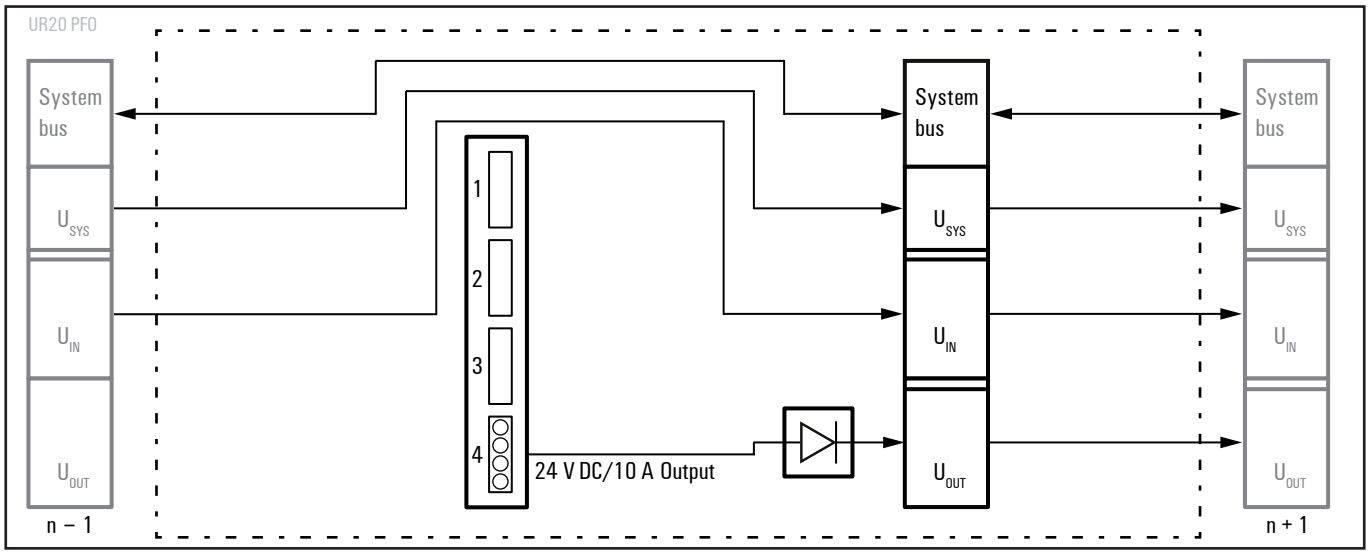
ATTENTION

Risk of material damage!
In the case of a maximum power supply of >8 A and a maximum temperature of >+55 °C, all four contacts must be connected with 1.5 mm² wiring!



	Module status LED Green: voltage applied and is > 18 V DC
4.1	Green: Supply voltage for output circuit > 18 V DC
4.2	Red: Supply voltage for output circuit < 18 V DC
4.4	Red: Internal fuse defective, replace module

LED indicators UR20-PF-O, error messages see Chapter 13

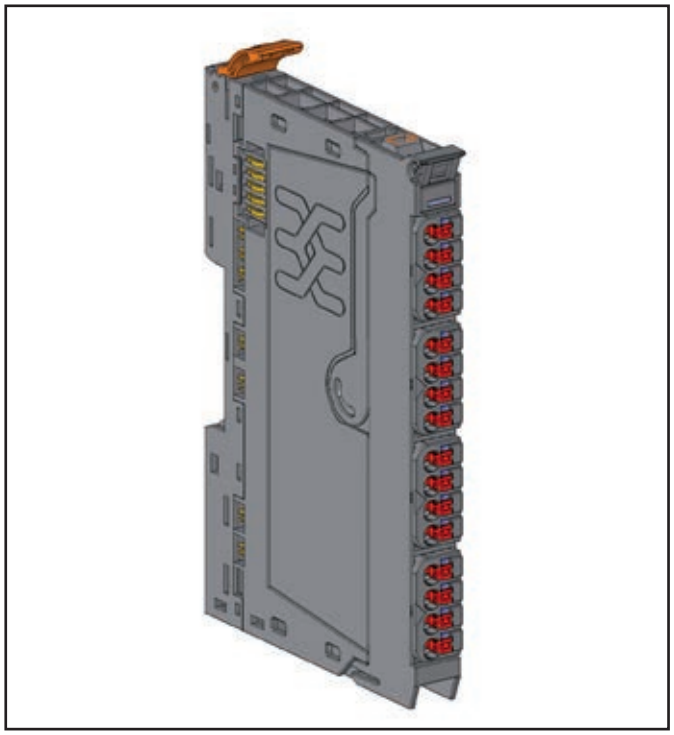


Block diagram UR20-PF-O

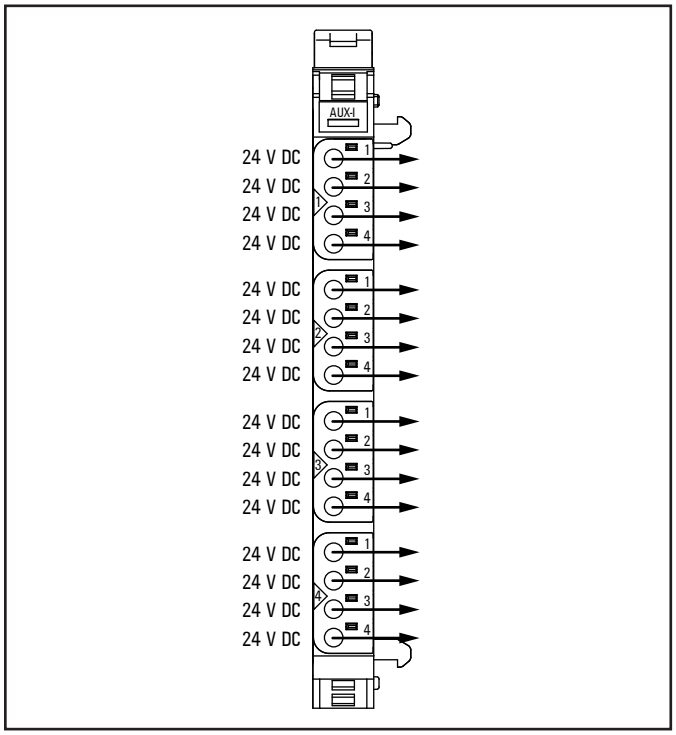
Technical data UR20-PF-O (Order No. 1334740000)

Supply	
Supply voltage for output modules	24 V DC +20 %/-15 %
Maximum feed-in current for output modules	10 A
Current consumption from output current path I_{OUT}	10 mA
Reactionless	no
General data	
Weight (operational status)	76 g
For additional general data, see Section 3.4	

6.56 Potential distribution module for input current path UR20-16AUX-I



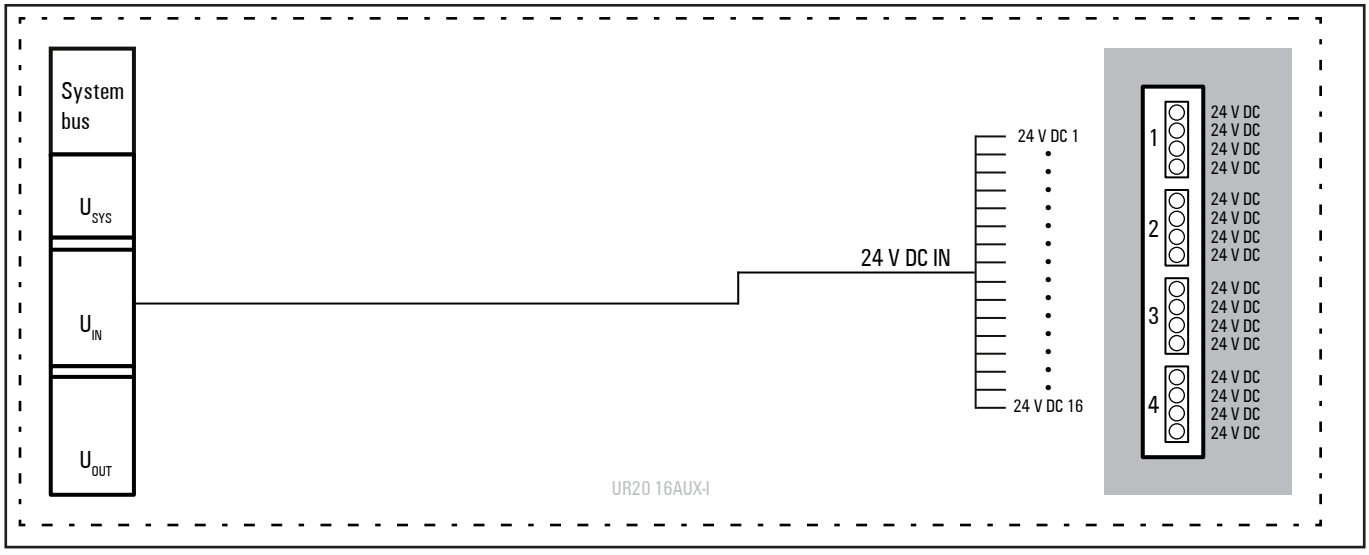
Power-feed module for output current path UR20-16AUX-I (Order No. 1334770000)



Connection diagram UR20-16AUX-I

The potential distribution module UR20-16AUX-I provides 16 connections for +24 V from the input current path. Potential distribution modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!

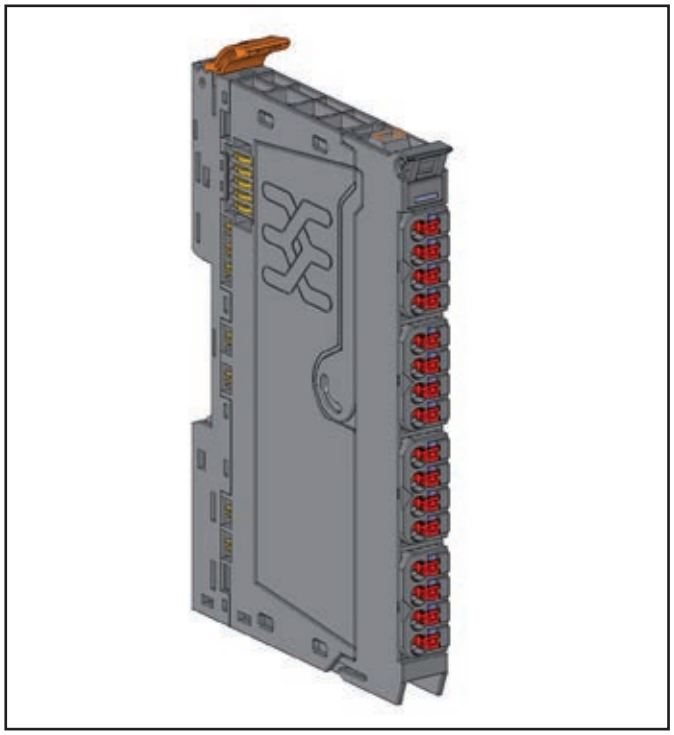


Block diagram UR20-16AUX-I

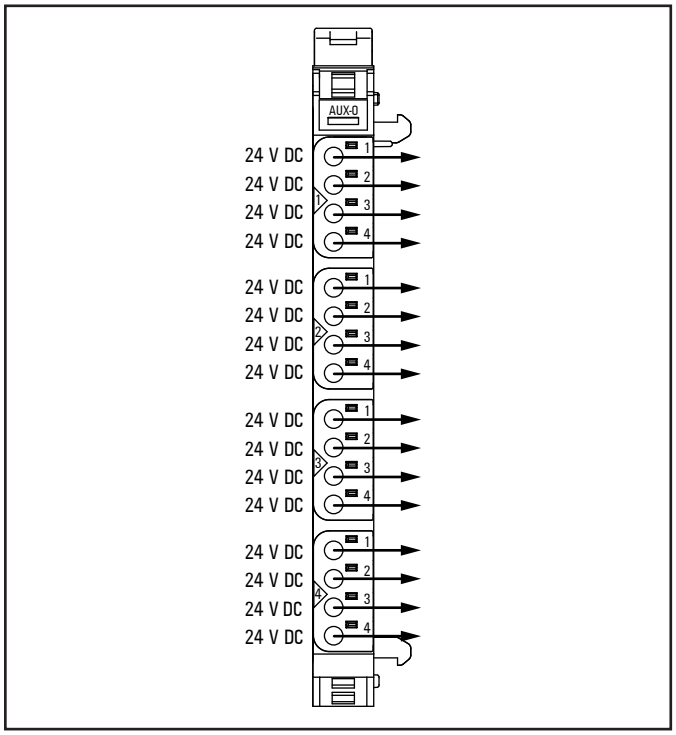
Technical data UR20-16AUX-I (Order No. 1334770000)

Supply	
Supply voltage	24 V DC +20 %/-15 % (from input current path)
General data	
Weight (operational status)	84 g
For additional general data, see Section 3.4	

6.57 Potential distribution module for output current path UR20-16AUX-O



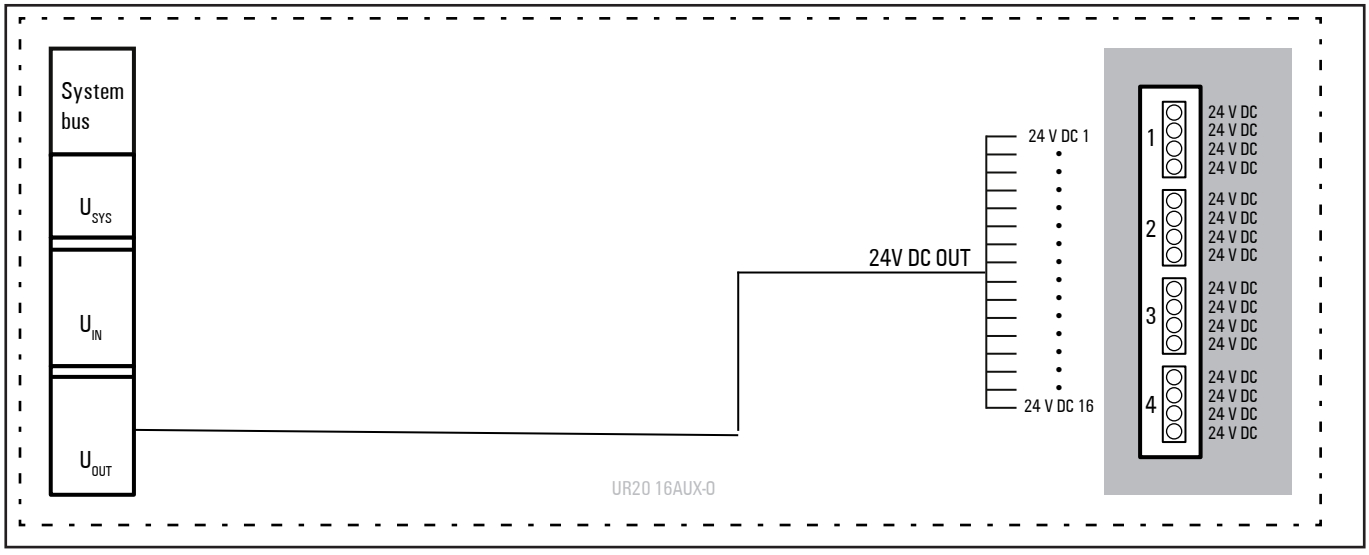
Potential distribution module for output current path UR20-16AUX-O (Order No. 1334780000)



Connection diagram UR20-16AUX-O

The potential distribution module UR20-16AUX-O provides 16 connections for +24 V from the output current path. Potential distribution modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!

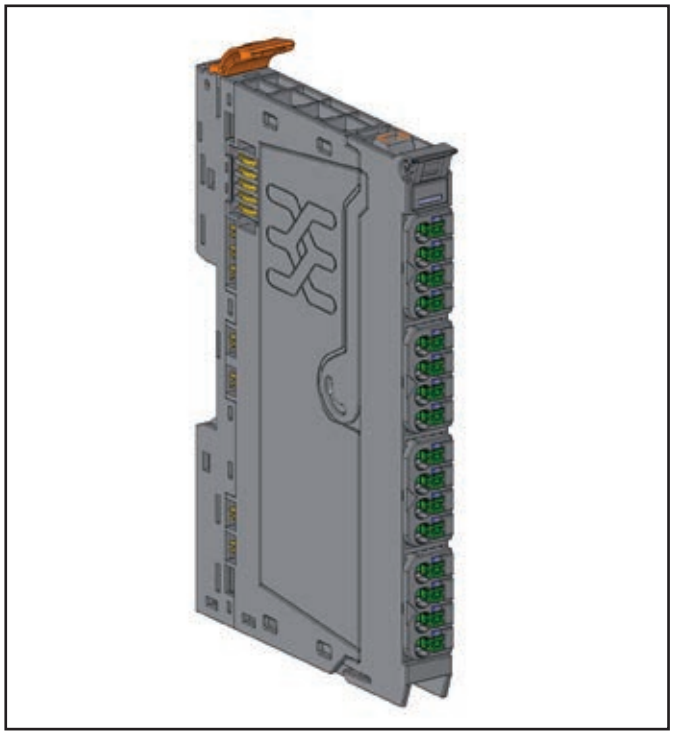


Block diagram UR20-16AUX-O

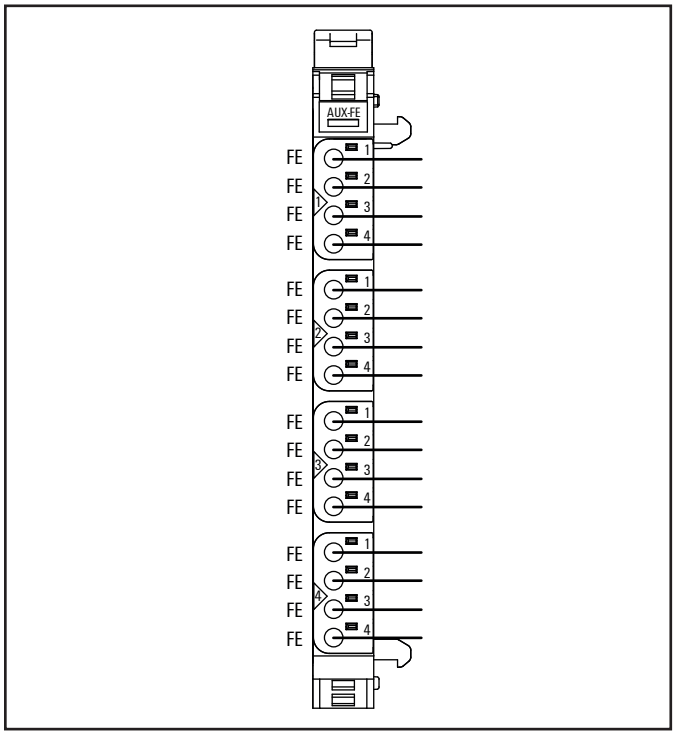
Technical data UR20-16AUX-O (Order No. 1334780000)

Supply	
Supply voltage	24 V DC +20 %/-15 % (from output current path)
Reactionless	yes
General data	
Weight (operational status)	84 g
For additional general data, see Section 3.4	

6.58 Potential distribution module for functional earth UR20-16AUX-FE



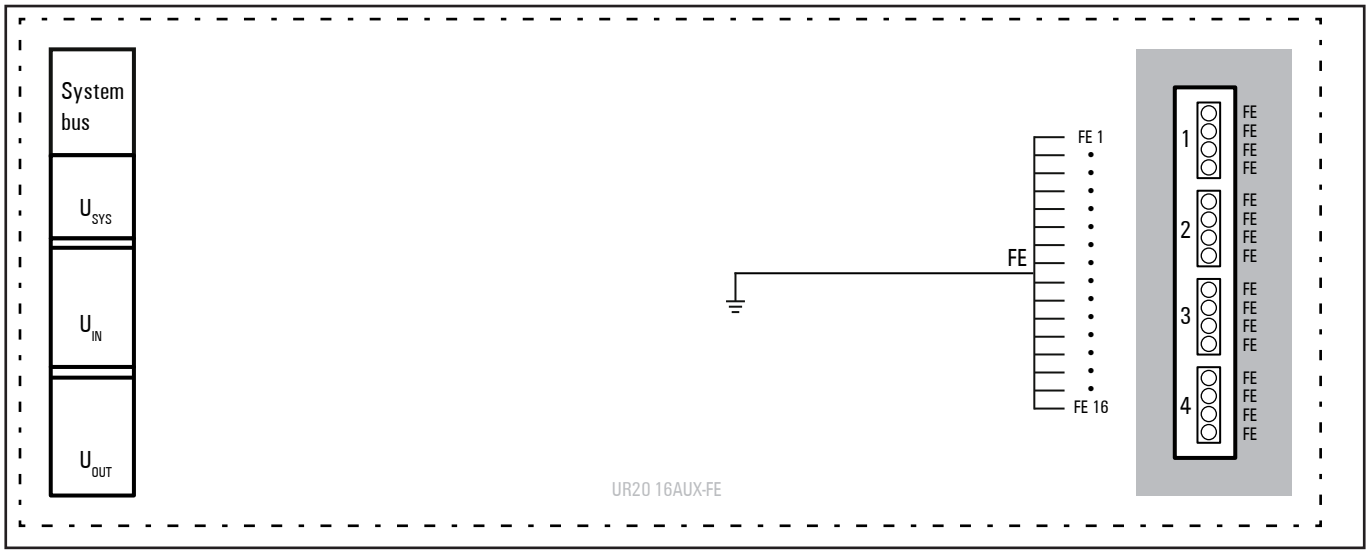
Potential distribution module for output current path UR20-16AUX-FE (Order No. 1334790000)



Connection diagram UR20-16AUX-FE

The potential distribution module UR20-16AUX-FE provides 16 connections for the functional earth. Potential distribution modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!

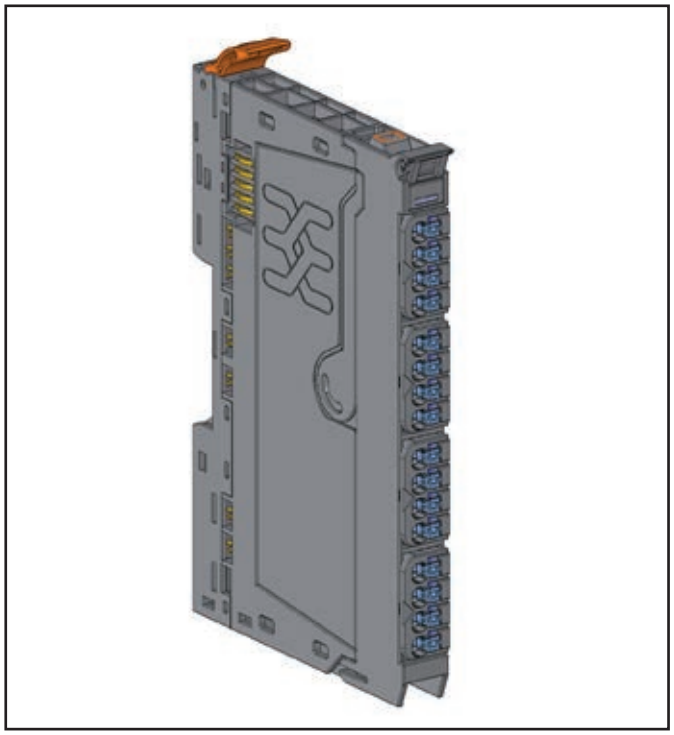


Block diagram UR20-16AUX-FE

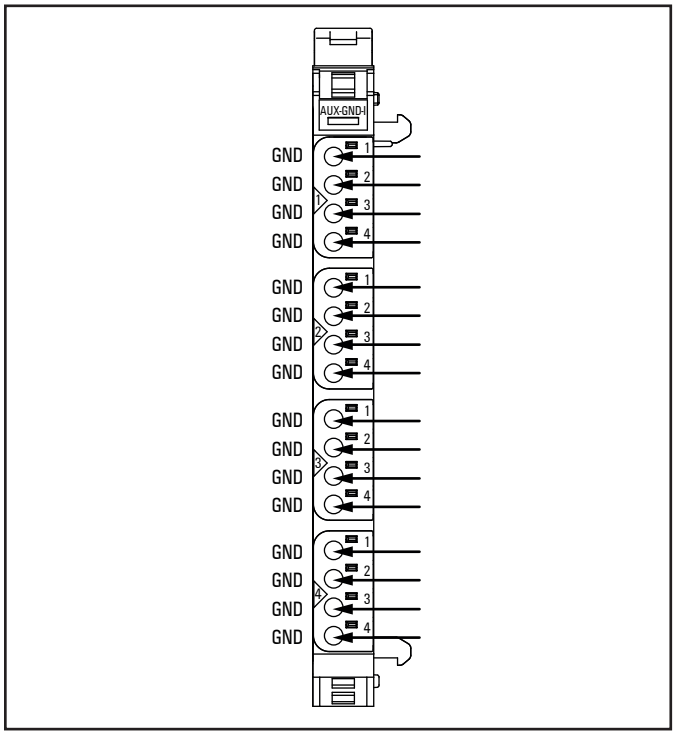
Technical data UR20-16AUX-FE (Order No. 1334790000)

Supply	
Supply voltage	None
General data	
Weight (operational status)	84 g
For additional general data, see Section 3.4	

6.59 0-V potential distribution module for the input current path UR20-16AUX-GND-I



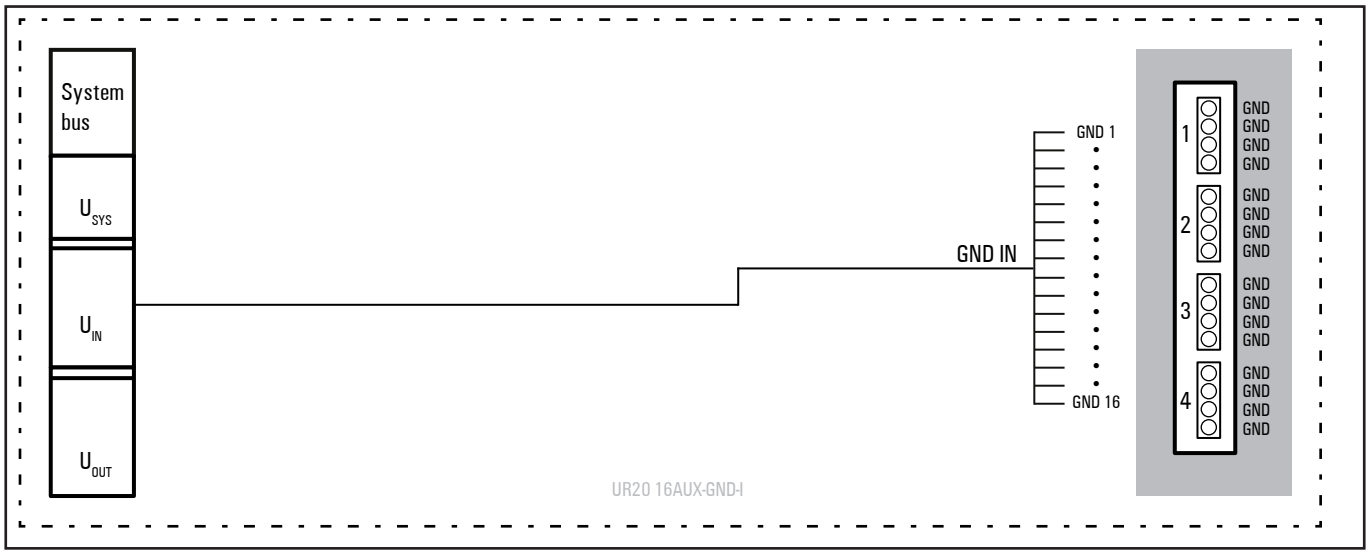
0-V potential distribution module for the input current path UR20-16AUX-GND-I (Order No. 1334800000)



Connection diagram UR20-16AUX-GND-I

The potential distribution module UR20-16AUX-GND-I provides 16 connections for 0 V from the input current path. Potential distribution modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!

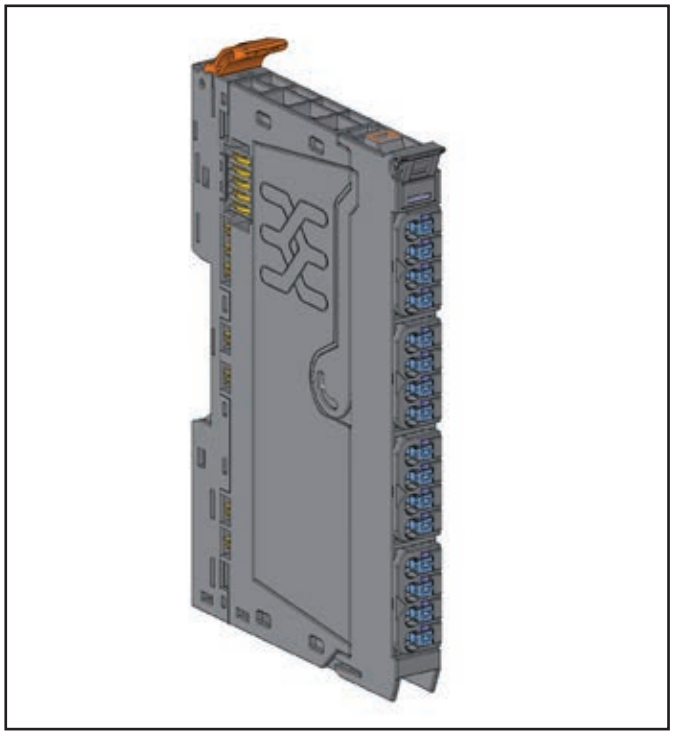


Block diagram UR20-16AUX-GND-I

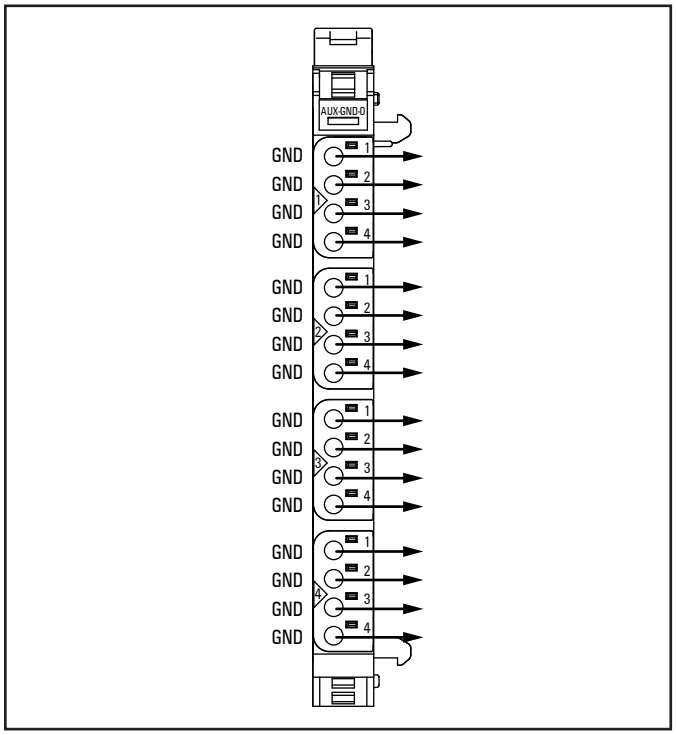
Technical data UR20-16AUX-GND-I (Order No. 1334800000)

Supply	
Supply voltage	0 V (from input current path)
General data	
Weight (operational status)	84 g
For additional general data, see Section 3.4	

6.60 0-V potential distribution module for the output current path UR20-16AUX-GND-0



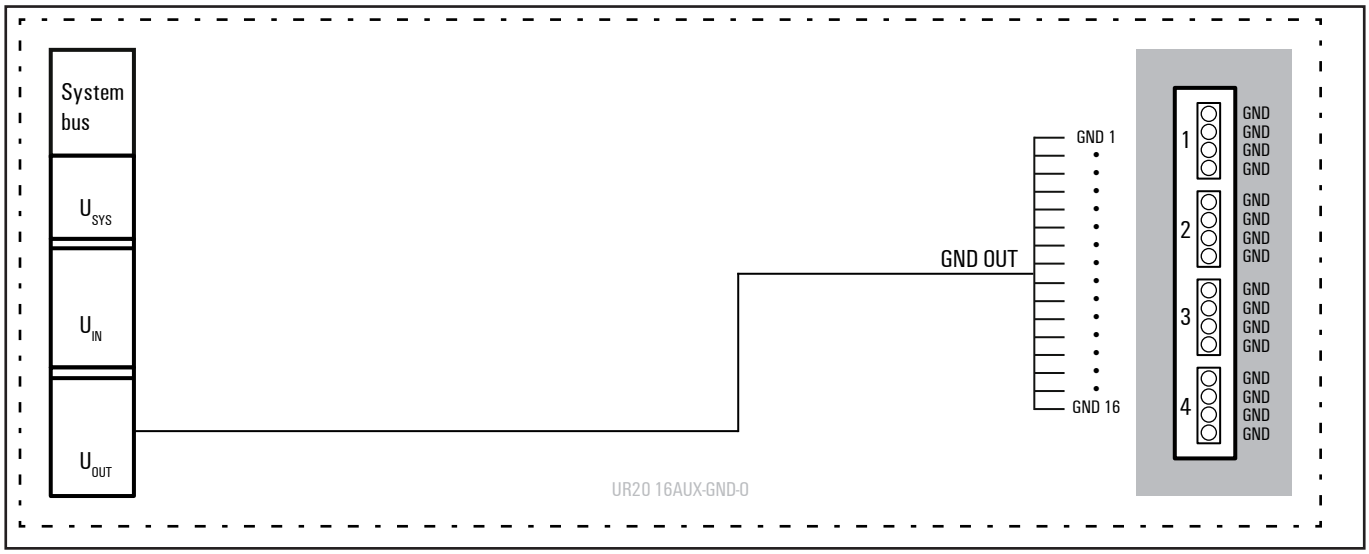
0-V potential distribution module for the output current path UR20-16AUX-GND-0 (Order No. 1334810000)



Connection diagram UR20-16AUX-GND-0

The potential distribution module UR20-16AUX-GND-0 provides 16 connections for 0 V from the output current path. Potential distribution modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!



