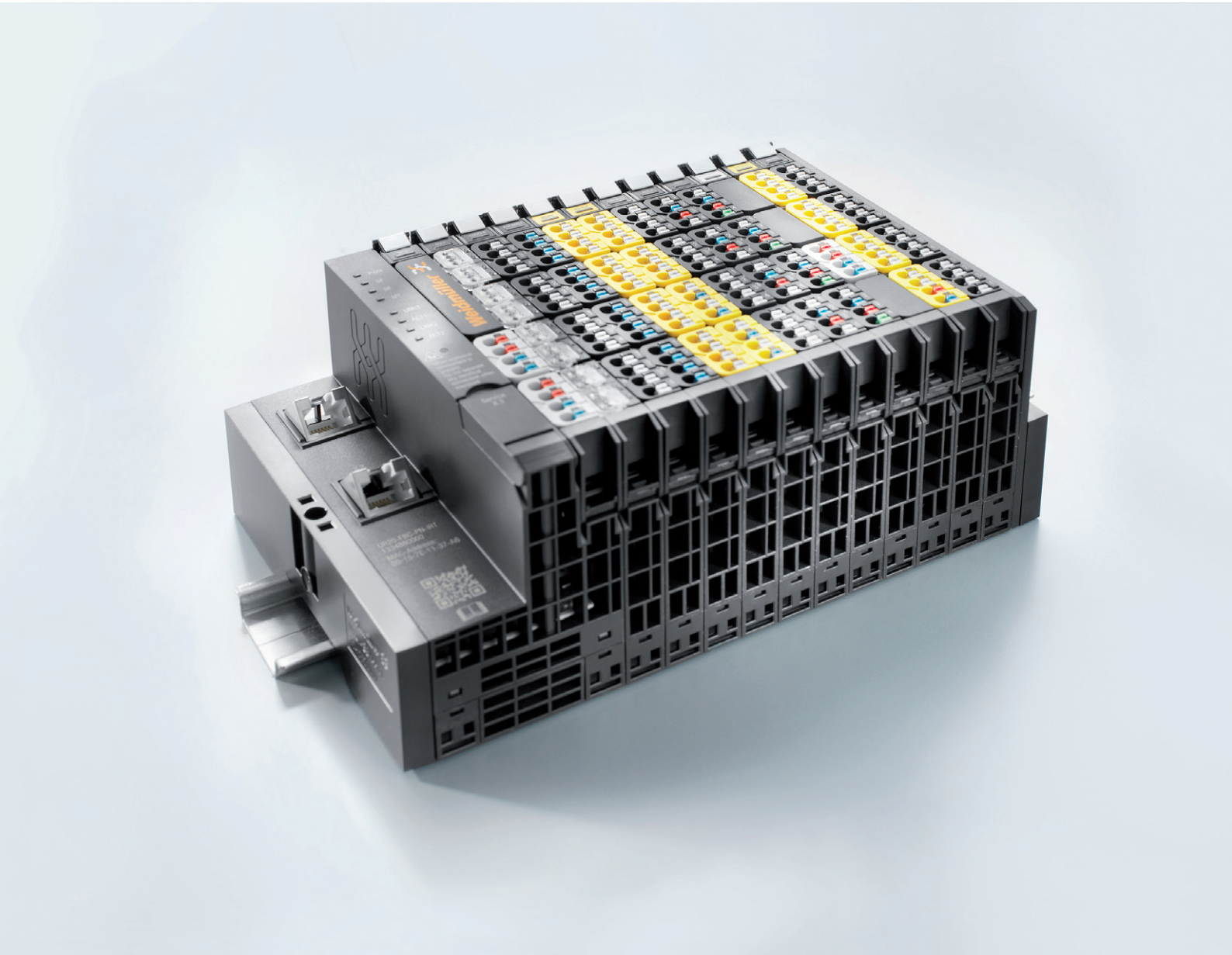
Remote I/O system u-remote
IP20 modules for functional safety
Manual (Original)



Weidmüller

Content

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Document No. 1484600000
Revision 10/November 2025

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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
	Warning against automatic startup
	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

This manual contains product-specific information and notes about the use of u-remote safe modules. This manual supplements but does not replace the u-remote manual (document no 1432790000).

You can find the documents as well a certificates and declarations of conformity in the Weidmüller Support Center.

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.

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 safety equipments and devices must not be made ineffective.

If a malfunction on a u-remote product cannot be fixed after following the recommended measures (see the chapter 8), the product in question must be sent back to Weidmüller. Weidmüller assumes no 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

If safe I/O modules or safe power-feed modules are installed within a u-remote station, a SELV/PELV power supply has to be applied to ensure the safety functions.

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.

To meet UL-specifications in accordance with UL 248-14, a UL-certified automatic fuse (e.g. ABB Type S201-B16) or a 8 A fuse with a medium time-lag (e.g. ESKA Part No. 522.226) 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.

A feed-in power supply with secure isolation must be used.

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 of the u-remote manual). The module is earthed by connecting the DIN rail to the protective earth via the earth terminal.

Shielding

Shielded lines are to be connected with shielded plugs and fixed on a shield bus in compliance with the relevant standard (see u-remote manual, 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. All modules of a station are integrated into a fieldbus structure and connected to the superordinate control unit via the fieldbus coupler.
The u-remote safe I/O modules (UR20-*FS*) as well as the safe power-feed modules (UR20-PF-O-xDI-SIL) are intended

for connecting equipment providing functional safety. Therefore safe I/O modules must be operated via a safety control.

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 2014/34/EU).
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.
- For applications in 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.
- Devices are for use in an area of not more than pollution degree 2 in accordance with EN 60664-1.
- Provision shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 140 % of the rated voltage.
- When 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.
- A visual inspection of the u-remote station is to be performed once per year.

2.4 Notes on functional safety

Safety Integrity Level (SIL)

The safety requirements necessary for the safety functions of an application are determined in a risk analysis. Here, the probability of the safety functions failing is important. In an operating mode with a high rate of demand or continuous demand, the probability of dangerous failure per hour (PFH) must be taken into consideration, whereas in an operating mode with a lower rate of demand, the probability of dangerous failure on demand (PFD) must be taken into consideration. According to IEC 61508 and IEC 62061, the safety requirements are graded by the failure limit values as follows:

Safety requirements by failure limit values

	PFD	PFH
SIL 3	$< 10^{-3}$	$< 10^{-7}$
SIL 2	$\geq 10^{-3}$ to $< 10^{-2}$	$\geq 10^{-7}$ to $< 10^{-6}$
SIL 1	$\geq 10^{-2}$ to $< 10^{-1}$	$\geq 10^{-6}$ to $< 10^{-5}$

Performance level (PL)

According to EN ISO 13849-1, the degree to which a safety function contributes to risk minimisation is defined as the performance level. A distinction is made between the five levels PLa to PLe with an increasing contribution to risk minimisation.

Safety categories

Safety categories according to EN ISO 13849-1 describe a minimum level of applicable safety and to what extent monitoring is required.
Category B: The safety-related components of machine controls and/or their safety equipment as well as their components must be designed, selected, assembled and combined to the state of the art such they can withstand the expected conditions.
Category 1: The requirements of Category B must be met. Use of proven safety-related components.
Category 2: The requirements of Category B must be met with the use of proven safety principles. The safety functions must be verified by the machine controls at suitable intervals (depending on the application and the type of machine).
Category 3: The requirements of Category B must be met with the use of proven safety principles. Controls must be designed so that a single failure in the control system does not lead to a loss of safety function(s), and whenever reasonably practicable, the single failure shall be detected with suitable means which meet the state of the art.
Category 4: The requirements of Category B must be met along with the use of proven safety principles. Controls must

be designed so that a single failure in the control system does not lead to a loss of safety function(s), and whenever reasonably practicable, a single failure is detected during or prior to the next demand upon the safety function, or if this is not possible, an accumulation of faults does not lead to the loss of the safety function(s).

Requirements on sensors / signal generators

The sensors / signal generators being connected must meet the following requirements:

- Only signal generators that are suited for the respective required safety level may be used.
- Positively opening control switches must be used in accordance with IEC 60947-5-1 (designated with this symbol: ⊕).
- Only use components that have been proven in operation.
- Depending on the established risk level, switches (e.g. for position monitoring) may have to have a redundant design.
- Depending on the required safety level, control devices may have to have a redundant design. In this regard, make sure to take into account the applicable C standards.

2.5 Legal notice

The u-remote series products are CE-compliant in accordance with the following directives:

- EMC Directive 2014/30/EU
- Low Voltage Directive 2014/35/EU
- ATEX Directive 2014/34/EU
- Directive on machinery 2006/42/EG (only modules for functional safety)

2.6 Cybersecurity

General notes

In order to achieve an effective protection against cyberattacks, every operator of industrial plants must develop a comprehensive security strategy and implement a cybersecurity concept in practice. It is also the operator's responsibility to continuously adapt the implemented cybersecurity measures to technological developments. Weidmüller products and solutions are designed to be part of such a security strategy and help ensure a secure infrastructure.
Devices, systems, machines and networks must be protected against unauthorised access. Components should only be connected to a company network or the internet if necessary and only if appropriate security measures such as firewalls and network segmentation have been implemented.

Further information about the topic of cybersecurity can be found on the Weidmüller Industrial Security website. Please observe the following documents:
– Industrial Product Security Guideline
– Security Data Sheets
For information on known vulnerabilities and current security advisories related to Weidmüller products, please visit the Weidmüller Security Advisory Board.
If you have identified a potential security vulnerability related to a Weidmüller product, please report it via the Coordinated Vulnerability Disclosure process.

Product specific notes

The V2 variants of the FSOE and the FSPS modules as well as the FSCC modules with FW version ≤ 01.01.07 are not developed in the scope of security and thus do not provide security measures covering all requirements from e.g. prEN50742. The security capabilities must always be considered in association with the intended UR20 fieldbus coupler, see the Security Data Sheet of the coupler. Therefore, when using these modules, a resulting safety-related security level of 0 must be assumed (SRSL according to prEN50742).
The V2 variants of the FSOE and the FSPS modules as well as the FSCC modules with FW version ≤ 01.01.07 including the intended UR20 fieldbus coupler may only be used in security-focused applications, if a higher Security level will be achieved by additional external security appliances and restricted access.
Future u-remote safety modules are intended to be developed in a security-context according to IEC 62443-3-3/4-1/4-2.

3 System description of safe I/O modules

This chapter contains product-specific information and notes about the use of safe I/O modules. Please also observe the system description in the u-remote manual (document number 1432790000).

The u-remote system provides safe I/O modules for the safety protocols Safety over EtherCAT[1)] (Fail safe over EtherCAT, FSOE), PROFIsafe and CC-Link IE Safety. Attached to a safety control the modules enable the selective switching off of plant devices.
For each safety protocol there is a 4DI-4DO module and an 8DI module.

- UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2
- UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2
- UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2
- UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2
- UR20-4DI-4DO-PN-FSCC
- UR20-8DI-PN-FSCC

The V2 variant of a module differs only in the firmware and therefore in the parameters (see module descriptions in Chapter 5). Antivalent switching safety devices can be connected to V2 modules.

- Only one variant exists for the FSCC modules. This variant corresponds to the V2 variant of the other modules.
- The V1 modules cannot be upgraded using the V2 firmware!

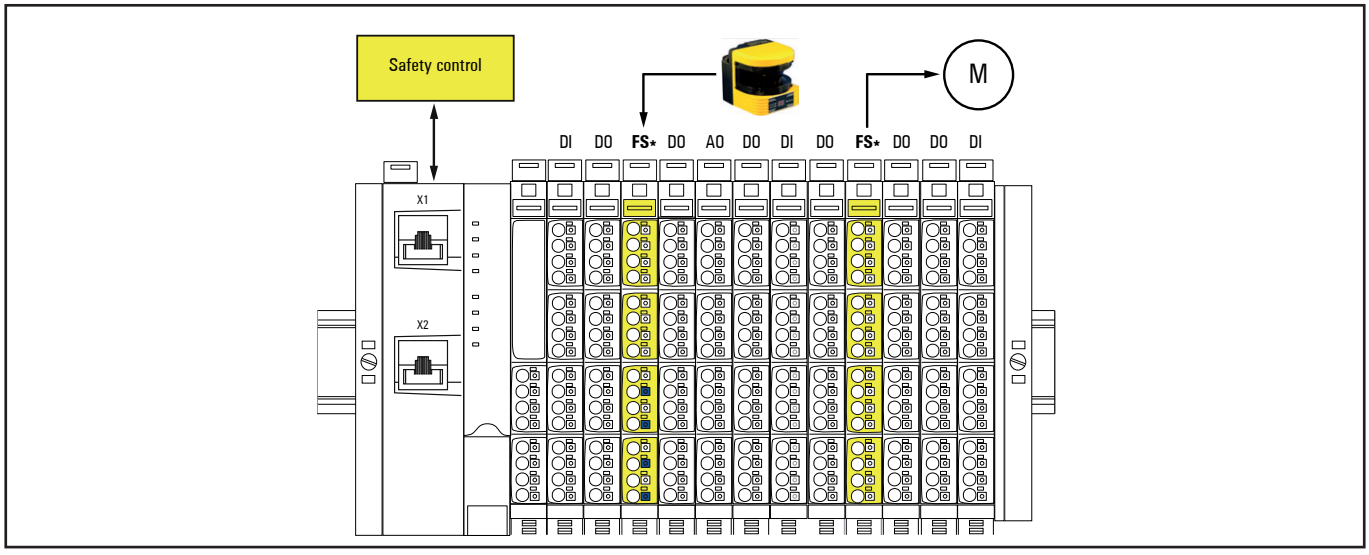
Single channel architectures (1oo1) as well as dual channel architectures (1oo2) can be realised with the safety inputs and safety outputs, also mixed operation is possible. In case of failure of the safety control the modules change into the safe status.

Safety function

The information on the inputs are transferred to the safety control via a black channel (according to EN 61508-2). A safety input will send the input information “false” to the safety control if a signal is within the inactive range or a fault has been detected.
Vice versa the information from the safety control are transferred to the outputs. The safety outputs will be deactivated if the output information “false” is sent from the safety control or a fault has been detected (safe status see technical data).
The safe I/O modules support module-specific passivation. Therefore, in the event of an error on any channel, the entire process image of all channels of the module is passivated.

3.1 Sample design

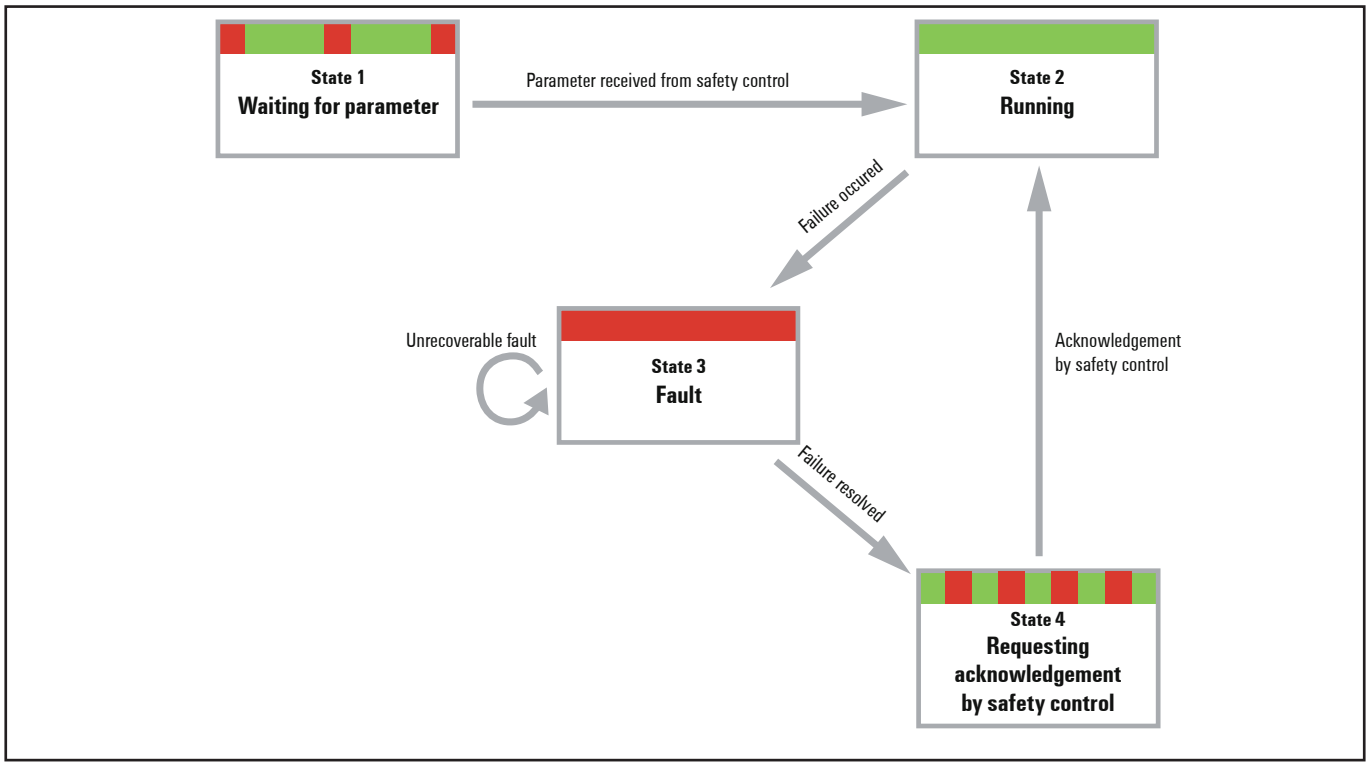
Safe I/O modules can be placed at any position in the u-remote station. The only exceptions are safety segments built up from safe power feed modules (s. section 4.1). No safe I/O module with outputs may be placed within a safety segment (UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSPS or UR20-4DI-4DO-PN-FSCC).
The following picture exemplifies how to design a u-remote station with safe I/O modules.