Block diagram UR20-16AUX-GND-0

Technical data UR20-16AUX-GND-0 (Order No. 1334810000)

Supply	
Supply voltage	0 V (from output current path)
Reactionless	yes
General data	
Weight (operational status)	84 g
For additional general data, see Section 3.4	

6.61 Empty slot module UR20-ES



Empty slot module UR20-ES (Order No. 1315770000)

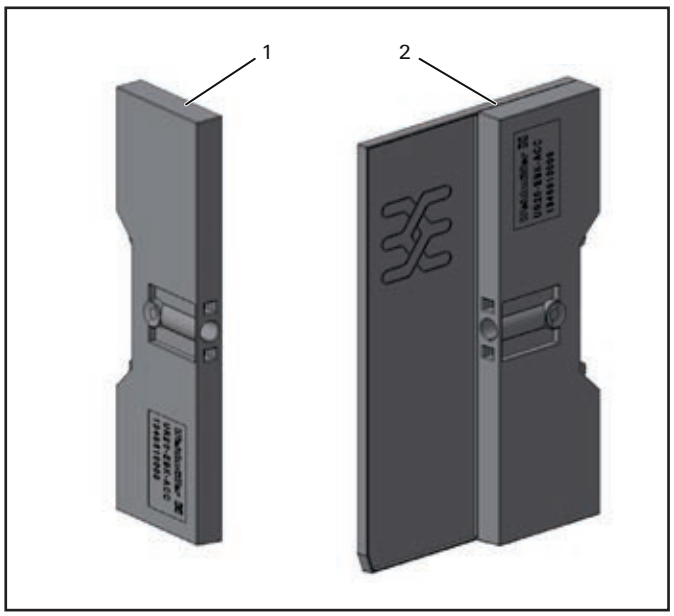
Empty slot modules can be integrated as reserve modules in a station. They bridge all contacts in the basic module 1:1 and otherwise have no function.
Empty slot modules are passive modules without fieldbus communication, therefore they are not considered during configuration.

A maximum of three passive modules (power-feed module, potential distribution module, empty slot module) may be installed in succession, however the next module to be installed must be an active module!

Technical data UR20-ES (Order No. 1315770000)

General data	
Weight (operational status)	70 g
For additional general data, see Section 3.4	

6.62 Termination kit, end bracket for vertical installation



Termination kit UR20-EBK-ACC (Order No. 1346610000)

Each UR20-FBC fieldbus coupler is delivered together with a termination kit UR20-EBK-ACC. This comprises two end brackets and an end plate. The end plate protects the contacts on the last module at the end of the u-remote station. The station is fixed to the DIN rail on both sides via the end brackets.



End bracket for vertical installation MEW 35/1 (Order No. 1805610000)

The MEW 35/1 end bracket is additionaly required for the vertical installation of a u-remote station. It is to be ordered separately.

Technical data

Weight (operational status)	
UR20-EBK-ACC (Order No. 1346610000)	51 g
MEW 35/1 (Order No. 1805610000)	66 g

7 Installation



WARNING

Explosion risk!
During assembly work, sparks can form and surfaces may become excessively hot.
- ► Before assembly, make sure that there is not a potentially explosive atmosphere!
- ► For applications in potentially explosive atmospheres, observe the installation and construction requirements of EN 60079-15 and/or country-specific regulations.



WARNING

Dangerous contact voltage!
- ► Carry out assembly and wiring work on the u-remote station only when the power supply is disconnected.
- ► Make sure that the place of installation (switch cabinet etc.) has been disconnected from the power supply!

7.1 Preparations for assembly

The u-remote station is designed for installation in switch cabinets, terminals or switch boxes in decentralised systems. The fieldbus coupler and I/O modules conform to protection class IP20.

Environmental conditions

Make sure that the permitted environmental conditions for installation and operation are observed (see the general technical data in Sections 3.2 and 3.4).

DIN rail

The u-remote station is designed to be installed on a DIN rail (35 × 7.5 mm or 35 x 15 mm) made from steel or galvanised steel according to EN 60715. The DIN rail must be mounted prior to the installation of the u-remote station.

The DIN rail must be attached to the surface at least every 20 cm to protect it from vibration and impact. If it is installed on earthed mounting plates, it does not have to be separately earthed.

Stripping lengths

The required stripping length for every Weidmüller product is specified in mm. These lengths, e.g. 6 mm ± 0.5 mm, ≥ 10 mm ±1 mm, must be observed. This also applies to the use of wire-end ferrules. The external dimensions of the crimped wire-end ferrules must conform with IEC-60947-1. For detailed information see section 7.5.

Unpacking the delivery

All of the elements that make up the u-remote station are packaged individually for delivery.
- ► Please check the delivery for completeness and transport damage.
- ► Please report any transport damage immediately to the respective transport company.



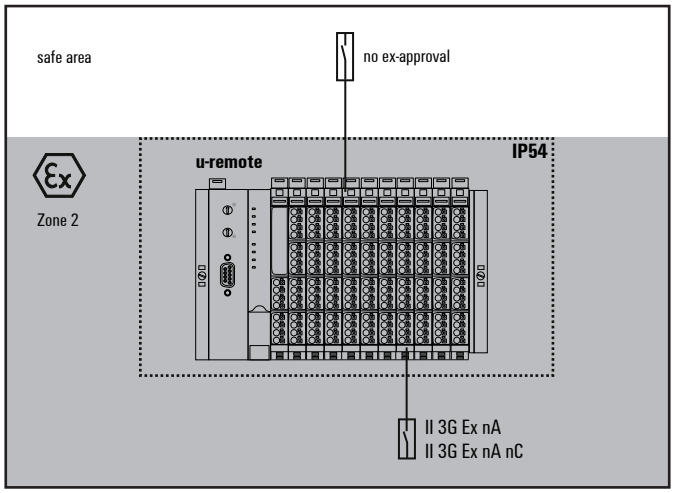
ATTENTION

The product can be destroyed by electrostatic discharge!
The components in the u-remote series can be destroyed by electrostatic discharge.
- ► Please make sure that personnel and work equipment are adequately earthed!

- ► Unpack all parts and sort the modules into the installation sequence as per the instructions.
- ► Dispose of all packaging in accordance with the local disposal guidelines. The cardboard packaging from the modules and fieldbus couplers can be sent for paper recycling.

Use in a potentially explosive atmosphere

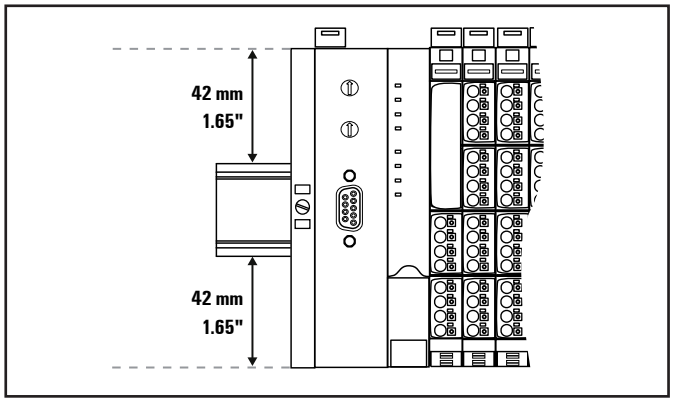
If the u-remote station is used in a potentially explosive atmosphere rated as Zone 2, the housing must meet the requirements of explosion protection type Ex n or Ex e and protection class IP54. Sensors and actuators that are located in Zone 2 or in a safe zone can be connected. All cable glands on the housing must be approved for Ex e.



Use in a potentially explosive atmosphere

Installation position

The u-remote station is usually installed on a horizontally positioned DIN rail.



Installation position of the u-remote station on the DIN rail (horizontal installation)

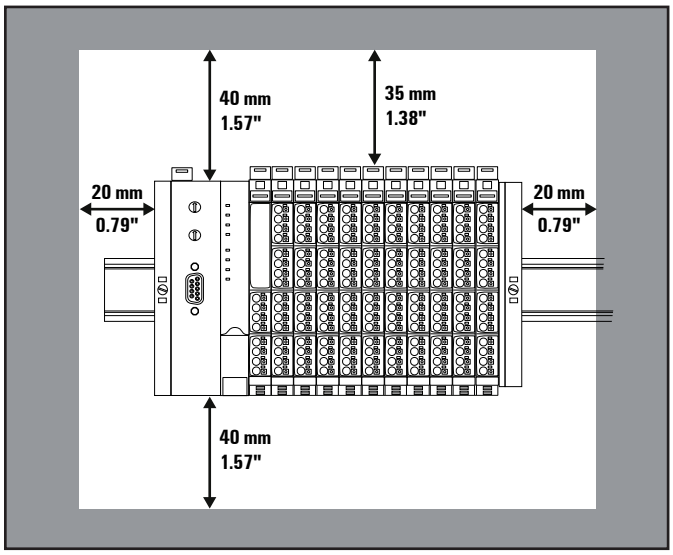
Installation on vertically positioned DIN rails is also possible. In this case however, the heat dissipation is reduced such that the derating values change (see Section 4.5).
In the case of vertical mounting, the fieldbus coupler must always be arranged as the first module at the bottom and secured with a reinforced end bracket for vertical mounting (Order no. 1805610000).

Installation distances

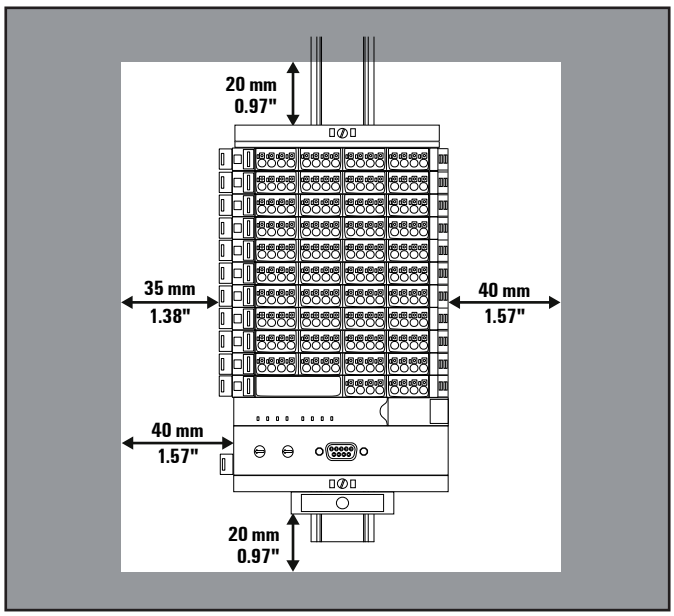
Depending on how the station shielding is implemented, the specified distances may have to be larger than those given below.

Ensure compliance with the minimum permissible cable bending radius.

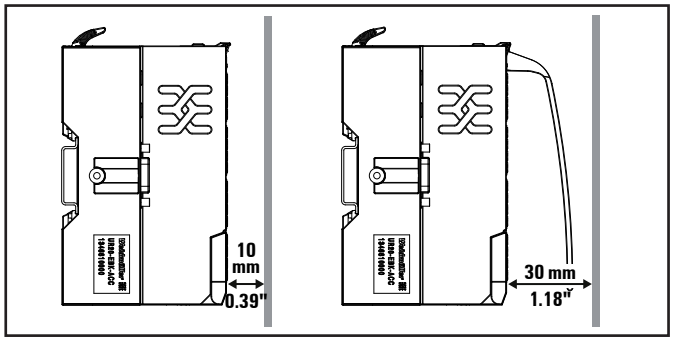
In order to be able to carry out the installation and further maintenance work and to ensure sufficient ventilation, the u-remote station must be installed while observing the following minimum distances. Earth terminals already installed can be ignored when calculating the distance.



Minimum distances with horizontal installation



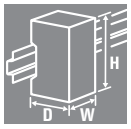
Minimum distances with vertical installation



Minimum distance to switch cabinet door (with/without swivel marker)

Calculation of space requirements

The space requirements for a u-remote station with n modules (**horizontal installation**) is calculated as follows:



Height:	120 mm (4.72″)	
	+ 2 × 40 mm (1.57″)	distances at top and bottom
	= **200 mm (7.87″)**	
Width:	8 mm (1.57″)	end bracket
	+ 52 mm (2.05″)	bus coupler
	+ n × 11.5 mm (0.45″)	n modules
	+ 11.5 mm (0.45″)	end plate and end bracket
	+ 2 × 20 mm (0.79″)	distances to the sides
	= **111.5 mm (4.39″) + n × 11.5 mm (0.45″)**	

For **vertical installation** interchange height and width. When calculating the width, 4.5 mm for the must be added for the end bracket MEW 35/1 (Order No. 1805610000).

Installation sequence

A u-remote station may only be installed in this sequence (starting from the left/bottom):

- End bracket
- Bus coupler
- Up to 64 active modules
- End plate and end bracket

If the station has already been configured, please proceed to the corresponding installation drawing. If you are configuring the station yourself, please observe the following instructions:

- Observe the maximum current carrying capacity (see section 4.5)!
- Furthermore, the modules may be arranged in any sequence. In order to configure the station as clearly as possible, we recommend arranging the modules according to their function.

Arrangement of safe power-feed modules

A safe power-feed module (PF-O-xDI-SIL) can be positioned anywhere in the u-remote-station. All of the following output modules up to the next PF-O module will be safely disconnected (safety segment). Multiple safe power-feed modules/ safety segments can be set up in a single station.

When using u-remote safe power-feed modules, please also observe the **Modules for Functional Safety Manual**.
The manual is available to download from the Weidmüller website.

Preparation and the required tool

The DIN rail must already be installed. To mechanically install the u-remote station, you will need a 3-mm screwdriver.

- ► Lay out the modules in the intended sequence.
- ► Check whether the DIN rail feet can be moved on both end brackets. If necessary, loosen the mounting screw until the DIN rail feet can be moved freely.
- ► If not done yet, fit an earth terminal to the DIN rail.

7.2 Assembling the u-remote station

WARNING

Explosion risk!

► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING

Dangerous contact voltage!

► All work on the u-remote station must be carried out with the power supply disconnected.

► Make sure that the place of installation (switch cabinet etc.) has been disconnected from the power supply!

ATTENTION

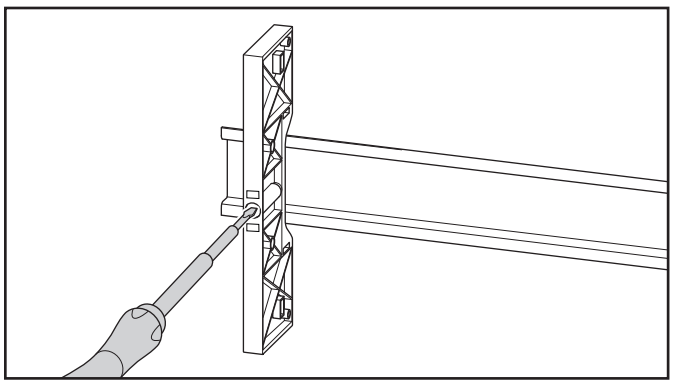
The product can be destroyed by electrostatic discharge!

The components in the u-remote series can be destroyed by electrostatic discharge.

► Please make sure that personnel and work equipment are adequately earthed!

Please note that for failure-free operation the end brackets delivered with the coupler have to be installed necessarily to achieve a permanent set of the u-remote station.

► On the left side of the installation site, place an end bracket on the DIN rail with the exterior of the bracket facing left and screw it down tightly (using a 3-mm screwdriver).



Attaching the end bracket

When installing the u-remote products, make sure that you listen for the double click:

1. When snapping onto the DIN rail
2. When pushing together with the neighbouring module.

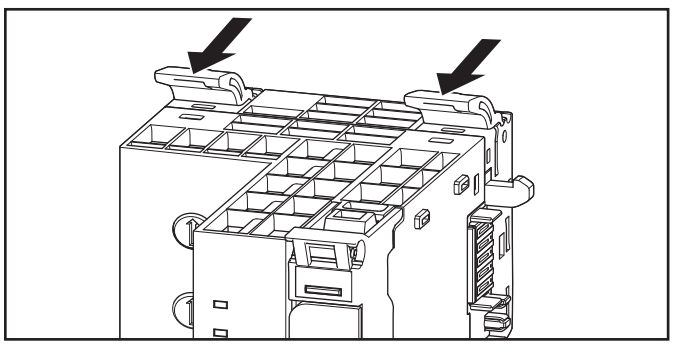
The modules are in the correct position and the connection is made only when both snapping noises are heard.

ATTENTION

Improper installation may prevent earthing!

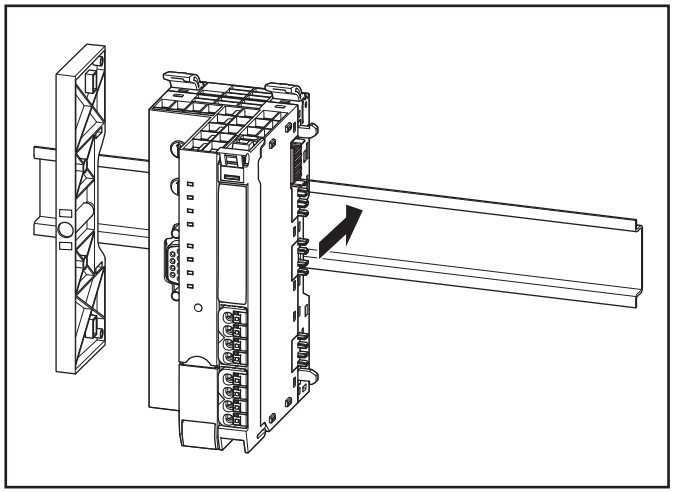
The earthing of the modules and couplers is only ensured if the FE spring at the bottom is in contact with the DIN rail.

► During installation, make sure that both release levers on the bus coupler and all release levers on the modules are closed before snapping onto the DIN rail.



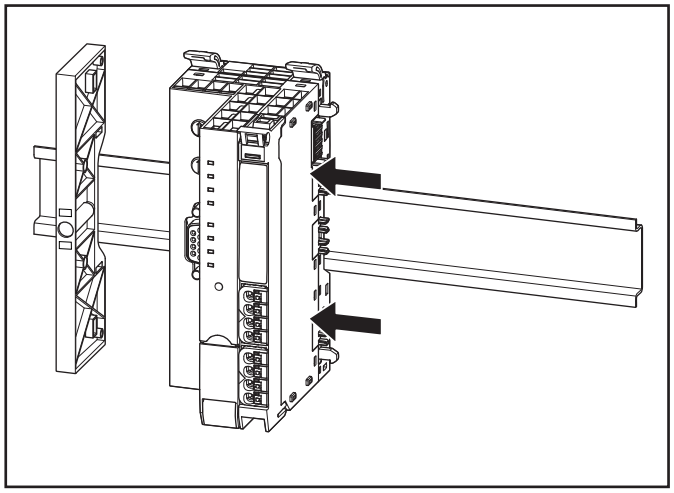
Release lever closed

► Place the field bus coupler (module side to the right) on the DIN rail so that it audibly clicks into place.



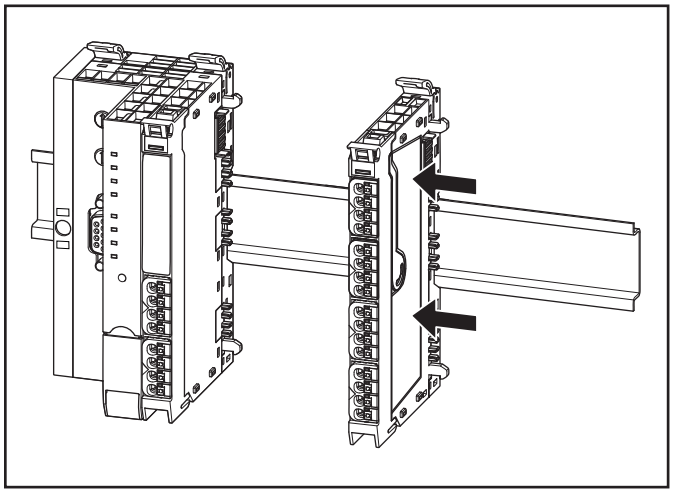
Attaching the bus coupler to the DIN rail

► Slide the bus coupler to the left until it completely connects with the end bracket. At the same time, press the bus coupler as close as possible to the DIN rail so that the coupler is not tilted.



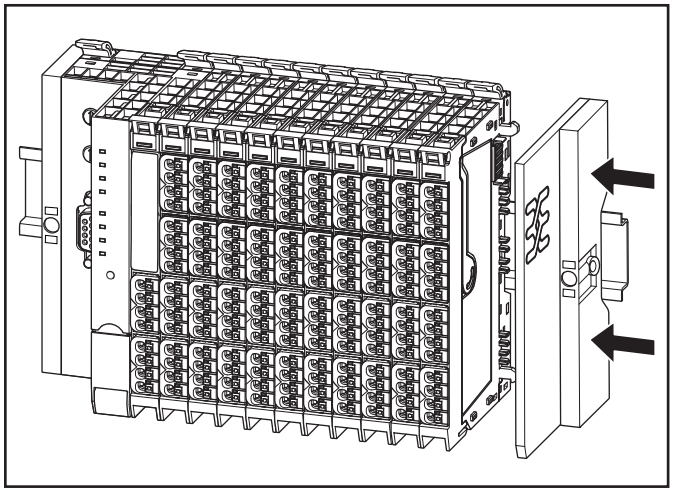
Sliding the bus coupler into position

► Place the first module on the DIN rail and press it down firmly. It must audibly click into place.
► Slide the module to the left until it audibly clicks into place on the bus coupler. At the same time, press the module as close as possible to the DIN rail so that the module is not tilted.



Sliding the module into position

► Attach all of the other modules as described above.
► Connect the second end bracket to the end plate as specified by the alignment pins.
► Place both parts on the DIN rail on the right-hand side of the station so that the end bracket faces outwards.
► Slide the end bracket and end plate to the left until it completely connects with the last module.



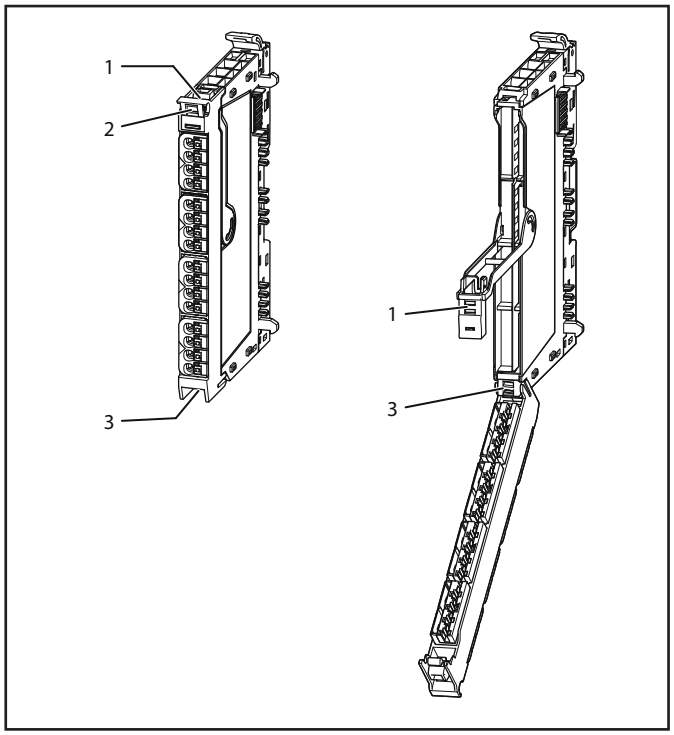
Sliding the end plate with end bracket into position

► Screw down the end bracket tightly (using a 3-mm screwdriver).
► Make sure that all release levers are in the locking position as standard. If this is not the case, click the open release lever into place.

7.3 Attaching the marker

Attaching the module marker

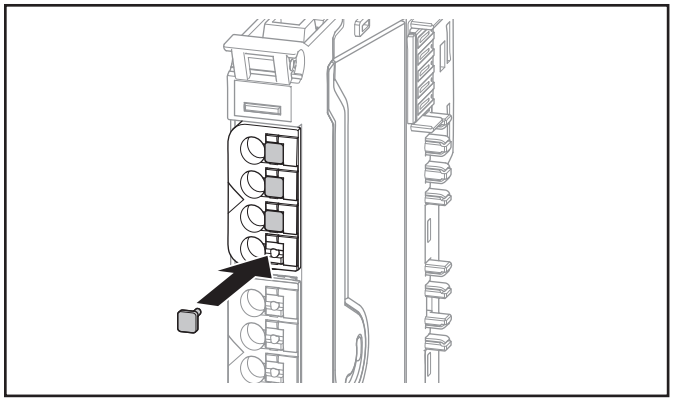
Each I/O module can be labelled at three points using the markers. This ensures clear allocation when replacing individual elements.



Three attachment points for markers

► Press the labelled marker into the corresponding fixture.

Attaching connection marker (connector PG 1.5 mm only)



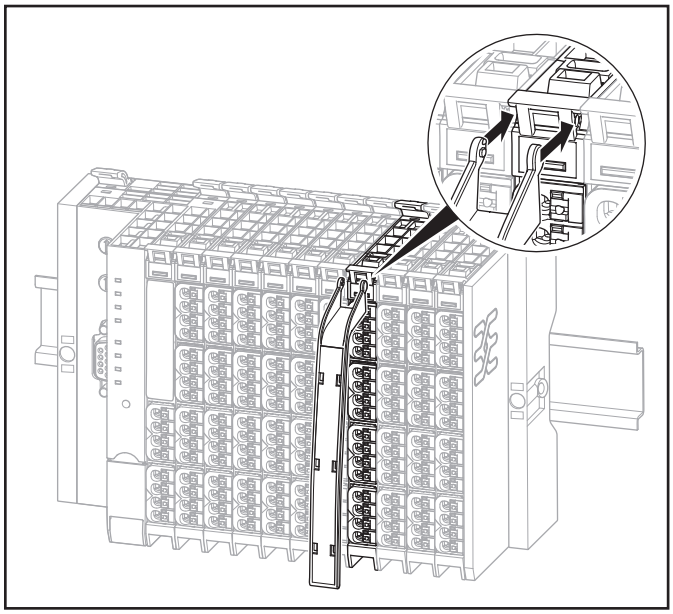
Attaching the connection marker

► Insert the labelled marker into the pusher for the connector.

Attaching the swivel marker

A swivel marker, available as an accessory (Order No. 1339920000), is best suited for making detailed markings on the connector frame.

► Snap the swivel marker into place on top of the module connector frame.

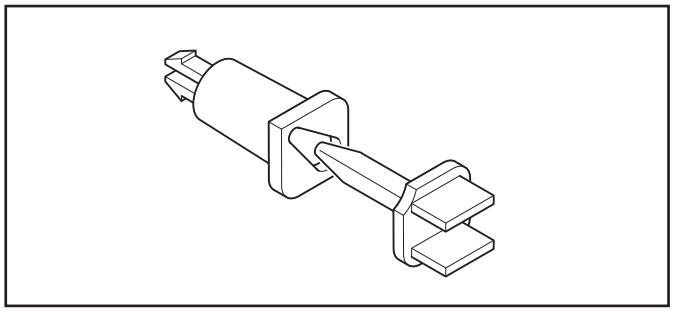


Attaching the swivel marker

► Insert the labelled marker into the swivel marker from below.

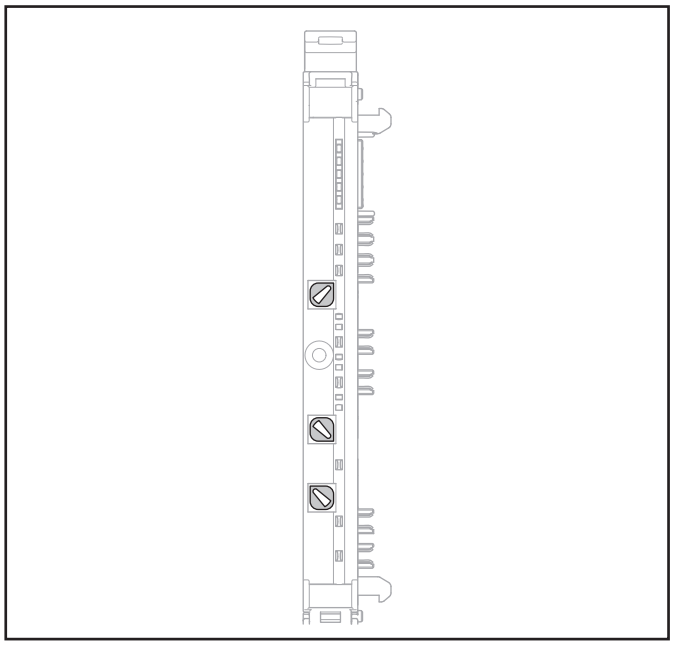
7.4 Coding the module

In order to prevent an electronic module being mismated, the modules can be coded by the customer. Coding is carried out by two small components: the orange coding socket and the black coding pin. Three codings can be applied to each basic module. Suggestions for the appropriate coding can be found in the annex.



Coding socket and coding pin

► Open the connection frame and remove the electronic unit (see Chapter 7).
► Place the coding sockets (orange) in the coding ports on the inside of the basic module.

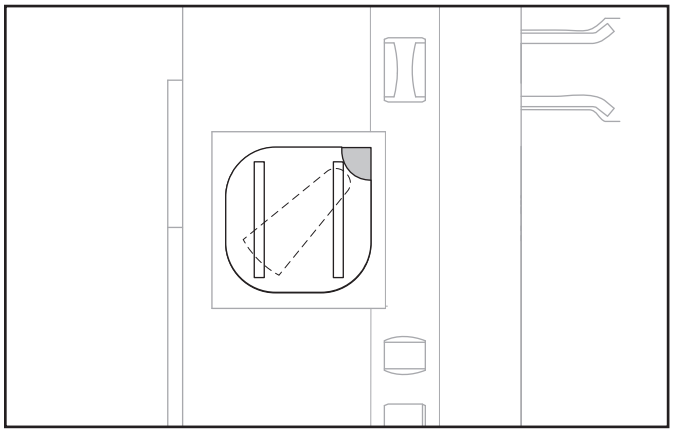


Basic module with inserted coding sockets

Each coding socket has one pointed and three rounded corners. The arrangement of the three sockets in the basic module allows for 4^3, i.e. 64, possible combinations.

► If necessary, you can rotate the inserted coding sockets into the required position using a 3-mm screwdriver.
► Insert a black coding pin to the stop in each coding socket.

A small orange corner will now be visible on each coding unit, which allows the coding state to be identified.



Coding socket with inserted coding pin

► Put the electronic module back into position.

The coding pin now engages securely in the electronic module. If the electronic unit has to be removed again, it can subsequently only be re-inserted back into the correspondingly coded basic module.

If the electronic module is replaced by a new module, this must be fitted with new coding pins.

7.5 Wiring



WARNING

Explosion risk!

- ► Before assembly, make sure that there is not a potentially explosive atmosphere!
- ► For applications in potentially explosive atmospheres, observe the installation and construction requirements of EN 60079-15 and/or country-specific regulations.



WARNING

Dangerous contact voltage!

- ► Carry out assembly and wiring work on the u-remote station only when the power supply is disconnected.
- ► Make sure that the place of installation (switch cabinet etc.) has been disconnected from the power supply!



WARNING

Safety functions can be impaired!

When safe I/O modules or safe power-feed modules are installed in the u-remote station, please observe the following points:

- ► Please use wire-end ferrules in combination with flexible/multi-conductor cables to avoid cross-circuits.
- ► Ensure that for safety inputs in the configuration without test pulses the cabling prevents external short circuits (see DIN EN ISO 13849-2 Table D.4).

Once the u-remote station has been mechanically installed, the wiring can be carried out in accordance with the wiring plan.

Wiring of modules with connectors PG 1.5 mm

Wires with a cross section between 0.14 mm² and 1.5 mm² (AWG 16 – 26) can be connected.

We recommend using the following wire-end ferrules:

Cross-section	AWG	Weidmüller order no. Weidmüller colour code	Weidmüller order no. DIN colour code
0.14 mm²	26	9028240000	
0.25 mm²	24	9025760000	
0.34 mm²	22	9025770000	
0.50 mm²	20	9025870000	9019020000
0.75 mm²	18	9025860000	9019050000
1.00 mm²	17	9025950000	9019100000
1.50 mm²	16	0635100000	9019130000

Wire-end ferrules for the wiring

The external dimensions of the crimped wire-end ferrules must conform with IEC-60947-1. We recommend the following tools for crimping:

- – Crimping tool for wire-end ferrules from 0.25 mm² to 1.5 mm² (AWG 16 – 24) with a trapezoidal indentation crimp, type: PZ 6/5 ZERT (Order No. 9017900000)
- – Crimping tool for wire-end ferrules from 0.14 mm² to 0.75 mm² (AWG 18 – 26) with a trapezoidal crimp, type: PZ 1.5 ZERT (Order No. 9017310000)

u-remote modules (except HD modules) and bus couplers are equipped with the "PUSH IN" connector system. Single-strand and fine-strand lines with wire-end ferrules can be inserted without the need for a tool.

- ► Each cable must be the optimal length so that the bending radii observe the manufacturer's specifications.
- ► Strip the insulation from the lines to a length of approx. 10 mm ± 1 mm, even if you are using wire-end ferrules. If you use wire-end ferrules with plastic collars, strip the wires to 12 mm ± 1 mm.
- ► Connect all lines according to wiring diagram.

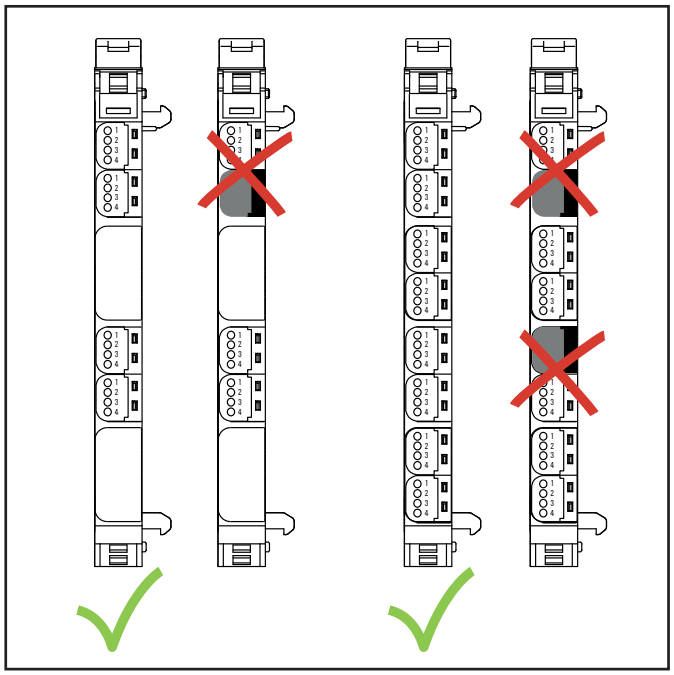
For the usage and handling of the "PUSH-IN" system, see Section 11.5.

Wiring of modules with HD connectors PG 0.35 mm

When using HD-connectors UR20-PG0.35 qualified wires with a cross section between 0.14 mm² and 0.35 mm² (AWG 22 – 26) and a outer wire diameter between 1.0 and 1.6 mm (0.04 to 0.06") can be connected by insulation displacement connectors (IDC). A list of SAI cables approved for the use with HD-connectors (Document-No. 1541020000) is available to download from the Weidmüller website.

Required tools:
- multi-stripax 6-16 (Order no. 9202210000)
- Pressing tool PWZ-UR20-HD (Order no.1525820000)

When using HD-connectors UR20-PG0.35 always two HD connectors must be applied into one slot of the connector frame.



Application of HD connectors

- ► Each cable must be the optimal length so that the bending radii observe the manufacturer's specifications.
- ► Strip the insulation from the cable to a length of approx. 20 mm using the multi-stripax 6-16.
- ► Insert all wires according to wiring diagram as far as they will go into the clamping unit of the connector. Regard the marking (pin 1 to 4) on the transparent presorter.
- ► Apply the pressing tool and check whether all wires are inserted as far as they will go.
- ► Press the HD connector using the pressing tool.
- ► Insert the wired connector into the module's connector frame.

7.6 Insulation test

Insulation tests on the u-remote station have to be done according to the national regulations, in any case necessarily before each commissioning.

ATTENTION

The product can be destroyed by too high test voltage!

Please note during insulation test:
- within one channel the test voltage between 24 V and GND must not exceed 28,8 V!*
- A maximum test voltage of 500 V can be applied tho all other connection points.
- Up to 4000 V can be applied to the modules UR20-4RO-SSR-255 and UR20-4RO-CO-255:
  - between the four channels
  - between one channel and the system voltage.

* We recommend to short-circuit 24 V and GND on all power supply connectors (fieldbus coupler, power-feed modules, safe power-feed modules and PLC-modules).

8 Earthing and shielding

The terms “earths” and “shields” are classified according to their relation to human safety or system safety. An earth is installed primarily to protect human life, and for this reason it is referred to as the protective earth (PE) conductor. A shield, on the other hand, serves to ensure the trouble-free operation of an electrotechnical system as well as electromagnetic compatibility.

The main differences between the two terms are therefore the electrical design and installation. A shield is not designed to transfer power, even though leakage currents can flow on it – something which must be avoided. In contrast, a PE conductor must be capable, at least in the short term, of discharging high residual currents (IEC 60947-7-2). The corresponding short-term current resistance of the PE connection must be 120 A/mm² of the connected cross-section. To make sure a shielding concept is able to work properly, the shield impedance must be 10 times larger than the impedance of the earth potential.

The following figure shows how these two topics relate to each other in application.

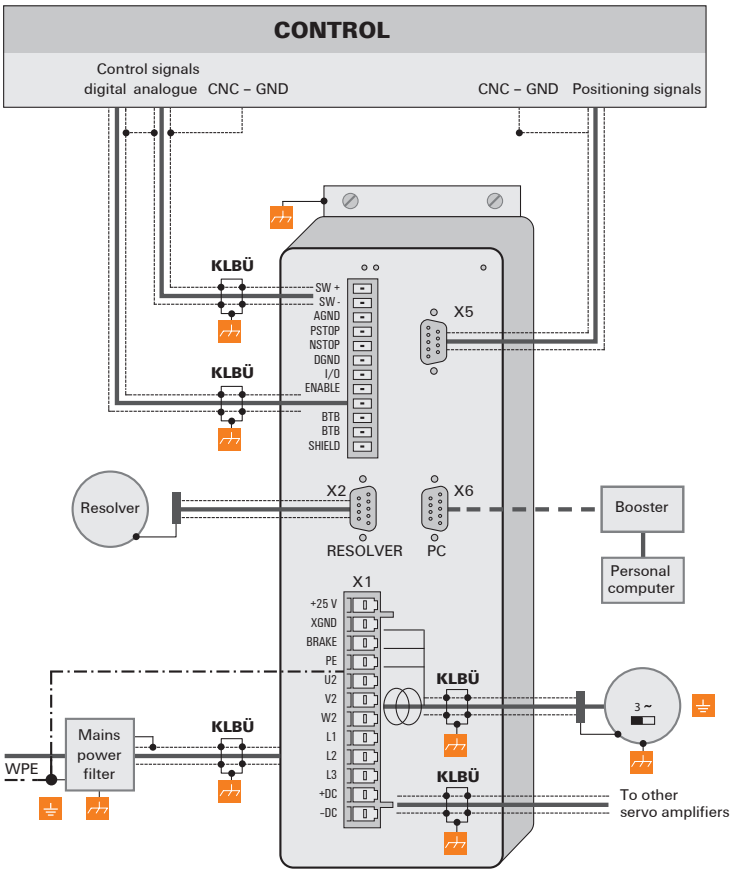
As shown in the figure below, the cable's shielding is connected to the earth potential so that the shield's current can be discharged. Depending on the sensitivity of the system, an attempt is made to create separate potential areas for this. However, it is still typical to mix the areas, i.e. the shielding has a common equipotential bonding (earth). This figure shows how the number of shields and PE conductors that need to be connected can increase quite rapidly (in this case only one component is used). The shielding and earthing systems must be planned carefully to provide adequate safeguards for personnel and equipment. The following sections describe the complexity and special characteristics in more detail.



Shielding



Earthing



Connection diagram of a frequency converter

8.1 Earthing of shielded cables

Electrical and electronic systems must be designed such that they are largely safeguarded against electrical interference, thus enabling them to operate securely even in the case of transient interference voltages.

Electrical interference can be introduced into electric circuits in a variety of ways. The most frequent causes are due to inductive interference. In addition, galvanic and capacitive coupling as well as electrical fields and other processes are causes for interference voltages. Here, high-frequency voltage fluctuations – known as transients – are the cause of interference with a high level of effectiveness.

Shielded cables increase interference resistance

The sources of interference voltages can rarely be eliminated and even then not always completely. Thus, it is necessary to take measures to combat their effect. In general, the more effectively interference voltages can be kept away from circuit elements or can be discharged, the less electrical circuits are affected. This can be accomplished in a variety of ways with varying levels of effectiveness. A very effective measure, in particular for safeguarding against inductive effects, i.e. ensuring "electromagnetic compatibility" (EMC), is the shielding of electrically functional components to earth potential. In doing so, for instance, components are installed in metallic, earthed housings and the connecting lines are equipped with shielding.

In general, it can be said that interference from cables can be combated by routing cables as far away as possible from each other, keeping the common return as short as possible and using twisted-pair wire. Far better protection, however, is provided by completely shielding of all cables. This is the most effective measure that can be taken against the coupling of interference signals.

The best type of shielding consists of a braided mesh sleeve that uses individual wires made of non-magnetic materials (copper, aluminium). The braided mesh should be sufficiently large and also be as thick as possible. For cables that are equipped with foil shields, it is necessary to be aware of the low mechanical strength and the low current-carrying capacity of the shielding.

Proper use of shielded cables

The shielding of cables will only result in the desired effect if this is implemented properly. Incorrect earthing or the use of improper components that perform their task inadequately reduces or even totally eliminates the effect. Placing the shielding at any spot on the earth potential will not suffice, as this earth connection may have no effect on high frequencies. In addition, ground loops must also be taken into consideration. Furthermore, the shielding should be earthed over a large surface area. Beyond that, the quality of the shield conductor and earthing accessories is also important.



A Weidmüller clamping bracket (KLBUE 10-20 SC)
Order number: 1712321001

In practice, the shield is still often twisted and connected to a terminal point. There is very high attenuation (voltage drop) on these connections, especially for high-frequency interference. Therefore, this type of shielding should not be used, even for short cable lengths. The shielding of the cable is practically negated and can, at best, be helpful for low-frequency interference. We recommend that there is a large amount of surface contact with the braided shield of the cable.

There are generally four distinct types of coupling:

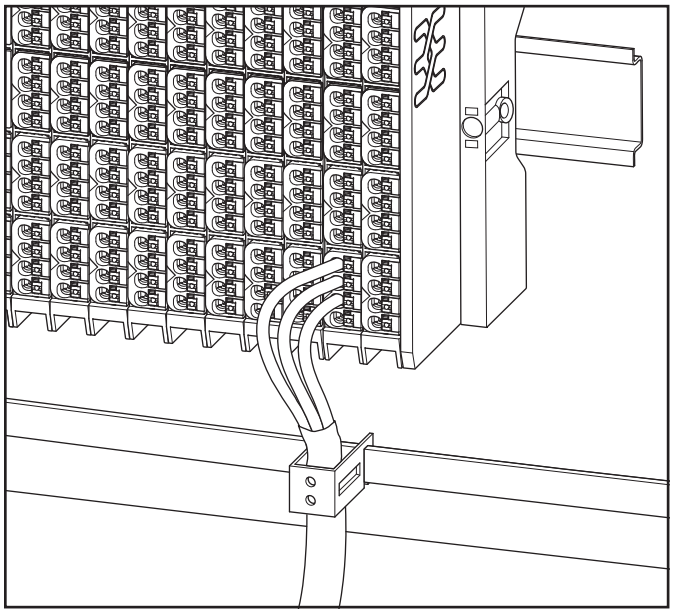
- Galvanic coupling
- Capacitive coupling
- Inductive coupling
- Radiation coupling

These types of interference usually occur mixed together, but they can be categorised as follows:

- Electromagnetic fields
- Ripple voltage (50 Hz)
- Lightning
- Interference pulses (current, voltage)
- Transient surge voltages
- Radio interference
- ESD (electrostatic discharge)
- Burst
- Mains feedback



Another area of concern as regards shield contact is the “flow” within the conductor. Temperature changes caused by the current lead to changes in the conductor cross-section. A rigid contact can therefore only be partially effective. A self-adjusting contact is what is really required. Weidmüller's clamping bracket products (KLBÜ series) provide the perfect solution to meet this challenge.



Use of a clamping bracket

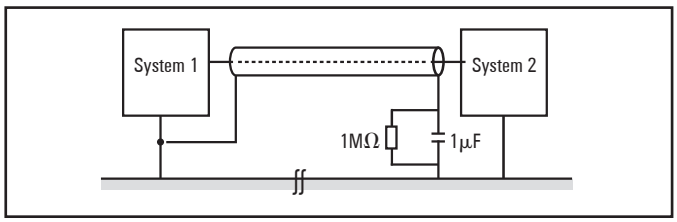
Effective shielding

It is important that the shielding is not positioned on the earth of the connected component, but on the protective earth. In the case of components that are installed in a metal housing, the shielding must be positioned to this housing. If no earthed housing is available, the shielding is positioned on a separate earth.

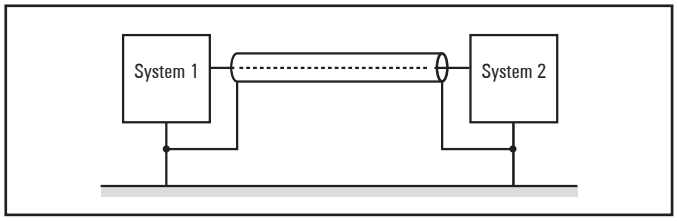
When installing ground connections on shielding, it is generally also important that no earth loops are created. The smaller the earth loop, the less the danger of the induction of interference voltages. It is therefore most suitable to have a purely neutral-point installation.

The following sketches show the possible shielding connections to protective earth.

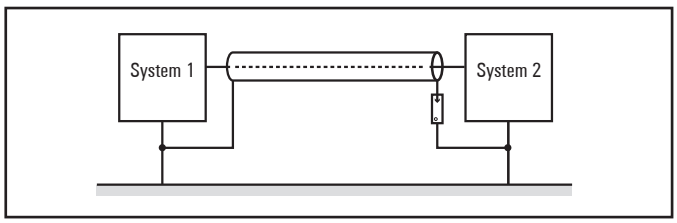
A one-sided connection of the shielding protects against capacitive coupling of interference voltages.



If you use a two-sided shielding connection, make sure that compensating current (different earth potentials) does not flow through the cable shield.



If you wish to avoid the disadvantages associated with creating an earth loop with two-sided shields, it is recommended you connect one side of the shield through a high impedance.

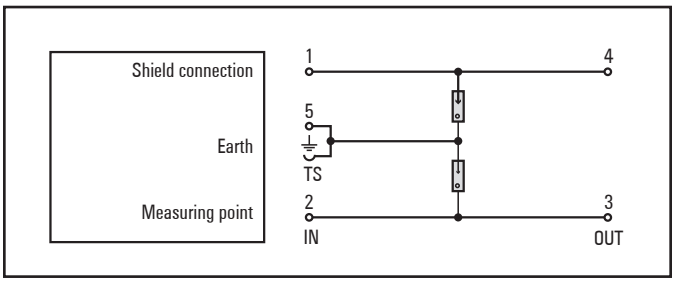


For longer lengths of shielded cables, such as if a sensor must be added to a control panel, a potential difference between both end points must not be ignored.

However, such shield conductors are relatively expensive and also require more time in working with them. Another possibility would be to place an additional voltage equalising cable between the measurement location and the control panel. The shield can then be hooked up on both sides.

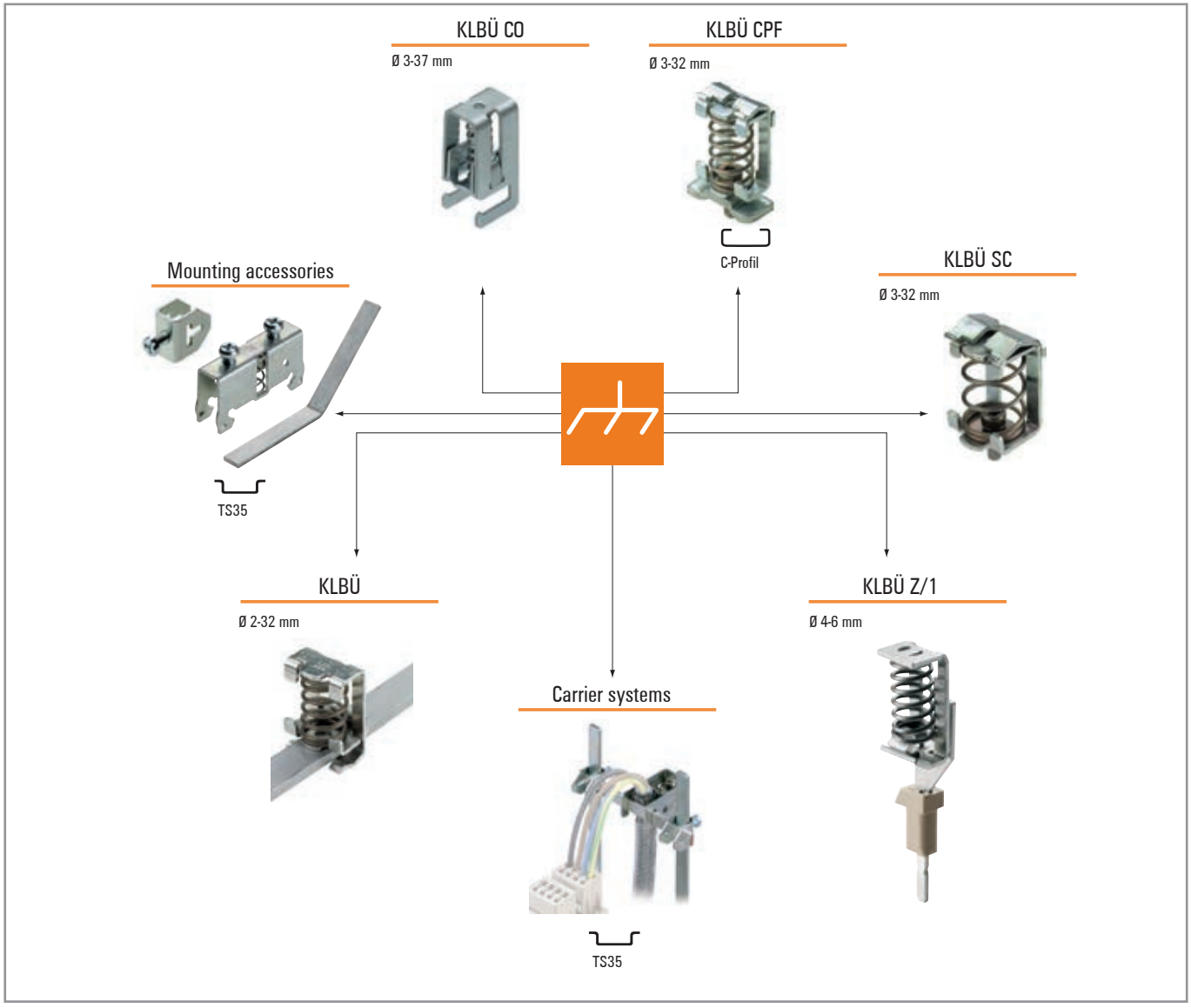
A high-impedance earth connection is also another option. In the control panel, the shield is then connected to the earth potential, and the shield has a high-impedance connection to earth at the measurement location via a gas discharge tube. This solves the problem of a potential transfer and 50-Hz humming.

For non-isolated measurement locations, two gas discharge tubes must be installed. One connects the shield to earth, and the other connects it to the non-isolated measurement location. This method prevents a galvanic coupling between the measurement circuit and the earthed measurement location.



Summary

Earthing is a key element for the reliable functioning of an electrical system in the event of interference. In this regard, HF-related aspects must be taken into consideration. Only the proper use of materials and a well thought-out circuit design will lead to success.



Overview of the product line for shielding connections



Please refer to our Modular Terminals Catalogue for more information. Order No.: 1282250000

8.2 Potential ratios

Basic aspects

As regards the potential ratios of a u-remote system, the following aspects must be kept in mind:

- The power supply of the coupler and I/O modules as well as field power is provided via the power supply at the power-feed module (PF)
- A potential-free design is made possible through the use of an isolated power supply at the system power supply and the field power supply

The block diagram shows the typical design of a u-remote system. The power supply concept here makes sure that, starting with a certain capacity utilisation, power refresh is implemented using power-feed modules.

Potential-free design

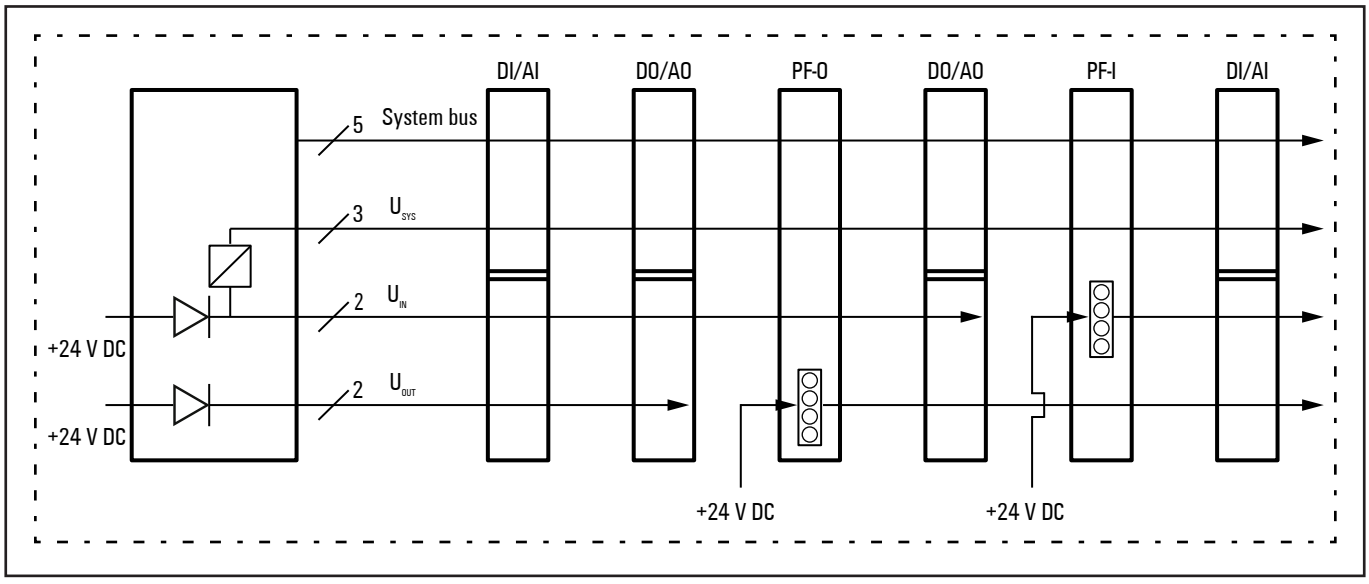
In a potential-free design, the reference potentials of control and load circuits are galvanically isolated from each other.
A potential-free design is necessary for the following:

- Use of the power-feed module (in both the PF-I and PF-O variants), i.e. in all AC load circuits
- DC load circuits that cannot be coupled

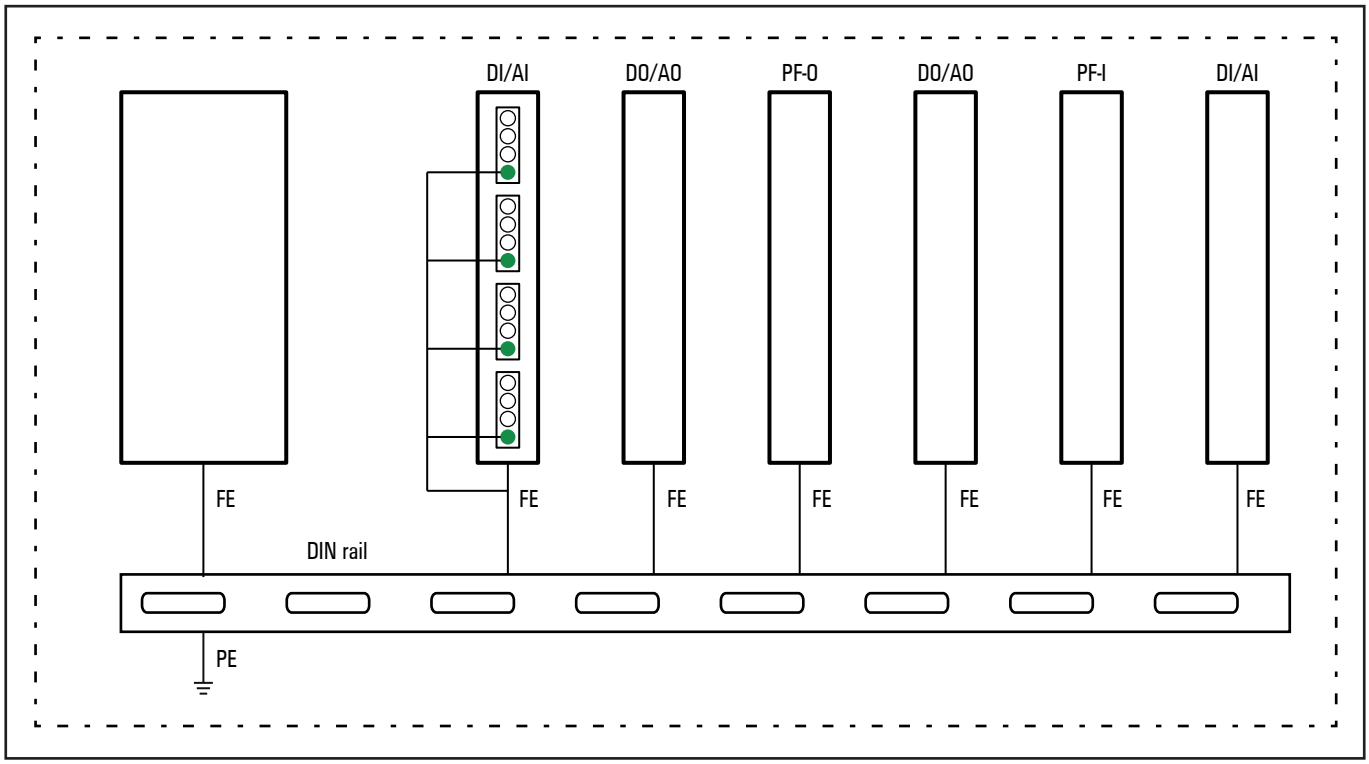
Potential-free installation depends on the type of earthing.

Non-isolated design

In a non-isolated design, the reference potentials of control and load circuits are galvanically connected to each other.



u-remote power supply concept



u-remote earthing concept: The spring contacts underneath the module and the coupler snap into the DIN rail to make a connection.

8.3 Electromagnetic compatibility (EMC)

u-remote products completely meet EMC requirements. EMC planning, however, is necessary prior to installation.

Aspects to consider include all potential interference sources such as galvanic, inductive and capacitive couplings, as well as radiation couplings.

Ensuring EMC

To ensure EMC, the following basic principles must be observed during installation of the u-remote modules:

- Proper, extensive earthing of inactive metal parts
- Correct shielding of cables and equipment
- Proper layout of wires – cabling
- Creation of a uniform reference potential and earthing of all electrical equipment
- Special EMC measures for special applications (e.g. frequency converters, servo drives)
- Contactors and relay coils must be equipped with the corresponding interference suppressors

Earthing of inactive metal parts

The earthing of all inactive metal parts reduces the influence of coupled interference. For this purpose, all inactive metal parts (such as switch cabinets, cabinet doors, support beams, mounting plates, DIN rails, etc.) must be connected to each other over a large surface area with low impedance, whereby a uniform reference potential is ensured for all control unit elements.

Required measures:

- Removal of the insulating layer around screw connections. Protection of connection points against corrosion
- Connection of moving earthed components (cabinet doors, separated mounting plates, etc.) through short earthing straps with large surfaces
- When possible, avoid using aluminium parts, because aluminium oxidises easily and in this respect is unsuited for earthing

PE connection

The connection from earth to the PE (protective earth) connection must be done centrally.



WARNING

Possible danger to life!
In the event of a fault, the earth must never take on a dangerous contact voltage, which is why it must be connected to a PE conductor.

Unearthed operation

In the event of unearthed operation, the corresponding safety regulations must be observed.

DIN rails

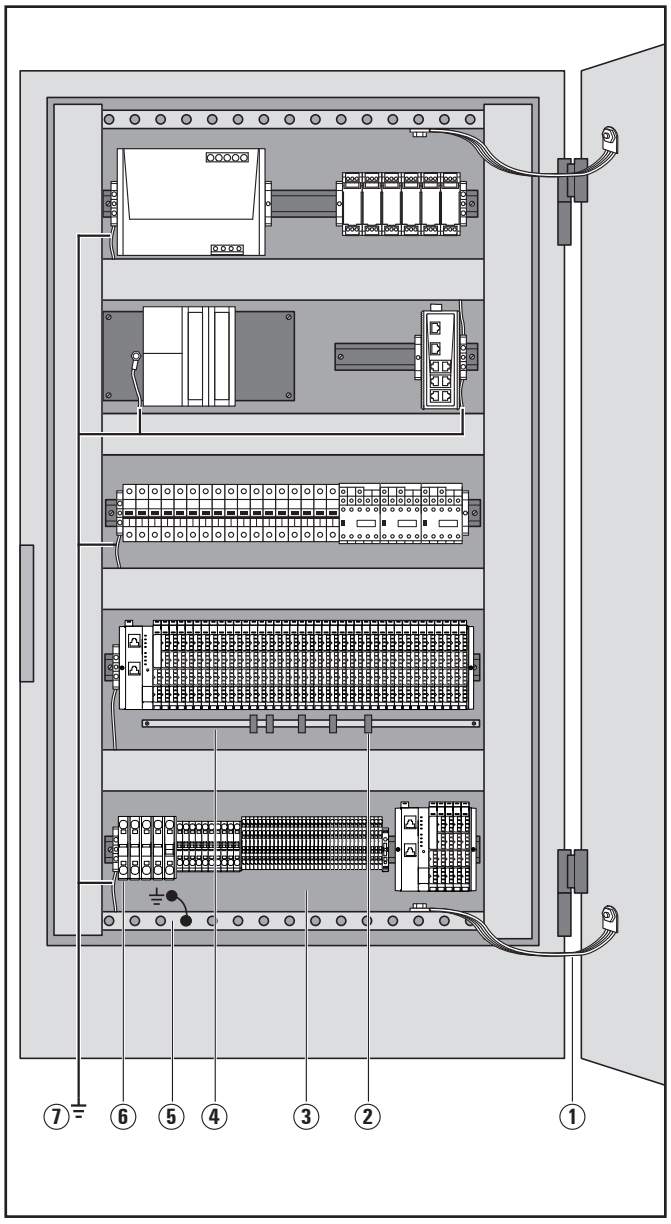
Notes concerning the use of DIN rails:

- Large-surface, low-impedance attachment on the mounting plate and corresponding contact with the carrier system using screws or rivets
- Proper earthing
- Use corrosion-proof DIN rails
- Remove the insulating layer on painted, anodised or insulated metal components in the area around the connection point
- Protect the connection point against corrosion (e.g. using grease; Attention: only use grease suitable for the purpose)

Leitungen zu Sensoren/Aktoren

To avoid antenna effects caused by looped lines, all lines that go to a certain sensor or actuator should be combined in one cable.

Cabinet design according to EMC guidelines:



1 Earthing strips
Earthing strips must be used for connecting inactive metal parts if it is not possible to connect two large pieces of metal. Use short earthing strips with large surfaces.