Example set-up of safe I/O modules (FS*) in a u-remote station

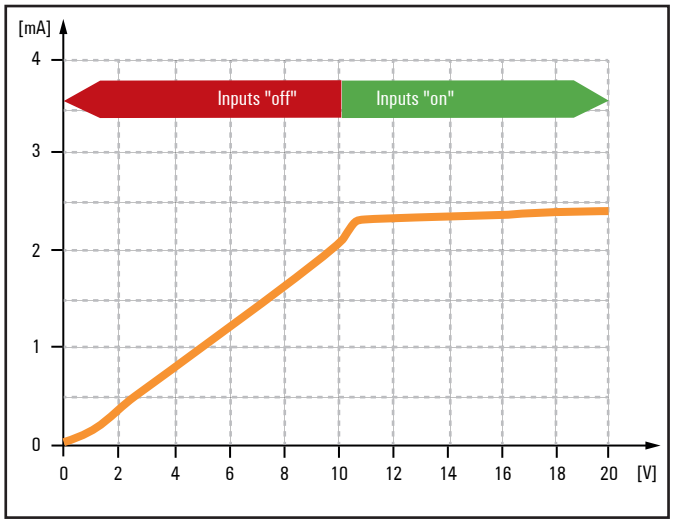
1) Safety over EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

3.2 Transition diagram

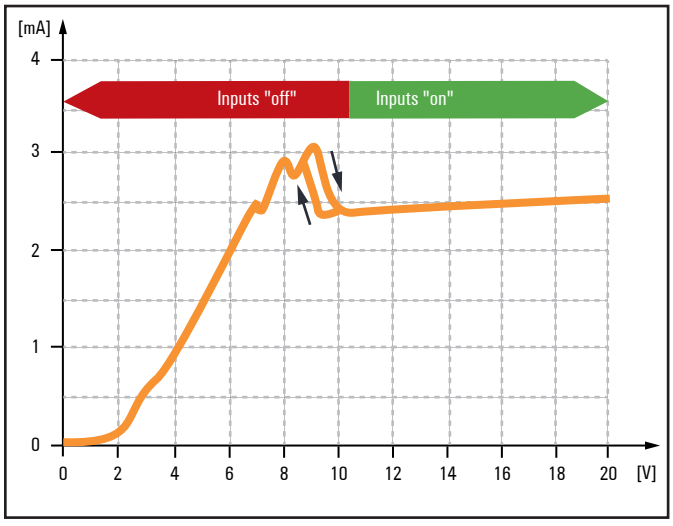


Transition diagram for safe I/O modules

3.3 Current-/voltage characteristics of the fail safe digital inputs



Current-/voltage characteristic for P-switching inputs



Current-/voltage characteristic for PN-switching inputs

3.4 Registration of safe I/O modules on the safety control

Safe I/O modules need to get registered on a safety control using an engineering tool. Via the web server the safe I/O modules can only be observed but not be parameterised or forced.

Switch-on sequence

For successful commissioning, it is important that the fieldbus coupler and the safe I/O modules are switched on **at the same time**. Whenever the fieldbus coupler is switched on subsequently, an error occurs in the safe I/O modules. This error can only be rectified by switching on the fieldbus coupler and safe I/O modules at the same time.

The described error can occur in the following constellations:
- The secure I/O modules are powered by PF-I or PF-O modules, which are supplied with power before the fieldbus coupler.
- An UR20-4DI-4DO-PN-FS module is present in the station, and the output current path of the fieldbus coupler is supplied before the input current path.

PROFIsafe

For the commissioning of safe I/O modules running with the PROFIsafe safety protocol you will need the Weidmüller CPD tool which is available to download on the website. According to the parameter settings this software tool calculates a check sum, which is needed for the commissioning of the engineering software.

If you work with the enginieering software STEP7, TIA portal or Bosch IndraWorks Engineering, proceed as follows:
► In the engineering software, start the CPD tool via the context menu of the respective safe I/O module.

The parameter settings configured in the engineering software are automatically adopted.
► In the Weidmüller CPD tool, check and confirm the adopted parameters.

The CPD tool calculates a check sum (iPar-CRC).
► Enter the check sum in the engineering software.

If you work with another engineering software, you may not be able to start the Weidmüller CPD tool directly from the context menu of the module. In this case, you have to switch the Weidmüller CPD tool once to edit mode.
► In the folder `C:\ProgramData\Weidmueller\Safety Configurator` open the file `WeidmuellerSafetyCRCTool.ini`.
► In the section `[COMMON]` set the key `EditModeEnabled=1`.
► Start the Weidmüller CPD tool via the start menu programs/Weidmüller/Safety Configurator.
► Select the fieldbus coupler, the module and the parameters one after the other.

The CPD tool calculates a check sum (iPar-CRC).
► Enter the check sum in the engineering software.

Fail-Safe-over-EtherCAT

For the commissioning of safe I/O modules running with the Fail safe over EtherCAT safety protocol you will need TwinCAT as well as a TwinSAFE safety control. The FSOE modules have been tested using the TwinSAFE-Logic EL6900 system (Beckhoff) and TwinCAT 2.11.2247 (Beckhoff).

CC-Link IE Safety

For the commissioning of safe I/O modules that work with the safety protocol CC-Link IE Safety, you need the Gx Works and a Melsec iQ-R safety controller.
The CC-Link IE Safety modules are tested with the System Safety CPU-SET R08SFCPU-SET (Mitsubishi Electric) and Gx Works 3 (Mitsubishi Electric).

3.5 Safety address

Before commissioning the safety address (F-address) has to be set on each safe I/O module using the DIP switches on the electronic unit. This address is indicated by the project planning. The safety control transfers the safety address to the module on each commissioning.
The safety address (decimal) has to be converted into a binary value and then set using the DIP switches .

Decimal/binary conversion table

decimal	2048	1024	512	256	128	64	32	16	8	4	2	1
binary	0	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0
1234	**0**	**1**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**1**	**0**

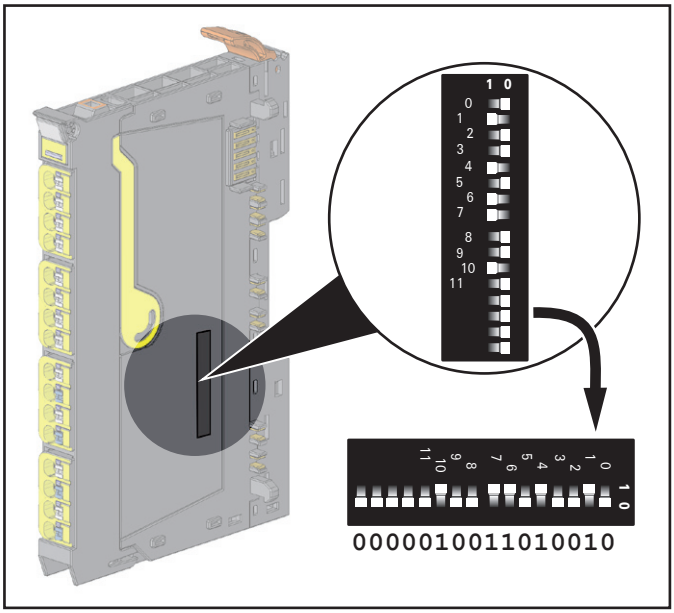
Example: Address „1234“ is represented by setting 0000**010011010010**.

Please use e.g. a ball pen to set the DIP switches and avoid sharp-edged tools.

With PROFIsafe modules: Make sure that switches without identification marking always remain in position “Zero”.

Setting the safety address

- ► Before snapping the module onto the DIN rail please set the safety address according to the project planning via the DIP switches on the electronic unit.
- ► Snap the module onto the DIN rail and continue the installation of the u-remote station.



DIP switches for setting the safety address (example setting: 1234)

Changing the safety address

To change the safety address after the module has been assigned to the control please act as follows (with V2 modules and UR20-...-FSCC modules start with step 5):

1. Pull out the electronic unit.
2. Set all DIP switches to position „Zero“.
3. Slide the electronic unit back into the module and turn on the module/station.
4. Please wait until the status LED of the module lights alternating red and green (3 s green, 1 s red).

Only now the old safety address has been deleted and the new one can be set.

5. Pull out the electronic unit again and set the new safety address.
6. Slide the electronic unit back into the module and turn on the module/station.

The status LED of the module lights green and the new safety address will be displayed on the web server.

3.6 Connection and classification of safe inputs

Operation with test pulses

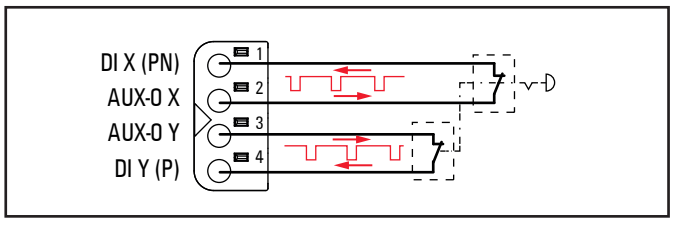
The information on classification refers to the ZVEI recommendation 2021.01 version 1 position paper CB 24 I "Classification of binary 24 V interfaces with testing in the area of functional safety".

ZVEI coding key for digital inputs

Source / Sink	Interface type	Additional measure	Source / Sink	Suitable interface type	Suitable interface type	Suitable interface type
Sink	A	M	Source	A	–	–
	B	M		B	–	–
	C1	M		C1	–	–
	C2	M		C2	–	–
	C3	M		C3	–	–

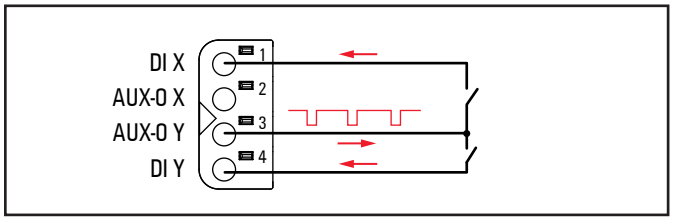
Interface type A – sink

Attribute	min.	typ.	max.
Input current I_i in status ON	2.25 mA	–	3.25 mA
Output voltage U_i	–	–	= U_{IN} (8DI) = U_{OUT} (4DI-4DO)
Input capacity C_i	–	10 nF	–
Additional measure M	– The module parameter **Test pulse** of input [n] must be set to **from AUX-O [n]**.		
Comments	– If the module parameter **Input polarity** is set to **N-switching,** the current and voltage values apply relative to the supply voltage with a negative sign. – The values correspond to EN 61131-2, input type 3. – V2 modules and UR20-...-FSCC modules can also be switched antivalently and parameterised respectively.		



Connecting example interface type A – sink

With the 4-wire connecting variant, DI X can be parameterised both P-switching and N-switching.



Connecting example interface type A – sink

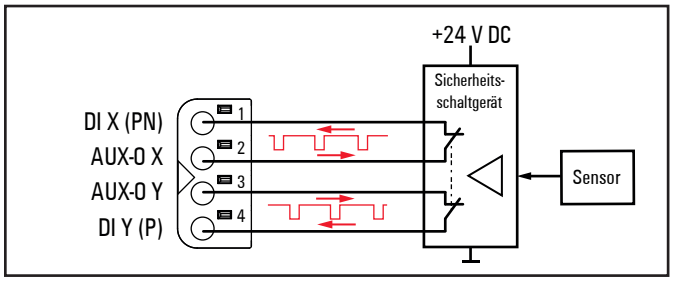
The 3-wire connecting variant can only be realised with V2 modules and UR20-...-FSCC modules. For this, DI X must be parameterised P-switching.

Interface type B – sink

Parameter	min.	typ.	max.
Test pulse delay Δt_i	0 ms	–	$t_i/2$
Test pulse duration t_i	0.5 ms	–	10 ms
Test pulse intervall T	600 ms	–	1200 ms (8DI)
Input capacity C_i	–	10 nF	–
Additional measure M	– The module parameter **Test pulse** of input [n] must be set to **from AUX-O [n]**.		
Comments	– The test pulse duration depends on the parameterised input delay, see following table. – V2 modules and UR20-...-FSCC modules can also be switched antivalently and parameterised respectively.		

Relationship between the module parameter Input delay and the test pulse duration

Parameterised input delay	Resulting test pulse duration
1 ms	0.5 ms
3 ms	1 ms
10 ms	3 ms
100 ms	10 ms

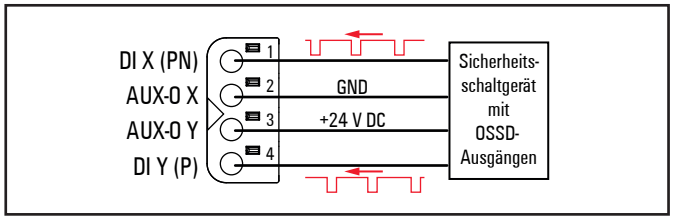


Connecting example interface type B – sink

Interface type C – sink[1)]

Parameter	min.	typ.	max.
Type / Class[2)]		C1	
Test pulse duration t_i	–	–	1 ms
Type / Class[2)]		C2	
Test pulse duration t_i	–	–	0.5 ms
Type / Class[2)]		C3	
Test pulse duration t_i	–	–	0.1 ms
		C (all classes)	
Test pulse intervall T	250 ms	–	–
Input resistance R	U_i/3.5 mA	–	–
Input capacity C_i	–	10 nF	–
Additional measure M	– The module parameter **Test pulse** of the input channel must be set to **external**. – To ensure that external test pulses have no effect on the process data of the inputs, the **Input delay** parameter must be set to the next highest value of the test pulse duration.		
Comments	– The inputs have a test pulse detection that expects at least one edge transition every 5 minutes.		

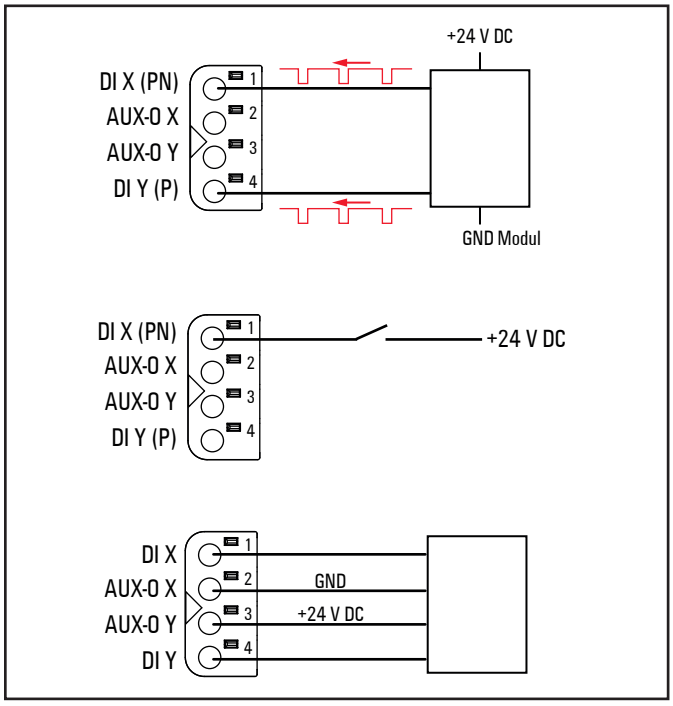
1) Only with V2 modules and UR20-...-FSCC modules
2) The coding key is not used for the free classe C0. This class needs an individual examination.



Connecting example interface type C – sink

Operation without test pulses

If a device is connected that can neither pass through test pulses generated by the sink nor generate its own test pulses, the **Test pulse** parameter of the corresponding input must be set to **internal**. For V1 modules, the **Test pulse** parameter must be set to **deactivated**. Classification in accordance with ZVEI CB 24 I is not intended for this type of application.



Connecting example for operation without test pulses

If the AUX-O connection is to be used as power supply for the DI X input ciruit and the parameter **Test pulse** for DI X is set to **internal** (**deactivated** with V1 modules), the **Input polarity** for DI X must be parameterised as **N-switching**.

3.7 Connection and classification of safe outputs

Operation with test pulses

The information on classification refers to the ZVEI recommendation 2021.01 version 1 position paper CB 24 I "Classification of binary 24 V interfaces with testing in the area of functional safety".

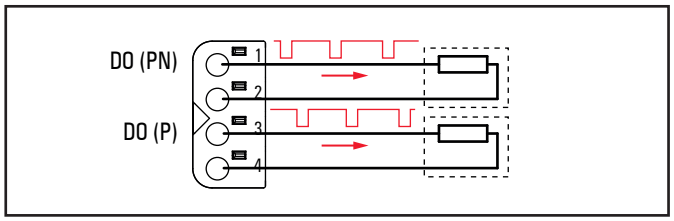
ZVEI coding key for digital inputs

Source / Sink	interface type	Additional measure	Source / Sink	Geeigneter interface type	Geeigneter interface type	Geeigneter interface type
Source	C1	M	Sink	C1	–	–
	C2	M		C2	–	–
	D1	M		D1	–	–
	D2	M		D2	–	–

Interface type C – Source

Parameter	min.	typ.	max.
Type / Class[1)]		C1	
Test pulse duration t_i	–	–	1 ms
Type / Class[1)]		C2	
Test pulse duration t_i	–	–	0.5 ms
Type / Class[1)]		C (alle Klassen)	
Test pulse intervall T	–	200 ms	–
Nominal current I_{IN}	–	–	0.5 A
Capacitive load C_L	–	–	100 µF
Inductive load	–	–	1150 mH (DC-13)
Additional measure M	– The RC ratio of the load must be selected so that the voltage falls below 6 V within the test pulse duration. – The parameter **Test pulse** must be set to **enabled**. – The parameter **Output test pulse duration (output [n])** must be set to **0.5 ms** (C2) or **1 ms** (C1).		