2 Clamping bracket for signal cables
If shielded signal cables are used, the shield must be attached to the clamping bracket (KLBÜ series) on the busbar over a large surface. The braided shield must cover and make good contact with a large part of the clamping bracket.

3 Mounting plate
The support beam for holding control components must be connected to a large part of the cabinet housing.

4 Busbar
The busbar must be connected via the rail holding fixture. The cable shields are fixed to the busbar.

5 Protective earth conductor rail
The protective earth conductor rail must likewise be attached to a large part of the mounting plate, and it must be connected to the protective earth conductor system via an external cable with a cross-section of at least 10 mm^2, in order to discharge interference current.

6 Protective earth terminal strip
The protective earth terminal strip must be connected to the protective earth conductor rail in a neutral-point configuration.

7 Cable to protective conductor system (earthing point)
The cable must be connected to a large part of the protective conductor system.

See also:
EMC Directive 2004/108/EC

8.4 Shielding of cables

To prevent the coupling of interference voltages and the decoupling of interference fields in cables, only shielded cables made from well-conducting material (copper or aluminium) with braided shielding and a coverage of at least 80 % should be used in the design of a cable shield.

Only when a cable shield is connected to the local reference potential on both sides is it possible to achieve optimal shielding against electric and magnetic fields. Exceptions are possible, for example, with high-impedance, symmetrical or analogue signal cables. If a shield is attached on only one side, this merely achieves an isolation against electric fields.

ATTENTION

Material damage!
Requirements for effective shielding design:
- The shield connection to the shield bus should be low impedance
- The shield must be connected directly at its entrance into the system
- Keep cable ends as short as possible
- Do not use cable shields for equipotential bonding

When connecting a data cable using a sub-D connector, the connection must be made through the connector's shield collar and never through pin 1.

The data cable's shield must be attached to the shield bus with the insulation stripped away. The shield is to be connected and attached with clamping brackets or similar metal fixing devices. The shield bus must be connected to the reference potential surface through a low impedance (e.g. fastening point with a separation of 10 to 20 cm). The brackets must surround and make contact with a large part of the shield.

Isolation of the cable shield should be avoided. Instead, it should be routed into the system (for example, the switch cabinet) up to the interface connection.

ATTENTION

Shielding of field bus cables
When shielding field-bus cables, the installation guidelines for the respective field buses must be observed. (See the websites of the field bus organisations.)

ATTENTION

Material damage!
If it is only possible to have a one-sided shield connection for reasons specific to the circuit or equipment, the second side of the cable shield can be routed to the local reference potential via a capacitor (with short connections). To prevent disruptive discharges when interference pulses occur, a varistor or a resistor can also be wired in parallel to the capacitor.
As an alternative, a doubled version (galvanically isolated) can be used, whereby the inner shield is connected on one side and the outside shield is connected on both sides.

Equipotential bonding

If system components are positioned separately from each other, potential differences may arise, provided that:

- Power is provided from different sources
- The earthing is implemented at different system parts, despite the cable shields being connected at both sides

A voltage equalising cable must be used for equipotential bonding.

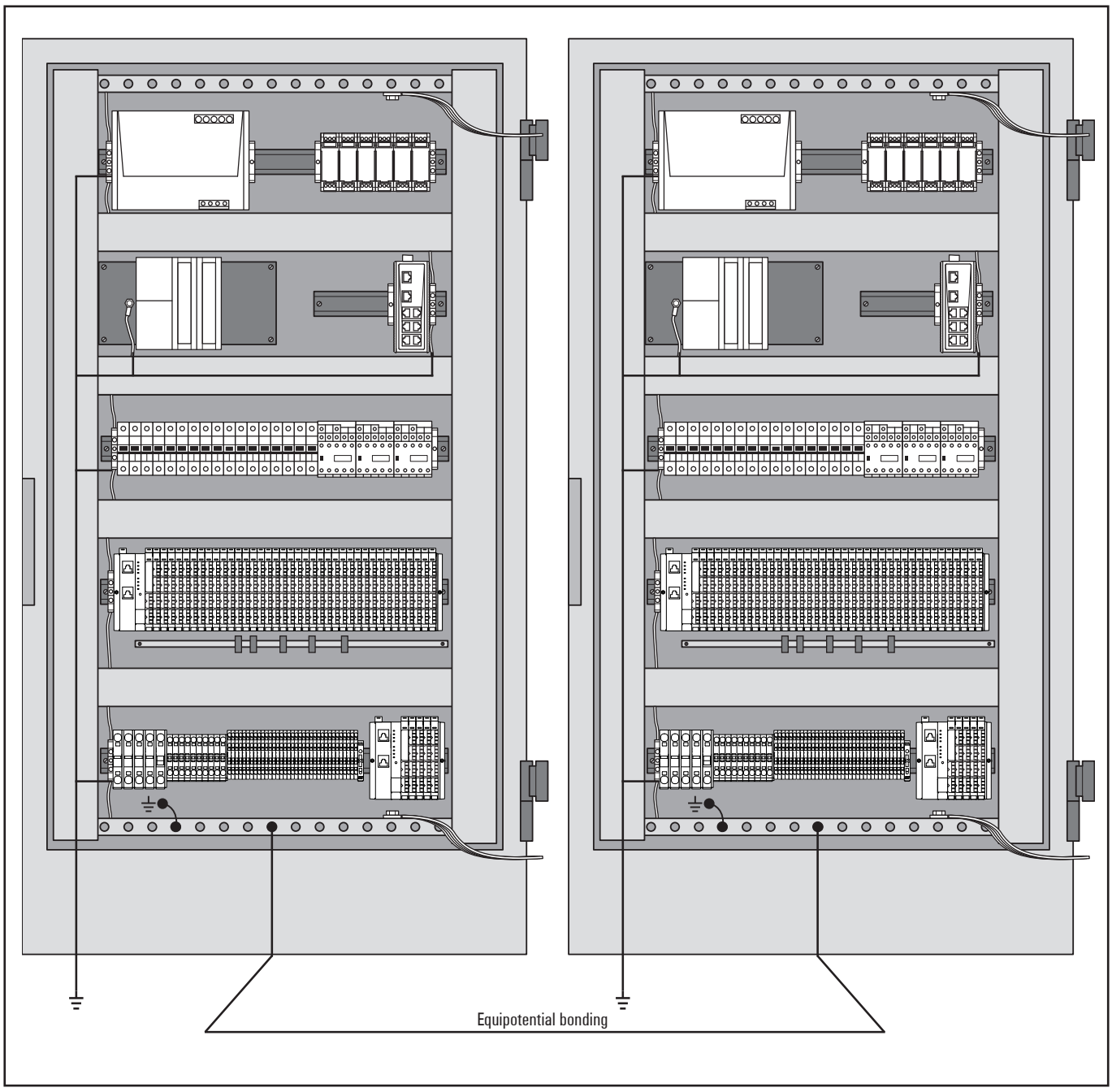


WARNING

Possible danger to life!
The shield must not be used for equipotential bonding!

The following features are essential for a voltage equalising cable:

- In the case of cable shields on both ends, the impedance of the equalising cable must be considerably smaller than that of the shield connection (maximum 10 % of its impedance)
- When the length of the equalising cable is less than 200 m, its cross-section must be at least 16 mm^2 If the cable is greater than 200 m in length, a cross-section of at least 25 mm^2 is necessary.
- Large-surface connection with the PE conductor or the earthing and corrosion protection are requirements for long-term safe operation
- They must be made of copper or galvanised steel
- In order to keep the enclosed area as small as possible, the equalising cable and signal cable must be routed as close to each other as possible


Equipotential bonding

9 Commissioning

WARNING

Explosion risk!

► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING!

Manipulation of the control unit!

During commissioning, the system may be manipulated to such an extent that can result in risks to life and material damage.

► Make sure that system components cannot start up unintentionally!

ATTENTION

Risk of product damage!

► Carry out an insulation test before each commissioning (see Section 7.6).

The procedures applied during commissioning depend on which control unit is being used on site. The descriptions in this chapter use commissioning with a PROFINET coupler and the Siemens SIMATIC Manager Step7 (from V5.5 SP2 on) as an example.

9.1 Requirements

Before you start the commissioning work, the following requirements must be fulfilled.

- The control unit must be in operation.
- The u-remote station must be completely assembled and wired up.
- The control unit and u-remote station must be connected via fieldbus, and a PC/laptop must also be connected.
- The power supply must be turned on.

If these requirements are fulfilled, the following LEDs light up:

- On the bus coupler
  - The PWR LED lights up green.
  - For the port to which the control unit is connected, the LINK LED lights up green and the ACT LED lights up yellow.
- On the modules, the Status LED lights up green.

9.2 Device description files

Downloading and installing files

► Download the device description files from the Weidmüller website.

These include:

- GSDML files for PROFINET couplers
- GSD files for PROFIBUS couplers

If bitmap files for visualising the coupler are also supplied, store them in the same folder as the device description files.

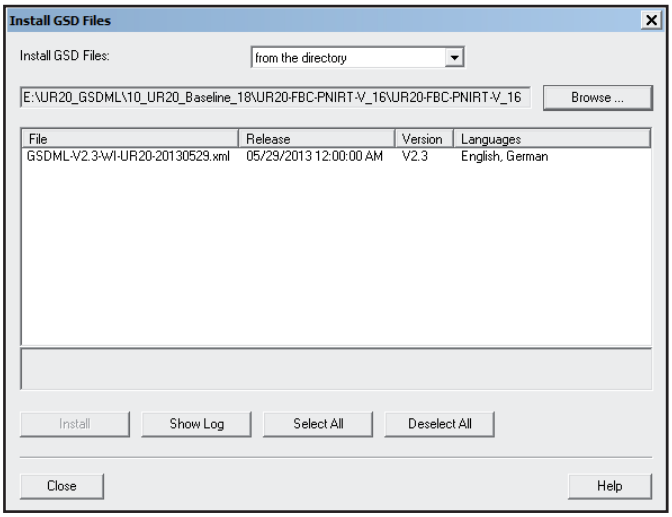
Projects must not be open in the hardware configuration tool while the files are being installed!

► Close any open projects before installing the device description files!

► In the hardware configuration tool, open: **Extras/Install GSD files**.

► Select the directory in which you have stored the device description files.

The files available are displayed.



Selecting GSD files

► Select the files that you would like to install.

► Click **Install**.

► When the installation is complete, click **Close**.

► Update the device catalogue via **Extras/Update catalogue**.

The devices associated with the current device description file are now listed in the device catalogue.

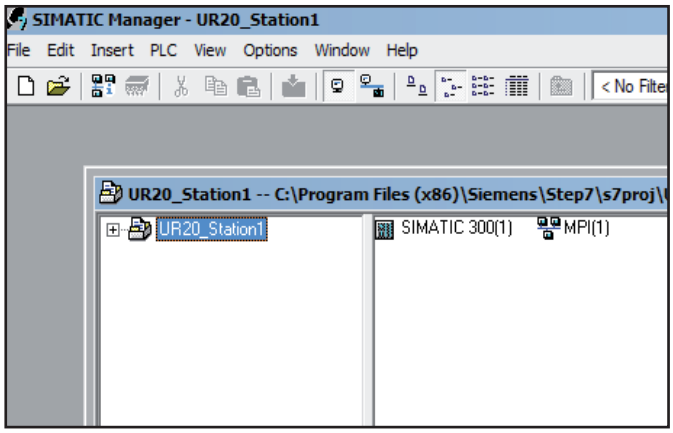
Updating device description files

The naming convention for GSD files (and GSDML files respectively) always follows this pattern: GSD_V2.3-WI-UR20-20121214.xml. By reading off the version (V2.3) and the date (14.12.2012), you can find out the status of a GSD file and determine whether you are already using the latest version.

► Download the latest GSD files from the Weidmüller website.

9.3 Commissioning the UR20-FBC-PN-IRT

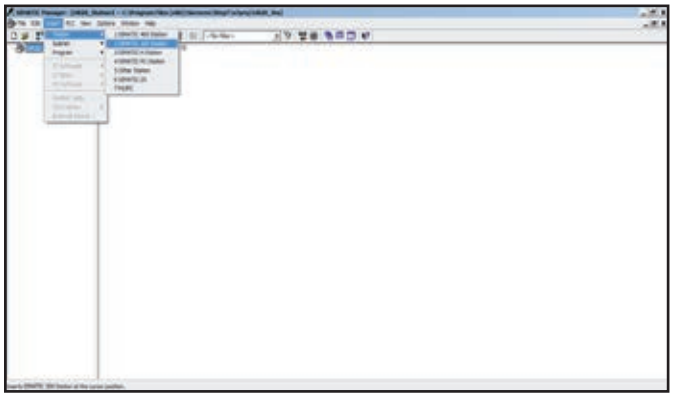
► Start SIMATIC Manager.
► To set up a new project, click **File/New**.
The "New Project" window opens.
► Enter a name for the new project (e.g. UR20_Station1) and click **OK**.
The new project is displayed in SIMATIC Manager.



Creating a new project

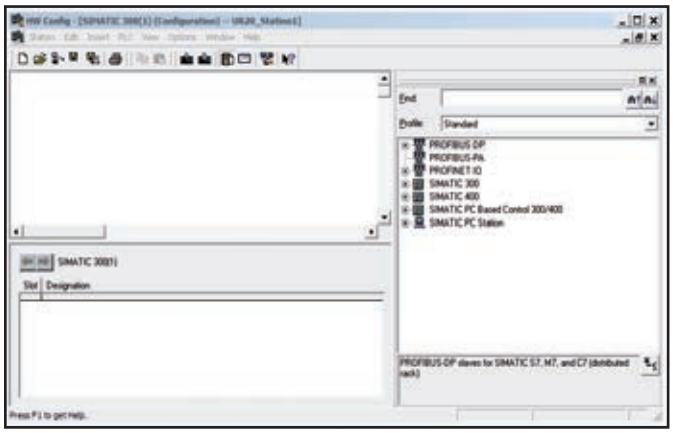
Adding a control unit type

► Select the project in SIMATIC Manager.
► Select the control unit type VIA **Add/Station** (e.g. SIMATIC 300).



Adding a station

► Double-click on the project name so that the station (SIMATIC 300) is displayed below in the directory tree.
► Click on the station (SIMATIC 300).
► Double-click **Hardware** on the right-hand side of the window.
The "Hardware Configuration" window opens.

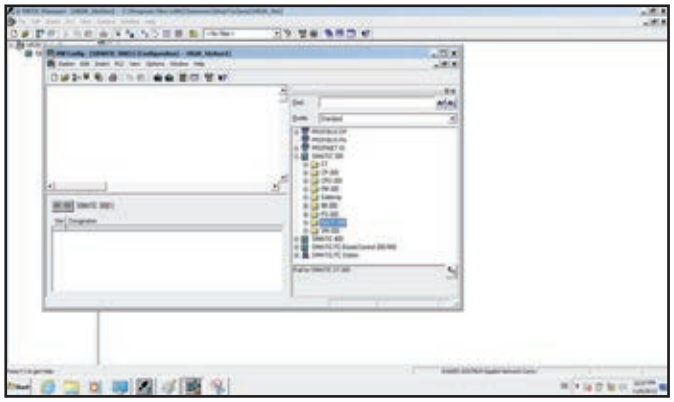


Hardware configuration

► The device catalogue is displayed on the right-hand side of this window. If this does not occur, open the catalogue via **View/Catalogue**.

Adding a profile rail

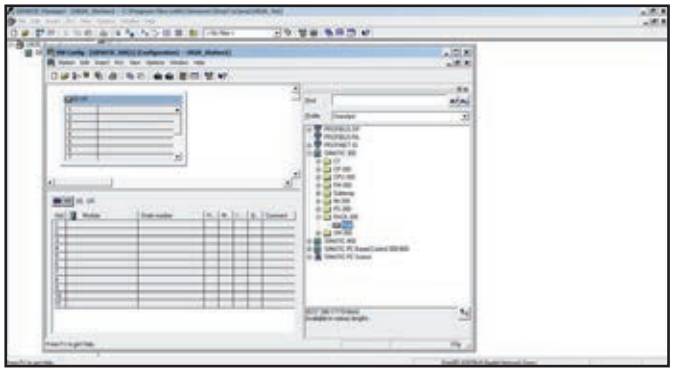
► In the catalogue, select the profile rail in use (e.g. SIMATIC 300/RACK-300).



Selecting a profile rail

► Double-click on the profile rail or drag it to the left-hand side of the window using the mouse.

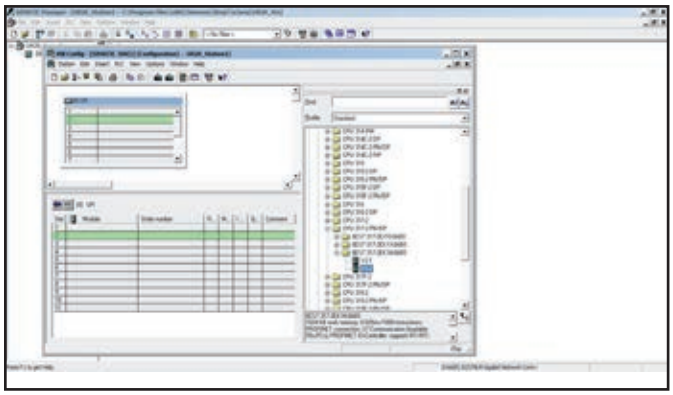
The profile rail (UR) is displayed with the open positions.



Profile rail with open positions

Selecting the control unit version

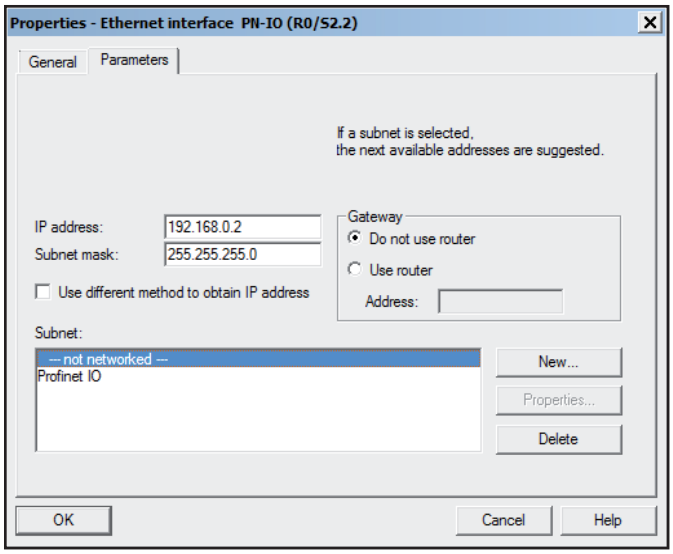
► Click on the second line of the **UR** table.
► From the catalogue, select the control unit in use and its version (inscription on the control unit, e.g. 317-2EK14- etc.).



Selecting the control unit version

► Double-click on the respective version, or use the mouse to drag it to the second position in the table on the left-hand side of the window.

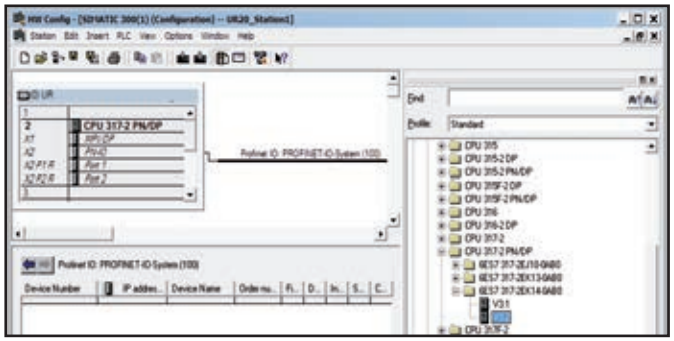
The **Ethernet interface properties** window opens.



Ethernet interface properties

► Enter the designated IP address and the subnet mask.
► Click on **New**.
► Enter a name for the subnet (e.g. Ethernet UR20-S1). This name is assigned to the control unit.
► Confirm **twice** by clicking **OK**.

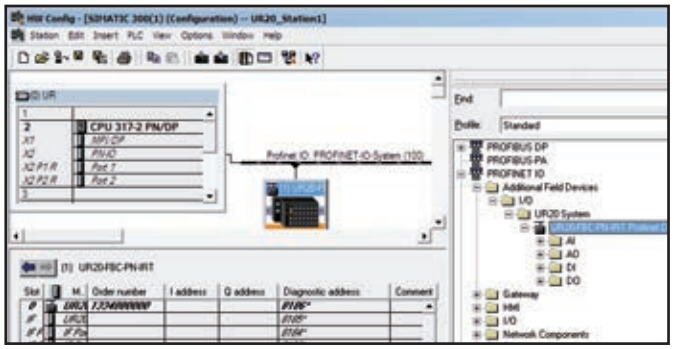
A network line which has the subnet name is now displayed in the configuration window.



Ethernet configuration

Linking a bus coupler

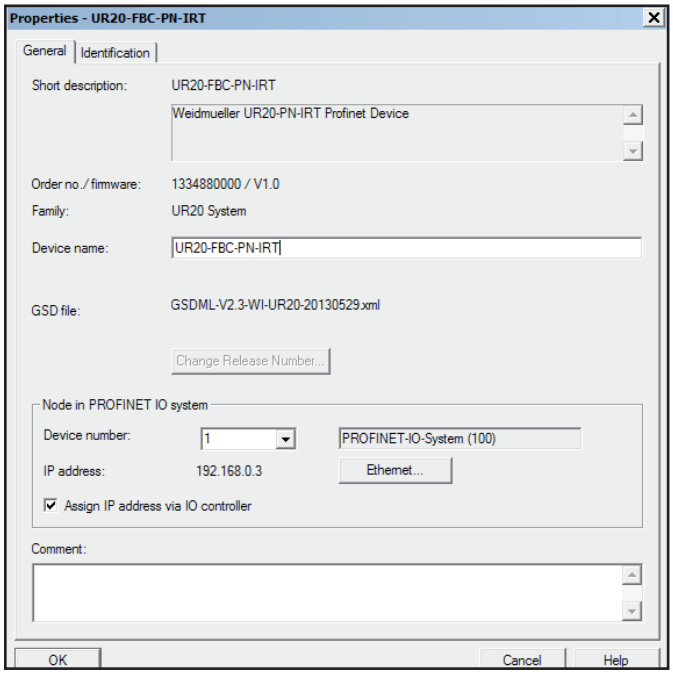
► Click on the network line in the configuration window.
► In the device catalogue, select the bus coupler (UR20-FBC-PN-IRT) under **PROFINET IO/Additional field devices/ I/O /UR20 system**.
► Double-click on the coupler or drag it to the subnet line.
The coupler is added to the subnet.



Linking the coupler

Providing the bus coupler with a device name

► Double-click on the bus coupler icon.
The **UR20-FBC-PN-IRT properties** window opens.



Bus coupler properties

The device name must accord with the name that has been defined in the device (see “Setting the properties of the Ethernet participants”).

► Change the device name if required and confirm by pressing OK.

All settings only take effect once they have been loaded into the component/control unit (see below).

Providing the control unit with a device name

► Double-click on **PN-IO** in the upper window (UR).
The **Properties** window opens.

► Click on the **General** tab.
► Change the **Device names** as required.

All settings only take effect once they have been loaded into the component (see below).

Adding modules

Only active modules can be added. All modules that do not communicate (AUX, PF power-feed modules and ES empty slot modules) are not listed in the device catalogue.

► In the hardware configuration tool, click on the icon for the UR20-FBC-PN-IRT bus coupler.

The list of components is listed in the lower part of the window.

► In the list of components, click in the first free line.
► Navigate to the device catalogue and select the first module you would like to add (corresponding to the first module in the u-remote station).
► Double-click on the module, or drag it into the configuration list.

The module is displayed in the list of components.



Adding modules

► The same method can be used for any additional modules be installed in the station.

Removing a module

► To delete a module from the list, select the module and click **Edit/Delete**.

or

► Using the right mouse button, click on the module in the list and select **Delete**.

Setting module parameters

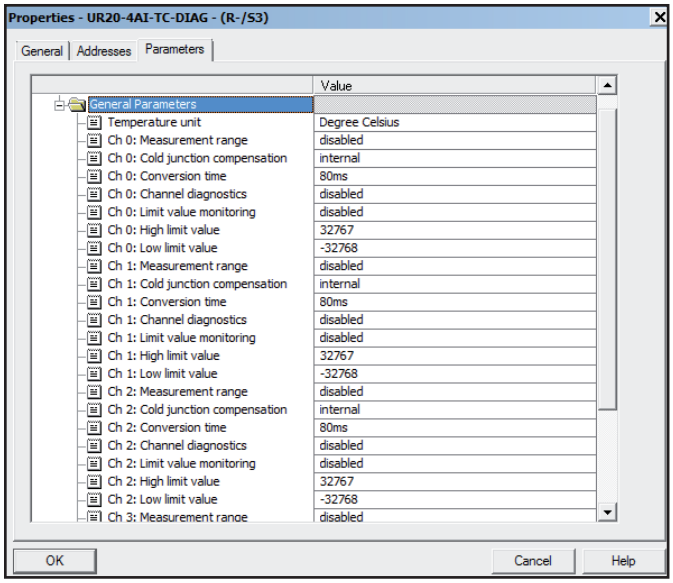
A wide range of parameters can be edited for some modules.

► Navigate to the list of components and click on the module.

The **Parameters - Module XY** window opens.

► Select the **Parameters** tab.

A list of all module parameters is displayed.



Editing module parameters

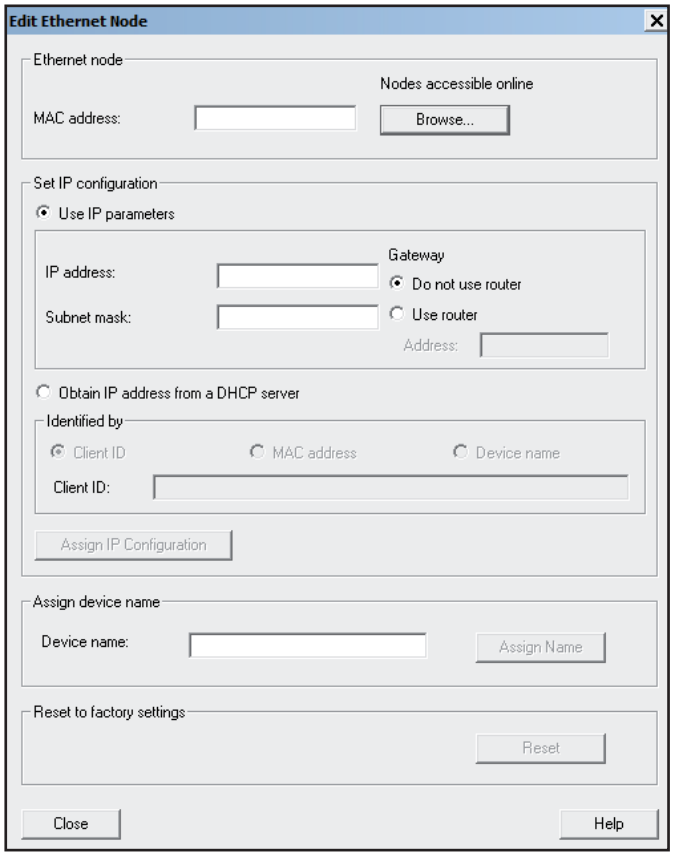
► Click on the parameter that you would like to change and amend the setting as required.
► Use this method to edit all of the parameters that you would like to change.
► Save the settings by clicking on **OK**.

All settings only take effect once they have been loaded into the component (see below).

Setting the properties of the Ethernet participants

To allow communication with the Ethernet participants, the device names and IP addresses of the participating devices must be defined.

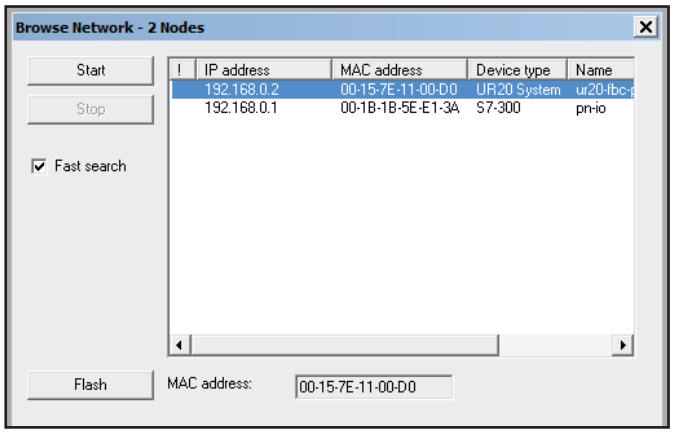
► Navigate to the device manager and select **Target system/Edit Ethernet participants**.



Searching for Ethernet participants

► Enter the MAC address of the participant or click on **Browse** to look for all connected participants.

The connected participants are displayed.



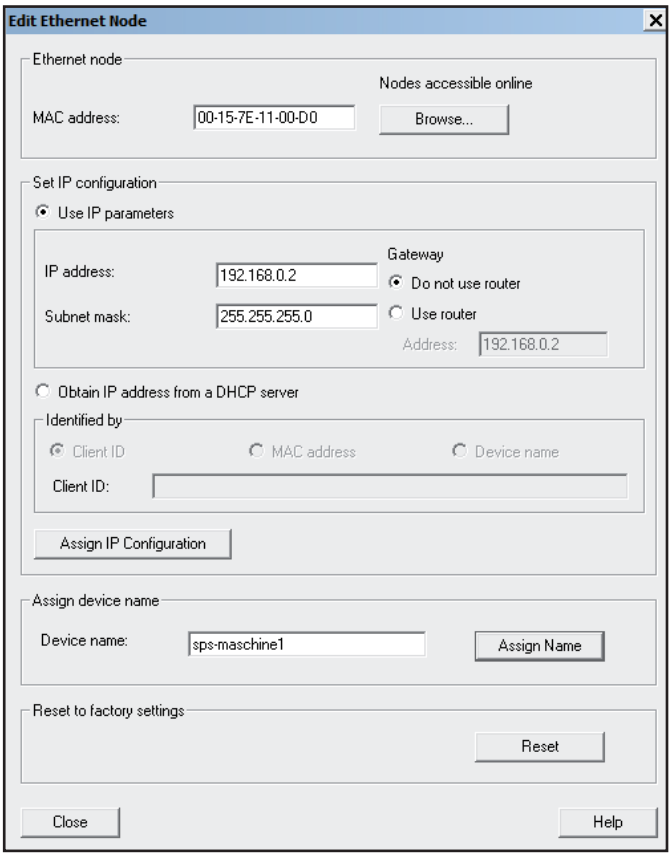
Ethernet participants found on the network

► To identify a participant at the station, click on **Flash**.

The data-transfer LED on the identified device now flashes.

► To stop the flashing, click on **Stop flashing**.

► Navigate to the list of participants and click on the one you would like to edit.



Editing Ethernet participants

► Change the **IP address** and **subnet mask** as required and click on **Assign IP configuration**.
► To change the **device name**, enter the new name and click on **Assign name**.
► If you would like to change the properties of other participants, click once again on **Browse** and select the next participant.
► Make the changes as described above.
► When you have finished editing all of the participants, click on **Close**.



These settings are sent directly to the devices!

Saving the configuration

You can save your project in the hardware configuration tool at any time and continue working on it at a later point in time. There are two ways to save the settings you have made:

- Click **Station/Save** to save the configuration in its current state. Use this function if you would like to stop working for a short period of time.
- Click **Station/Save and translate** to save the configuration in its current state and translate it into the data-transfer language. **Always** use this function when you have finished working on the configuration and want to transfer it to the control unit.

Loading the configuration into the control unit

► Navigate to the hardware configuration tool.
► If not already done, save the configuration via **Station/Save and translate**.
► To load the configured project into the control unit, open **Target system/Load in components**.
► Select the target component and click on **OK**.

The project is transferred to the connected control unit.



Any changes made later to the configuration take effect only after you reload the project in the control unit.

10 Web server

This chapter describes how to use the web server application (release 1.X). You will find the description of the releases 2.0 and higher in the "u-remote web server manual" which is available to download from the u-remote website.

With the web server, the u-remote station is displayed on a connected PC. This allows you to carry out the following tasks e.g. for testing purposes, during commissioning or service:
- Simulate the operation of the u-remote station
- Query the status of each coupler and module
- Display the parameters of couplers and modules, and change them for testing purposes
- Access diagnostic information
- Operate the station in Force mode for testing purposes

With default settings each coupler type offers web server access only via the USB port of the coupler. For that multiple IP addresses can be parametrized. Please note that this is a virtual DHCP server. To avoid network disruption no other network device with the same subnet ID should be connected to the PC.
Using couplers for ethernet-based fieldbus systems – recognizable by the RJ45 socket – web server access can be realized alternatively via ethernet (see section 10.4).
Any changes of the IP settings on either USB port or ethernet port will not be effective until restarting the coupler.