1) The coding key is not used for the free classe CO. This class needs an individual examination.



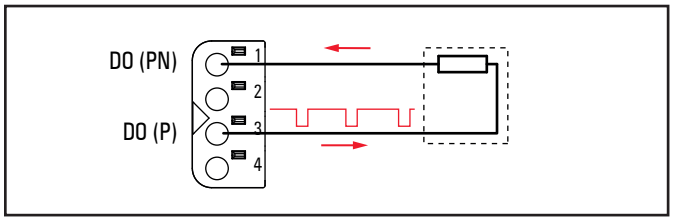
Connecting example interface type C – Source

This connecting variant can be parameterised both as dual single-channel and dual-channel.

Interface type D – Source

Parameter	min.	typ.	max.
Type / Class[1)]		D1	
Test pulse duration t_i	–	–	1 ms
Type / Class[1)]		D2	
Test pulse duration t_i	–	–	0.5 ms
Type / Class[1)]		D (all classes)	
Test pulse intervall T	–	200 ms	–
Leakage current $I_{LEAKAGE}$ of the output in status OFF	–	–	1 mA
Nominal current I_{IN} of the output in status ON	–	–	0.5 A
Capacitive load C_L	–	–	100 µF
Inductive load	–	–	1150 mH (DC-13)
Additional measure M	– The RC ratio of the load must be selected so that the voltage falls below 6 V within the test pulse duration. – The sink must be connected at a DO pair. – The module parameter **Test pulse** must be set to **enabeld**. – The module parameter **Output test pulse duration (output [n])** must be set to **0.5 ms** (D2) or **1 ms** (D1).		
Recommendation	The module parameter **Output dual channel mode** of the DO pair should be set to **dual channel**.		

1) The coding key is not used for the free classe CO. This class needs an individual examination.



Connecting example interface type D - Source

Operation without test pulses

If required, test pulses can be disabled separately for each output. Classification in accordance with ZVEI CB 24 I is not intended for this type of application.

3.8 Processing time

The processing time of a signal within the safety chain can be calculated as follows:

Input delay (parameterised)
+ Response time input
+ Response time output
+ Data transfer from and to the PLC
+ PLC computing time

= Processing time

The response times of the inputs and the outputs of safe I/O modules are indicated in the technical data tables.

3.9 Resetting safety modules

A remote reset (soft reset) is not a safety-related function and shall not have an influence on safety modules. A power cycle is necessary to execute a (hard) reset of a safety module.
A remote reset only triggers a restart (soft reset) of the field-bus coupler. The backplane bus is reinitialised during boot-up, but no safety I/O modules are reset. The remote reset deletes the local coupler information (including diagnostics). Safety modules therefore remain in a safe state even during the remote reset and may no longer communicate. Present diagnostics are not communicated again to the coupler in such a scenario.

4 System description of safe power-feed modules

This chapter contains product-specific information and notes about the use of safe power-feed modules. Please also observe the system description in the u-remote manual (document number 1432790000).

The UR20-PF-O-xDI-SIL modules are controlled using contact-based safety transducers and/or safety transducers with OSSD outputs.

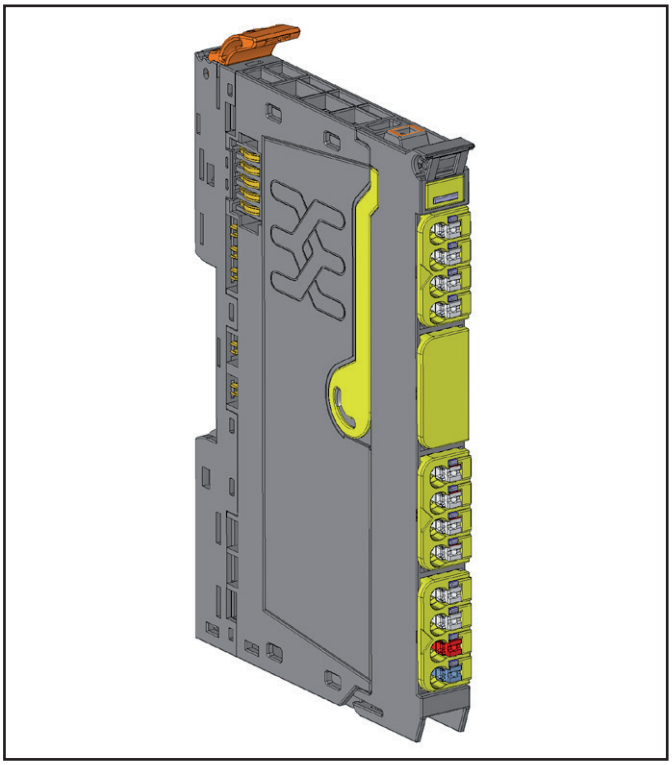
Each UR20-PF-O-xDI-SIL module safely switches off all following modules that are supplied by the output current path and thus creates a safety segment. A survey of the switchable modules is shown at the end of this section. The safety segment extends either to the next PF-O module or to the end of the station. A safety-related input circuit together with pulsed inputs is used for detecting broken wires and short circuits.

Three types of safe power-feed modules are available in the u-remote system:
- UR20-PF-O-1DI-SIL (one safe input)
- UR20-PF-O-2DI-SIL (two safe inputs)
- UR20-PF-O-2DI-DELAY-SIL (two safe inputs, delayed switching off possible)

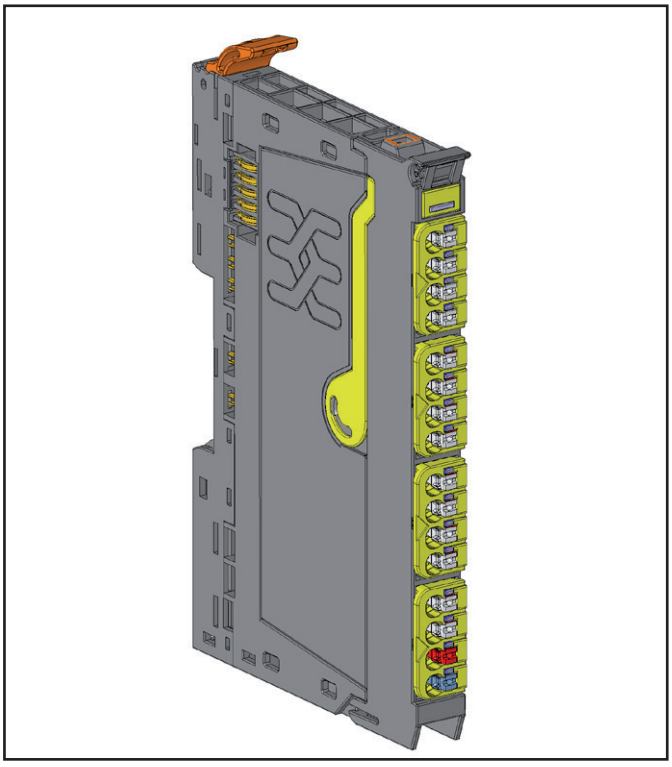
Thereby the following safety functions can be implemented:
- Up to two dual-channel safety circuits (AND linked), e.g. for emergency stop switch, safety door contacts and safety light curtains
- A range of output modules within a u-remote station is safely supplied with power via the switched 24 V Safe output.
- UR20-PF-O-xDI-SIL modules can be cascaded.

Safety function

The safety function of the safe power-feed modules is that the safe output “24 V Safe” is being switched according to the informations of the inputs (Type 3 according to EN 61131-2, N-switching respectively). The safe status is “24 V switched off” (current path for outputs and the output “24 V Safe” is switched off).



Safe power-feed module UR20-PF-O-1DI-SIL



Safe power-feed module UR20-PF-O-2DI-SIL and UR20-PF-O-2DI-DELAY-SIL

4.1 Sample design

The following picture exemplifies how to design a safety segment using a safe power-feed module. All output modules arranged within the safety segment will be switched safely. Input modules can be arranged within the safety segment, only they do not fulfill any safety function and are not influenced by the UR20-PF-O-xDI-SIL module.

Safe I/O modules with outputs may not be positioned within a safety segment.

For detailed planning please also observe the notes in the section „Configuration“.

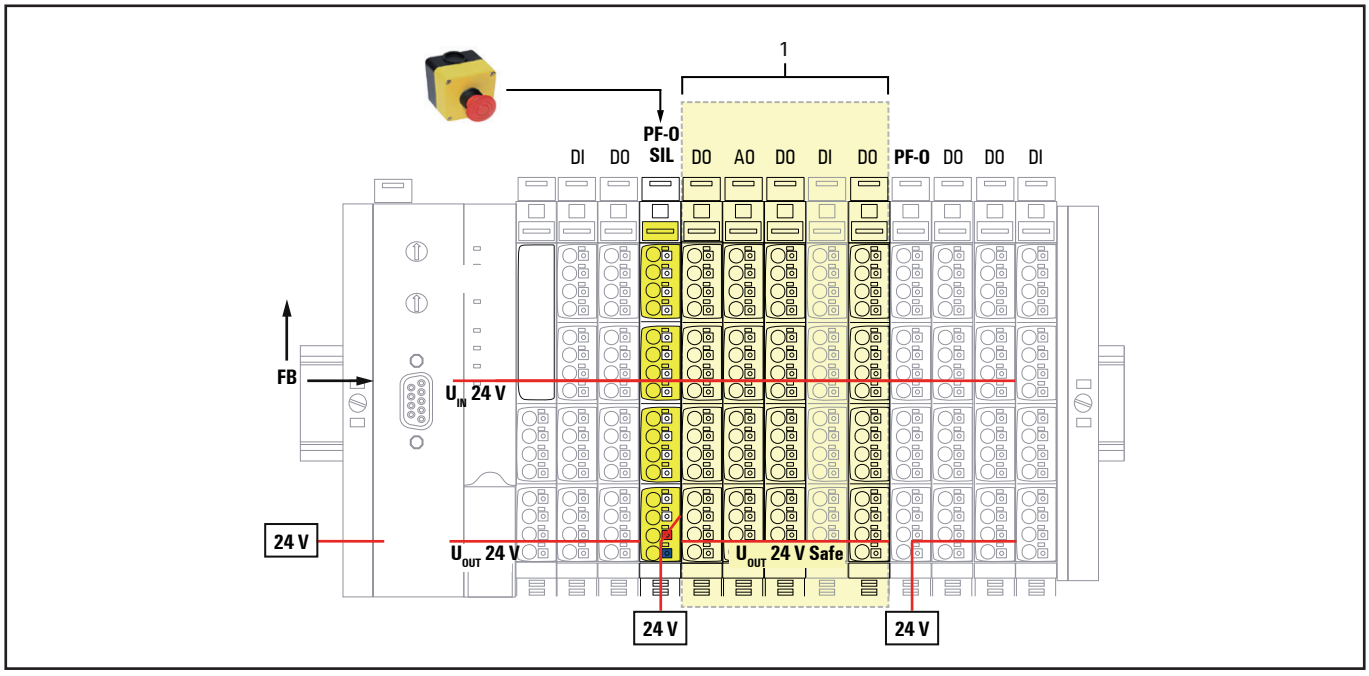
To switch the 24 V Safe voltage back on, either an automatic or a manual start can be selected.

- Automatic start: the safe output current path is switched on immediately after resetting the safety circuit(s).

WARNING

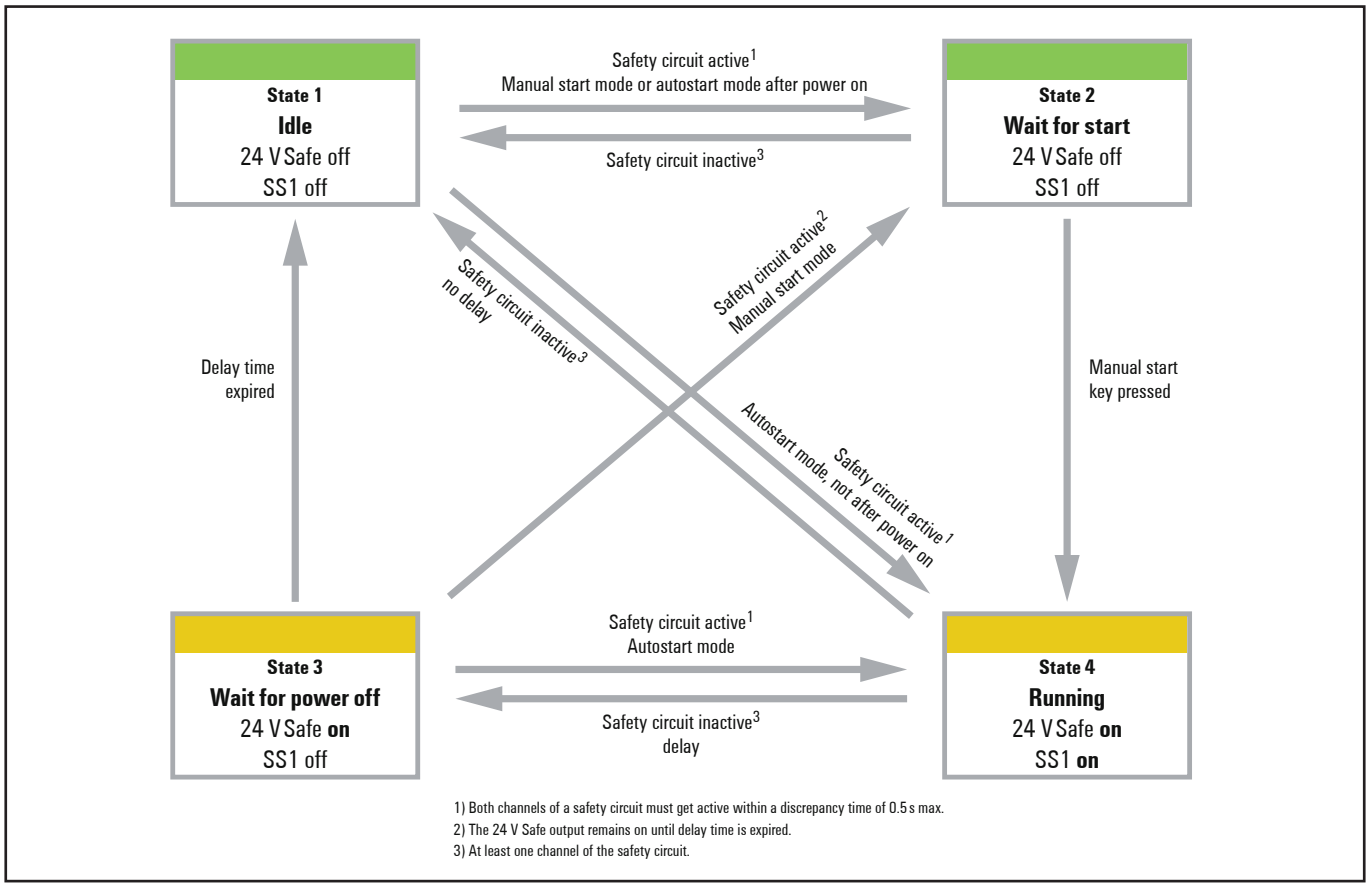
Possible danger to life!
The option “Automatic start” might only be used, after a risk analysis has shown that the application is suitable.

- Manual start: the output current path is only switched on again if the start button has been held down for 0.5 to 2 seconds.



Example set-up of a safety segment (1) with UR20-PF-O-xDI-SIL

4.2 Transition diagram



Transition diagram of safe power-feed modules

With the delay SIL module (UR20-PF-O-2DI-DELAY-SIL) switching off can be delayed by a defined time so that, for example, a machine can be shut down in a controlled manner. The delay time can be set in four steps between 0 and 60 seconds (corresponds to stop category 1 as per EN 60204).

4.3 Modules safely switchable by UR20-PF-O-xDI-SIL

Safely switchable 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
- UR20-8DIO-P-3W-DIAG
- UR20-2PWM-I-2.5A-2DI-P
- UR20-2PWM-PN-0.5A, UR20-2PWM-PN-0.5A-V2
- UR20-2PWM-PN-2A, UR20-2PWM-PN-2A-V2
- UR20-2AO-UI-16
- UR20-2AO-UI-16-DIAG
- UR20-2AO-UI-ISO-16-DIAG
- UR20-4AO-UI-16
- UR20-4AO-UI-16-HD
- UR20-4AO-UI-16-DIAG
- UR20-4AO-UI-16-DIAG-HD
- UR20-4AO-UI-16-M
- UR20-4AO-UI-16-M-DIAG

In case a N-switching output module is positioned within a safety segment the connected load needs to be switched against +24 V Safe.
The following modules are **not** safely switchable, therefore they must not switch any safety function:
- UR20-4RO-CO-255
- UR20-4RO-SSR-255
- UR20-4DO-ISO-4A
- UR20-16DO-P-PLC-INT
- UR20-16DO-N-PLC-INT
- UR20-1SM-50W-6DI2DO-P

The digital counter module UR20-1CNT-100-1DO will not be switched since it is supplied via the input current path.

4.4 Configuration

A UR20-PF-O-xDI-SIL module can be positioned anywhere in the u-remote station. Multiple UR20-PF-O-xDI-SIL modules and thus safety segments can be set up in a single station. When planning a u-remote station with UR20-PF-O-xDI-SIL modules, the following requirements must be met:
- The overall current consumption from the system current path of all switchable modules within a safety segment must be lower than 100 mA (see table in section 4.5).
- Each safety segment might include at most 12 switchable modules.
- The switch-off delay time for the safe input channels within a safety circuit is 500 ms ± 10 ms.
- The feed-in of the UR20-PF-O-xDI-SIL module must be safeguarded with a 8-A super fast fuse.
- A SELV/PELV power supply must be used.
- The safely shut-off systems/applications must get their power exclusively from the safe feed-in module UR20-PF-O-xDI-SIL. Likewise, it must not be possible to feed external energy into the safety segment elsewhere.
- Relay modules can be located within a safety segment, however their outputs cannot be safely shut off in case of a malfunction.
- At the SS1 output of the UR20-PF-O-2DI-DELAY-SIL, only systems/equipment that do not feed any power back into the system in the event of a malfunction can be connected.
- Any external short circuits in the wiring of the safe output must be avoided.
- Fault exclusion as per EN ISO 13849-2 must be provided.

4.5 Switch-off delay time

The turn-off time of a UR20-PF-O-xDI-SIL module is 20 ms, caused by the hardware and firmware delay time. The time required until the output voltage even of the last switchable module of a safety segment is below 5 V, can be calculated as follows:

Turn-off time of a UR20-PF-O-xDI-SIL module
\+ Sum of all modules' hardware delay
= Switch off delay [ms]

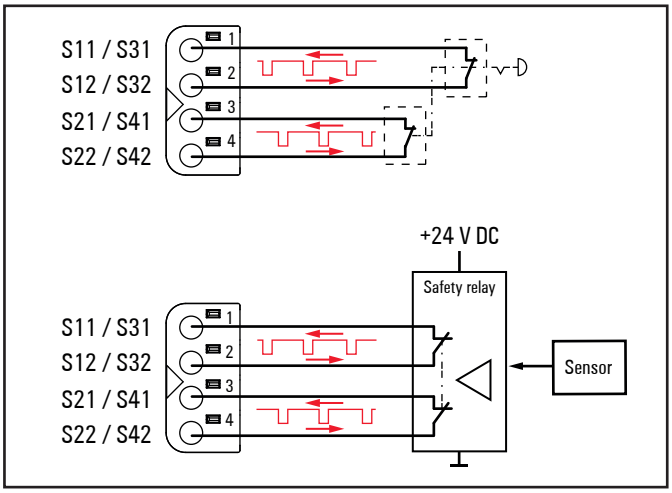
Switch-off delay and current consumption

	Hardware delay [ms]	Current consumption from I_{SYS} [mA]
UR20-4DO-P	2	8
UR20-4DO-P-2A	2	8
UR20-4DO-PN-2A	3	15
UR20-8DO-P	1	15
UR20-8DO-P-2W-HD	1	15
UR20-16DO-P	1	10
UR20-16DO-P-PLC-INT	1	10
UR20-4DO-N	2	8
UR20-4DO-N-2A	2	8
UR20-8DO-N	1	15
UR20-16DO-N	1	10
UR20-16DO-N-PLC-INT	1	10
UR20-4DO-ISO-4A	0	8
UR20-2PWM-PN-0.5A	5	10
UR20-2PWM-PN-2A	5	10
UR20-2AO-UI-16, UR20-2AO-UI-16-DIAG	150*	8
UR20-2AO-UHSO-16-DIAG	16	8
UR20-4AO-UI-16	150*	10
UR20-4AO-UI-16-HD	150*	10
UR20-4AO-UI-16-DIAG	150*	10
UR20-4AO-UI-16-DIAG-HD	150*	10

*The delay time is always 150 ms, irrespective of the amout of these modules.

4.6 Operation with and without test pulses

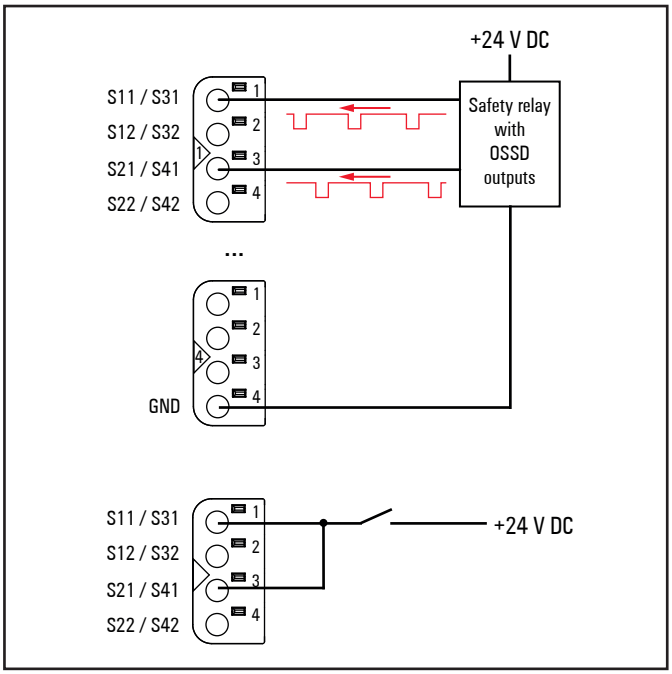
The safe input circuits are designed to connect passive dual channel switching devices. Each input channel is provided with pulsed voltage the test pulses of which are analysed. Therefore the highest safety levels can be achieved (see technical data).



Exemplary operation with test pulses

The safe power-feed module UR20-PF-O-2DI-DELAY-SIL might also be operated without test pulses. This is mandatory whenever an external device gernerating own test pulses is connected.

When using switching devices generating own test pulses please regard that low level with a duration of more than 2 ms will be detected as an opening of the safety circuit.



Exemplary operation of the UR20-PF-O-2DI-DELAY-SIL without test pulses

Test pulses can be enabled or disabled using the DIP-switches of the module.

5 Detailed descriptions of safe modules

5.1 General technical 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)
Dimensions	Height	120 mm (128 mm with release lever)
	Width	11.5 mm
	Depth	76.0 mm
Protection class (DIN EN 60529)	IP20	
Flammability rating UL 94	V-0	
Temperature data	Operation	-20 °C to +60 °C
	Storage, transport	-40 °C to +85 °C
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 for 11 ms, half sinewave, as per IEC 60068-2-27	
Potential isolation	Test voltage	Max. 28.8 V within a channel 500 V DC field/system
	Pollution severity level	2
	Overvoltage category	II
Approvals and Standards[1)]	cULus	UL 61010
	Potentially explosive atmosphere Zone 2	ATEX Directive 2014/34/EU
	EMC	EN 61000 (Partial standards as per requirements of IEC 61131-2)
	Explosion protection	EN 60079-0:2017 and EN 60079-15:2017
	PLC	IEC 61131-2
	FS	DIN EN ISO 13849-1, IEC 61508, IEC 62061

[1)] Unless otherwise noted within the product-specific technical data.

You can find all product-specific technical data in the corresponding product description.

5.2 Data width dependent on the coupler used

Data width

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
UR20-FBC-PB-DP						
1334870000	UR20-FBC-PB-DP	–	8	47	–	–
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	–
1335060000	UR20-4DI-4DO-PN-FSPS	7	26	47	5	5
1335070000	UR20-8DI-PN-FSPS	7	26	47	5	5
2464570000	UR20-4DI-4DO-PN-FSPS-V2	7	30	47	5	5
2464590000	UR20-8DI-PN-FSPS-V2	7	35	47	5	5
Max. data (in byte)		244	244	244	244	244
UR20-FBC-PN-IRT						
1334880000	UR20-FBC-PN-IRT	4	10	47	4	4
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
1335060000	UR20-4DI-4DO-PN-FSPS	4	23	47	6	6
1335070000	UR20-8DI-PN-FSPS	4	23	47	6	6
2464570000	UR20-4DI-4DO-PN-FSPS-V2	4	27	47	6	6
2464590000	UR20-8DI-PN-FSPS-V2	4	32	47	6	6
Max. data (in byte)		260	4362	1408	512	512
UR20-FBC-EC						
1334910000	UR20-FBC-EC	256	4096	3328	1024	1024
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	–
1529800000	UR20-8DI-PN-FSOE	4	5	47	6	6
1529780000	UR20-4DI-4DO-PN-FSOE	4	5	47	6	6
2464580000	UR20-4DI-4DO-PN-FSOE-V2	4	9	47	6	6
2464600000	UR20-8DI-PN-FSOE-V2	4	14	47	6	6
Max. data (in byte)		1514 pro telegramm + CoE	1514 pro telegramm + CoE	1514 pro telegramm + CoE	1024	1024
UR20-FBC-EIP						
1334910000	UR20-FBC-EC	8	–	–	2/10	2/10
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	–	–	496/504	496/504

Data width

Order No.	Module	Configuration	Parameter	Diagnostics	Process data	
					Input	Output
		Bytes	Bytes	Bytes	Bytes	Bytes
UR20-FBC-DN						
1334900000	UR20-FBC-DN	-	11	47	2/10	2/10
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						
1334890000	UR20-FBC-CAN	–		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
UR20-FBC-CC-TSN						
2680260000	UR20-FBC-CC-TSN	–	10	47	1024	1024
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	–
2742570000	UR20-4DI-4DO-PN-FSCC	4	32	47	64	60
2742580000	UR20-8DI-PN-FSCC	4	32	47	64	60
Max. Daten (in Byte)		–	–	–	1024	1024

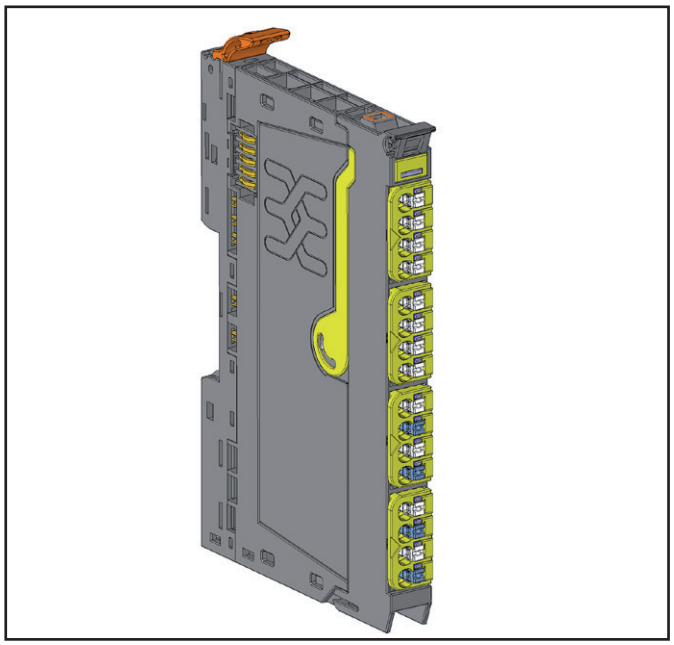
UR20-FBC-MOD-TCP

Order No.	Module	Process data	
		Input	Output
		Bytes	Bytes
1335030000	UR20-PF-O-1DI-SIL	4 Bytes	–
1335040000	UR20-PF-O-2DI-DELAY-SIL	4 Bytes	–
1335050000	UR20-PF-O-2DI-SIL	4 Bytes	–

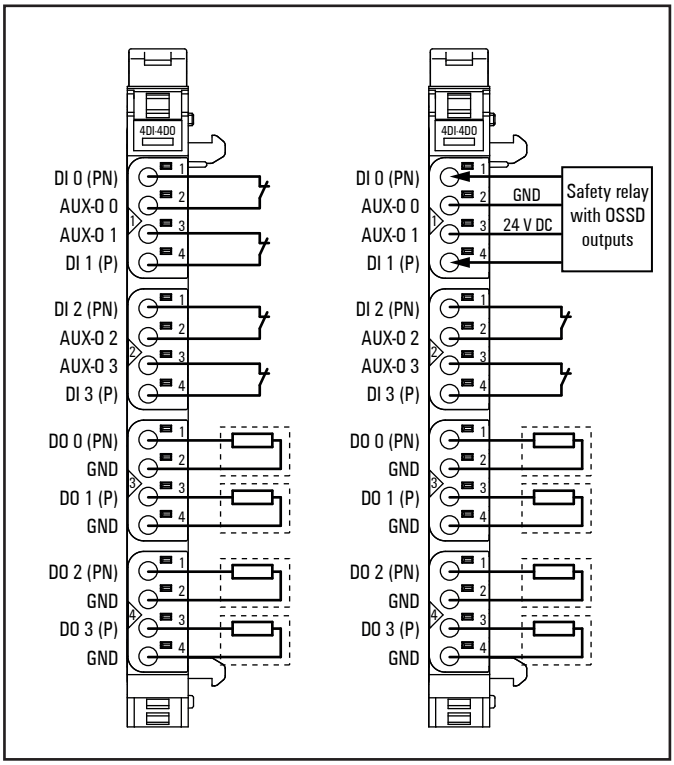
The register structure for UR20-FBC-MOD-TCP see u-remote manual, section 5.4.

5.3 Digital in- and output module UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2

Safety over EtherCAT®



Digital in- and output module UR20-4DI-4DO-PN-FSOE (Order No. 1529780000), UR20-4DI-4DO-PN-FSOE-V2 (Order No. 2464580000)



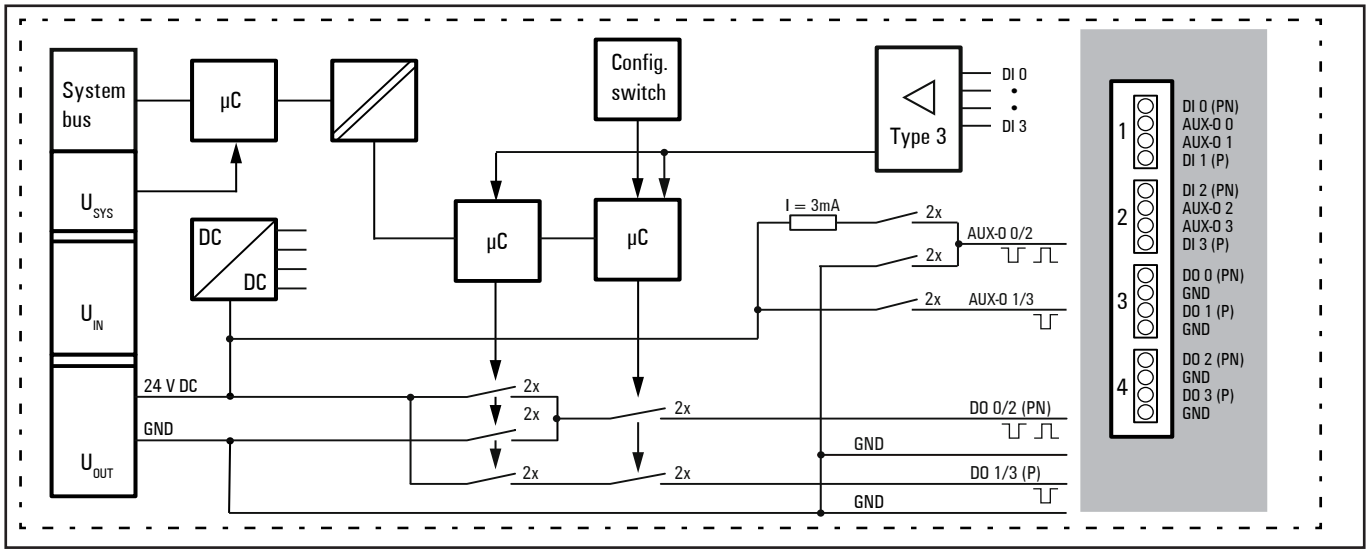
Connection diagram UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2 (Examples)

The UR20-4DI-4DO-PN-FSOE or UR20-4DI-4DO-PN-FSOE-V2 digital input and output module is a safe I/O module for the Fail-Safe-over-EtherCAT (FSoE) protocol. Each module provides four digital inputs and outputs respectively, it can detect up to four binary control signals and control up to four actuators each with a maximum of 0.5 A. Two inputs and outputs respectively can be parameterised P- or N-switching. Sensors can be connected to connectors 1 and 2 using a 2-wire, 3-wire or 4-wire connection. In the event that the available supply current of 0.8 A per plug will not suffice, the sensor supply must be realised using the auxiliary outputs of another module (e.g. potential distribution module) within the same power segment.
Actuators can be connected to connectors 3 and 4 using a 2-wire connection. A status LED is assigned to each channel. The module electronics supply the inputs as well as the outputs with power from the output current path (I_{OUT}).
A test pulse check of the inputs can be parameterised as a cross-circuit detection between input singal and supply voltage, between different input signals or other signals. An input only remains active without error when the signal of the dedicated auxiliary output is present. Short circuit detection is not possible when using a 3-wire connection.

With the variant 1 module the active output signal always includes test pulses for the purpose of cross-circuit and error detection. The test pulse duration can be parameterised.
A safety sensor that is being connected in a dual channel mode must allocate the PN and the P-input of one connector (safety architecture of category 4 acc. to DIN EN ISO 13849). The external circuitry of a PN/P output pair is described in Chapter 3.