WARNING

Explosion risk!
► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING

Manipulation of the control unit!
In Force mode, the system may be manipulated to such an extent that can result in life-threatening personal injury and damage to materials.
Only use Force mode if you are very familiar with the connected system and know at all times the consequences that your actions will have!

ATTENTION

Risk of severe damage!
► Prior to connecting a PC, make sure that the u-remote station has been earthed properly!

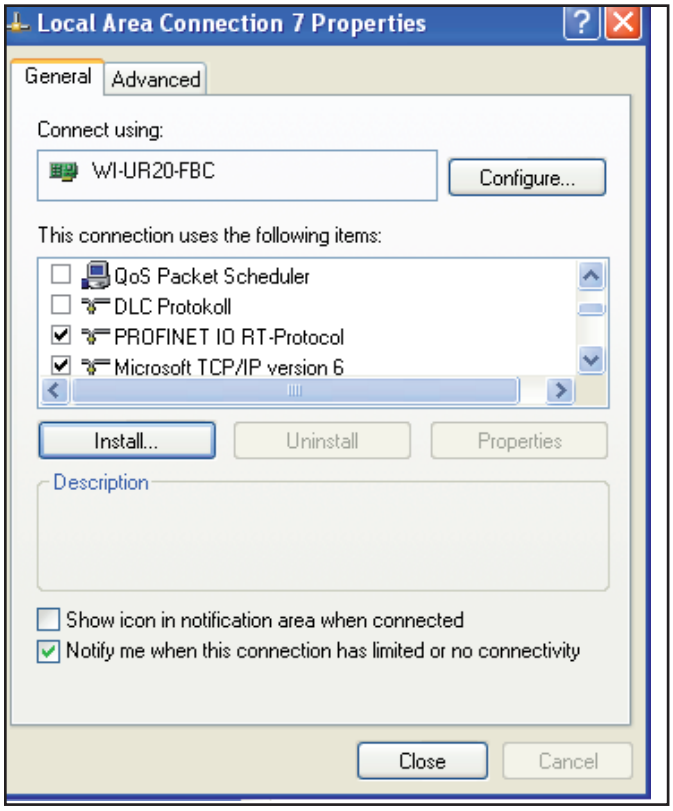
10.1 Requirements

The u-remote station must be completely assembled and supplied with voltage.

Operating system

The u-remote web server is designed for operation with the Windows XP®, Windows 7® and Windows Vista® operating systems.

For **operation with Windows XP**: if you installed the Siemens Primary Setup Tool, the DLC (data link control) protocol was also installed. To access the web server, you must deactivate the DLC protocol on the USB interface (LAN connection with WI-UR20-FBC).



Deactivating the DLC protocol

Browser

The u-remote web server can be used with the following browsers:

- Microsoft Internet Explorer 9, 10, 11
- Mozilla Firefox 4.0 or higher
- Opera10.61 or higher
- Google Chrome 9.0 or higher

Device drivers

You need the driver files **usb8023.inf** and **wmrndis.inf**, which you can download from the Weidmüller website.

10.2 Installing the USB driver

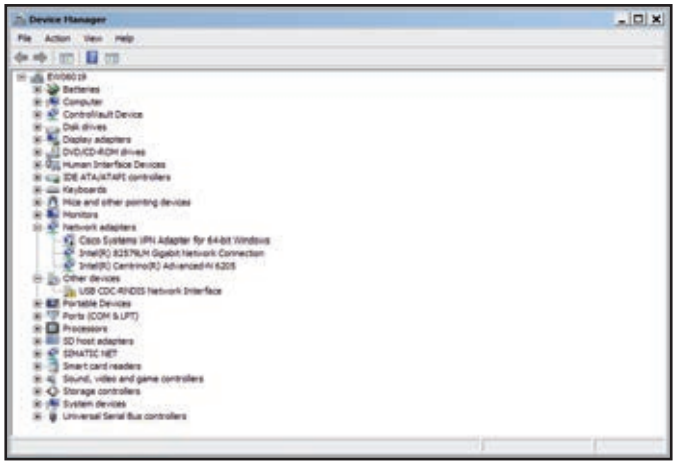
The USB port acts as an virtual DHCP Server. Please do not assign any IP addresses to other devices within the same subnet of the USB port (default 192.168.1.0), otherwise network failure might occur.

► Start up your PC.
► Connect the PC to the coupler using a USB cable (Type USB-A to USB Micro-B e.g. Weidmüller Order No. 1487980000). The USB socket at the coupler can be found behind the service flap on the front of the coupler.

The USB cable can be a maximum of 2 m in length. Extension cables must not be used!

You receive the message that Windows cannot install the driver.
► To install the driver manually, open the Device Manager.

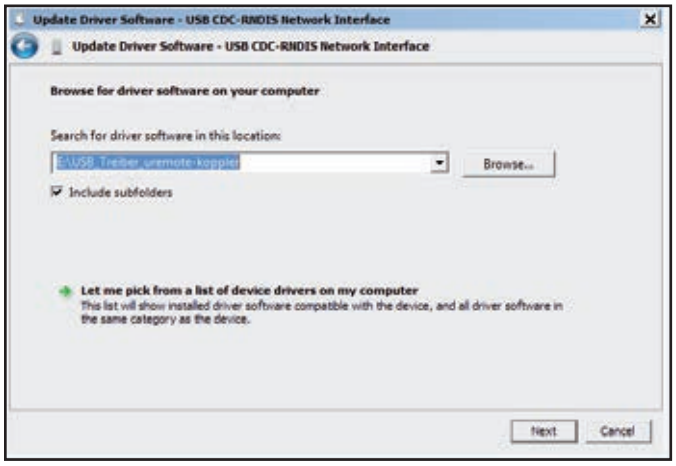
Under "Other devices" the interface **USB CDC-RNDIS Network Interface** appears.



New USB interface in the Device Manager

► Using the mouse, right-click on the interface and select **Update driver software**.

You will be asked if you would like to search for the driver software.
► Select the option **Search for driver software on this computer.**.



Searching for installation files on the computer

► Click on **Search** and select the folder in which you have stored both .inf files.

There could possibly be a security enquiry because the driver software does not have a signature. Nonetheless, continue with the installation.
► Follow the rest of the steps in the installation routine until the successful installation is confirmed.

The driver will now appear in the Device Manager under **Network adapters.**
► Close the Device Manager.

10.3 Starting the web server

Simultaneous access via both interfaces to the webserver is not possible. Make sure that there is no USB connection before you start the access via Ethernet.

► Open one of the browsers listed above.
► In the address line, enter the IP address of the coupler (default: 192.168.1.202, UR20-FBC-EIP: 192.168.5.202).

The web server is started.
After registration, the connected station is displayed with all of its active modules.

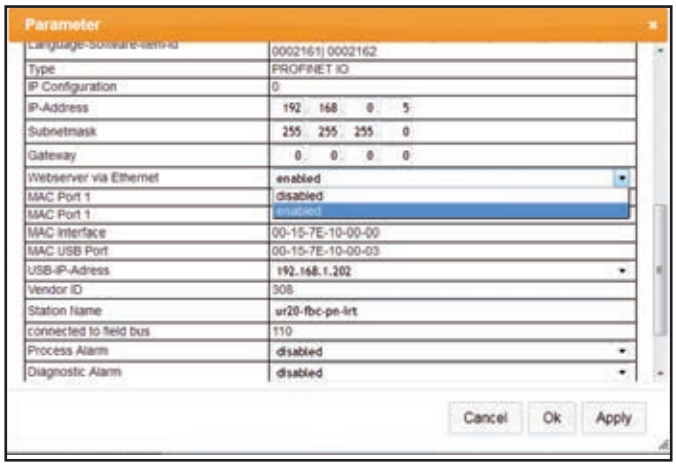


Display after the program starts up

The web server only registers modules that can communicate on the system bus. Empty slot modules and other passive modules (e.g. AUX modules) are not registered by the web server and thus are not displayed in the screen view. The numbering of the modules in the web server view may therefore deviate from the count in the actual station!

10.4 Activating the Ethernet socket

- ► In the station view, click on the **Coupler** and then on **Parameters.**
- ► Type in the IP address, subnet mask and gateway to be used.
- ► Make sure that the parameter **Web server via Ethernet** is set to **enabled**.



Activating the Ethernet socket

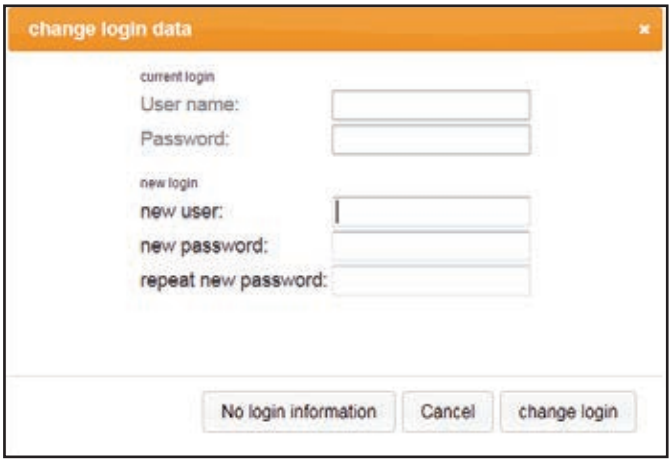
- ► Enter the required IP address and subnet mask.
- ► Confirm the entry by clicking OK.
- ► Close the coupler window and restart the coupler.

10.5 Setting up registration data and password protection

If you do not set up a user, all web server functions are accessible to every user at all times!
As soon as you set up a user with password protection, users without a user ID will only have read-only rights. Write access is blocked for them, which means that they **cannot** do the following:

- – Change parameters
- – Operate the station in Force mode
- – Load firmware updates

When you start up the web server for the first time, you are prompted to enter the registration data. The **Change login data** window opens automatically. You can access this window later via the **Coupler status** dialogue box (see Section 10.6):



Changing login data, setting up password protection

- ► Enter the user name and password.
- ► To change the login data, enter the new user name and the new password twice, then click on **Change login**.
- ► To deactivate password protection, do not enter any new data, but instead click on **No login information**.
- ► If you have changed the login data, you must log back in again afterwards.

You can overwrite a forgotten password as follows:

► Disconnect the coupler from the modules.
► Restart the coupler.
► Open the status window of the coupler.
► Click on **Change login data** and chose **No login information**.

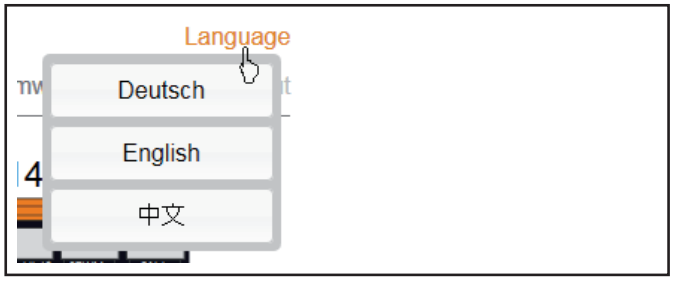
The old password is now deleted.

10.6 Navigation and operating instructions

Setting the language

When the program is started, the web server attempts to start with the language set in your web browser. If this language is not supported by the web server, the program starts with the "English" setting.
New language versions are continually being developed and can be later installed by the user with separate language files.

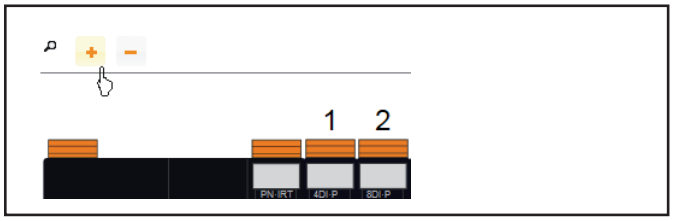
► To change the language, click on **Language** and choose the desired setting.



Setting the language

Zooming the view in/out

► Click on the magnifying glass symbol to zoom in or out on the station's display.

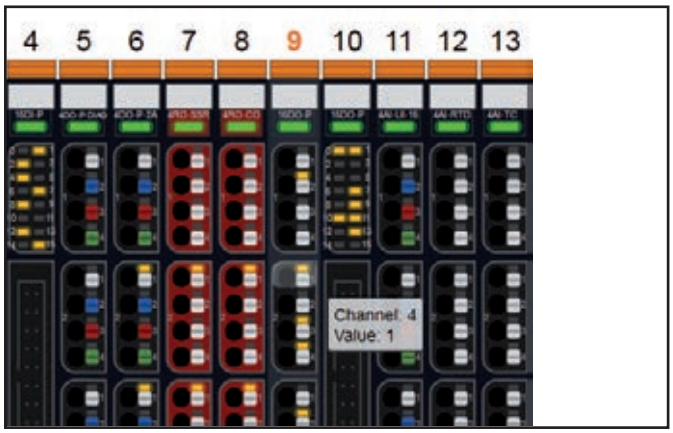


Scaling the display

Quick view of detailed values

► Move the cursor slowly over the station without clicking.

The detailed values of the channel on top of which the cursor is presently situated are displayed.



Display of channel values

10.7 Displaying and editing the coupler status

These functions are only accessible when Force mode is **not** activated.

The status data can be displayed at all time, regardless of the state of the field bus connection. Setup changes can only be stored while the field bus is not active.

► Click on the coupler.
The **Coupler Status** dialogue box opens.



Coupler Status dialogue box

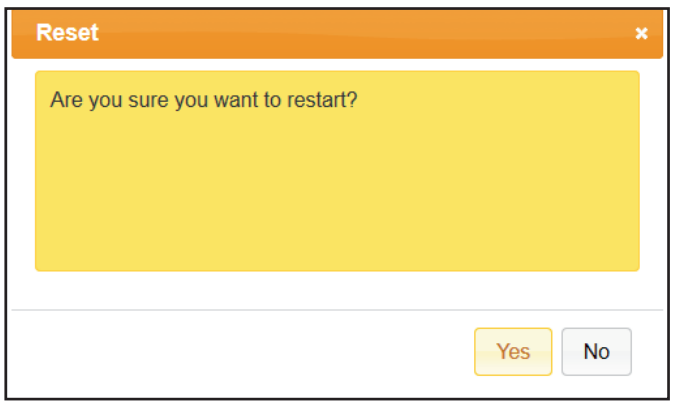
Here you can:
- Reset the coupler to factory default settings
- Change the registration data and set up password protection to limit access to the web server
- Reset any changes that have been made
- Access the coupler parameters
- Access the coupler's datasheet (link to product designation)

Resetting the web server

You can undo all the changes that have been made since the last time that the web server was started.

After a reset, the coupler is restarted! All data which is not protected against power failure is reset.

► Click on the coupler.
► Click on **Reset** In the coupler status dialogue box.



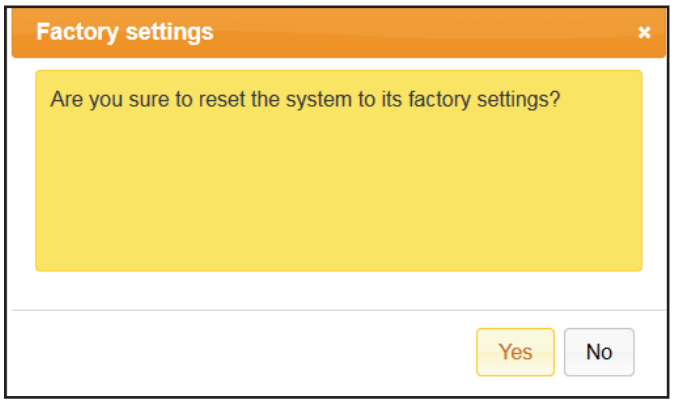
Resetting changes

► To reset changes that have been made, respond to the prompt by clicking **Yes**.

Resetting the coupler to factory settings

This function allows you to set up the web server in its original state as at delivery. This also includes registration data and password protection.

► Click on the coupler.
► In the Coupler Status dialogue box, click on **Factory settings.**



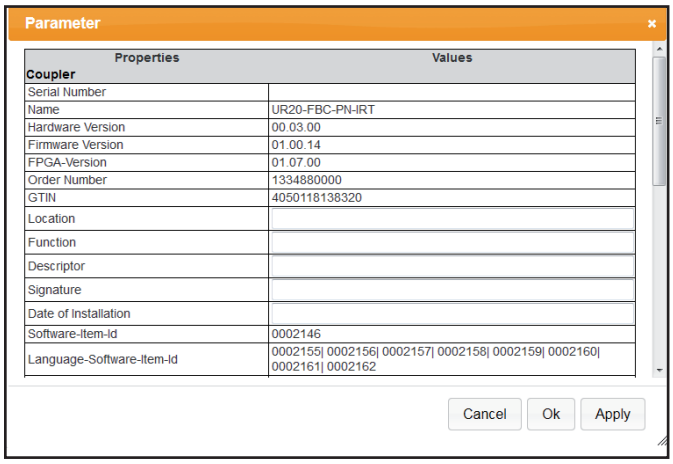
Resetting the coupler to factory settings

► To confirm that you would like to reset the coupler to the factory settings, respond to the prompt by clicking **Yes**.

Accessing coupler parameters

► Navigate to the Coupler Status dialogue box and click **Parameters**.

All the parameters are then listed in a new window.



Editing coupler parameters

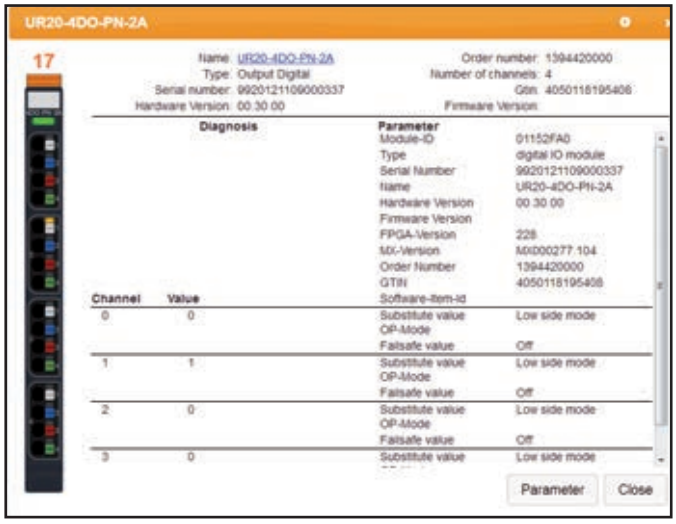
For parameters that can be edited, you can enter the changes in the entry fields or choose alternative settings from a dropdown menu.

10.8 Displaying module data and editing parameters

These functions are only accessible when Force mode is **not** activated.

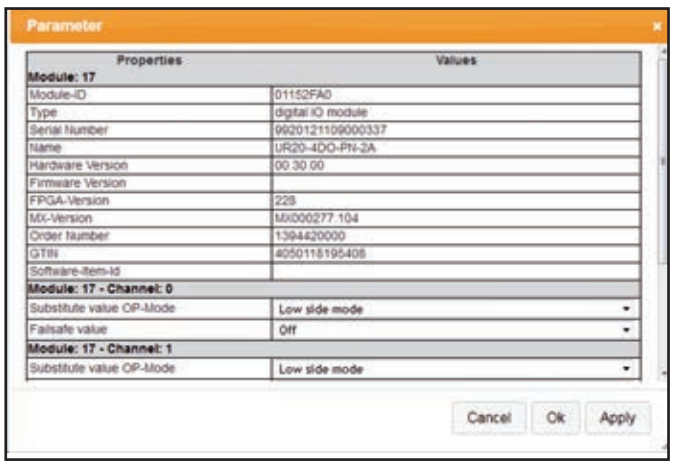
Parameters can only be written when the field bus is **not** active.

► Click on a module if you would like to see its properties.
A window with all status values opens.



Module Status dialogue box

► To open the datasheet for the module, click on the link next to **Name**.
► To change individual parameters, click **Parameters**.
All the parameters are then listed in a new window.



Editing module parameters

For parameters which can be edited, alternative settings are offered in a dropdown menu.

► Select the parameter you would like to change.
► Select the desired setting from the dropdown menu.
► To save the change, click **Apply**. You can now change other parameters.
► To save all changes and close the window, click **OK**.
► Click on **Close** to close the Module Status window.

Modules with registers

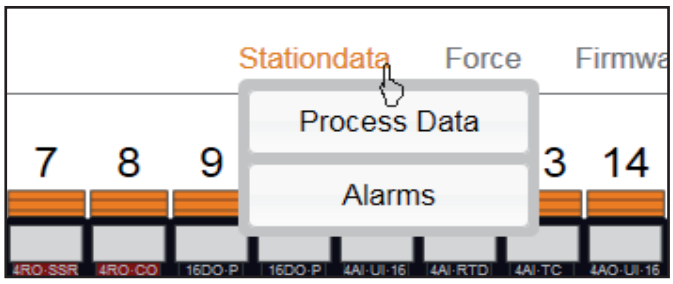
For modules with registers (e.g. counter modules and PWM modules), the register settings are displayed in a tool tip.
► Move the cursor over the **Status** entry to see the register settings.
The registers displayed in bold are activated, all of the others are deactivated.



Displaying register settings

10.9 Displaying station data

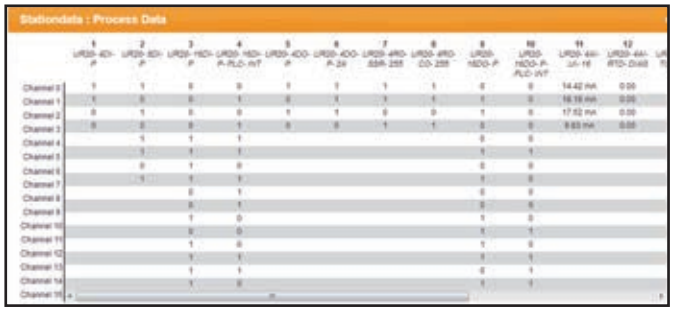
You can use this menu to display all of the **process data** and **Alarms**.



Station data menu

Displaying process data

► Click on **Station data** and then on **Process data**.
The overview displays all modules and channels along with their current values; these values are continuously updated.



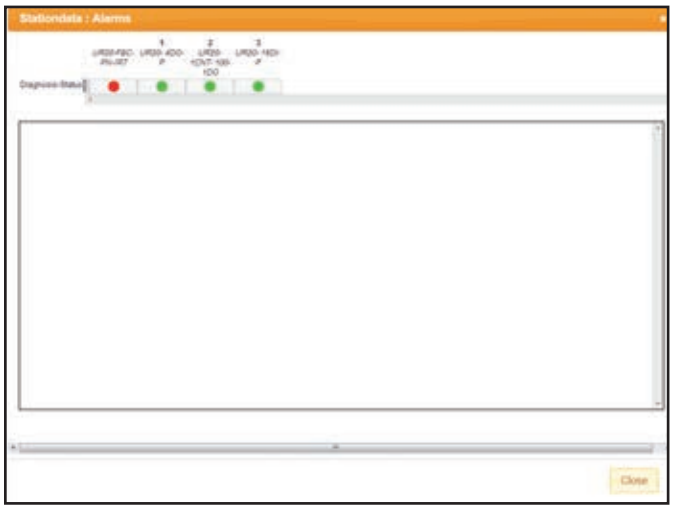
Display of process data

► To leave this view, click on **Close**.

Displaying diagnostic data

► Click on **Station data** and then on **Alarms**.

In the overview, all of the modules are displayed with symbols; if there is a green dot next to a module, there are no messages. Modules that have a red dot next to them have a diagnostic message.



Display of diagnostic data

► To view a diagnostic message, click on the red dot.
► To leave this view, click on **Close**.

10.10 Web server in force mode

	***WARNING!***
	Manipulation of the control unit! In force mode, the system may be manipulated to such an extent that can result in life-threatening personal injury and damage to materials. Only use force if you are very familiar with the connected system and know at all times the consequences that your actions will have!

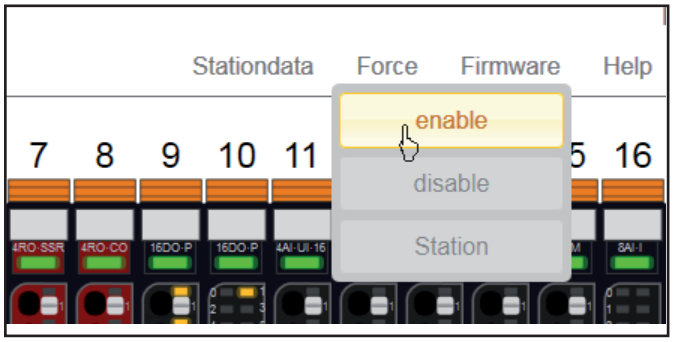
If the force mode is activated during an established field bus connection a diagnose alarm is generated. Depending on parametrised alarm behaviour the PLC can continue to transmit output process data and the u-remote station will process them for all unforced output channels. However, forced output channels will ignore any process data and behave according to forced values.
Input process data are transferred all the time, independently whether they are simulated by forcing or read via the physical inputs.

If the force mode is activated without an established field bus connection the fieldbus interface will be deactivated for the duration of forcing. Another fieldbus connection can only be established after the force mode has been deactivated.

Safety related modules (safe I/O modules and safe power-feed modules) can not be forced.

The force mode allows you to carry out functional tests or preconfigure the station prior to commissioning, even if sensors have not yet been connected.
To do so, you must change the operating mode of the web server.

► Click on **Force** and **enable**.



Switching over to force mode

The web server is now in force mode.

When force mode is activated, the screen display changes – the entire station is highlighted and outlined in warning colours.

If the USB connection is interrupted, force mode is stopped immediately.



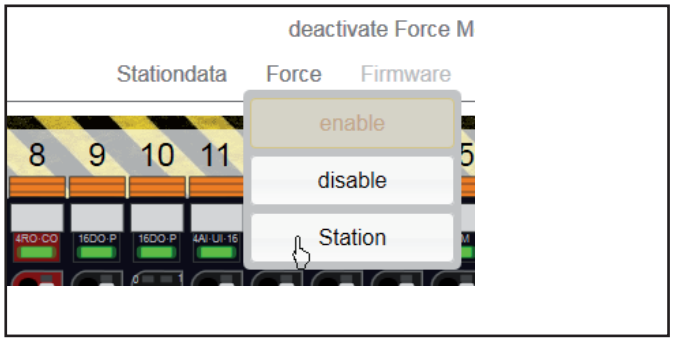
Display of the station in force mode

► To force a module, click on the respective channels.
► To accept an individual change, click on **Apply changes**.
► To accept all changes, click **OK**.

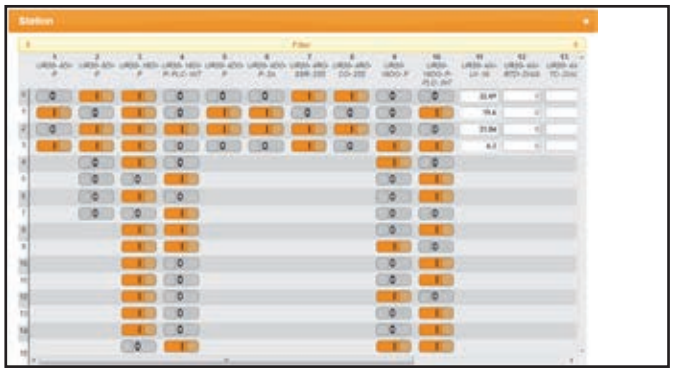
Open the detail view of the station in force mode

For a better survey we recommend to change to the detail view. In this view modules can be fade out and in, which is helpful, especially when working with larger stations.

► Click on **Force** and **Station**.



Open the detail view in force mode



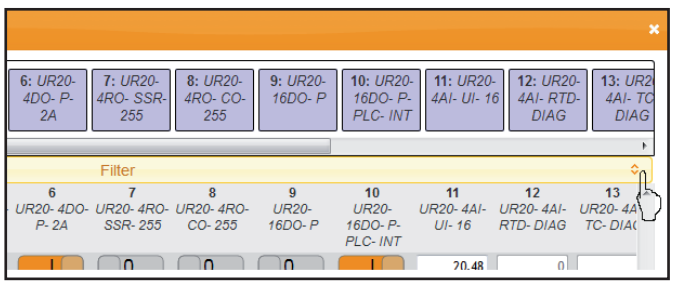
Detail view of the station in force mode

All active modules are displayed in the overview. The switchable channels are provided with a changeover switch.

Filtering the module view

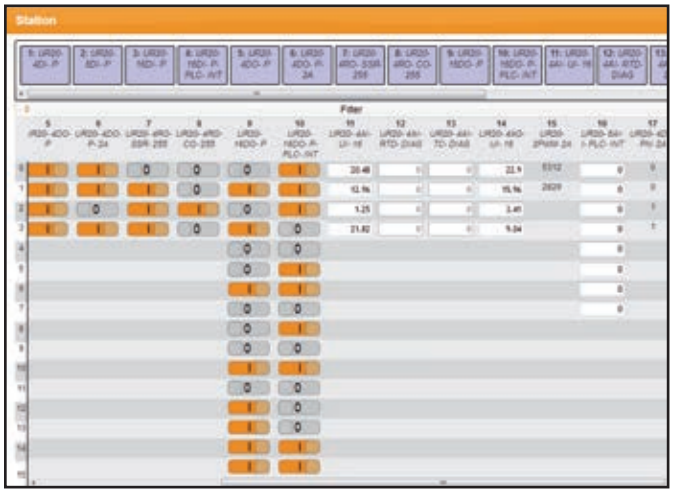
If you only want to see the modules that you would like to force, use the filter function.

► Click on the **Filter bar**.



Window with filter function open

Displayed modules are highlighted in colour in the filter bar, while hidden modules are displayed in white.



Window with filter running

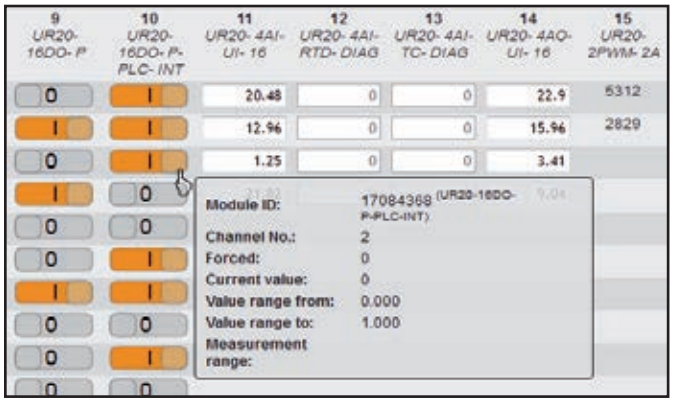
► To display or hide modules, go to the filter bar and click on the module you would like to display or hide.

Resetting filters

► To display all modules again, click **Display all**.
► To hide all modules, click **Hide all**.

Manually switching outputs (forcing)

► To switch a channel, click on the corresponding switch in the station display.



Forcing a channel

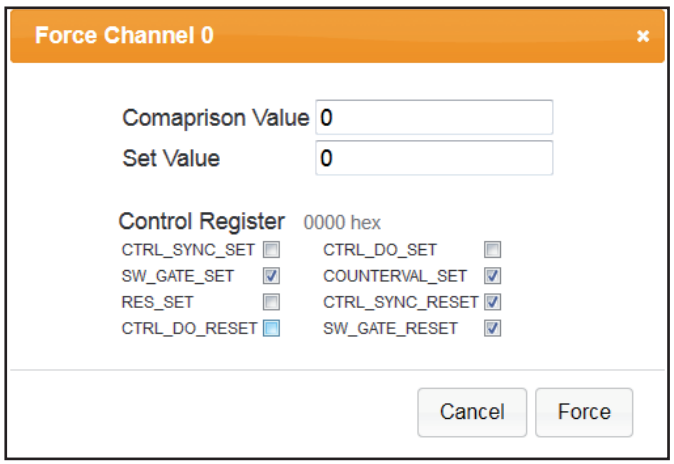
► To accept an individual change, click on **Apply changes**.
► To accept all changes, click **OK**.

Modules with registers

Modules with registers (e.g. counter modules and PWM modules) can be forced individually.

► Click on the module.

The **Force channel** window appears.



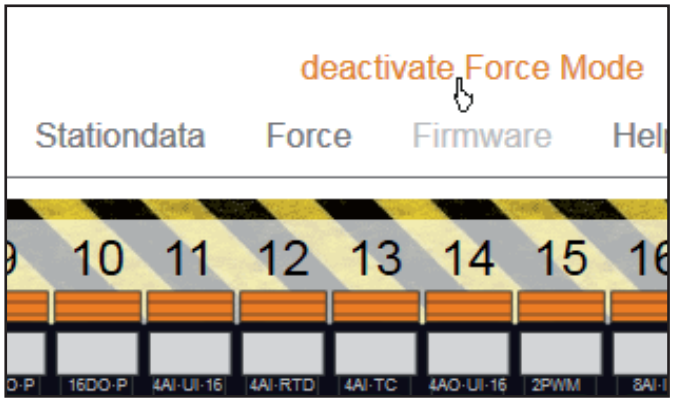
Forcing modules with registers (e.g. UR20-1CNT-100-1DO)

► Enter the desired value and select the desired register via the check box

Ending/deactivating forced operations

► To cancel a forced operation, click **Cancel**.
All of the changes you made will not have any effect.