	Module status LED Green: Communication on system bus 3 s green/1 s red: Waiting for parameters 1 s green/1 s red: Waiting for acknowledgement by safety control 2 s red/2 s off: Station configuration has changed during operation Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.3	Red: Error sensor supply or input 0 or input 1
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.3	Red: Error sensor supply or input 2 or input 3
2.4	Yellow: Input 3 active
3.1	Yellow: Output 0 active
3.2	Red: Error output 0
3.3	Yellow: Output 1 active
3.4	Red: Error output 1
4.1	Yellow: Output 2 active
4.2	Red: Error output 2
4.3	Yellow: Output 3 active
4.4	Red: Error output 3

LED indicators UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2, error messages see Chapter 8



Block diagram UR20-4DI-4DO-PN-FSOE , UR20-4DI-4DO-PN-FSOE-V2

Technical data UR20-4DI-4DO-PN-FSOE (Order No. 1529780000), UR20-4DI-4DO-PN-FSOE-V2 (Order No. 2464580000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see section 5.2	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Safety-related data according to EN ISO 13849-1 (Regard the entire safety chain!)		
Achievable safety level inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	PLd, Categorie 2 PLe, Categorie 4
Achievable safety level outputs		PLe, Categorie 4
Diagnostic Coverage (DC) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	90% 99%
Diagnostic Coverage (DC) outputs	Dual-channel circuit 1oo2	99%
$MTTF_D$ (Mean Time To Failure dangerous) inputs		> 100 Years (840 Years)
$MTTF_D$ (Mean Time To Failure dangerous) outputs		> 100 Years (279 Years)
Safety-related data according to EN 62061 (Regard the entire safety chain!)		
Achievable safety level inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SILCL 2 SILCL 3
Achievable safety level outputs		SILCL 3
PFH (Probability of Failure per hour in 1/h) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}94*10^{-9}$
PFH (Probability of Failure per hour in 1/h) outputs		$5{,}56*10^{-9}$
Fault reaction time	Single-channel circuit 1oo1	5 s
Safety-related data according to EN 61508 (Regard the entire safety chain!)		
Achievable safety level inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SIL 2 SIL 3
Achievable safety level outputs		SIL 3
PFH (Probability of Failure per hour in 1/h) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}17*10^{-10}$
PFH (Probability of Failure per hour in 1/h) outputs		$2{,}17*10^{-10}$
PFD (Probability of Failure per Demand) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	$8{,}77*10^{-4}$ $1{,}85*10^{-5}$
PFD (Probability of Failure per Demand) outputs		$1{,}85*10^{-5}$
HFT (Hardware Failure Tolerance) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	0 1
HFT (Hardware Failure Tolerance) outputs		1
SFF (Safe Failure Fraction) inputs and outputs	98%	
Presumed lifecycle time	20 Years	
Prooftest intervall	No prooftest needed within the life cycle	
Classification acc. to EN 61508-2	Type B	

Technical data UR20-4DI-4DO-PN-FSOE (Order No. 1529780000), UR20-4DI-4DO-PN-FSOE-V2 (Order No. 2464580000)

Inputs		
Number	4, two of which are parameterisable P- or N-switching	
Input Type	Type 1 and 3[1)] as per IEC 61131-2 (N-switching based on the standard)	
Input filter	Input delay adjustable from 1 to 100 ms	
Detection time	min. 5 ms active level, min. 3 ms non-active level	
Response time	<10 ms	
Low input voltage	P-switching: < 5 V; N-switching: > -5 V to +24 V	
High input voltage	P-switching: >11 V; N-switching: <-11 V to +24 V	
Sensor supply	Max. 0.8 A per plug, total max. 1.6 A	
Sensor connection	2-wire, 3-wire, 4-wire	
Reverse polarity protection	yes	
Module diagnosis	yes	
Individual channel diagnosis	yes	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Outputs		
Number	4, two of which are parameterisable P- or N-switching	
Type of load	Ohmic, inductive, filament lamp load	
Response time	V1 modules V2 modules (sw[2)] 01.00.05 or higher) V2 modules (up to sw[2)] 01.00.04)	<10 ms <10 ms < 65 ms
Output current	per channel	0.002 to 0.5 A
	per module	max. 2 A
Breaking energy (inductive)	150 mJ/channel	
Switching frequency	Resistive load (min. 47 Ω)	10 Hz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 10 Hz with suitable free-wheeling diode
	Filament lamp load (12 W)	10 Hz
Actuator connection	2-wire	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off approx. 1,1 A (P-switching), approx. 3,5 A (N-switching)	
Response time of the current limiting circuit	< 100 µs	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Safe status	P-switching: < 5 V, < 2 mA N-switching: > -2 mA (referred to +24 V DC)	

2) The module software version is indicated here:
- in the web server within the "general information" of each module
- within the I&M data when using the engineering tool item "check online connection"

Technical data UR20-4DI-4DO-PN-FSOE (Order No. 1529780000), UR20-4DI-4DO-PN-FSOE-V2 (Order No. 2464580000)

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 + output current + current consumption from the auxiliary outputs
General data	
Weight (operational status)	93 g
Additional general data, see Section 5.1.	

Overview of the editable parameters[1] UR20-4DI-4DO-PN-FSOE

Channel	Description	Options	Default
0 ... 1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0 ... 1	Test pulse	disabled (0) / enabled (1)	disabled
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel (1)	single channel
0 + 1	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
2 ... 3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2 ... 3	Test pulse	disabled (0) / enabled (1)	disabled
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel (1)	single channel
2 + 3	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
4 ... 5	Output test pulse duration (output 0 ... 1)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
4	Output polarity	P-switching (0) / N-switching (1)	P-switching
4 + 5	Output dual channel mode (outputs 0 + 1)	single channel (0) / dual channel (1)	single channel
6 ... 7	Output test pulse duration (output 2 ... 3)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
6	Output polarity	P-switching (0) / N-switching (1)	P-switching
6 + 7	Output dual channel mode (outputs 2 + 3)	single channel (0) / dual channel (1)	single channel

1) Please regard the notes for parameter settings.

Overview of the editable parameters[1] UR20-4DI-4DO-PN-FSOE-V2

Channel	Description	Options	Default
0	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
1	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal

1) Please regard the notes for parameter settings.

Overview of the editable parameters[1] UR20-4DI-4DO-PN-FSOE-V2

Channel	Description	Options	Default
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
0 + 1	Discrepancy time	5 ... 30.000 ms	500 ms
2	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2	Test pulse	internal (0) / external[1] (1) / from AUX2 (2) / from AUX3 (3)	internal
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
3	Test pulse	internal (0) / external[1] (1) / from AUX3 (3)	internal
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
2 + 3	Discrepancy time	5 ... 30.000 ms	500 ms
4 ... 5	Test pulse	enabled (0) / disabled[1] (1)	enabled
4 ... 5	Output test pulse duration (output 0 ... 1)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
4	Output polarity	P-switching (0) / N-switching (1)	P-switching
4 + 5	Output dual channel mode (outputs 0 + 1)	single channel (0) / dual channel (1)	single channel
6 ... 7	Test pulse	enabled (0) / disabled[1] (1)	enabled
6 ... 7	Output test pulse duration (output 2 ... 3)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
6	Output polarity	P-switching (0) / N-switching (1)	P-switching
6 + 7	Output dual channel mode (outputs 2 + 3)	single channel (0) / dual channel (1)	single channel

1) Please regard the notes for parameter settings.

Notes for parameter settings

- The module independently performs a plausibility test for the relevant pair of inputs or outputs, if the dual channel mode is parameterised. On this it will be checked if both inputs or outputs become active or inactive simultaneously within the discrepancy time.
- The "test pulse" parameter of an input must be disabled (V1 variant) or set "external" (V2 variant) if a safety relay with OSSD outputs generating own test pulses is connected. The test pulse duration depends on the parameterised input delay:

Input delay [ms]	1	3	10	100
Test pulse duration [ms]	0.5	1	3	10

- The parameter setting "internal" activates test pulses in the communication between the redundant controllers in the module. This increases the safety level of externally supplied safety relays without own test pulses. With this parameter setting, no passive safety switches can be connected.
- Please regard the following when parameterising „external" test pulses with a UR20-4DI-4DO-PN-FSOE-V2 module:
  - An edge transition must occur at least every five minutes at an active input. Otherwise a module error will be signalised.
  - With this setting the module cannot detect any short circuits. The short circuit detection must be realised by the connected OSSD device.

ATTENTION

Please regard the following to ensure that the safety function will not be influenced.

- In the event that the output test pulses of a UR20-4DI-4DO-PN-FSOE-V2 module are disabled output errors will only be detected under the following conditions:
  - No filament lamp load must be connected.
  - The capacitive load at this output may be 250 µF at maximum.

– An antivalent circuit can be parameterised for V2 modules. This means that a valid input signal can be “false”. With two channel parameterisation, both bits in the process data are always the same:
  11 Both inputs are valid and active, with antivalent parameterisation, the first input (IN X) is relevant.
  00 Both inputs are not active or invalid status and error with diagnostic alarm after the discrepancy time has elapsed.

This means for the process data:

Antivalent

IN X	IN Y	Process data	
0	1	00	not active
1	0	11	active
0	0	00	invalid, error after discrepancy time has elapsed
1	1	00	invalid, error after discrepancy time has elapsed

Equivalent

IN X	IN Y	Process data	
0	0	00	not active
1	1	11	active
0	1	00	invalid, error after discrepancy time has elapsed
1	0	00	invalid, error after discrepancy time has elapsed

Diagnostic data UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	0
		1	Internal error	0
		2	Reserved	0
		3	Channel error	0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	0	0
Module Type	1	0	1	0x03
		1	1	
		2	0	
		3	0	
		4	1	1
		5	0	0
		6	0	0
		7	0	0
Error byte 2	2	0 ... 7	Failure code (see attachment)	0
Error byte 3	3	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	Communication fault	0
		5	0	0
		6	0	0
		7	0	0
Channel Type	4	0	1	0x77
		1	1	
		2	1	
		3	0	
		4	1	
		5	1	
		6	1	
		7	0	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
Channel error	8 ... 10	0 ... 7	Reserved	0

Diagnostic data UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2

Name	Byte	Bit	Description	Default
Channel 0 error	11	0	Input 0, Short circuit	0
		1	Input 0, Cross connection	0
		2	Input 0, Discrepancy error	0
		3	Input 0, Other error	0
		4 ... 7	Reserved	0
Channel 1 error	12	0	Input 1, Short circuit	0
		1	Input 1, Cross connection	0
		2	Input 1, Discrepancy error	0
		3	Input 1, Other error	0
		4 ... 7	Reserved	0
Channel 2 error	13	0	Input 2, Short circuit	0
		1	Input 2, Cross connection	0
		2	Input 2, Discrepancy error	0
		3	Input 2, Other error	0
		4 ... 7	Reserved	0
Channel 3 error	14	0	Input 3, Short circuit	0
		1	Input 3, Cross connection	0
		2	Input 3, Discrepancy error	0
		3	Input 3, Other error	0
		4 ... 7	Reserved	0
Channel 4 error	15	0	Output 0, Short circuit	0
		1	Output 0, Cross connection	0
		2	Output 0, Readback error	0
		3	Output 0, Other error	0
		4 ... 7	Reserved	0
Channel 5 error	16	0	Output 1, Short circuit	0
		1	Output 1, Cross connection	0
		2	Output 1, Readback error	0
		3	Output 1, Other error	0
		4 ... 7	Reserved	0
Channel 6 error	17	0	Output 2, Short circuit	0
		1	Output 2, Cross connection	0
		2	Output 2, Readback error	0
		3	Output 2, Other error	0
		4 ... 7	Reserved	0
Channel 7 error	18	0	Output 3, Short circuit	0
		1	Output 3, Cross connection	0
		2	Output 3, Readback error	0
		3	Output 3, Other error	0
		4 ... 7	Reserved	0
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Process data inputs UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2

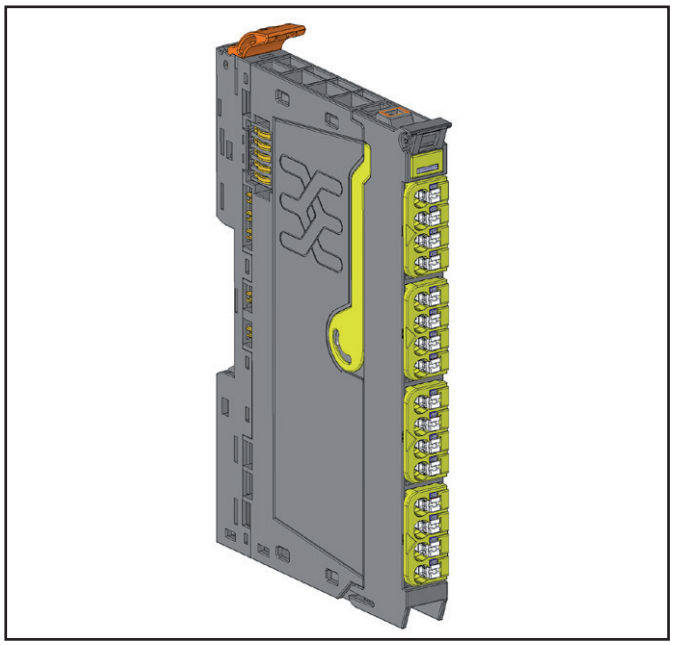
Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	Status DO0 (UR20-4DI-4DO-PN-FSOE-V2 only)
	IX0.5	Status DO1 (UR20-4DI-4DO-PN-FSOE-V2 only)
	IX0.6	Status DO2 (UR20-4DI-4DO-PN-FSOE-V2 only)
	IX0.7	Status DO3 (UR20-4DI-4DO-PN-FSOE-V2 only)

Process data outputs UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2

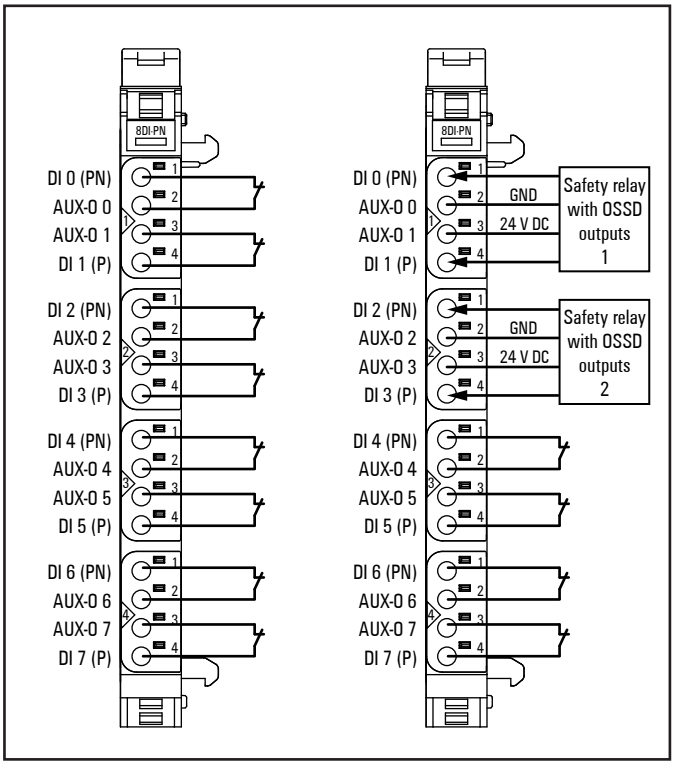
Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3

5.4 Digital input module UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2

Safety over EtherCAT®



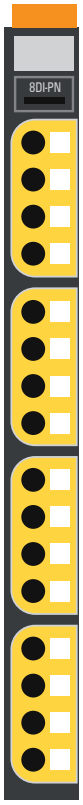
Digital input module UR20-8DI-PN-FSOE (Order No. 1529800000), UR20-8DI-PN-FSOE-V2 (Order No. 2464600000)



Connection diagram UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2

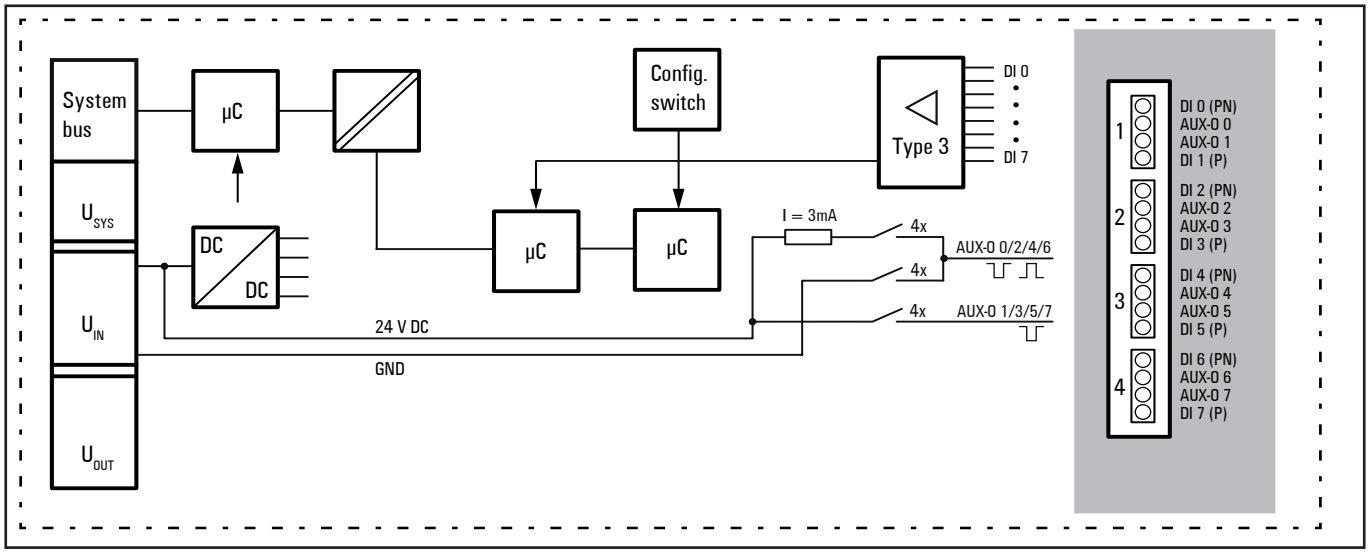
The UR20-8DI-PN-FSOE or UR20-8DI-PN-FSOE-V2 digital input module is a safe I/O module for the Fail-Safe-over-EtherCAT (FSoE) protocol. The module can detect up to 8 binary control signals. Two sensors can be connected to each connector using a 2-wire, 3-wire or 4-wire connection. In the event that the available supply current of 0.8 A per plug will not suffice, the sensor supply must be realised using the auxiliary outputs of another module (e.g. potential distribution module) within the same power segment.
A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN})
A test pulse check of the inputs can be parameterised as a cross-circuit detection between input singal and supply voltage, between different input signals or other signals. An input only remains active without error when the signal of the dedicated auxiliary output is present. Short circuit detection is not possible when using a 3-wire connection.