► To end a forced operation, close the window.
► To deactivate Force mode, click on **Deactivate force mode**.



Deactivating force mode

10.11 Updating firmware

► Before you can update the firmware, you must download the latest firmware file for each coupler and each module from the Weidmüller website to your local PC.

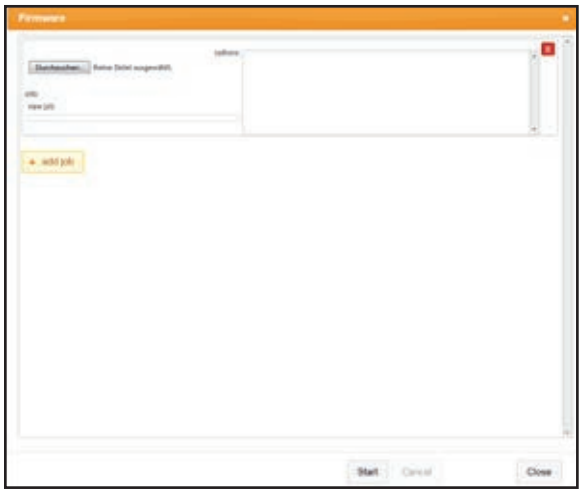
Firmware files have the extension .bsc (for fieldbus couplers) or .bsm (for modules). For PROFINET couplers, for instance, the file might be named FBC-PN-IRT-00XX.bsc.

You can determine for each module separately whether an update shall be proceed.

A firmware update cannot be undone. The old firmware in the coupler/module is overwritten.

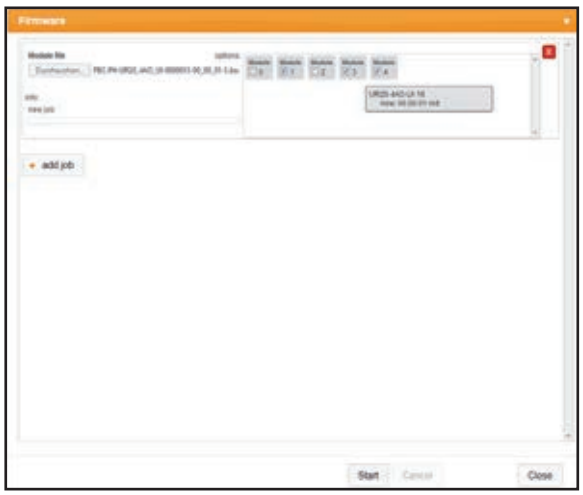
Make sure that the power supply is not interrupted while the firmware files are being loaded!

► To carry out a firmware update, navigate to the web server and click on **Firmware**.
The **Firmware** window opens.



Updating firmware

► To select a firmware file, click on **Search**.
► Select the firmware file from the storage location on your computer and click **Open**.



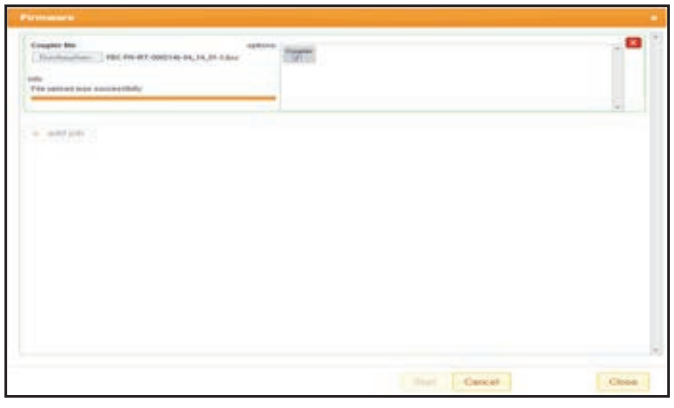
Loading a firmware file

- ► If you would like to carry out a firmware update for individual modules in the u-remote station, click on **Add job**.
- ► You can also use the relevant firmware file for this purpose.

Once the firmware file has been loaded, the **Options** area shows which modules can be updated with this file.

- ► Tick or untick the boxes so that only those modules that are to be updated are ticked.
- ► Once you have called up all the required firmware files and you have selected the modules as required, click on **Start**.

The firmware is updated. For each job ticket, progress of the data upload is displayed in the **Info** area. Once the data has been transferred, the job ticket is marked with a green outline.



Firmware data successfully transferred

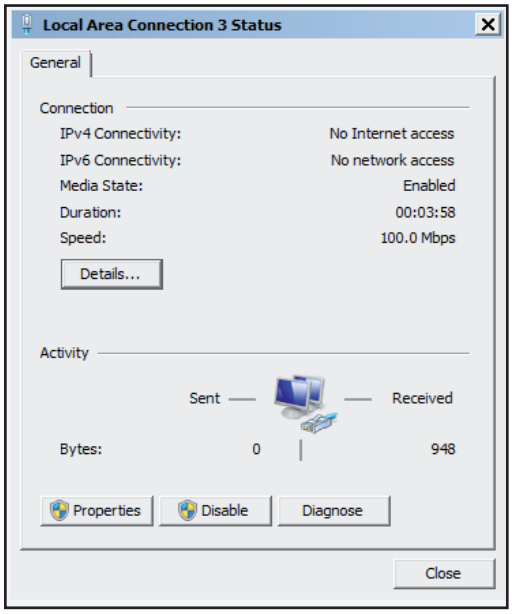
- ► To complete the firmware update, click **Close** and restart the coupler (power reset).

10.12 Review the IP address of the USB connection

You can review the IP address in the **Network and Sharing Center**, which is found in the **Windows Control Panel**:

- ► Under **Unidentified network**, click on **LAN connection**.

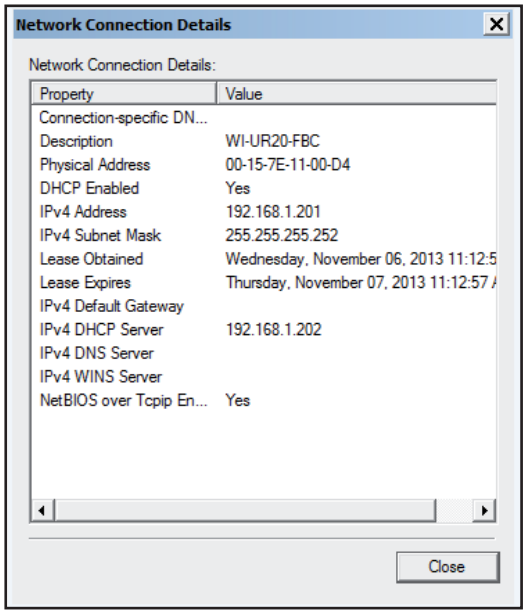
The **LAN connection status** window opens.



LAN connection status

- ► Click on **Details**.

The **Network connection details** window opens.

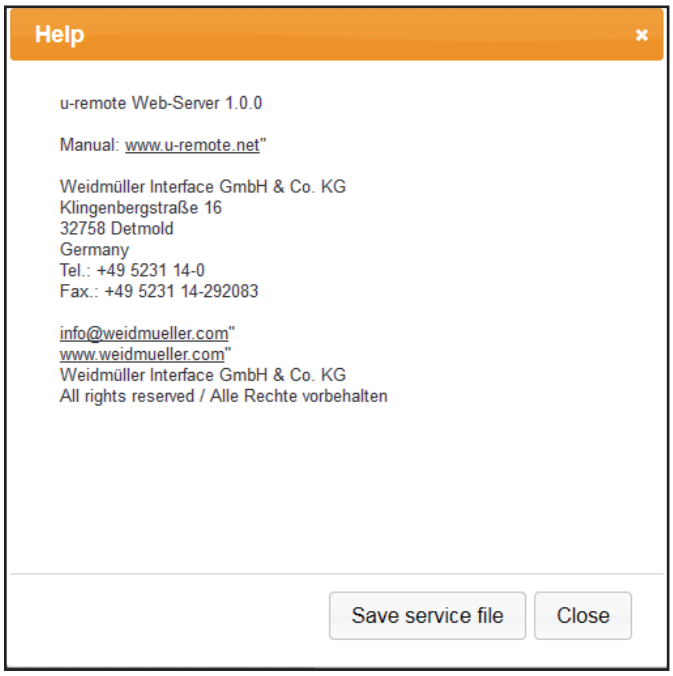


Network connection details

The IP address of the virtual LAN port (USB connection) is displayed under **IPv4 DHCP server.** The standard IP address of the fieldbus coupler is: 192.168.1.202 (UR20-FBC-EIP: 192.168.5.202).

10.13 Web server help

► Click on **Help**.



Help dialogue box

The program version of the web server is displayed in the help dialogue box.

► To open the manual for the u-remote station, click on the link.

Exporting log data, saving a service file

In the event of problems and service cases, it may be helpful to save the current log data for the u-remote station. This data can provide the service technician with valuable information about the malfunction.

► To save a service file, click on **Save service file**.
► Select a storage location on your PC for the service file (logdata.wmi) and click **Save**.
► To close the window, click on **Close**.

11 Replacing components

11.1 Removing/replacing the plug-in unit

WARNING

Explosion risk!

► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING

Dangerous contact voltage!

► All work on the u-remote station must be carried out with the power supply disconnected.

► Make sure that the place of installation (switch cabinet etc.) has been disconnected from the power supply!

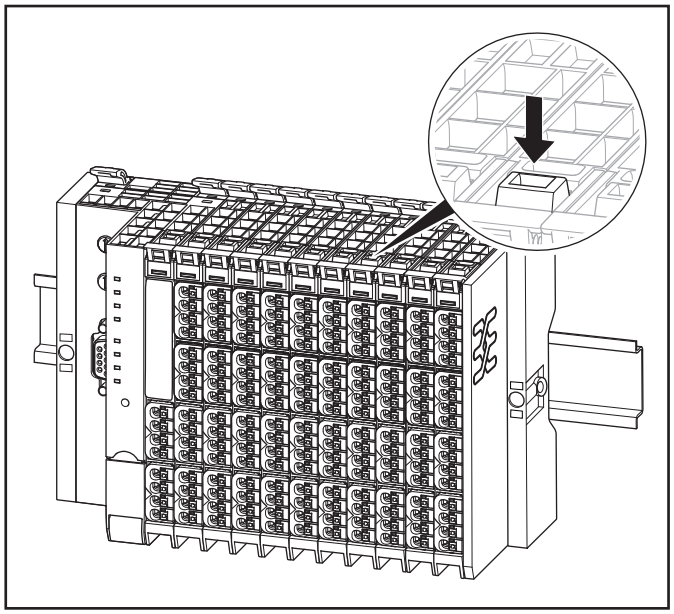
ATTENTION

The product can be destroyed by electrostatic discharge!

The components in the u-remote series can be destroyed by electrostatic discharge.

► Please make sure that personnel and work equipment are adequately earthed!

► Unlock the connector frame.

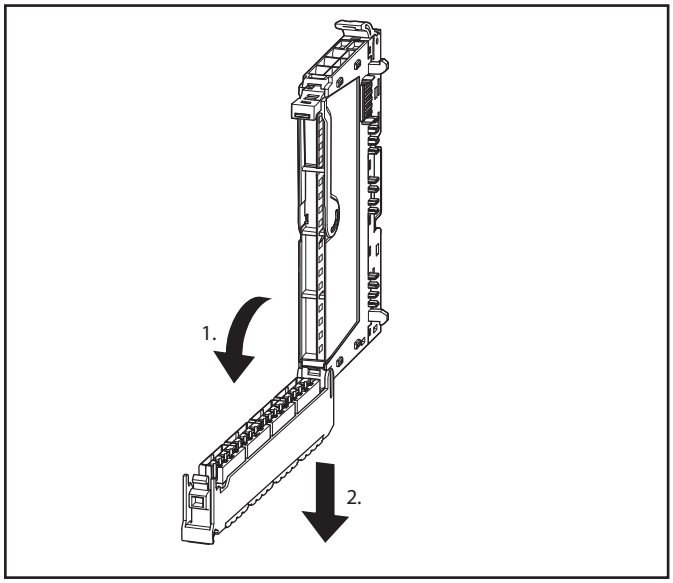


Unlocking the connector frame

► Swivel the plug-in unit with the cabling towards the front by 90°.

The plug-in unit can only be removed in this 90° position!

► Remove the plug-in unit by pulling it out in a straight, downward motion.



Opening the connector frame and pulling out the plug-in unit

11.2 Replacing the electronic unit

WARNING

Explosion risk!
Pulling out the electronic unit (hot swap) may generate sparks.
► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING

Pulling or inserting of an electronic unit might bring the inputs and outputs of all other modules temporaryly into an undefined condition!
► If the machine/system might be put into a dangerous state as a result of the removal of an electronic unit, a replacement can only be made once the machine/system is disconnected from the power!
► Only one electronic unit may be removed from the station at any one time. If multiple electronic units have to be replaced, this must be done consecutively.

ATTENTION

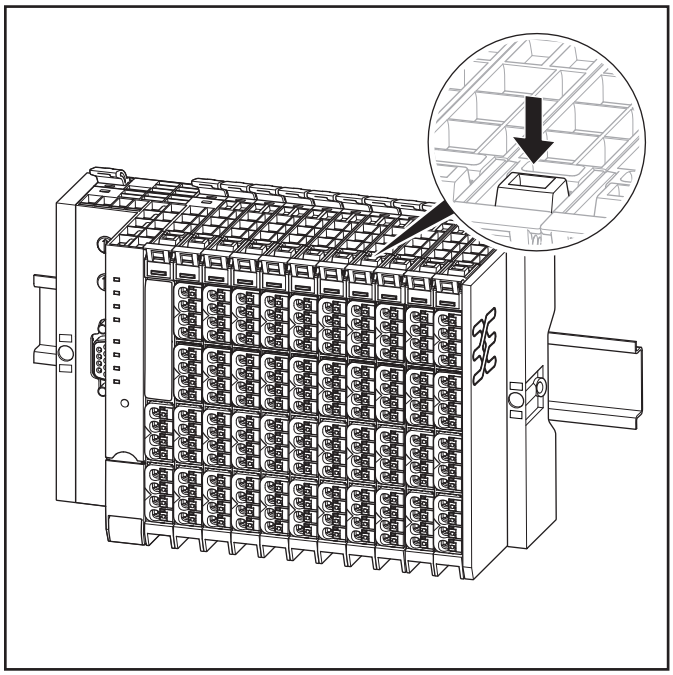
The product can be destroyed by electrostatic discharge!
The components in the u-remote series can be destroyed by electrostatic discharge.
► Please make sure that personnel and work equipment are adequately earthed!

Once an electronic unit is removed from a power-feed module, the inputs and outputs of the subsequent modules are no longer supplied with power. For safe power-feed modules, this is equivalent to triggering the connected safety equipment!

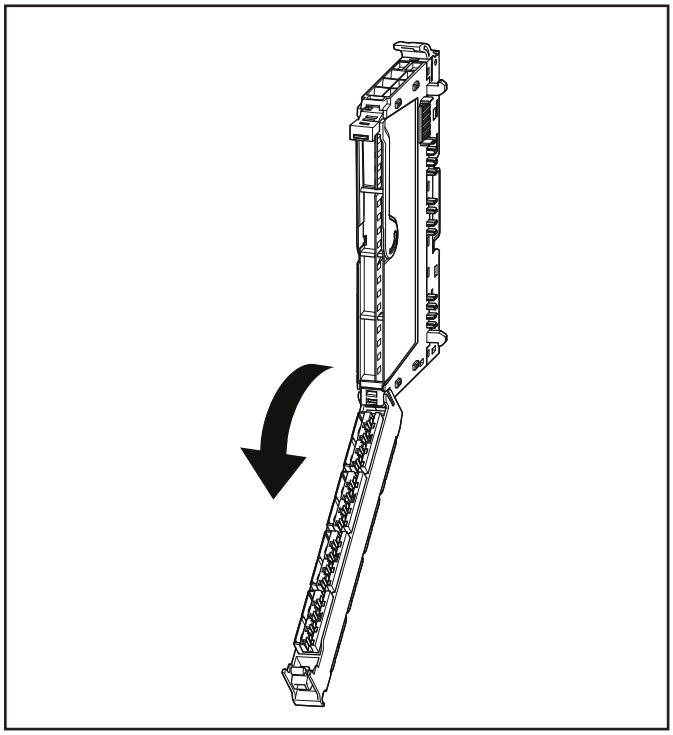
An electronic unit can be replaced while the system is powered up (no load) and in operation without having to disassemble the module. The station remains functional, and there is no need to disconnect and restart it. When replacing the electronic unit, the wiring remains intact.

If the new electronic unit is to be coded by the customer, new coding pins will be required.

► Unlock the connector frame and open it as far as possible (at least to an angle of 90°).

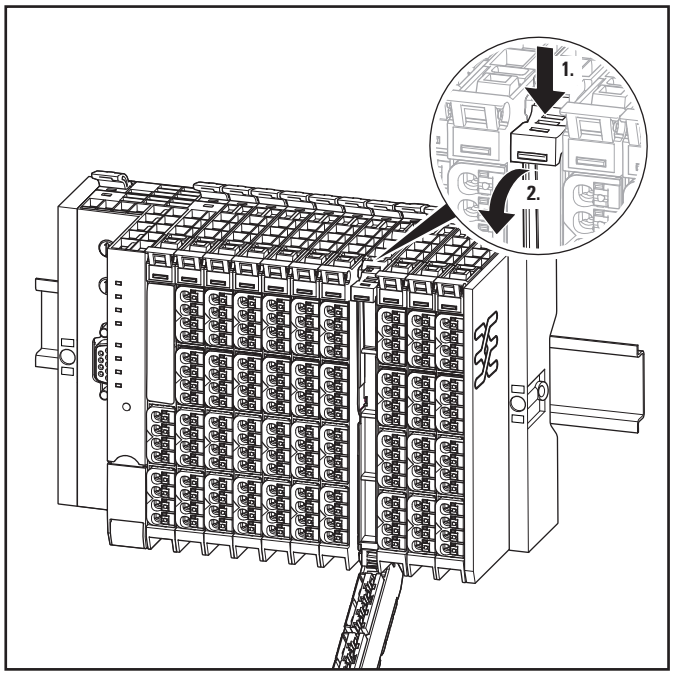


Unlocking the connector frame

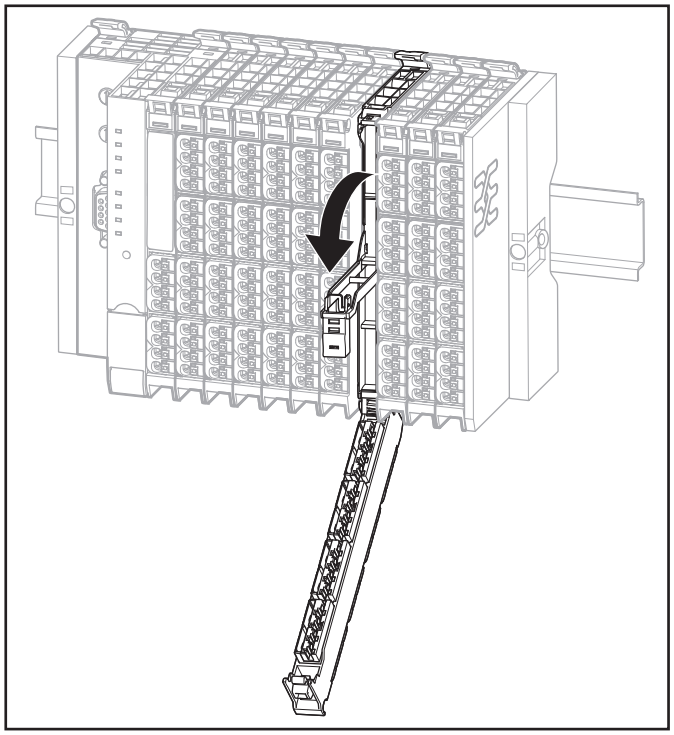


Opening the connector frame

► Lift the electronic unit removal lever and swivel it forwards by 90°.

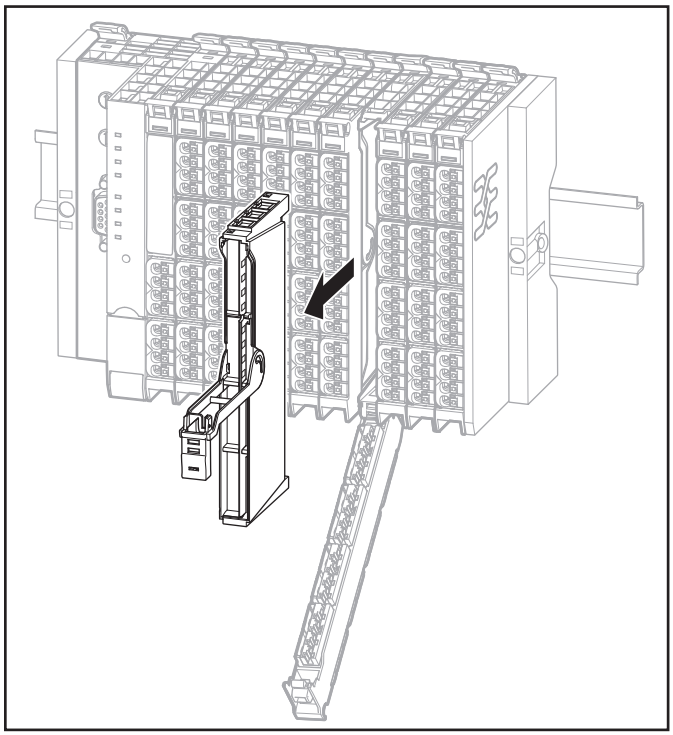


Unlocking the electronic unit



Opening the removal lever for the electronic unit

► Using the removal lever, pull the electronic unit forwards and out.

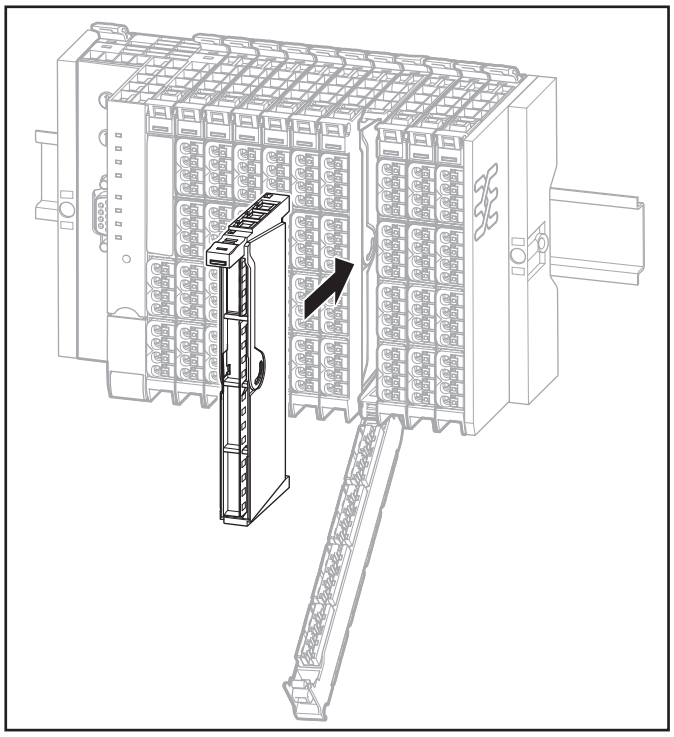


Pulling out the electronic unit

► If the existing electronic unit was coded, insert the new coding pins into the coding seats located in the base module (see Section 7.4).
► Safe I/O modules: Make sure, that the same address is set on the new electronic unit like on the old one (DIP-switches).

► Hold the new electronic unit by the top and the bottom, and carefully slide it into the base module.

The electronic units are functionally coded so that they can only be inserted into the appropriate base module. If it is not possible to insert a new electronic unit into the base module, check if the combination is correct and if there is a possible mix-up.



Inserting the new electronic unit

► Fold the connector frame back so that it closes and clicks into place.
► In case of replacement during operation: Pay attention to the **collective error LED** (**SF**) on the fieldbus coupler. Only when this doesn't light up any more, the new electronic unit has been recognised and the next electronic unit is able to be pulled out.

11.3 Replacing an I/O module

WARNING

Explosion risk!
► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING

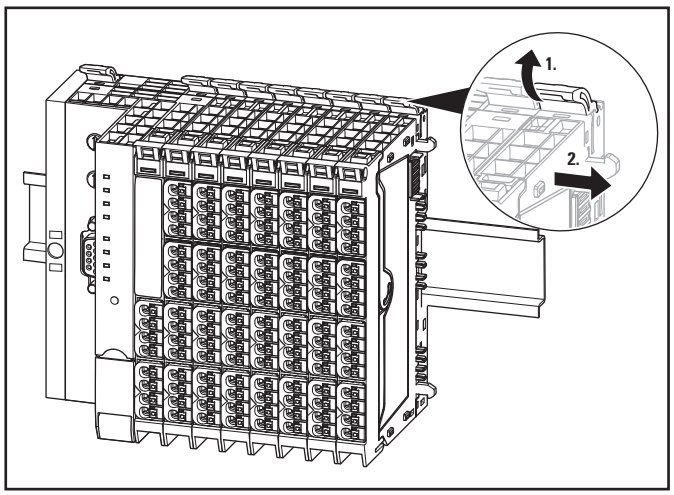
Dangerous contact voltage!
► Prior to removing modules, the u-remote station must be completely de-energised (supply of the field bus coupler and all external feed-in).
► Make sure that the place of installation (switch cabinet etc.) has been disconnected from the power supply.

ATTENTION

The product can be destroyed by electrostatic discharge!
The components in the u-remote series can be destroyed by electrostatic discharge.
► Please make sure that personnel and work equipment are adequately earthed!

To remove an individual module from the station, all modules to the right of it and the termination kit must be moved by approximately 5 cm.

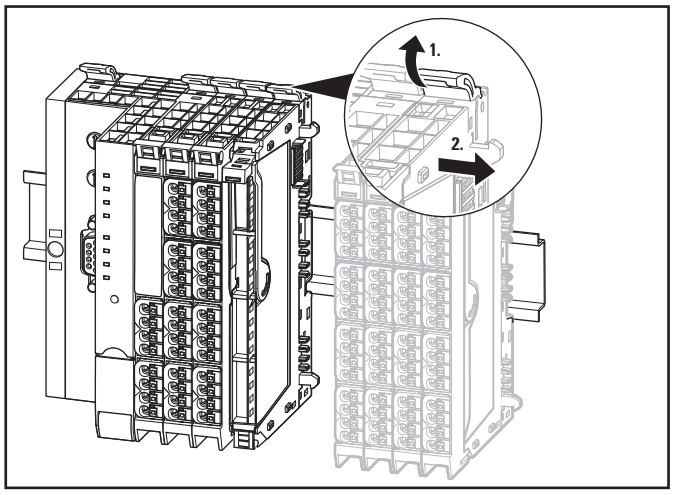
► Unfasten the mounting screw on the right-hand end bracket.
► Slide the end bracket and end plate approximately 5 cm to the right or remove both parts from the DIN rail.
► Open the release lever on the module furthest to the right.



Unlocking the last I/O module

- ► Slide the module on the DIN rail approximately 5 cm to the right, push it onto the DIN rail and click the release lever into place.
- ► Repeat the aforementioned step for all other modules which are located to the right of the module being replaced: release, slide to the right and click in once again.

- ► Remove the plug-in unit of the module to be replaced as described in the section **Removing/replacing the plug-in unit**.
- ► Open the release lever for the module to be removed.



Unlocking the I/O module to be replaced

- ► Slide the module to the right and remove it from the DIN rail.
- ► Safe I/O modules: Make sure, that the same address is set on the new module like on the old one (DIP-switches).

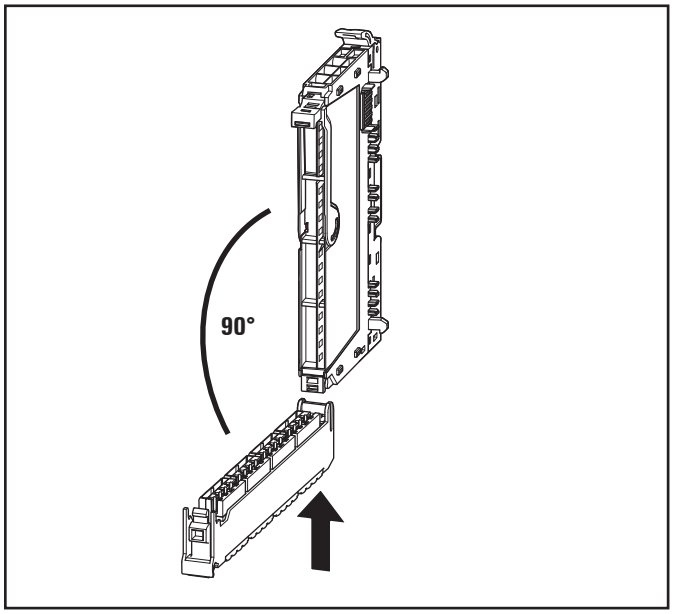
Position the new module with its closed release lever on the DIN rail so that it clicks audibly into place.

- ► Slide the module to the left until it audibly clicks into place against the neighbouring module.
- ► Return the modules that were slid away back into their original position: slide the modules to the left so that they audibly click into place on the new module.

After all the modules have been moved, make sure that they have all been clicked securely into place on the DIN rail!

- ► Reassemble the end plate and end bracket.
- ► Place the plug-in unit in a 90° position from below into the guideway of the base module on the new module.

The plug-in unit can only be inserted in this 90° position!



Inserting the plug-in unit

- ► Swivel the plug-in unit upwards until the connector frame clicks into place.

11.4 Removing/replacing connectors

WARNING

Explosion risk!

► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING

Operation of the machine/system can be disrupted!

► In the event of the machine/system being put into a dangerous state as a result of the removal of a connector, a replacement can only be made once the machine/system is disconnected from the power!

WARNING

Risk of contact fire!

► Remove connectors only while they are load current free.

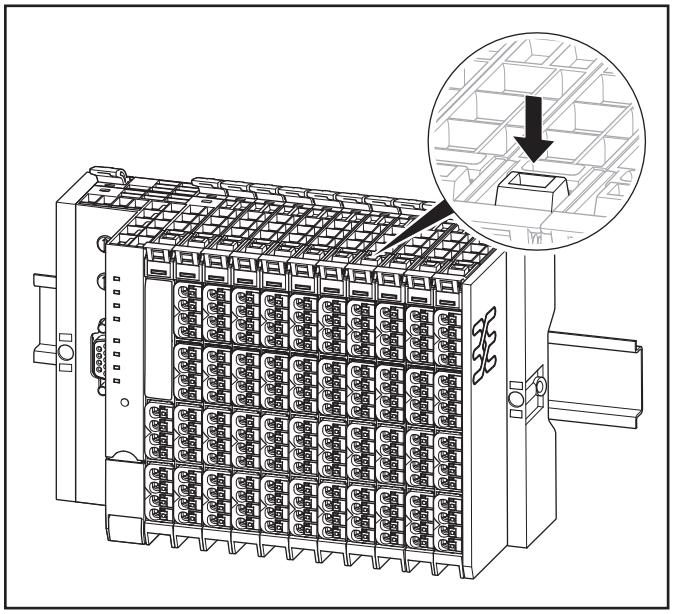
ATTENTION

The product can be destroyed by electrostatic discharge!

The components in the u-remote series can be destroyed by electrostatic discharge.

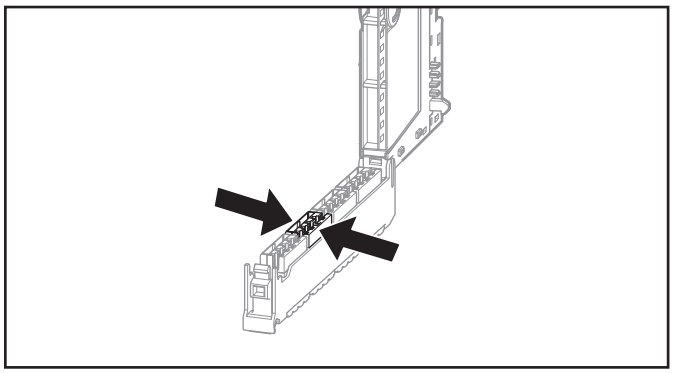
► Please make sure that personnel and work equipment are adequately earthed!

► Open the connector frame and flip the plug-in unit open so far that you can reach the connector.



Unlocking the connector frame

► Press both sides of the connector together so that it can be slid off the frame.



Pushing the connector together

► Remove the connector by pulling it off.
► Insert the new connector in the frame so that it audibly clicks into place.
► Swivel the plug-in unit upwards until the connector frame clicks into place.

11.5 Removing/replacing cables

WARNING

Explosion risk!

► Prior to starting work, make sure that there is not a potentially explosive atmosphere!

WARNING

Operation of the machine/system can be disrupted!

► If the machine/system is put into a dangerous state as a result of the removal of cables a replacement can only be made once the machine/system is disconnected from the power!

WARNING

Dangerous contact voltage!

► Prior to removing modules, the u-remote station must be completely de-energised (supply of the field bus coupler and all external feed-in).

► Make sure that the place of installation (switch cabinet etc.) has been disconnected from the power supply.

ATTENTION

The product can be destroyed by electrostatic discharge!

The components in the u-remote series can be destroyed by electrostatic discharge.

► Please make sure that personnel and work equipment are adequately earthed!

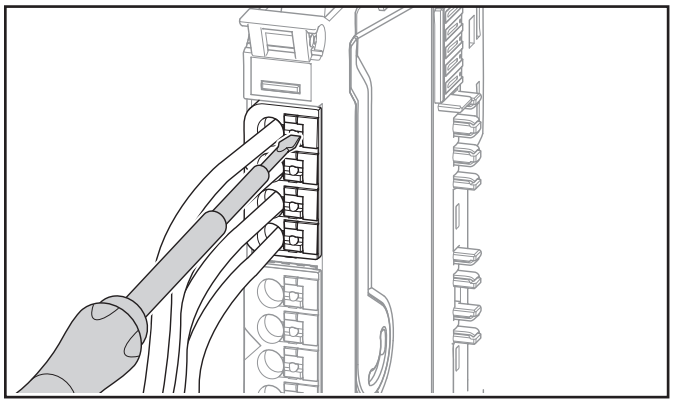
ATTENTION

The product can be destroyed by overcurrent!

Potentials may only be disconnected either simultaneously or in the correct order.

► At the fieldbus coupler as well as at power-feed modules always disconnect the 24 V supply (red pusher) first, before you disconect the GND potential (blue pusher)!

► Using a 3-mm screwdriver, push in the pusher adjacent to the cable to be removed and pull the wire out.



Pushing the pusher in with a screwdriver

► Release the pusher.

► Insert the new wire into the opening. To do so, you do not need to push in the pusher.

12 Disassembly and disposal

12.1 Disassembling the u-remote station



WARNING

Explosion risk!

► Prior to starting work, make sure that there is not a potentially explosive atmosphere!



WARNING

Dangerous contact voltage!

► Carry out all disassembly work on the u-remote station only when the power supply is disconnected.
► Make sure that the place of installation (switch cabinet etc.) has been disconnected from the power supply!

► Remove all cables and lines.
► Remove the end bracket marker (if present).
► Unfasten the mounting screw on the right-hand end bracket.
► Slide the end bracket with the end plate to the right and remove both from the DIN rail.

You can now disassemble the modules and the fieldbus coupler either individually or in groups of three to four modules.

► Press all the release levers of a module group towards the mounting plate so that they click into place.
► Slide the module group to the right and remove it from the DIN rail.
► Repeat the above procedure for all remaining modules/ module groups.
► To disassemble the fieldbus coupler, open both release levers and remove it from the DIN rail.
► Unfasten the mounting screw on the left-hand end bracket and remove it.
► Please observe the instructions for proper disposal.

12.2 Disposing of the u-remote station



ATTENTION

Products in the u-remote series are subject to WEEE (EU Directive 2002/96 EC), which regulates the collection and recycling of electrical and electronic equipment.
► Make sure that disassembled products are properly disposed of!

When all u-remote products reach the end of their life cycle, you can return them to Weidmüller, and we will arrange for their proper disposal. This also applies to countries outside the European Union.
► Please pack the products properly and send them to your responsible distributor.

You can find the address of your respective country representative in the annex and at the Weidmüller website.

13 LED indicators and troubleshooting

In the event of a malfunction occurring on a u-remote station, carry out the following recommended measures. If the malfunction cannot be fixed, send the affected product to Weidmüller (see the Service addresses in the annex).

Weidmüller does not assume any liability If the base or electronic module has been tampered with!



Technical support:
Tel. +49 5231 14-292828
support-electronics@weidmueller.de

13.1 Fieldbus coupler

Coupler/indicator	LED	Status	Recommended action
UR20-FBC-PB-DP			
Power LED	PWR	**Green**: Supply voltage applied	
		Off, status LED of the module is **green**: Defective coupler	Have the coupler repaired or replaced The internal fuse was triggered due to an overload
		Off, module status LED is **off**: Improper supply voltage	Check the supply voltage
Collective error	SF	**Red**: Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode	Check that the GSD file is up-to-date Check if the configured station setup matches the actual setup Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
Bus failure	BF	**Red**: No connection to the fieldbus	Check the fieldbus cable and the PLC configuration
		Red flashing: Configuration error, no connection to the control unit, or error in the parameter set or slave address error or firmware update is running	Check the fieldbus parameters and the PLC configuration Check that the GSD file is up-to-date Check if the configured station setup matches the actual setup
Maintenance	MT	**Yellow**: Error on the system bus or the fieldbus	Check that the modules have been snapped into place properly Check fieldbus wiring Check the fieldbus connection parameters
Input supply voltage	3.1	**Green**: Supply voltage for input current path > 18 V DC	
	3.2	**Red**: Supply voltage for input current path < 18 V DC	Check the supply voltage
	3.4	**Red**: Internal fuse defective	Replace the coupler
Output supply voltage	4.1	**Green**: Supply voltage for output current path > 18 V DC	
	4.2	**Red**: Supply voltage for output current path < 18 V DC	Check the supply voltage
	4.4	**Red**: Internal fuse defective	Replace the coupler

Coupler/indicator	LED	Status	Recommended action
UR20-FBC-PN-IRT			
Power LED	PWR	**Green**: Supply voltage	
		Off and the status LED on the module is **green**: Defective coupler	Have coupler repaired or replaced The internal fuse was triggered due to an overload
		Off and the status LED on the module is **off**: Improper supply voltage	Check the supply voltage
Collective error	SF	**Red**: Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode	Check that the GSDML file is up-to-date. Check if the configured station setup matches the actual setup Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
Bus failure	BF	**Red**: No connection to the fieldbus	Check the fieldbus cable and the PLC configuration
		Red flashing: Configuration error, no connection to the control unit, or error in the parameter set	Check the fieldbus parameters and the PLC configuration Check that the GSD file is up-to-date Check if the configured station setup matches the actual setup
Maintenance	MT	**Yellow**: Error on the system bus	Check that the modules have been snapped into place properly
Connection	LINK1	**Green**: Connection established between port 1 of the coupler and another field device	
		Off: No connection	Check the connection to the next participant and the fieldbus cable
Active	ACT1	**Yellow flashing**: Data being exchanged on port 1	
Connection	LINK2	**Green**: Connection established between port 2 of the coupler and another field device	
		Off: No connection	Check the connection to the next participant and the fieldbus cable
Active	ACT2	**Yellow flashing**: Data being exchanged on port 2	
Input supply voltage	3.1	**Green**: Supply voltage for input current path > 18 V DC	
	3.2	**Red**: Supply voltage for input current path < 18 V DC	Check the supply voltage
	3.4	**Red**: Internal fuse defective	Replace the coupler
Output supply voltage	4.1	**Green**: Supply voltage for output current path > 18 V DC	
	4.2	**Red**: Supply voltage for output current path < 18 V DC	Check the supply voltage
	4.4	**Red**: Internal fuse defective	Replace the coupler

Coupler/indicator	LED	Status	Recommended action
UR20-FBC-EC			
Power LED	PWR	**Green**: Supply voltage	
		Off and the status LED on the module is **green**: Defective coupler	Have coupler repaired or replaced The internal fuse was triggered due to an overload
		Off and the status LED on the module is **off**: Improper supply voltage	Check the supply voltage
Collective error	SF	**Red**: Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode	Check that the ESI configuration file is up-to-date Check if the configured station setup matches the actual setup Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
Bus failure	BF	**Red**: No connection to the fieldbus	Check the fieldbus cable and the PLC configuration
		Red flashing: Configuration error, no connection to the control unit, or error in the parameter set	Check the fieldbus parameters and the PLC configuration Check that the ESI configuration file is up-to-date Check if the configu**red** station setup matches the actual setup
Maintenance	MT	**Yellow**: Error on the system bus or fieldbus	Check that the modules have been snapped into place properly
Connection/active	L/A IN	**Off**: No connection	Check the fieldbus cable
		Green: Connection established between port 1 of the coupler and another field device **Green flashing**: Data being exchanged on port 1	
Connection/active	L/A OUT	**Off**: No connection	Check the fieldbus cable
		Green: Connection established between port 2 of the coupler and another field device **Green flashing**: Data being exchanged on port 2	
Coupler state	RUN	**Off**: Coupler in INIT state **Green flashing**: Coupler in PRE-OPERATIONAL state **Green** lights up **briefly**: Coupler in SAFE OPERATIONAL state **Green**: Coupler in OPERATIONAL state	
Internal error	ERROR	**Red**: Critical error in the coupler **Red** lights up **briefly**: Error in the coupler application **Red** lights up **briefly twice**: Output of the sync manager watchdog out-of-date **Red flashing**: Configuration error	Check that the ESI file is up-to-date. Check if the configu**red** station setup matches the actual setup Check that the coupler firmware is up-to-date. Compare the master cycle time with the time set up on watchdog timer
Input supply voltage	3.1	**Green**: Supply voltage for input current path > 18 V DC	
	3.2	**Red**: Supply voltage for input current path < 18 V DC	Check the supply voltage
	3.4	**Red**: Internal fuse defective	Replace the coupler
Output supply voltage	4.1	**Green**: Supply voltage for output current path > 18 V DC	
	4.2	**Red**: Supply voltage for output current path < 18 V DC	Check the supply voltage
	4.4	**Red**: Internal fuse defective	Replace the coupler

Coupler/indicator	LED	Status	Recommended action
UR20-FBC-MOD-TCP			
Power LED	PWR	**Green**: Supply voltage	
		Off and the status LED on the module is **green**: Defective coupler	Have coupler repaired or replaced The internal fuse was triggered due to an overload
		Off and the status LED on the module is **off**: Improper supply voltage	Check the supply voltage
Collective error	SF	**Red**: Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode	Check if the configured station setup matches the actual station setup Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
Bus failure	BF	**Red**: No connection to the fieldbus	Check the fieldbus cable and the PLC configuration
		Red flashing: Configuration error, no connection to the control unit, or error in the parameter set	Check if the configu**red** station setup matches the actual station setup Check the master configuration and try again to establish connection
Maintenance	MT	**Yellow**: Error on the system bus or the fieldbus	Check that the modules have been snapped into place properly Check the fieldbus cabling Check the fieldbus connection parameters
Connection/active	L/A X1	**Green**: Connection established between port 1 of the coupler and another field device	
		Green flashing: Data being exchanged on port 1	
		Off: No connection	Check the connection to the next participant and the fieldbus cable
Connection/active	L/A X2	**Green**: Connection established between port 2 of the coupler and another field device	
		Green flashing: Data being exchanged on port 2	
		Off: No connection	Check the connection to the next participant and the fieldbus cable
Input supply voltage	3.1	**Green**: Supply voltage for input current path > 18 V DC	
	3.2	**Red**: Supply voltage for input current path < 18 V DC	Check the supply voltage
	3.4	**Red**: Internal fuse defective	Replace the coupler
Output supply voltage	4.1	**Green**: Supply voltage for output current path > 18 V DC	
	4.2	**Red**: Supply voltage for output current path < 18 V DC	Check the supply voltage
	4.4	**Red**: Internal fuse defective	Replace the coupler

Coupler/indicator	LED	Status	Recommended action
UR20-FBC-EIP			
Power LED	PWR	**Green**: Supply voltage	
		Off and the status LED on the module is **green**: Defective coupler	Have coupler repaired or replaced The internal fuse was triggered due to an overload
		Off and the status LED on the module is **off**: Improper supply voltage	Check the supply voltage
Collective error	SF	**Red**: Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message	Check if the configured station setup matches the actual station setup Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
		Red flashing: Station in Force mode	
Module status	MS	**Red**: More than one module does not fit the start-up configuration	Check if the station's start-up setup matches the actual station setup; restart coupler to define a new start-up configuration
		Red flashing: One module does not fit the start-up configuration or there is a diagnostic message on at least one module	Check if the station's start-up setup matches the actual station setup; restart coupler to define a new start-up configuration Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
Network status	NS	**Off**: At least one EtherNet/IP connection is established	
		Yellow: Address conflict or no IP address configured	Assign address via web server or DHCP/BootP
		Yellow flashing (1 Hz): valid IP address but no EtherNet/IP connection established	Check the fieldbus cable Check the CLP configuration
		Yellow flashing (4 Hz): Connection timeout on an exclusive owner	Check the fieldbus cable Check the CLP configuration
Connection/active	L/A X1	**Green / Yellow***: Connection established between port 1 of the coupler and another field device	
		Green flashing / Yellow flashing*: Data being exchanged on port 1	
		Off: No connection	Check the connection to the next participant and the fieldbus cable
Connection/active	L/A X2	**Green / Yellow***: Connection established between port 2 of the coupler and another field device	
		Green flashing / Yellow flashing*: Data being exchanged on port 2	
		Off: No connection	Check the connection to the next participant and the fieldbus cable
Input supply voltage	3.1	**Green**: Supply voltage for input current path > 18 V DC	
	3.2	**Red**: Supply voltage for input current path < 18 V DC	Check the supply voltage
	3.4	**Red**: Internal fuse defective	Replace the coupler
Output supply voltage	4.1	**Green**: Supply voltage for output current path > 18 V DC	
	4.2	**Red**: Supply voltage for output current path < 18 V DC	Check the supply voltage
	4.4	**Red**: Internal fuse defective	Replace the coupler
		*Green: transfer rate 100 Mbps; yellow: transfer rate 10 Mbps	

Coupler/indicator	LED	Status	Recommended action
UR20-FBC-DN			
Power LED	PWR	**Green**: Supply voltage	
		Red: Boot loader failure	Have coupler repaired or replaced
		Off and the status LED on the module is **green**: Defective coupler	Have coupler repaired or replaced The internal fuse was triggered due to an overload
		Off and the status LED on the module is **off**: Improper supply voltage	Check the supply voltage
Collective error	SF	**Red**: Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode	Check that the ESI configuration file is up-to-date Check if the configured station setup matches the actual setup Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
Bus failure	BF	**Red**: No connection to the fieldbus	Check the fieldbus cable and the PLC configuration
		Red flashing: Configuration error, no connection to the control unit, or error in the parameter set	Check the fieldbus parameters and the PLC configuration Check that the ESI configuration file is up-to-date Check if the configu**red** station setup matches the actual setup
Maintenance	MT	**Yellow**: Error on the system bus or fieldbus	Check that the modules have been snapped into place properly
Module/Network status	MNS	**Off:** Duplicate MAC ID check active **Green**: DeviceNet connection established, device status OK **Green flashing**: No DeviceNet connection established, device status OK	
		Red: Bus failure	Check if MAC-ID is duplicated or device is in state BusOFF or check bus physics
		Red flashing: Bus connection timeout	Check the fieldbus for: cable interruption, plug has been pulled, 24 V supply for the fieldbus
Input/Output	IO	**Green**: Data exchange active, outputs are accessed by the PLC	
		Green flashing: Station in idle mode (outputs are not accessed by the PLC)	Check if the CPU of the PLC is in STOPP mode
		Red: At least one stack differs from the start configuration (e.g. one module has been pulled)	Check the configuration of the station
		Red flashing: Diagnostic message on at least one module	Read/confirm diagnostic message
Input supply voltage	3.1	**Green**: Supply voltage for input current path > 18 V DC	
	3.2	**Red**: Supply voltage for input current path < 18 V DC	Check the supply voltage
	3.4	**Red**: Internal fuse defective	Replace the coupler
Output supply voltage	4.1	**Green**: Supply voltage for output current path > 18 V DC	
	4.2	**Red**: Supply voltage for output current path < 18 V DC	Check the supply voltage
	4.4	**Red**: Internal fuse defective	Replace the coupler

Coupler/indicator	LED	Status	Recommended action
UR20-FBC-CAN			
Power LED	PWR	**Green**: Supply voltage	
		Red: Boot loader failure	Have coupler repaired or replaced
		Off and the status LED on the module is **green**: Defective coupler	Have coupler repaired or replaced The internal fuse was triggered due to an overload
		Off and the status LED on the module is **off**: Improper supply voltage	Check the supply voltage
Collective error	SF	**Red**: Configuration error, or error in the coupler, or error in a module, or there is a new diagnostic message **Red flashing**: Station in Force mode	Check that the ESI configuration file is up-to-date Check if the configured station setup matches the actual setup Read the diagnostic message with the web server or an engineering tool and determine which further actions to take
Bus failure	BF	**Red**: No connection to the fieldbus	Check the fieldbus cable and the PLC configuration
		Red flashing: Configuration error, no connection to the control unit, or error in the parameter set	Check the fieldbus parameters and the PLC configuration Check that the ESI configuration file is up-to-date Check if the configu**red** station setup matches the actual setup
Maintenance	MT	**Yellow**: Error on the system bus or fieldbus	Check that the modules have been snapped into place properly
Internal error	ERROR	**Red**: No fieldbus communication (BusOFF)	Check the fieldbus wiring (terminating resistor)
		***Red fast flashing**: Auto baud rate detection running	Check the fieldbus wiring, restart the fieldbus
		Red flashing: Configuration error	Check the configuration, check the bus address
		Red one short flash: CAN error counter reached warning level	Bad bus physics or collision, check fieldbus
		Red two short flashes: Node guarding (node guard or heartbeat)	PLC or NMT master failed
Coupler state	RUN	**Green**: Fieldbus running (OPERATIONAL) **Green flashing**: Fieldbus in state PRE-OPERATIONAL	
		***Green fast flashing**: Auto baud rate detection running	see above
Input supply voltage	3.1	**Green**: Supply voltage for input current path > 18 V DC	
	3.2	**Red**: Supply voltage for input current path < 18 V DC	Check the supply voltage
	3.4	**Red**: Internal fuse defective	Replace the coupler
Output supply voltage	4.1	**Green**: Supply voltage for output current path > 18 V DC	
	4.2	**Red**: Supply voltage for output current path < 18 V DC	Check the supply voltage
	4.4	**Red**: Internal fuse defective	Replace the coupler
		*Alternating	

13.2 I/O modules

Module	LED	Status	Recommended action
Digital input modules			
UR20-4DI-P, UR20-4DI-P-3W, UR20-8DI-P-2W, UR20-8DI-P-3W, UR20-8DI-P-3W-HD, UR20-16DI-P, UR20-2DI-P-TS, UR20-4DI-P-TS, UR20-4DI-N, UR20-8DI-N-3W, UR20-16DI-N	Status LED	**Red**: – Error in supply voltage at input current path – Communication error on the system bus – There is a new diagnostic message	– Check that the module has been snapped into place properly – Check the supply voltage
UR20-16DI-P-PLC-INT **UR20-16DI-N-PLC-INT**	Status LED	**Red**: – Error in the supply voltage – Communication error on the system bus – There is a new diagnostic message – Channel error – Error on the supply voltage of the feed-in plug	– Check that the module has been snapped into place properly – Check the supply voltage – Check channel error – Check supply voltage of feed-in plug
		Status LED **off** and all other LEDs **red**: – Error in the bus coupler power supply	– Check the bus coupler supply voltage
	Channel LED 4.1	**Green**: – Supply voltage feed-in plug > 18 V DC	
	4.2	**Red**: – Error on the supply voltage of the feed-in plug	– Check supply voltage of feed-in plug
UR20-4DI-2W-230V-AC	Status LED	**Red**: – Error in the supply voltage – Communication error on the system bus – There is a new diagnostic message	– Check that the module has been snapped into place properly – Check the supply voltage
	Channel LED 1.1 ... 4.1	**Yellow**: – Input active	
Digital output modules			
UR20-4DO-P, UR20-4DO-P-2A, UR20-4DO-PN-2A, UR20-8DO-P, UR20-8DO-P-2W-HD, UR20-16DO-P, UR20-4DO-N, UR20-4DO-N-2A, UR20-8DO-N, UR20-16DO-N	Status LED	**Red**: – Error in supply voltage at output current path – Communication error on the system bus – There is a new diagnostic message – At least one output overloaded	– Check that the module has been snapped into place properly – Check the supply voltage – Eliminate the overload/short circuit
UR20-16DO-P-PLC-INT, UR20-16DO-N-PLC-INT	Status LED	**Red**: – Error in the supply voltage – Communication error on the system bus – There is a new diagnostic message – Channel error – Error on the supply voltage of the feed-in plug	– Check that the module has been snapped into place properly – Check the supply voltage – Check channel error – Check supply voltage of feed-in plug
		Status LED **off** and all other LEDs **red**: – Error in the bus coupler power supply	– Check the bus coupler supply voltage
	Channel LED 4.1	**Green**: – Supply voltage feed-in plug > 18 V DC	
	4.2	**Red**: – Error on the supply voltage of the feed-in plug	– Check supply voltage of feed-in plug

Module	LED	Status	Recommended action
Digital relay output modules			
UR20-4RO-SSR-255, UR20-4RO-CO-255	Status LED	**Red**: – Error in supply voltage at output current path – Communication error on the system bus – There is a new diagnostic message	– Check that the module has been snapped into place properly – Check the supply voltage
Pulse-width modulation modules			
UR20-2PWM-PN-0.5A, UR20-2PWM-PN-2A	Status LED	**Red**: – Error in supply voltage at output current path – Communication error on the system bus – There is a new diagnostic message – At least one output overloaded	– Check that the module has been snapped into place properly – Check the supply voltage – Eliminate the overload/short circuit
Analogue input modules			
UR20-4AI-UI-16, UR20-4AI-UI-16-DIAG, UR20-4AI-UI-16-HD, UR20-4AI-UI-16-DIAG-HD, UR20-4AI-UI-12	Status LED	**Red**: – Error in supply voltage at input current path – Communication error on the system bus – There is a new diagnostic message – Channel error – Firmware error	– Check that the module has been snapped into place properly – Check the supply voltage – Check channel error – Check firmware, update firmware as nessecary
		Status LED off and all other LEDs **red**: Error in the bus coupler power supply	Check the bus coupler supply voltage
	Channel LED 1.1 ... 4.1	**Red**: – Input signal outside permissible range – System bus cannot be accessed (e.g. caused by interruption of the bus coupler power supply)	– Check the input signal – Check the bus coupler supply voltage
UR20-8AI-I-16-HD, UR20-8AI-I-16-DIAG-HD	Status LED	**Red**: – Error in supply voltage at output current path – Communication error on the system bus – There is a new diagnostic message – At least one output overloaded	– Check that the module has been snapped into place properly – Check the supply voltage – Eliminate the overload/short circuit
	Channel LED 1.1 ... 8.1	**Red**: – Channel error	– Check channel error
UR20-8AI-I-PLC-INT	Status LED	**Red**: – Error in the supply voltage – Communication error on the system bus – There is a new diagnostic message – Channel error – Error on the supply voltage of the feed-in plug	– Check that the module has been snapped into place properly – Check the supply voltage – Check channel error – Check supply voltage of feed-in plug
		Status LED **off** and all other LEDs **red**: – Error in the bus coupler power supply	– Check the bus coupler supply voltage
	Channel LED 1.0 ... 1.7	**Red**: – Input signal outside permissible range – System bus cannot be accessed (e.g. caused by interruption of the bus coupler power supply)	– Check the input signal – Check the bus coupler supply voltage
	4.1	**Green**: Supply voltage feed-in plug > 18 V DC	
	4.2	**Red**: Error on the supply voltage of the feed-in plug	– Check supply voltage of feed-in plug
	4.4	**Red**: – Fuse for the sensor supply has been trigger**ed**	– Check the load connected to the sensor supply

Module	LED	Status	Recommended action
UR20-4AI-TC-DIAG, UR20-4AI-RTD-DIAG			
	Status LED	**Red**: – Error in supply voltage at input current path – Communication error on the system bus – There is a new diagnostic message – Channel error – Firmware error	– Check that the module has been snapped into place properly – Check the supply voltage – Check channel error – Check firmware, update firmware as nessecary
		Status LED **off** and all other LEDs **red**: – Error in the bus coupler power supply	– Check the bus coupler supply voltage
	Channel LED 1.1 ... 4.1	**Red**: – Input signal outside the permissible range – Line break – Cold-junction compensation error (UR20-4AI-TC-DIAG only) – System bus cannot be accessed (e.g. caused by interruption of the bus coupler power supply)	– Check the input signal, the cabling and, if necessary, the sensor for external cold-junction compensation. – Check the bus coupler supply voltage
Analogue output modules			
UR20-4AO-UI-16, UR20-4AO-UI-16-DIAG, UR20-4AO-UI-16-HD, UR20-4AO-UI-16-DIAG-HD	Status LED	**Red**: – Error in the supply voltage – Communication error – Channel error	– Check that the module has been snapped into place properly. – Check the supply voltage – Check the channel error
		Status LED **off** and all other LEDs **red**: – Error in the bus coupler power supply	– Check the bus coupler supply voltage
	Channel LED 1.1 ... 4.1	**Red**: – Overload in voltage mode – Broken line in current mode – System bus cannot be accessed (e.g. caused by interruption of the bus coupler power supply)	– Check the connected load, – Check the cabling, – Check the bus coupler supply voltage
Digital counter modules			
UR20-1CNT-100-1DO, UR20-2CNT-100, UR20-2FCNT-100, UR20-1CNT-500	Status LED	**Red**: – Error in supply voltage at input current path – Communication error on the system bus – There is a new diagnostic message	– Check that the module has been snapped into place properly – Check the supply voltage
Digital interface modules			
UR20-1SSI	Status LED	**Red**: – Error in supply voltage at input current path – Communication error on the system bus – There is a new diagnostic message	– Check that the module has been snapped into place properly – Check the supply voltage
	Channel LED 4.1	**Green**: – Supply voltage sensor 5 V DC	
	4.3	**Green**: – Supply voltage sensor 24 V DC	

Module	LED	Status	Recommended action
Communication modules			
UR20-1COM-232-485-422	Status LED	**Red**: – Erroor in the supply voltage at input current path – Communication error on the system bus – There is a new diagnostic message	– Check that the module has been snappeed into place properly – Check the supply voltage
	Channel LED 1.1, 1.2	**Yellow:** RS232 has been parameterised	
	1.1	**Yellow flashing:** Receiving data (RS232)	
	1.2	**Yellow flashing:** Transmitting data (RS232)	
	3.1 ... 3.4	**Yellow:** RS422 has been parameterised	
	3.1, 3.2 3.3, 3.4	**Off** **Yellow:** RS485 has been parameterised	
	3.3	**Flashing yellow**: Receiving data (RS485 or RS 422)	
	3.4	**Flashing yellow**: Transmitting data (RS485 or RS 422)	
	4.1	**Green**: Supply voltage OK (5 V DC)	
	4.3	**Green**: Supply voltage OK (24 V DC)	
UR20-1COM-SAI-PRO	Status LED	**Red**: – Erroor in the supply voltage at input current path – Communication error on the system bus – There is a new diagnostic message	– Check that the module has been snappeed into place properly – Check the supply voltage
	Channel LED 3.1	**Yellow flashing (0.5 Hz)**: – Subbus communication is being initialised **Yellow:** – Subbus communication OK	– Please wait
	3.2	**Red**: – Supply voltage error	– Check the power supply unit and the cabling
	3.3	**Green**: – Supply voltage OK	
	3.4	**Red**: – Subbus communication error	– Check the connected subbus modules and sensors

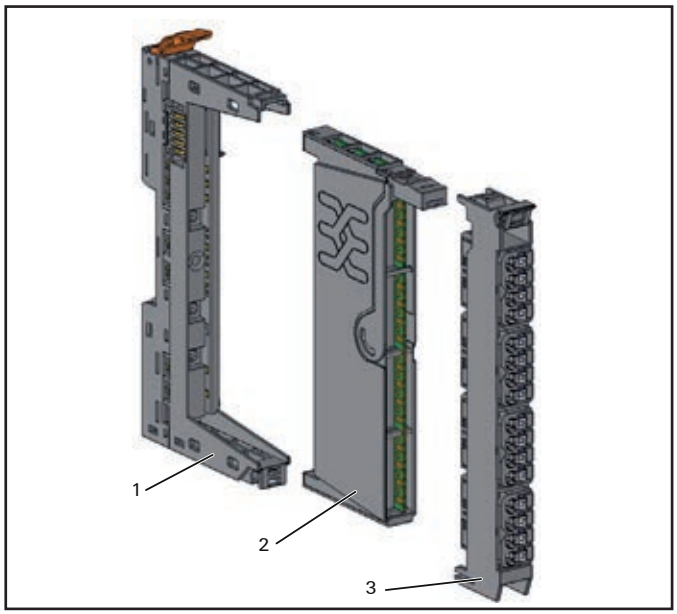
Module	LED	Status	Recommended action
UR20-PF-I			
	Status LED	**Red**: – Channel error or communication error on the system bus, or there is an error in the supply voltage	– Check that the module has been snapped into place properly – Check the channel error, check the supply voltage
	3.2	**Red**: – Supply voltage of the feed-in plug < 18 V DC	Check the supply voltage of the feed-in plug
	3.4	**Red**: – Damage of internal fuse	– replace module
UR20-PF-O			
	Status LED	**Red**: – Channel error or communication error on the system bus, or there is an error in the supply voltage	– Check that the module has been snapped into place properly – Check the channel error, check the supply voltage
	4.1	**Red**: – Supply voltage of the feed-in plug < 18 V DC	Check the supply voltage of the feed-in plug
	4.2	**Red**: – Damage of internal fuse	– replace module
Potential distribution modules			
UR20-16AUX-I **UR20-16AUX-GND-I**	Status LED	**Red**: – Error on the supply voltage of the input path	– Check that the module has been snapped into place properly – Check the supply voltage
UR20-16AUX-O **UR20-16AUX-GND-O**	Status LED	**Red**: – Error on the supply voltage of the output path	– Check that the module has been snapped into place properly – Check the supply voltage
UR20-16AUX-FE	Status LED	**Off**: No supply voltage	– Check that the module has been snapped into place properly
Safe I/O modules see "Modules for functional safety manual"			

14 Accessories and replacement parts

14.1 Accessories

Order No.	Designation	Purpose
9009030000	Screwdriver SDS 0.4X2.5X75	Unfastening conductors from PUSH IN contacts
9008320000	Screwdriver SDS 0.5X3.0X80	Assembling/disassembling an end bracket
1323700000	PM 2.7/2.6 MC SDR marker	Connection marker for a pusher, with custom printing to customer specifications
1323710000	PM 2.7/2.6 MC NE WS marker	Connection marker for a pusher, unprinted
1341610000	DEK 5/8-11.5 MC SDR marker	Module marker with custom printing to customer specifications
1341630000	DEK 5/8-11.5 MC NE WS marker	Module marker, unprinted
1339920000	UR20-SM-ACC swivel marker	Pivoting holder for module markers
1429420000	White thermal-transfer label for swivel markers	Can be printed with thermal-transfer printers
1429910000	Yellow thermal-transfer labels for swivel markers	Can be printed with thermal-transfer printers
1429430000	Paper labels for swivel markers	Can be printed with laser printers
1806120000	EM 8/30 end bracket marker	Marks the station at the end bracket
1483050000	KOSM BHZ5.00 coding elements	Coding element for customised module coding
1346610000	UR20-EBK-ACC termination kit	Set with two end brackets and one end plate
1805610000	MEW 35/1 end bracket for vertical installation	Reinforced end bracket required in addition to terminal kit for vertical installation
1469340000	HD-Plug UR20-PG0.35	Plug for HD-modules (8 pieces per package)
1919990000	PCB plug-in connector BLDZ DN5.08/05/180F GY BX PRT	5-pole female connector for fieldbus connection UR20-FBC-DN (10 wire connections)
1933550000	PCB plug-in connector BLZ DN 5.08/05/180F AU GY BX PRT	5-pole female connector for fieldbus connection UR20-FBC-DN (5 wire connections)
9202210000	multi-stripax 6-16	Stripping tool for conductors to be used with HD-Plugs
1525820000	Pressing tool PWZ-UR20-HD	Pressing tool for fixing HD-Plugs
1487980000	IE-USB-A-MICRO-1.8M	Connecting line, USB A to USB Micro, sheath material PVC, 1.8 m