A safety sensor that is being connected in a dual channel mode must allocate the PN and the P-input of one connector (safety architecture of category 4 acc. to DIN EN ISO 13849).



	Module status LED Green: Communication on system bus 3 s green/1 s red: Waiting for parameters 1 s green/1 s red: Waiting for acknowledgement by safety control 2 s red/2 s off: Station configuration has changed during operation Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.3	Red: Error sensor supply or input 0 or input 1
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.3	Red: Error sensor supply or input 2 or input 3
2.4	Yellow: Input 3 active
3.1	Yellow: Input 4 active
3.3	Red: Error sensor supply or input 4 or input 5
3.4	Yellow: Input 5 active
4.1	Yellow: Input 6 active
4.3	Red: Error sensor supply or input 6 or input 7
4.4	Yellow: Input 7 active

LED indicators UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2, error messages see Chapter 8



Block diagram UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2

Technical data UR20-8DI-PN-FSOE (Order No. 1529800000), UR20-8DI-PN-FSOE-V2 (Order No. 2464600000)

System dat		
Data	Process, parameter and diagnostic data depend on the coupler used, see section 5.2	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	PLd, Categorie 2 PLe, Categorie 4
Diagnostic Coverage (DC)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	90% 99%
$MTTF_D$ (Mean Time To Failure dangerous)		> 100 Years (840 Years)
Safety-related data as per EN 62061 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SILCL 2 SILCL 3
PFH (Probability of Failure per hour in 1/h)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}94*10^{-9}$
Fault reaction time	Single-channel circuit 1oo1	10 s
Safety-related data as per EN 61508 (Regard the entire safety chain!))		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SIL 2 SIL 3
PFH (Probability of Failure per hour in 1/h)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}17*10^{-10}$
PFD (Probability of Failure per Demand)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	$8{,}77*10^{-4}$ $1{,}85*10^{-5}$
HFT (Hardware Failure Tolerance)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	0 1
SFF (Safe Failure Fraction)	98%	
Presumed lifecycle time	20 Years	
Prooftest intervall	No prooftest needed within the life cycle.	
Classification acc. to EN 61508-2	Type B	
Inputs		
Number	8, four of which are parameterisable P- or N-switching	
Input Type	Type 1 and 3[1)] as per IEC 61131-2 (N-switching based on the standard)	
Input filter	Input delay adjustable from 1 to 100 ms	
Detection time	min. 5 ms active level, min. 3 ms non-active level	
Response time	< 10 ms	
Low input voltage	P-switching: <5 V; N-switching: >-5 V against +24 V	
High input voltage	P-switching: >11 V; N-switching: <-11 V against +24 V	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Technical data UR20-8DI-PN-FSOE (Order No. 1529800000), UR20-8DI-PN-FSOE-V2 (Order No. 2464600000)

Sensor supply	Max. 0.8 A per plug, total max. 3.2 A
Sensor connection	2-wire, 3-wire, 4-wire
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 + current consumption from the auxiliary outputs
General data	
Weight (operational status)	93 g
Additional general data, see Section 5.1.	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Overview of the editable parameters[1] UR20-8DI-PN-FSOE

Channel	Description	Options	Default
0 ... 1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0 ... 1	Test pulse	disabled (0) / enabled (1)	disabled
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel (1)	single channel
0 + 1	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
2 ... 3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2 ... 3	Test pulse	disabled (0) / enabled (1)	disabled
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel (1)	single channel
2 + 3	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
4 ... 5	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
4 ... 5	Test pulse	disabled (0) / enabled (1)	disabled
4	Input polarity	P-switching (0) / N-switching (1)	P-switching
4 + 5	Input dual channel mode (inputs 4 + 5)	single channel (0) / dual channel (1)	single channel
4 + 5	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
6 ... 7	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
6 ... 7	Test pulse	disabled (0) / enabled (1)	disabled
6	Input polarity	P-switching (0) / N-switching (1)	P-switching
6 + 7	Input dual channel mode (inputs 6 + 7)	single channel (0) / dual channel (1)	single channel
6 + 7	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms

1) Please regard the notes for parameter settings.

Overview of the editable parameters[1] UR20-8DI-PN-FSOE-V2

Channel	Description	Options	Default
0	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
1	Test pulse	internal (0) / external (1) / from AUX1 (3)	internal
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
0 + 1	Discrepancy time	5 ... 30.000 ms	500 ms
2	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2	Test pulse	internal (0) / external (1) / from AUX2 (2) / from AUX3 (3)	internal
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
3	Test pulse	internal (0) / external (1) / from AUX3 (3)	internal
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
2 + 3	Discrepancy time	5 ... 30.000 ms	500 ms
4	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
4	Test pulse	internal (0) / external (1) / from AUX4 (2) / from AUX5 (3)	internal
4	Input polarity	P-switching (0) / N-switching (1)	P-switching
5	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
5	Test pulse	internal (0) / external (1) / from AUX5 (3)	internal
4 + 5	Input dual channel mode (inputs 4 + 5)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
4 + 5	Discrepancy time	5 ... 30.000 ms	500 ms
6	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
6	Test pulse	internal (0) / external (1) / from AUX6 (2) / from AUX7 (3)	internal
6	Input polarity	P-switching (0) / N-switching (1)	P-switching
7	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
7	Test pulse	internal (0) / external (1) / from AUX7 (3)	internal
6 + 7	Input dual channel mode (inputs 6 + 7)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
6 + 7	Discrepancy time	5 ... 30.000 ms	500 ms

1) Please regard the notes for parameter settings.

Notes for parameter settings

- The module independently performs a plausibility test for the relevant pair of inputs, if the dual channel mode is parameterised. On this it will be checked if both inputs become active or inactive simultaneously within the discrepancy time.
- The “test pulse” parameter of an input must be disabled (variant V1) or set “external” (variant V2) if a safety relay with OSSD outputs generating own test pulses is connected.The test pulse duration depends on the parameterised input delay:

Input delay [ms]	1	3	10	100
Test pulse duration [ms]	0.5	1	3	10

- Please regard the following when parameterising „external“ test pulses with a UR20-8DI-PN-FSOE-V2 module:
  - An edge transition must occur at least every five minutes at an active input. Otherwise a module error will be signalised.
  - With this setting the module cannot detect any short circuits. The short circuit detection must be realised by the connected OSSD device.

– An antivalent circuit can be parameterised for V2 modules. This means that a valid input signal can be “false”. With two channel parameterisation, both bits in the process data are always the same:
  11 Both inputs are valid and active, with antivalent parameterisation, the first input (IN X) is relevant.
  00 Both inputs are not active or invalid status and error with diagnostic alarm after the discrepancy time has elapsed.

This means for the process data:

Antivalent

IN X	IN Y	Process data	
0	1	00	not active
1	0	11	active
0	0	00	invalid, error after discrepancy time has elapsed
1	1	00	invalid, error after discrepancy time has elapsed

Equivalent

IN X	IN Y	Process data	
0	0	00	not active
1	1	11	active
0	1	00	invalid, error after discrepancy time has elapsed
1	0	00	invalid, error after discrepancy time has elapsed

Diagnostic data UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	0
		1	Internal error	0
		2	Reserved	0
		3	Channel error	0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	0	0
Module Type	1	0	1	0x03
		1	1	
		2	0	
		3	0	
		4	1	1
		5	0	0
		6	0	0
		7	0	0
Error byte 2	2	0 … 7	Failure code (see attachment)	0
Error byte 3	3	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	Communication fault	0
		5	0	0
		6	0	0
		7	0	0
Channel Type	4	0	0	0x7A
		1	1	
		2	0	
		3	1	
		4	1	
		5	1	
		6	1	
		7	0	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
Channel error	8 … 10	0 … 7	Reserved	0

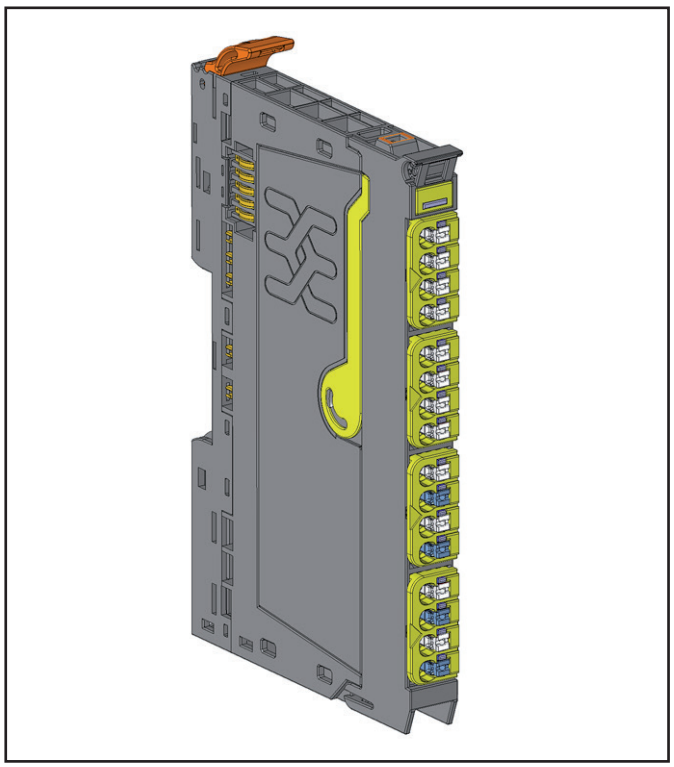
Diagnostic data UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2

Name	Byte	Bit	Description	Default
Channel 0 error	11	0	Input 0, Short circuit	0
		1	Input 0, Cross connection	0
		2	Input 0, Discrepancy error	0
		3	Input 0, Other error	0
		4 ... 7	Reserved	0
Channel 1 error	12	0	Input 1, Short circuit	0
		1	Input 1, Cross connection	0
		2	Input 1, Discrepancy error	0
		3	Input 1, Other error	0
		4 ... 7	Reserved	0
Channel 2 error	13	0	Input 2, Short circuit	0
		1	Input 2, Cross connection	0
		2	Input 2, Discrepancy error	0
		3	Input 2, Other error	0
		4 ... 7	Reserved	0
Channel 3 error	14	0	Input 3, Short circuit	0
		1	Input 3, Cross connection	0
		2	Input 3, Discrepancy error	0
		3	Input 3, Other error	0
		4 ... 7	Reserved	0
Channel 4 error	15	0	Input 4, Short circuit	0
		1	Input 4, Cross connection	0
		2	Input 4, Discrepancy error	0
		3	Input 4, Other error	0
		4 ... 7	Reserved	0
Channel 5 error	16	0	Input 5, Short circuit	0
		1	Input 5, Cross connection	0
		2	Input 5, Discrepancy error	0
		3	Input 5, Other error	0
		4 ... 7	Reserved	0
Channel 6 error	17	0	Input 6, Short circuit	0
		1	Input 6, Cross connection	0
		2	Input 6, Discrepancy error	0
		3	Input 6, Other error	0
		4 ... 7	Reserved	0
Channel 7 error	18	0	Input 7, Short circuit	0
		1	Input 7, Cross connection	0
		2	Input 7, Discrepancy error	0
		3	Input 7, Other error	0
		4 ... 7	Reserved	0
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

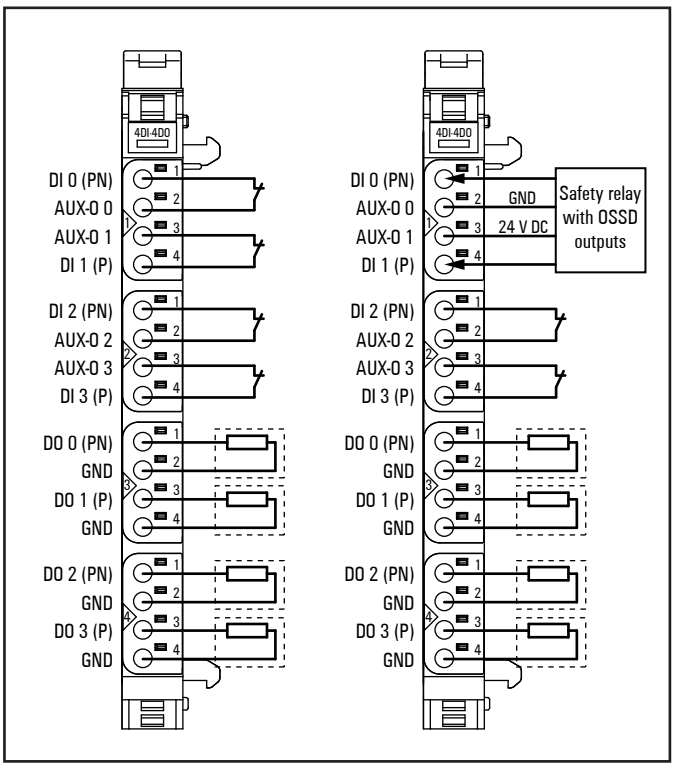
Process data inputs UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2

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

5.5 Digital in- and output module UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2



Digital input and output module UR20-4DI-4DO-PN-FSPS (Order No. 1335060000), UR20-4DI-4DO-PN-FSPS-V2 (Order No. 2464570000)



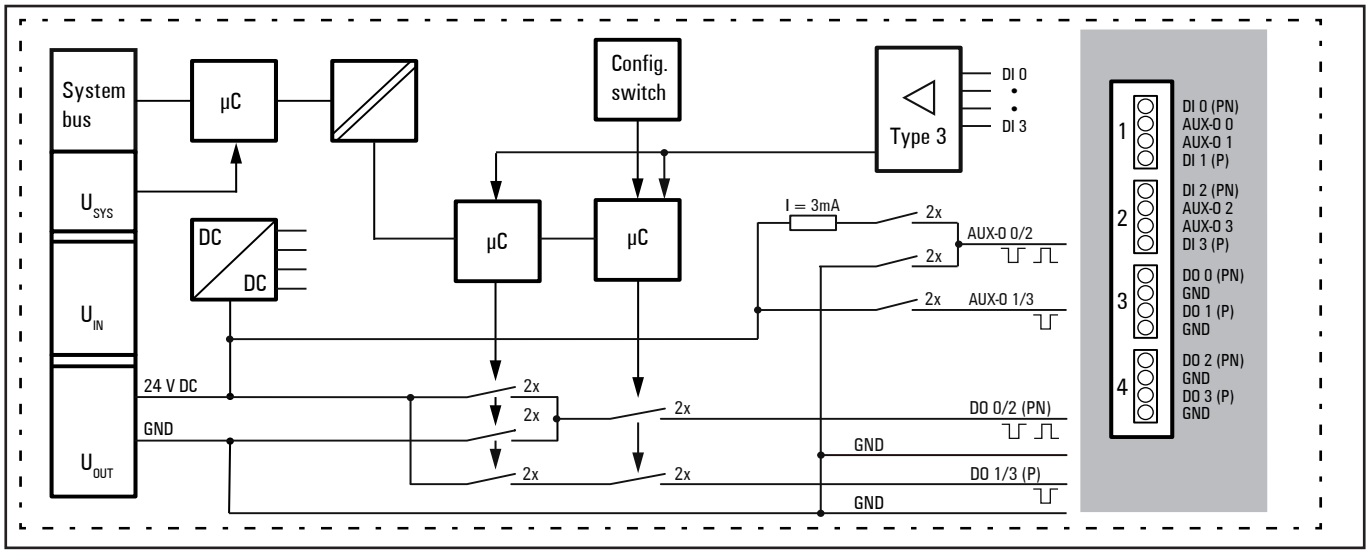
Connection diagram UR20-4DI-4DO-PN-FSPS , UR20-4DI-4DO-PN-FSPS-V2

The UR20-4DI-4DO-PN-FSPS or UR20-4DI-4DO-PN-FSPS-V2 digital input and output module is a safe I/O module for the PROFIsafe protocol. Each module provides four digital inputs and outputs respectively, it can detect up to four binary control signals and control up to four actuators each with a maximum of 0.5 A. Two inputs and outputs respectively can be parameterised P- or N-switching.
Sensors can be connected to connectors 1 and 2 using a 2-wire, 3-wire or 4-wire connection. In the event that the available supply current of 0.8 A per plug will not suffice, the sensor supply must be realised using the auxiliary outputs of another module (e.g. potential distribution module) within the same power segment.
Actuators can be connected to connectors 3 and 4 using a 2-wire connection. A status LED is assigned to each channel. The module electronics supply the inputs as well as the outputs with power from the output current path (I_{OUT}).
A test pulse check of the inputs can be parameterised as a cross-circuit detection between input singal and supply voltage, between different input signals or other signals. An input only remains active without error when the signal of the dedicated auxiliary output is present. Short circuit detection is not possible when using a 3-wire connection.