14.2 Replacement parts



1 Base module
2 Electronic unit
3 Plug-in unit

Replacement parts for couplers

Coupler	Order No.	Plug-in unit
UR20-FBC-PB-DP	1334870000	UR20-PK-1334870000-SP Order No.: 1346580000
UR20-FBC-PN-IRT	1334880000	UR20-PK-1334880000-SP Order No.: 1484120000
UR20-FBC-MOD	1334930000	UR20-PK-1334930000-SP Order No.: 1484130000
UR20-FBC-EC	1334910000	UR20-PK-1334910000-SP Order No.: 1484440000
UR20-FBC-EIP	1334920000	UR20-PK-1334920000-SP Order No.: 1541290000
UR20-FBC-DN	1334900000	UR20-PK-1334900000-SP Order No.: 2003540000
UR20-FBC-CAN	1334890000	UR20-PK-1334890000-SP Order No.: 2003530000

Replacement parts for modules

Module	Order No.	Base module	Electronic unit	Plug-in unit
UR20-4DI-P	1315170000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315170000-SP Order No.: 1346640000	UR20-PK-1315170000-SP Order No.: 1346440000
UR20-4DI-P-3W	2009360000	UR20-BM-SP Order No.: 1350930000	UR20-EM-2009360000-SP Order No.: 2011260000	UR20-PK-2009360000-SP Order No.: 2011240000
UR20-8DI-P-2W	1315180000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315180000-SP Order No.: 1490220000	UR20-PK-1315180000-SP Order No.: 1346430000
UR20-8DI-P-3W	1394400000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1394400000-SP Order No.: 1434220000	UR20-PK-1394400000-SP Order No.: 1411430000
UR20-8DI-P-3W-HD	1315190000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315190000-SP Order No.: 1346670000	UR20-PK-1315190000-SP Order No.: 1518800000
UR20-16DI-P	1315200000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315200000-SP Order No.: 1346680000	UR20-PK-1315200000-SP Order No.: 1346400000
UR20-16DI-P-PLC-INT	1315210000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315210000-SP Order No.: 1346690000	UR20-PK-1315210000-SP Order No.: 1346590000
UR20-2DI-P-TS	1460140000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1460140000-SP Order No.: 1463690000	UR20-PK-1460140000-SP Order No.: 1484110000
UR20-4DI-P-TS	1460150000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1460150000-SP Order No.: 1463680000	UR20-PK-1460150000-SP Order No.: 1484430000
UR20-4DI-N	1315350000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315350000-SP Order No.: 1346870000	UR20-PK-1315350000-SP Order No.: 1559770000
UR20-8DI-N-3W	1315370000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315370000-SP Order No.: 1346880000	UR20-PK-1315370000-SP Order No.: 1559780000
UR20-16DI-N	1315390000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315390000-SP Order No.: 1346920000	UR20-PK-1315390000-SP Order No.: 1559790000
UR20-16DI-N-PLC-INT	1315400000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315400000-SP Order No.: 1346930000	UR20-PK-1315400000-SP Order No.: 1559800000
UR20-4DI-2W-230V-AC	1550070000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1550070000-SP Order No.: 1558880000	UR20-PK-1550070000-SP Order No.: 1559820000
UR20-4DO-P	1315220000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315220000-SP Order No.: 1346700000	UR20-PK-1315220000-SP Order No.: 1483960000
UR20-4DO-P-2A	1315230000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315230000-SP Order No.: 1346710000	UR20-PK-1315230000-SP Order No.: 1483970000
UR20-4DO-PN-2A	1394420000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1394420000-SP Order No.: 1480950000	UR20-PK-1394420000-SP Order No.: 1483980000
UR20-8DO-P	1315240000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315240000-SP Order No.: 1346720000	UR20-PK-1315240000-SP Order No.: 1346410000
UR20-8DO-P-2W-HD	1509830000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1509830000-SP Order No.: 1515450000	UR20-PK-1509830000-SP Order No.: 1559720000
UR20-16DO-P	1315250000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315250000-SP Order No.: 1346730000	UR20-PK-1315250000-SP Order No.: 1483990000
UR20-16DO-P-PLC-INT	1315270000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315270000-SP Order No.: 1346740000	UR20-PK-1315270000-SP Order No.: 1483940000
UR20-4DO-N	1315410000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315410000-SP Order No.: 1346940000	UR20-PK-1315410000-SP Order No.: 1559840000
UR20-4DO-N-2A	1315420000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315420000-SP Order No.: 1346950000	UR20-PK-1315420000-SP Order No.: 1559850000

Replacement parts for modules

Module	Order No.	Base module	Electronic unit	Plug-in unit
UR20-8DO-N	1315430000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315430000-SP Order No.: 1346970000	UR20-PK-1315430000-SP Order No.: 1984770000
UR20-16DO-N	1315440000	UR20-BM-SP Best.-Nr.: 1350930000	UR20-EM-1315440000-SP Best.-Nr.: 1346980000	UR20-PK-1315440000-SP Best.-Nr.: 2000520000
UR20-16DO-N-PLC-INT	1315450000	UR20-BM-SP Best.-Nr.: 1350930000	UR20-EM-1315450000-SP Best.-Nr.: 1346990000	UR20-PK-1315450000-SP Best.-Nr.: 2000540000
UR20-4RO-SSR-255	1315540000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315540000-SP Order No.: 1347120000	UR20-PK-1315540000-SP Order No.: 1484000000
UR20-4RO-CO-255	1315550000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315550000-SP Order No.: 1347130000	UR20-PK-1315550000-SP Order No.: 1346500000
UR20-2PWM-PN-0.5A	1315600000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315600000-SP Order No.: 1347180000	UR20-PK-1315600000-SP Order No.: 1484010000
UR20-2PWM-PN-2A	1315610000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315610000-SP Order No.: 1347190000	UR20-PK-1315610000-SP Order No.: 1346550000
UR20-4AI-UI-16	1315620000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315620000-SP Order No.: 1347200000	UR20-PK-1315620000-SP Order No.: 1484020000
UR20-4AI-UI-16-DIAG	1315690000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315690000-SP Order No.: 1347280000	UR20-PK-1315690000-SP Order No.: 1518870000
UR20-4AI-UI-16-HD	1506920000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1506920000-SP Order No.: 1515420000	UR20-PK-1506920000-SP Order No.: 1518830000
UR20-4AI-UI-16-DIAG-HD	1506910000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1506910000-SP Order No.: 1515430000	UR20-PK-1506910000-SP Order No.: 1518820000
UR20-4AI-UI-12	1394390000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1394390000-SP Order No.: 1434230000	UR20-PK-1394390000-SP Order No.: 1484030000
UR20-8AI-I-16-HD	1315650000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315650000-SP Order No.: 1347240000	UR20-PK-1315650000-SP Order No.: 1559740000
UR20-8AI-I-16-DIAG-HD	1315720000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315720000-SP Order No.: 1347320000	UR20-PK-1315720000-SP Order No.: 1559750000
UR20-8AI-I-PLC-INT	1315670000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315670000-SP Order No.: 1347250000	UR20-PK-1315670000-SP Order No.: 1483950000
UR20-4AI-RTD-DIAG	1315700000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315700000-SP Order No.: 1347290000	UR20-PK-1315700000-SP Order No.: 1484040000
UR20-4AI-TC-DIAG	1315710000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315710000-SP Order No.: 1435740000	UR20-PK-1315710000-SP Order No.: 1484050000
UR20-4AO-UI-16	1315680000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315680000-SP Order No.: 1347270000	UR20-PK-1315680000-SP Order No.: 1484070000
UR20-4AO-UI-16-DIAG	1315730000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315730000-SP Order No.: 1347330000	UR20-PK-1315730000-SP Order No.: 1518880000
UR20-4AO-UI-16-HD	1510690000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1510690000-SP Order No.: 1515470000	UR20-PK-1510690000-SP Order No.: 1531830000
UR20-4AO-UI-16-DIAG-HD	1506930000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1506930000-SP Order No.: 1515480000	UR20-PK-1506930000-SP Order No.: 1531810000
UR20-1CNT-100-1DO	1315570000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315570000-SP Order No.: 1347140000	UR20-PK-1315570000-SP Order No.: 1346520000
UR20-2CNT-100	1315590000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315590000-SP Order No.: 1347150000	UR20-PK-1315590000-SP Order No.: 1346540000

Replacement parts for modules

Module	Order No.	Base module	Electronic unit	Plug-in unit
UR20-1CNT-500	1315580000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315580000-SP Order No.: 1347170000	UR20-PK-1315580000-SP Order No.: 1346530000
UR20-2FCNT-100	1508080000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1508080000-SP Order No.: 1515440000	UR20-PK-1508080000-SP Order No.: 1518840000
UR20-1SSI	1508090000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1508090000-SP Order No.: 1515490000	UR20-PK-1508090000-SP Order No.: 1559870000
UR20-1COM-232-485-422	1315750000	UR20-BM-SP Best.-Nr.: 1350930000	UR20-EM-1315750000-SP Best.-Nr.: 1347350000	UR20-PK-1315750000-SP Best.-Nr.: 2425150000
UR20-1COM-SAI-PRO	2007430000	UR20-BM-SP Best.-Nr.: 1350930000	UR20-EM-2007430000-SP Best.-Nr.: 0000	UR20-PK-2007430000-SP Best.-Nr.: 0000
UR20-4DI-4DO-PN-FSOE	1529780000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1529780000-SP Order No.: 1993030000	UR20-PK-1529780000-SP Order No.:1992960000
UR20-8DI-PN-FSOE	1529800000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1529800000-SP Order No.: 1993040000	UR20-PK-1529800000-SP Order No.: 1992970000
UR20-4DI-4DO-PN-FSPS	1335060000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1335060000-SP Order No.: 1347550000	UR20-PK-1335060000-SP Order No.: 1992940000
UR20-8DI-PN-FSPS	1335070000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1335070000-SP Order No.: 1347570000	UR20-PK-1335070000-SP Order No.: 1992950000
UR20-PF-O-1DI-SIL	1335030000	UR20-BM-SIL-SP Order No.: 1350970000	UR20-EM-1335030000-SP Order No.: 1347520000	UR20-PK-1335030000-SP Order No.: 1346560000
UR20-PF-O-2DI-SIL	1335050000	UR20-BM-SIL-SP Order No.: 1350970000	UR20-EM-1335050000-SP Order No.: 1347540000	UR20-PK-1335050000-SP Order No.: 1346570000
UR20-PF-O-2DI-DELAY-SIL	1335040000	UR20-BM-SIL-SP Order No.: 1350970000	UR20-EM-1335040000-SP Order No.: 1347530000	UR20-PK-1335040000-SP Order No.: 1484100000
UR20-PF-I	1334710000	UR20-BM-PF-I-SP Order No.: 1350940000	UR20-EM-1334710000-SP Order No.: 1347380000	UR20-PK-1334710000-SP Order No.: 1346460000
UR20-PF-O	1334740000	UR20-BM-PF-O-SP Order No.: 1350950000	UR20-EM-1334740000-SP Order No.: 1347420000	UR20-PK-1334740000-SP Order No.: 1346480000
UR20-16AUX-I	1334770000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1334770000-SP Order No.: 1347450000	UR20-PK-1334770000-SP Order No.: 1346450000
UR20-16AUX-O	1334780000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1334780000-SP Order No.: 1347470000	UR20-PK-1334780000-SP Order No.: 1484080000
UR20-16AUX-FE	1334790000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1334790000-SP Order No.: 1347480000	UR20-PK-1334790000-SP Order No.: 1346490000
UR20-16AUX-GND-I	1334800000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1334800000-SP Order No.: 1347490000	UR20-PK-1334800000-SP Order No.: 1346470000
UR20-16AUX-GND-O	1334810000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1334810000-SP Order No.: 1347500000	UR20-PK-1334810000-SP Order No.: 1484090000
UR20-ES	1315770000	UR20-BM-SP Order No.: 1350930000	UR20-EM-1315770000-SP Order No.: 1347370000	UR20-PK-1315770000-SP Order No.: 1346510000

ANNEX

Decimal ↔ hexadecimal conversion table	**A-2**
Examples for automatic I/O mapping with different engineering tools	**A-3**
Examples of module position coding	**A-4**
EC Declaration of Conformity	**A-6**
Breakdown of Serial Numbers	**A-9**
Service	**A-10**

Decimal ↔ hexadecimal conversion table

Conversion decimal ↔ hexadecimal

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
001	1	034	22	067	43	100	64
002	2	035	23	068	44	101	65
003	3	036	24	069	45	102	66
004	4	037	25	070	46	103	67
005	5	038	26	071	47	104	68
006	6	039	27	072	48	105	69
007	7	040	28	073	49	106	6A
008	8	041	29	074	4A	107	6B
009	9	042	2A	075	4B	108	6C
010	A	043	2B	076	4C	109	6D
001	B	044	2C	077	4D	110	6E
012	C	045	2D	078	4E	111	6F
013	D	046	2E	079	4F	112	70
014	E	047	2F	080	50	113	71
015	F	048	30	081	51	114	72
016	10	049	31	082	52	115	73
017	11	050	32	083	53	116	74
018	12	051	33	084	54	117	75
019	13	052	34	085	55	118	76
020	14	053	35	086	56	119	77
021	15	054	36	087	57	120	78
022	16	055	37	088	58	121	79
023	17	056	38	089	59	122	7A
024	18	057	39	090	5A	123	7B
025	19	058	3A	091	5B	124	7C
026	1A	059	3B	092	5C	125	7D
027	1B	060	3C	093	5D	126	7E
028	1C	061	3D	094	5E	127	7F
029	1D	062	3E	095	5F	128	80
030	1E	063	3F	096	60	129	81
031	1F	064	40	097	61	130	82
032	20	065	41	098	62	131	83
033	21	066	42	099	63	132	84

Conversion decimal ↔ hexadecimal

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
133	85	166	A6	199	C7	232	E8
134	86	167	A7	200	C8	233	E9
135	87	168	A8	201	C9	234	EA
136	88	169	A9	202	CA	235	EB
137	89	170	AA	203	CB	236	EC
138	8A	171	AB	204	CC	237	ED
139	8B	172	AC	205	CD	238	EE
140	8C	173	AD	206	CE	239	EF
141	8D	174	AE	207	CF	240	F0
142	8E	175	AF	208	D0	241	F1
143	8F	176	B0	209	D1	242	F2
144	90	177	B1	210	D2	243	F3
145	91	178	B2	211	D3	244	F4
146	92	179	B3	212	D4	245	F5
147	93	180	B4	213	D5	246	F6
148	94	181	B5	214	D6	247	F7
149	95	182	B6	215	D7	248	F8
150	96	183	B7	216	D8	249	F9
151	97	184	B8	217	D9	250	FA
152	98	185	B9	218	DA	251	FB
153	99	186	BA	219	DB	252	FC
154	9A	187	BB	220	DC	253	FD
155	9B	188	BC	221	DD	254	FE
156	9C	189	BD	222	DE	255	FF
157	9D	190	BE	223	DF	256	100
158	9E	191	BF	224	E0	257	101
159	9F	192	C0	225	E1	258	102
160	A0	193	C1	226	E2	259	103
161	A1	194	C2	227	E3	260	104
162	A2	195	C3	228	E4	261	105
163	A3	196	C4	229	E5	262	106
164	A4	197	C5	230	E6	263	107
165	A5	198	C6	231	E7	264	108

Automatic I/O mapping with different engineering tools

The decimal value 1000000 ($F4240_{hex}$) is to be written into a 32 bit address (double word), e. g. for a UR20-PWM-xx-module output data “Pulse duration”.
“n” is to be the address number the auto-mapping assigns to the 32 bit data object. The enumeration of linked 16 bit (word) and 8 bit (byte) objects differs depending on the engineering tool, as well as the syntax of set values.

UR20-FBC-PB-DP or UR20-FBC-PN-IRT Motorola format (default) with Simatic Manager Step7 5.5

D_n = DW#16#000F4240			
W_{n+2} = W#16#4240		W_n = W#16#000F	
B_{n+3} = B#16#40	B_{n+2} = B#16#42	B_{n+1} = B#16#0F	B_n = B#16#00

UR20-FBC-PB-DP or UR20-FBC-PN-IRT Intel format (parameterized) with Simatic Manager Step7 5.5

D_n = DW#16#40420F00			
W_{n+2} = W#16#0F00		W_n = W#16#4042	
B_{n+3} = B#16#00	B_{n+2} = B#16#0F	B_{n+1} = B#16#42	B_n = B#16#40

UR20-FBC-MOD-TCP Motorola format (default) with CODESYS 3.5

D_n = 16#000F4240			
W_{2n+1} = 16#4240		W_{2n} = 16#000F	
B_{4n+3} = 16#40	B_{4n+2} = 16#42	B_{4n+1} = 16#0F	B_{4n} = 16#00

UR20-FBC-MOD-TCP Intel format (parameterized) with CODESYS 3.5

D_n = 16#40420F00			
W_{2n+1} = 16#0F00		W_{2n} = 16#4042	
B_{4n+3} = 16#00	B_{4n+2} = 16#0F	B_{4n+1} = 16#42	B_{4n} = 16#40

UR20-FBC-EC Intel format (default) with CODESYS 3.5

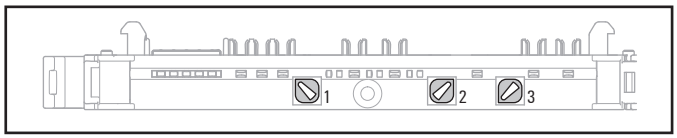
D_n = 16#000F4240			
W_{2n+1} = 16#000F		W_{2n} = 16#4240	
B_{4n+3} = 16#00	B_{4n+2} = 16#0F	B_{4n+1} = 16#42	B_{4n} = 16#40

UR20-FBC-EC Motorola format (parameterized) with CODESYS 3.5

D_n = 16#40420F00			
W_{2n+1} = 16#4042		W_{2n} = 16#0F00	
B_{4n+3} = 16#40	B_{4n+2} = 16#42	B_{4n+1} = 16#0F	B_{4n} = 16#00

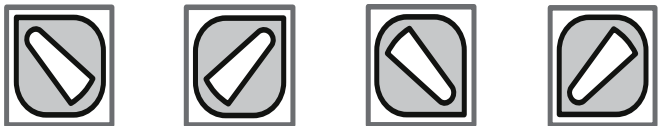
Examples of module position coding

The incorrect insertion of electronic units can be prevented if the base modules are given coding elements KOSM BHZ5.00 (Order No. 1483050000)
Three coding sockets each with four possible positions can be plugged into every base module. This results in a maximum of 4^3 or 64 codes.
It is practical to use either functionally oriented or slot-oriented coding. Example codes are provided for each coding scheme in the following tables.



Base module with three coding places and coding sockets plugged (Example code 013)

Possible positions of the coding sockets:



Functionally-oriented coding

	Coding position			
Code	**1**	**2**	**3**	**Meaning**
01	0	0	0	4 digital inputs (4DI)
02	0	0	1	8 digital inputs (8DI)
03	0	0	2	16 digital inputs (16DI)
10	0	2	1	4 digital outputs (4DO)
11	0	2	2	8 digital outputs (8DO)
12	0	2	3	16 digital outputs (16DO)
40	2	1	3	1-channel counter (1CNT)
41	2	2	0	2-channel counter (2CNT)
13	0	3	0	2-channel PWM module (2PWM)
20	1	0	3	4 analogue inputs (4AI)
21	1	1	0	8 analogue inputs (8AI)
30	1	3	1	4 analogue outputs (4AO)
22	1	1	1	4 temperature inputs (4AI-X-DIAG)
50	3	0	1	Power-feed module input (PF-I)
51	3	0	2	Power-feed module output (PF-O)
52	3	0	3	Power-feed module output 1DI-SIL
53	3	1	0	Power-feed module output 2DI-SIL
60	3	2	3	Potential distributor +
61	3	3	0	Potential distributor –
62	3	3	1	Potential distributor FE (16AUX-FE)

Slot-oriented coding

Code	Coding position 1	2	3	Station slot
01	0	0	0	1
02	0	0	1	2
03	0	0	2	3
04	0	0	3	4
05	0	1	0	5
06	0	1	1	6
07	0	1	2	7
08	0	1	3	8
09	0	2	0	9
10	0	2	1	10
11	0	2	2	11
12	0	2	3	12
13	0	3	0	13
14	0	3	1	14
15	0	3	2	15
16	0	3	3	16
17	1	0	0	17
18	1	0	1	18
19	1	0	2	19
20	1	0	3	20
21	1	1	0	21
22	1	1	1	22
23	1	1	2	23
24	1	1	3	24
25	1	2	0	25
26	1	2	1	26
27	1	2	2	27
28	1	2	3	28
29	1	3	0	29
30	1	3	1	30
31	1	3	2	31
32	1	3	3	32

Slot-oriented coding

Code	Coding position 1	2	3	Station slot
33	2	0	0	33
34	2	0	1	34
35	2	0	2	35
36	2	0	3	36
37	2	1	0	37
38	2	1	1	38
39	2	1	2	39
40	2	1	3	40
41	2	2	0	41
42	2	2	1	42
43	2	2	2	43
44	2	2	3	44
45	2	3	0	45
46	2	3	1	46
47	2	3	2	47
48	2	3	3	48
49	3	0	0	49
50	3	0	1	50
51	3	0	2	51
52	3	0	3	52
53	3	1	0	53
54	3	1	1	54
55	3	1	2	55
56	3	1	3	56
57	3	2	0	57
58	3	2	1	58
59	3	2	2	59
60	3	2	3	60
61	3	3	0	61
62	3	3	1	62
63	3	3	2	63
64	3	3	3	64

EC Declaration of Conformity

Weidmüller

EG-Konformitätserklärung
EC Declaration of Conformity

Dokument-Nr (.../Monat/Jahr) Document No. (.../month/year)	**K552/08/15**
Hersteller / Manufacturer	**Weidmüller Interface GmbH & Co. KG**
Anschrift / Address	**Klingenbergstr. 16** **32758 Detmold, Germany**
Gegenstand der Erklärung / Object of the declaration	**Modulares Remote-I/O-System "u-remote" (siehe Liste auf Seite 2)** **Modular remote I/O-System "u-remote" (see list on page 2)**

☑ Fortsetzung auf Seite 2 und 3 / Continued on page 2 and 3

Der Hersteller erklärt in alleiniger Verantwortung, dass der oben beschriebene Gegenstand mit den grundlegenden Anforderungen der Richtlinien übereinstimmt: / The manufacturer attests, in sole-responsibility, that the object of the declaration described above is in conformity with the essential requirements of directive(s):

☑	**2006/95/EG**	Niederspannungsrichtlinie (NSR) Anbringung der CE-Kennzeichnung: / Affixing of the CE marking: 2013	Low Voltage Directive (LVD)
☑	**2004/108/EG**	Elektromagnetische Verträglichkeit (EMV)	Electromagnetic Compatibility (EMC)
☐	**2006/42/EG**	Maschinenrichtlinie	Mechanical Equipment - Machinery
☑	**94/9/EG**	ATEX-Richtlinie Kennzeichnung (Gerätegruppe, Kategorie, Atmosphäre) / Marking (Equipment Group, Category, Atmosphere) II 3 G Ex nA IIC T4 Gc, II 3 G Ex nA nC IIC T4 Gc	ATEX Directive
☐	**1995/5/EG**	Funkanlagen und Telekommunikationsendeinrichtungen	Radio Equipment and Telecommunications Terminal Equipment (R&TTE)

Verweis auf die angewandten relevanten harmonisierten Normen oder Bestimmungen aufgrund derer die Konformität erklärt wird: / References to the relevant harmonised standards used, or references to the specifications in relation to which conformity is declared:

EN 50178:1997
EN 61131-2:2007
EN 60079-0:2012 /A11:2013, EN 60079-15:2010-05
EN 61000-6-2:2005, EN 61000-6-4:2007,

Herausgegebene Zertifikate benannter Stellen: / Issued certificates from notified bodies:

Benannte Stelle (Name und Kennnummer) Notified body (name and number)	Beschreibung der Einbindung Description of intervention	Zertifikat Certificate

Detmold, 03.08.2015
Ort, Datum / place, date

Rechtsverbindliche Unterschrift / legally binding signature

Name und Funktion / name and function

Dr. Björn Griese, Business Unit Leiter Remote I/O/ Vice President BU Remote I/O

Diese Erklärung bescheinigt die Übereinstimmung mit der genannten Richtlinie, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten. / This declaration certifies compliance with the indicated directive but no warranty of properties. The safety instructions of the accompanying product documentation shall be observe.

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Weidmüller

EG-Konformitätserklärung
EC Declaration of Conformity

Dokument-Nr (.../Monat/Jahr)
Document No. (.../month/year) **K552/08/15**

Gegenstand der Erklärung /
Object of the declaration

II 3 G Ex nA IIC T4 Gc:

I/O-Modules:

1315170000	UR20-4DI-P	Digital input module	4 channels, 4-wire
1460150000	UR20-4DI-P-TS	Digital input module	4 channels, 4-wire
1460140000	UR20-2DI-P-TS	Digital input module	2 channels, 4-wire
1394400000	UR20-8DI-P-3W	Digital input module	8 channels, 3-wire
1315180000	UR20-8DI-P-2W	Digital input module	8 channels, 2-wire
1315190000	UR20-8DI-P-3W-HD	Digital input module	8 channels, 4-wire
1315200000	UR20-16DI-P	Digital input module	16 channels, 1-wire
1315210000	UR20-16DI-P-PLC-INT	Digital input module	16 channels, PLC interface
1315220000	UR20-4DO-P	Digital output module	4 channels, 4-wire
1315240000	UR20-8DO-P	Digital output module	8 channels, 2-wire
1315250000	UR20-16DO-P	Digital output module	16 channels, 1-wire
1315270000	UR20-16DO-P-PLC-INT	Digital output module	16 channels, PLC interface
1315620000	UR20-4AI-UI-16	Analogue input module	4 channels, 16 bits
1394390000	UR20-4AI-UI-12	Analogue input module	4 channels, 12 bits
1315690000	UR20-4AI-UI-16-DIAG	Analogue input module	4 channels, 16 bits
1506920000	UR20-4AI-UI-16-HD	Analogue input module	4 channels, 16 bits
1506910000	UR20-4AI-UI-16-DIAG-HD	Analogue input module	4 channels, 16 bits
1315700000	UR20-4AI-RTD-DIAG	Analogue input module	4 channels, RTD
1315710000	UR20-4AI-TC-DIAG	Analogue input module	4 channels, thermocouple
1315680000	UR20-4AO-UI-16	Analogue output module	4 channels, 16 bits
1315730000	UR20-4AO-UI-16-DIAG	Analogue output module	4 channels, 16 bits
1315670000	UR20-8AI-I-PLC-INT	Analogue input module	8 channels, 3-wire
1315230000	UR20-4DO-P-2A	Digital output module	4 channels, 4-wire
1394420000	UR20-4DO-PN-2A	Digital output module	4 channels, 4-wire
1315570000	UR20-1CNT-100-1DO	Counter input module	1 channels, 12-wire
1315590000	UR20-2CNT-100	Counter input module	2 channels, 4-wire
1508080000	UR20-2FCNT-100	Freq. Counter input module	2 channels, 4-wire
1315600000	UR20-2PWM-PN-0.5A	Pulse output module	2 channels, 4-wire
1315610000	UR20-2PWM-PN-2A	Pulse output module	2 channels, 4-wire
1509830000	UR20-8DO-P-2W-HD	Digital output module	8 channels, 2-wire
1315650000	UR20-8AI-I-16-HD	Analogue input module	8 channels, 3-wire
1315720000	UR20-8AI-I-16-DIAG-HD	Analogue input module	8 channels, 16 bits
1510690000	UR20-4AO-UI-16-HD	Analogue output module	4 channels, 16 bits
1506930000	UR20-4AO-UI-16-DIAG-HD	Analogue output module	4 channels, 16 bits
1315580000	UR20-1CNT-500	Counter input module	1 channel, 6-wire
1550070000	UR20-4DI-2W-230V-AC	Digital input module	4 channel, 2-wire
1508090000	UR20-1SSI	Serial interface module	1 channel, SSI
1315350000	UR20-4DI-N	Digital input module	4 channels, 4-wire
1315370000	UR20-8DI-N-3W	Digital input module	8 channels, 3-wire
1315390000	UR20-16DI-N	Digital input module	16 channels, 1-wire
1315400000	UR20-16DI-N-PLC-INT	Digital input module	16 channels, 1-wire
1315410000	UR20-4DO-N	Digital output module	4 channels, 4-wire
1315420000	UR20-4DO-N-2A	Digital output module	4 channels, 4-wire
1315430000	UR20-8DO-N	Digital output module	8 channels, 2-wire

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EG-Konformitätserklärung
EC Declaration of Conformity

Bus couplers:

1334870000	UR20-FBC-PB-DP	Fieldbus coupler	PROFIBUS DP-V1
1334880000	UR20-FBC-PN-IRT	Fieldbus coupler	PROFINET IRT
1334910000	UR20-FBC-EC	Fieldbus coupler	EtherCAT
1334920000	UR20-FBC-EIP	Fieldbus coupler	EtherNet/IP
1334930000	UR20-FBC-MOD-TCP	Fieldbus coupler	Modbus TCP
1334890000	UR20-FBC-CAN	Fieldbus coupler	CANopen

Power-feed modules:

1334710000	UR20-PF-O	Power supply module (Output current path)
1334740000	UR20-PF-I	Power supply module (Input current path)

Potential distribution modules:

1334770000	UR20-16AUX-I	Potential distribution module (Input current path, positive branch)
1334780000	UR20-16AUX-O	Potential distribution module (Output current path, positive branch)
1334790000	UR20-16AUX-FE	Potential distribution module (Functional earth)
1334800000	UR20-16AUX-GND-I	Potential distribution module (Input current path, GND branch)
1334810000	UR20-16AUX-GND-O	Potential distribution module (Input current path, GND branch)

Empty Slot Modules:

1315770000	UR20-ES	Empty Slot Module

II 3 G Ex nA nC IIC T4 Gc:

I/O-Modules:

1315550000	UR20-4RO-CO-255	Digital output module	4 channels, relais
1315540000	UR20-4RO-SSR-255	Digital output module	4 channels solid state relais

Die Konformität der I/O Module ist nur gültig in Verbindung mit den Feldbuskopplern UR20-FBC-.../ The conformity of the I/O-modules is only valid in combination with the field bus coupler UR20-FBC-...

Diese CE Erklärung EC_Declaration-K5520815_2015-07-28 ersetzt die CE Erklärung EC_Declaration-K5521113_2015-05-27. Folgende Änderungen sind vorgenommen worden:
Koppler UR20-FBC-CAN und Modul UR20-8DO-N neu hinzugefügt
Artikelnummern für UR20-4RO-CO-255 und 1315540000 ergänzt
Richtlinien aktualisiert

This CE Declaration EC_Declaration-K5520815_2015-07-28 replaces the CE declaration EC_Declaration-K5521113_2015-05-27. The following changes have been made:
Coupler UR20-FBC-CAN and module UR20-8DO-N added
Article numbers for UR20-4RO-CO-255 and 1315540000 completed
Updated directives

F_Entw_Konformitätserklärung

Breakdown of Serial Numbers

Position	1	2		3		4		5	6	7	8	9	10	11	12	13	14	15
Year	Code		Month	Code	Tag	Code	Manufacturer	Code		Product family code				Serial numbers				
2013	A	N	January	1	1	1		0	**1**	**P**	**C**	**7**	**3**	**0**	**0**	**1**	**0**	**1**
2014	**A**	**0**	February	2	2	2		0	2									
2015	A	P	March	3	3	3		0	3									
2016	A	Q	April	4	4	4		0	4									
2017	A	R	May	5	5	5		0	5									
2018	A	S	June	6	6	6		0	6									
2019	A	T	**July**	**7**	7	7		0	7									
2020	A	U	August	8	8	8		0	8									
2021	A	V	September	9	9	9		0	9									
2022	A	W	October	O	10	A		1	0									
2023	A	X	November	N	11	B		1	1									
2024	A	Y	December	D	12	C		1	2									
2025	A	Z			13	D		1	3									
2026	B	A			14	E		1	4									
2027	B	B			15	F		1	5									
2028	B	C			16	G		1	6									
2029	B	D			**17**	**H**		1	7									
2030	B	E			18	I		1	8									
2031	B	F			19	J		1	9									
2032	B	G			20	K		**2**	0									
2033	B	H			21	L		2	1									
2034	B	I			22	M		2	2									
2035	B	J			23	N		2	3									
2036	B	K			24	O		2	4									
2037	B	L			25	P		2	5									
2038	B	M			26	Q		2	6									
2039	B	N			27	R		2	7									
2040	B	O			28	S		2	8									
2041	B	P			29	T		2	9									
2042	B	Q			30	U		3	0									
2043	B	R			31	V		3	1									
2044	B	S																
...																		
2052	C	A																
2053	C	B																
...																		

Example: A07H21PC7300101
Date: 17 July 2014
Manufacturer: Weidmüller
Product family: u-remote

Service

If you have any questions about u-remote, please contact your responsible country representatives.

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