With the variant 1 module the active output signal always includes test pulses for the purpose of cross-circuit and error detection. The test pulse duration can be parameterised.
A safety sensor that is being connected in a dual channel mode (safety architecture of category 4 acc. to DIN EN ISO 13849) must allocate the PN and the P-input of one connector.
The external circuitry of a PN/P output pair is described in Chapter 3.

	Module status LED Green: Communication on system bus 3 s green/1 s red: Waiting for parameters 1 s green/1 s red: Waiting for acknowledgement by safety control 2 s red/2 s off: Station configuration has changed during operation Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.3	Red: Error sensor supply or input 0 or input 1
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.3	Red: Error sensor supply or input 2 or input 3
2.4	Yellow: Input 3 active
3.1	Yellow: Output 0 active
3.2	Red: Error output 0
3.3	Yellow: Output 1 active
3.4	Red: Error output 1
4.1	Yellow: Output 2 active
4.2	Red: Error output 2
4.3	Yellow: Output 3 active
4.4	Red: Error output 3

LED indicators UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2, error messages see Chapter 8



Block diagram UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2

Technical data UR20-4DI-4DO-PN-FSPS (Order No. 1335060000), UR20-4DI-4DO-PN-FSPS-V2 (Order No. 2464570000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see section 5.2	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)		
Achievable safety level inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	PLd, Categorie 2 PLe, Categorie 4
Achievable safety level outputs		PLe, Categorie 4
Diagnostic Coverage (DC) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	90% 99%
Diagnostic Coverage (DC) outputs		99%
$MTTF_D$ (Mean Time To Failure dangerous) inputs		> 100 Years (840 Years)
$MTTF_D$ (Mean Time To Failure dangerous) outputs		> 100 Years (279 Years)
Safety-related data as per EN 62061 (Regard the entire safety chain!)		
Achievable safety level inputs and outputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SILCL 2 SILCL 3
Achievable safety level outputs		SILCL 3
PFH (Probability of Failure per hour in 1/h) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}94*10^{-9}$
PFH (Probability of Failure per hour in 1/h) outputs		$5{,}56*10^{-9}$
Fault reaction time	Single-channel circuit 1oo1	5 s
Safety-related data as per EN 61508 (Regard the entire safety chain!)		
Achievable safety level inputs and outputs		SIL 3
PFH (Probability of Failure per hour in 1/h) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}17*10^{-10}$
PFH (Probability of Failure per hour in 1/h) outputs		$2{,}17*10^{-10}$
PFD (Probability of Failure per Demand) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	$8{,}77*10^{-4}$ $1{,}85*10^{-5}$
PFD (Probability of Failure per Demand) outputs		$1{,}85*10^{-5}$
HFT (Hardware Failure Tolerance) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	0 1
HFT (Hardware Failure Tolerance) outputs		1
SFF (Safe Failure Fraction) inputs and outputs		98%
Presumed lifecycle time	20 Years	
Prooftest intervall	No prooftest needed within the life cycle.	
Classification acc. to EN 61508-2	Type B	

Technical data UR20-4DI-4DO-PN-FSPS (Order No. 1335060000), UR20-4DI-4DO-PN-FSPS-V2 (Order No. 2464570000)

Inputs		
Number	4, two of which are parameterisable P- or N-switching	
Input Type	Type 1 and 3[1] as per IEC 61131-2 (N-switching based on the standard)	
Input filter	Input delay adjustable from 1 to 100 ms	
Detection time	min. 5 ms active level, min. 3 ms non-active level	
Response time	<10 ms	
Low input voltage	P-switching: < 5 V; N-switching: > -5 V to +24 V	
High input voltage	P-switching: >11 V; N-switching: <-11 V to +24 V	
Sensor supply	Max. 0.8 A per plug, total max. 1.6 A	
Sensor connection	2-wire, 3-wire, 4-wire	
Reverse polarity protection	yes	
Module diagnosis	yes	
Individual channel diagnosis	yes	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Outputs		
Number	4, two of which are parameterisable P- or N-switching	
Type of load	Ohmic, inductive, filament lamp load	
Response time	V1 modules V2 modules (sw[2] 01.00.05 or higher) V2 modules (up to sw[2] 01.00.04)	<10 ms <10 ms < 65 ms
Output current	per channel	0.002 to 0.5 A
	per module	max. 2 A
Breaking energy (induktive)	150 mJ/channel	
Switching frequency	Resistive load (min. 47 Ω)	10 Hz
	Inductive load (DC 13)	0.2 Hz without free-wheeling diode 10 Hz with suitable free-wheeling diode
	Filament lamp load (12 W)	10 Hz
Actuator connection	2-wire	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off approx. 1,1 A (P-switching), approx. 3,5 A (N-switching)	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Safe status	P-switching: < 5 V, < 2 mA N-switching: >-2 mA (referred to +24 V DC)	

2) The module software version is indicated here:
- in the web server within the "general information" of each module
- within the I&M data when using the engineering tool item "check online connection"

Technical data UR20-4DI-4DO-PN-FSPS (Order No. 1335060000), UR20-4DI-4DO-PN-FSPS-V2 (Order No. 2464570000)

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 + output current + current consumption from the auxiliary outputs
General data	
Weight (operational status)	93 g
Additional general data, see Section 5.1.	

Overview of the editable parameters[1] UR20-4DI-4DO-PN-FSPS

Channel	Description	Options	Default
0 ... 1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0 ... 1	Test pulse	disabled (0) / enabled (1)	disabled
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel (1)	single channel
0 + 1	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
2 ... 3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2 ... 3	Test pulse	disabled (0) / enabled (1)	disabled
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel (1)	single channel
2 + 3	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
4 ... 5	Output test pulse duration (output 0 ... 1)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
4	Output polarity	P-switching (0) / N-switching (1)	P-switching
4 + 5	Output dual channel mode (outputs 0 + 1)	single channel (0) / dual channel (1)	single channel
6 ... 7	Output test pulse duration (output 2 ... 3)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
6	Output polarity	P-switching (0) / N-switching (1)	P-switching
6 + 7	Output dual channel mode (outputs 2 + 3)	single channel (0) / dual channel (1)	single channel

1) Please regard the notes for parameter settings.

Overview of the editable parameters[1] UR20-4DI-4DO-PN-FSPS-V2

Channel	Description	Options	Default
0	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
1	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
0 + 1	Discrepancy time	5 ... 30.000 ms	500 ms

1) Please regard the notes for parameter settings.

Overview of the editable parameters[1] UR20-4DI-4DO-PN-FSPS-V2

Channel	Description	Options	Default
2	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2	Test pulse	internal (0) / external[1] (1) / from AUX2 (2) / from AUX3 (3)	internal
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
3	Test pulse	internal (0) / external[1] (1) / from AUX3 (3)	internal
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
2 + 3	Discrepancy time	5 ... 30.000 ms	500 ms
4 ... 5	Test pulse	enabled (0) / disabled[1] (1)	enabled
4 ... 5	Output test pulse duration (output 0 ... 1)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
4	Output polarity	P-switching (0) / N-switching (1)	P-switching
4 + 5	Output dual channel mode (outputs 0 + 1)	single channel (0) / dual channel (1)	single channel
6 ... 7	Test pulse	enabled (0) / disabled[1] (1)	enabled
6 ... 7	Output test pulse duration (output 2 ... 3)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
6	Output polarity	P-switching (0) / N-switching (1)	P-switching
6 + 7	Output dual channel mode (outputs 2 + 3)	single channel (0) / dual channel (1)	single channel

1) Please regard the notes for parameter settings.

Notes for parameter settings

- The module independently performs a plausibility test for the relevant pair of inputs or outputs, if the dual channel mode is parameterised. On this it will be checked if both inputs or outputs become active or inactive simultaneously within the discrepancy time.
- The "test pulse" parameter of an input must be disabled (V1 variant) or set "external" (V2 variant) if a safety relay with OSSD outputs generating own test pulses is connected. The test pulse duration depends on the parameterised input delay:

Input delay [ms]	1	3	10	100
Test pulse duration [ms]	0.5	1	3	10

- Please regard the following when parameterising „external" test pulses with a UR20-4DI-4DO-PN-FSPS-V2 module:
  - An edge transition must occur at least every five minutes at an active input. Otherwise a module error will be signalised.
  - With this setting the module cannot detect any short circuits. The short circuit detection must be realised by the connected OSSD device.

ATTENTION

Please regard the following to ensure that the safety function will not be influenced.

- In the event that the output test pulses of a UR20-4DI-4DO-PN-FSOE-V2 module are disabled output errors will only be detected under the following conditions:
  - No filament lamp load must be connected.
  - The capacitive load at this output may be 250 µF at maximum.

– An antivalent circuit can be parameterised for V2 modules. This means that a valid input signal can be “false”. With two channel parameterisation, both bits in the process data are always the same:
  11 Both inputs are valid and active, with antivalent parameterisation, the first input (IN X) is relevant.
  00 Both inputs are not active or invalid status and error with diagnostic alarm after the discrepancy time has elapsed.

This means for the process data:

Antivalent

IN X	IN Y	Process data	
0	1	00	not active
1	0	11	active
0	0	00	invalid, error after discrepancy time has elapsed
1	1	00	invalid, error after discrepancy time has elapsed

Equivalent

IN X	IN Y	Process data	
0	0	00	not active
1	1	11	active
0	1	00	invalid, error after discrepancy time has elapsed
1	0	00	invalid, error after discrepancy time has elapsed

Diagnostic data UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	0
		1	Internal error	0
		2	Reserved	0
		3	Channel error	0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	0	0
Module Type	1	0	1	0x03
		1	1	
		2	0	
		3	0	
		4	1	1
		5	0	0
		6	0	0
		7	0	0
Error byte 2	2	0 ... 7	Failure code (see attachment)	0
Error byte 3	3	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	Communication fault	0
		5	0	0
		6	0	0
		7	0	0
Channel Type	4	0	1	0x77
		1	1	
		2	1	
		3	0	
		4	1	
		5	1	
		6	1	
		7	0	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
Channel error	8 ... 10	0 ... 7	Reserved	0

Diagnostic data UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2

Name	Byte	Bit	Description	Default
Channel 0 error	11	0	Input 0, Short circuit	0
		1	Input 0, Cross connection	0
		2	Input 0, Discrepancy error	0
		3	Input 0, Other error	0
		4 ... 7	Reserved	0
Channel 1 error	12	0	Input 1, Short circuit	0
		1	Input 1, Cross connection	0
		2	Input 1, Discrepancy error	0
		3	Input 1, Other error	0
		4 ... 7	Reserved	0
Channel 2 error	13	0	Input 2, Short circuit	0
		1	Input 2, Cross connection	0
		2	Input 2, Discrepancy error	0
		3	Input 2, Other Error	0
		4 ... 7	Reserved	0
Channel 3 error	14	0	Input 3, Short circuit	0
		1	Input 3, Cross connection	0
		2	Input 3, Discrepancy error	0
		3	Input 3, Other Error	0
		4 ... 7	Reserved	0
Channel 4 error	15	0	Output 0, Short circuit	0
		1	Output 0, Cross connection	0
		2	Output 0, Readback error	0
		3	Output 0, Other Error	0
		4 ... 7	Reserved	0
Channel 5 error	16	0	Output 1, Short circuit	0
		1	Output 1, Cross connection	0
		2	Output 1, Readback error	0
		3	Output 1, Other error	0
		4 ... 7	Reserved	0
Channel 6 error	17	0	Output 2, Short circuit	0
		1	Output 2, Cross connection	0
		2	Output 2, Readback error	0
		3	Output 2, Other error	0
		4 ... 7	Reserved	0
Channel 7 error	18	0	Output 3, Short circuit	0
		1	Output 3, Cross connection	0
		2	Output 3, Readback error	0
		3	Output 3, Other error	0
		4 ... 7	Reserved	0
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

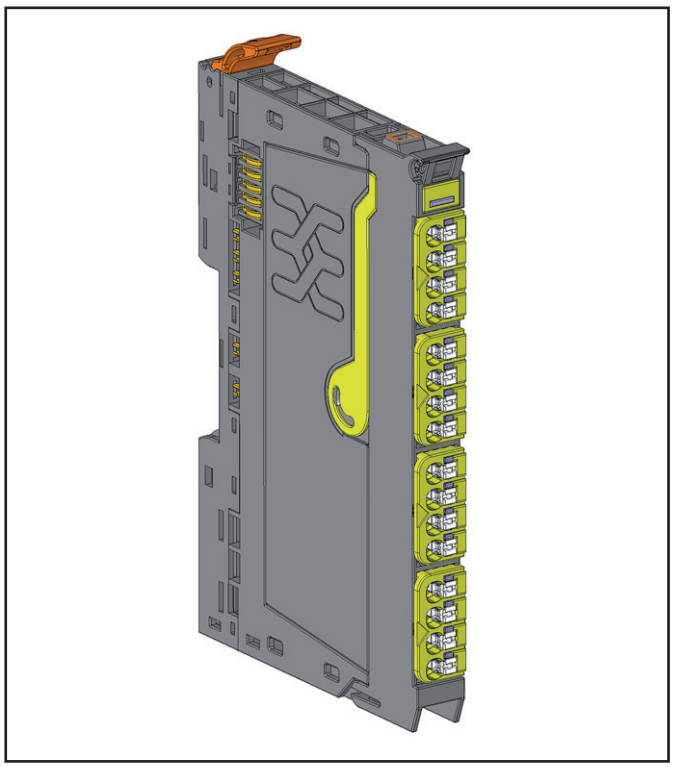
Process data inputs UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2

Byte	Bit	Description
IB0	IX0.0	DI0
	IX0.1	DI1
	IX0.2	DI2
	IX0.3	DI3
	IX0.4	Status DO0 (UR20-4DI-4DO-PN-FSPS-V2 only)
	IX0.5	Status DO1 (UR20-4DI-4DO-PN-FSPS-V2 only)
	IX0.6	Status DO2 (UR20-4DI-4DO-PN-FSPS-V2 only)
	IX0.7	Status DO3 (UR20-4DI-4DO-PN-FSPS-V2 only)

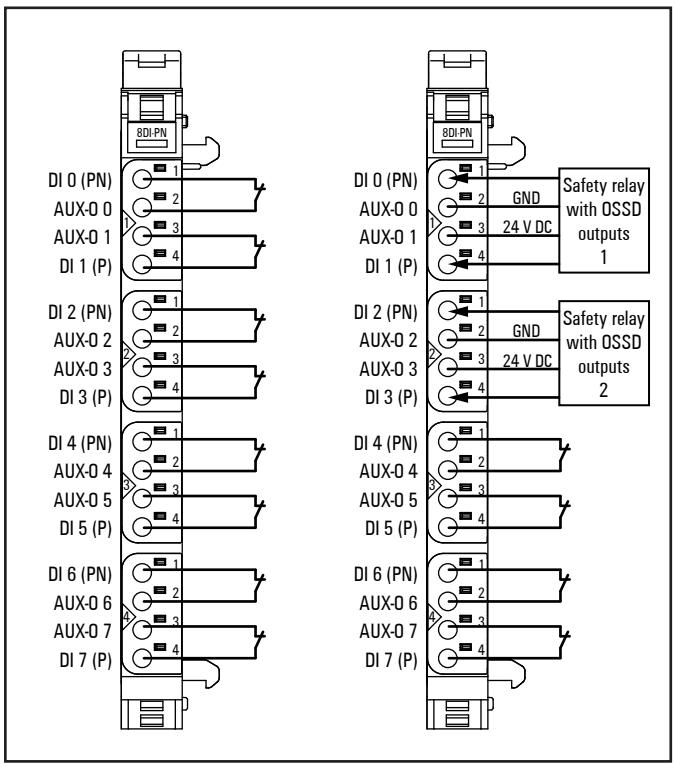
Process data outputs UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2

Byte	Bit	Description
QB0	QX0.0	DO0
	QX0.1	DO1
	QX0.2	DO2
	QX0.3	DO3

5.6 Digital input module UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2



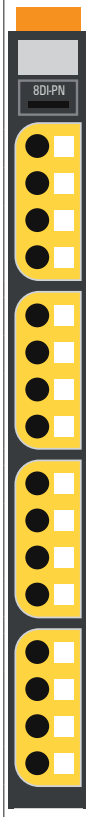
Digital input module UR20-8DI-PN-FSPS ((Order No. 1335070000), UR20-8DI-PN-FSPS-V2 (Order No. 2464590000)



Connection diagram UR20-8DI-PN-FSPS , UR20-8DI-PN-FSPS-V2

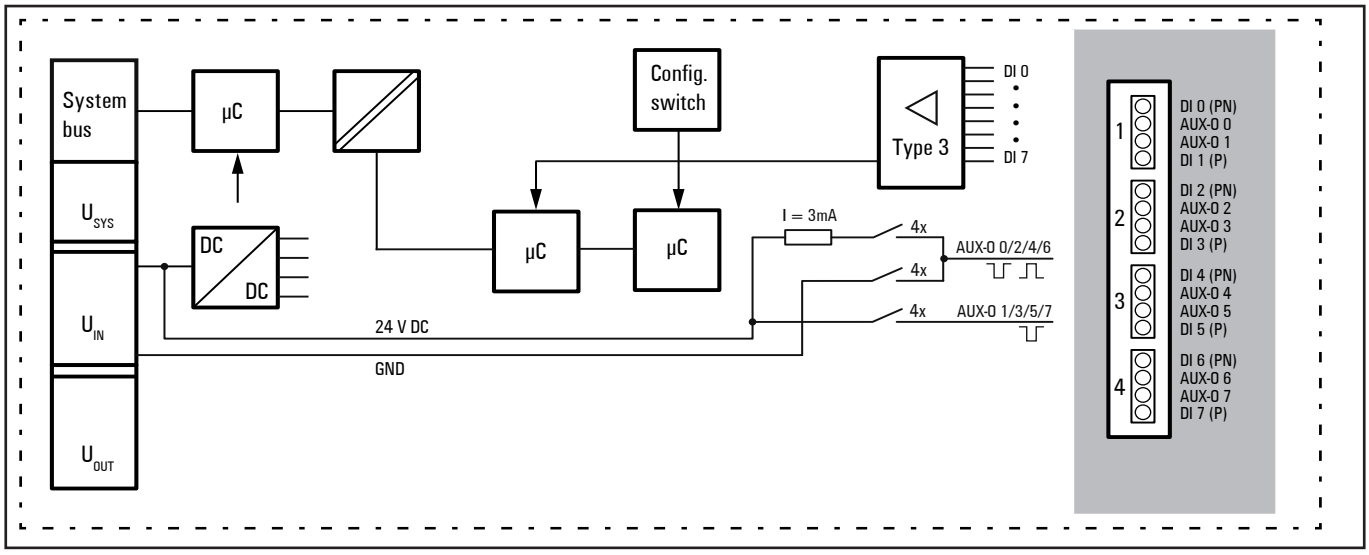
The UR20-8DI-PN-FSPS or UR20-8DI-PN-FSPS-V2 digital input module is a safe I/O module for the PROFIsafe protocol. The module can detect up to 8 binary control signals. Two sensors can be connected to each connector using a 2-wire, 3-wire or 4-wire connection. In the event that the available supply current of 0.8 A per plug will not suffice, the sensor supply must be realised using the auxiliary outputs of another module (e.g. potential distribution module) within the same power segment.
A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN})
A test pulse check of the inputs can be parameterised as a cross-circuit detection between input singal and supply voltage, between different input signals or other signals. An input only remains active without error when the signal of the dedicated auxiliary output is present. Short circuit detection is not possible when using a 3-wire connection.

A safety sensor that is being connected in a dual channel mode (safety architecture of category 4 acc. to DIN EN ISO 13849) must allocate the PN and the P-input of one connector.



	Module status LED Green: Communication on system bus 3 s green/1 s red: Waiting for parameters 1 s green/1 s red: Waiting for acknowledgement by safety control 2 s red/2 s off: Station configuration has changed during operation Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.3	Red: Error sensor supply or input 0 or input 1
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.3	Red: Error sensor supply or input 2 or input 3
2.4	Yellow: Input 3 active
3.1	Yellow: Input 4 active
3.3	Red: Error sensor supply or input 4 or input 5
3.4	Yellow: Input 5 active
4.1	Yellow: Input 6 active
4.3	Red: Error sensor supply or input 6 or input 7
4.4	Yellow: Input 7 active

LED indicators UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2, error messages see Chapter 8



Block diagram UR20-8DI-PN-FSPS , UR20-8DI-PN-FSPS-V2

Technical data UR20-8DI-PN-FSPS (Order No. 1335070000), UR20-8DI-PN-FSPS-V2 (Order No. 2464590000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see section 5.2	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	PLd, Categorie 2 PLe, Categorie 4
Diagnostic Coverage (DC)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	90% 99%
$MTTF_D$ (Mean Time To Failure dangerous)		> 100 Years (840 Years)
Safety-related data as per EN 62061 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SILCL 2 SILCL 3
PFH (Probability of Failure per hour in 1/h)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}94*10^{-9}$
Fault reaction time	Single-channel circuit 1oo1	10 s
Safety-related data as per EN 61508 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SIL 2 SIL 3
PFH (Probability of Failure per hour in 1/h)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}17*10^{-10}$
PFD (Probability of Failure per Demand)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	$8{,}77*10^{-4}$ $1{,}85*10^{-5}$
HFT (Hardware Failure Tolerance)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	0 1
SFF (Safe Failure Fraction)	98%	
Presumed lifecycle time	20 Years	
Prooftest intervall	No prooftest needed within the life cycle.	
Classification acc. to EN 61508-2	Type B	
Inputs		
Number	8, four of which are parameterisable P- or N-switching	
Input Type	Type 1 and 3[1)] as per IEC 61131-2 (N-switching based on the standard)	
Input filter	Input delay adjustable from 1 to 100 ms	
Detection time	min. 5 ms active level, min. 3 ms non-active level	
Response time	< 10 ms	
Low input voltage	P-switching: <5 V; N-switching: >-5 V to +24 V	
High input voltage	P-switching: >11 V; N-switching: <-11 V to +24 V	
Sensor supply	Max. 0.8 A per plug, total max. 3.2 A	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Technical data UR20-8DI-PN-FSPS (Order No. 1335070000), UR20-8DI-PN-FSPS-V2 (Order No. 2464590000)

Sensor connection	2-wire, 3-wire, 4-wire
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 + current consumption from the auxiliary outputs
General data	
Weight (operational status)	93 g
Additional general data, see Section 5.1.	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Overview of the editable parameters[1] UR20-8DI-PN-FSPS

Channel	Description	Options	Default
0 ... 1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0 ... 1	Test pulse	disabled (0) / enabled (1)	disabled
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel (1)	single channel
0 + 1	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
2 ... 3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2 ... 3	Test pulse	disabled (0) / enabled (1)	disabled
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel (1)	single channel
2 + 3	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
4 ... 5	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
4 ... 5	Test pulse	disabled (0) / enabled (1)	disabled
4	Input polarity	P-switching (0) / N-switching (1)	P-switching
4 + 5	Input dual channel mode (inputs 4 + 5)	single channel (0) / dual channel (1)	single channel
4 + 5	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms
6 ... 7	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
6 ... 7	Test pulse	disabled (0) / enabled (1)	disabled
6	Input polarity	P-switching (0) / N-switching (1)	P-switching
6 + 7	Input dual channel mode (inputs 6 + 7)	single channel (0) / dual channel (1)	single channel
6 + 7	Discrepancy time	5 ms (0) / 50 ms (1) / 2 s (2) / 30 s (3)	5 ms

1) Please regard the notes for parameter settings.

Overview of the editable parameters[1] UR20-8DI-PN-FSPS-V2

Channel	Description	Options	Default
0	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
1	Test pulse	internal (0) / external (1) / from AUX1 (3)	internal
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
0 + 1	Discrepancy time	5 ... 30.000 ms	500 ms
2	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2	Test pulse	internal (0) / external (1) / from AUX2 (2) / from AUX3 (3)	internal
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
3	Test pulse	internal (0) / external (1) / from AUX3 (3)	internal
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
2 + 3	Discrepancy time	5 ... 30.000 ms	500 ms
4	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
4	Test pulse	internal (0) / external (1) / from AUX4 (2) / from AUX5 (3)	internal
4	Input polarity	P-switching (0) / N-switching (1)	P-switching
5	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
5	Test pulse	internal (0) / external (1) / from AUX5 (3)	internal
4 + 5	Input dual channel mode (inputs 4 + 5)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
4 + 5	Discrepancy time	5 ... 30.000 ms	500 ms
6	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
6	Test pulse	internal (0) / external (1) / from AUX6 (2) / from AUX7 (3)	internal
6	Input polarity	P-switching (0) / N-switching (1)	P-switching
7	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
7	Test pulse	internal (0) / external (1) / from AUX7 (3)	internal
6 + 7	Input dual channel mode (inputs 6 + 7)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
6 + 7	Discrepancy time	5 ... 30.000 ms	500 ms

1) Please regard the notes for parameter settings.

Notes for parameter settings

- The module independently performs a plausibility test for the relevant pair of inputs, if the dual channel mode is parameterised. On this it will be checked if both inputs become active or inactive simultaneously within the discrepancy time.
- The “test pulse” parameter of an input must be disabled (V1 variant) or set “external” (V2 variant) if a safety relay with OSSD outputs generating own test pulses is connected. The test pulse duration depends on the parameterised input delay:

Input delay [ms]	1	3	10	100
Test pulse duration [ms]	0.5	1	3	10

- Please regard the following when parameterising “external“ test pulses with a UR20-8DI-PN-FSPS-V2 module:
  - An edge transition must occur at least every five minutes at an active input. Otherwise a module error will be signalised.
  - With this setting the module cannot detect any short circuits. The short circuit detection must be realised by the connected OSSD device.

– An antivalent circuit can be parameterised for V2 modules. This means that a valid input signal can be "false". With two channel parameterisation, both bits in the process data are always the same:
  11 Both inputs are valid and active, with antivalent parameterisation, the first input (IN X) is relevant.
  00 Both inputs are not active or invalid status and error with diagnostic alarm after the discrepancy time has elapsed.

This means for the process data:

Antivalent

IN X	IN Y	Process data	
0	1	00	not active
1	0	11	active
0	0	00	invalid, error after discrepancy time has elapsed
1	1	00	invalid, error after discrepancy time has elapsed

Equivalent

IN X	IN Y	Process data	
0	0	00	not active
1	1	11	active
0	1	00	invalid, error after discrepancy time has elapsed
1	0	00	invalid, error after discrepancy time has elapsed

Diagnostic data UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	0
		1	Internal error	0
		2	Reserved	0
		3	Channel error	0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	0	0
Module Type	1	0	1	0x03
		1	1	
		2	0	
		3	0	
		4	1	1
		5	0	0
		6	0	0
		7	0	0
Error byte 2	2	0 ... 7	Failure code (see attachment)	0
Error byte 3	3	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	Communication fault	0
		5	0	0
		6	0	0
		7	0	0
Channel Type	4	0	0	0x7A
		1	1	
		2	0	
		3	1	
		4	1	
		5	1	
		6	1	
		7	0	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
Channel error	8 ... 10	0 ... 7	Reserved	0

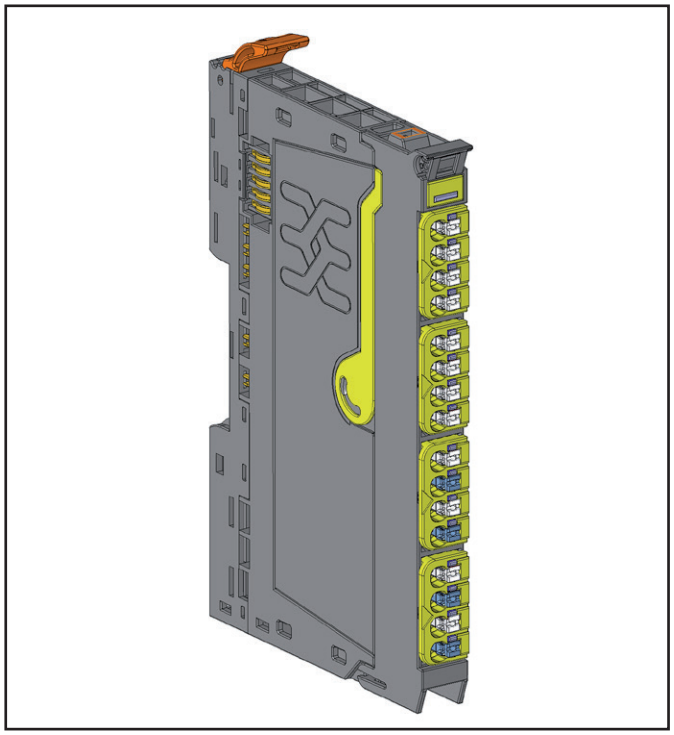
Diagnostic data UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2

Name	Byte	Bit	Description	Default
Channel 0 error	11	0	Input 0, Short circuit	0
		1	Input 0, Cross connection	0
		2	Input 0, Discrepancy error	0
		3	Input 0, Other error	0
		4 ... 7	Reserved	0
Channel 1 error	12	0	Input 1, Short circuit	0
		1	Input 1, Cross connection	0
		2	Input 1, Discrepancy error	0
		3	Input 1, Other error	0
		4 ... 7	Reserved	0
Channel 2 error	13	0	Input 2, Short circuit	0
		1	Input 2, Cross connection	0
		2	Input 2, Discrepancy error	0
		3	Input 2, Other error	0
		4 ... 7	Reserved	0
Channel 3 error	14	0	Input 3, Short circuit	0
		1	Input 3, Cross connection	0
		2	Input 3, Discrepancy error	0
		3	Input 3, Other error	0
		4 ... 7	Reserved	0
Channel 4 error	15	0	Input 4, Short circuit	0
		1	Input 4, Cross connection	0
		2	Input 4, Discrepancy error	0
		3	Input 4, Other error	0
		4 ... 7	Reserved	0
Channel 5 error	16	0	Input 5, Short circuit	0
		1	Input 5, Cross connection	0
		2	Input 5, Discrepancy error	0
		3	Input 5, Other error	0
		4 ... 7	Reserved	0
Channel 6 error	17	0	Input 6, Short circuit	0
		1	Input 6, Cross connection	0
		2	Input 6, Discrepancy error	0
		3	Input 6, Other error	0
		4 ... 7	Reserved	0
Channel 7 error	18	0	Input 7, Short circuit	0
		1	Input 7, Cross connection	0
		2	Input 7, Discrepancy error	0
		3	Input 7, Other error	0
		4 ... 7	Reserved	0
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

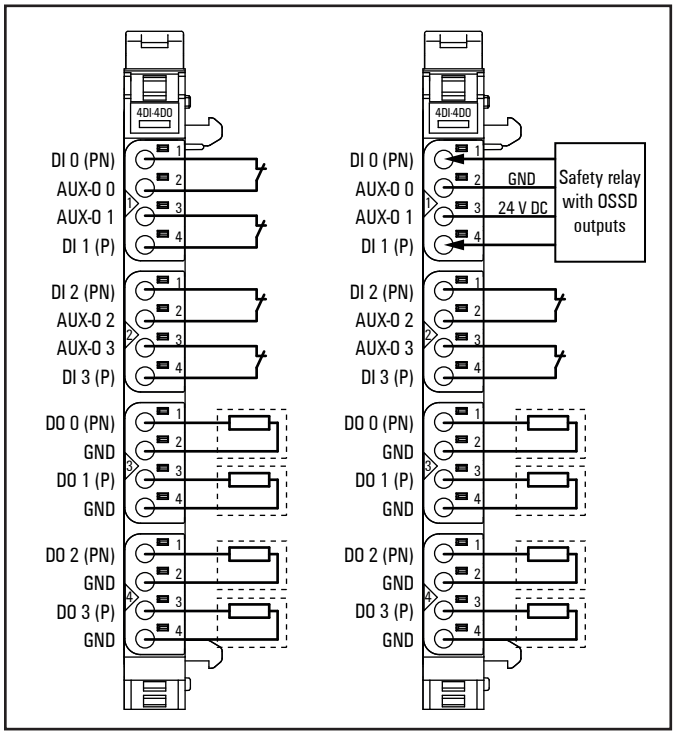
Process data inputs UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2

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

5.7 Digital in- and output module UR20-4DI-4DO-PN-FSCC



Digital input and output module UR20-4DI-4DO-PN-FSCC (Order No. 2742570000)



Connection diagram UR20-4DI-4DO-PN-FSCC

The UR20-4DI-4DO-PN-FSCC digital input and output module is a safe I/O module for the CC-Link IE Safety protocol. Each module provides four digital inputs and outputs respectively, it can detect up to four binary control signals and control up to four actuators each with a maximum of 0.5 A. Two inputs and outputs respectively can be parameterised P- or N-switching.
Sensors can be connected to connectors 1 and 2 using a 2-wire, 3-wire or 4-wire connection. In the event that the available supply current of 0.8 A per plug will not suffice, the sensor supply must be realised using the auxiliary outputs of another module (e.g. potential distribution module) within the same power segment.
Actuators can be connected to connectors 3 and 4 using a 2-wire connection. A status LED is assigned to each channel. The module electronics supply the inputs as well as the outputs with power from the output current path (I_{OUT}).
A test pulse check of the inputs can be parameterised as a cross-circuit detection between input singal and supply voltage, between different input signals or other signals. An input only remains active without error when the signal of the dedicated auxiliary output is present. Short circuit detection is not possible when using a 3-wire connection.

If a safety sensor is being connected in a dual channel mode (safety architecture of category 4 acc. to EN ISO 13849), the sensor must allocate the PN and the P-input of one connector.
The external circuitry of a PN/P output pair is described in Chapter 3.

Dangerous situation due to automatic restart

CC-Link IE safety controllers do not require a start-up acknowledgement after switching the (safety)-CPU from STOP to RUN mode. The safety function is always active regardless of the operation state and only the outputs are set to zero in STOP state.
The operator of the system must analyse whether an automatic restart can cause a hazardous situation and how this can be avoided. Please refer to the relevant documentation for the specific behaviour of the respective control unit.

When switching on the system, the UR20-FSCC-modules expect a one-time start-up acknowledgement before the modules enables their inputs and outputs. This is no longer the case when the PLC operating status changes.

Maximum number of modules per station

For the structure of the CC-Link IE Safety Frame, the module occupies 60 bytes of input and output process data each. As each coupler can process a maximum of 1024 bytes input

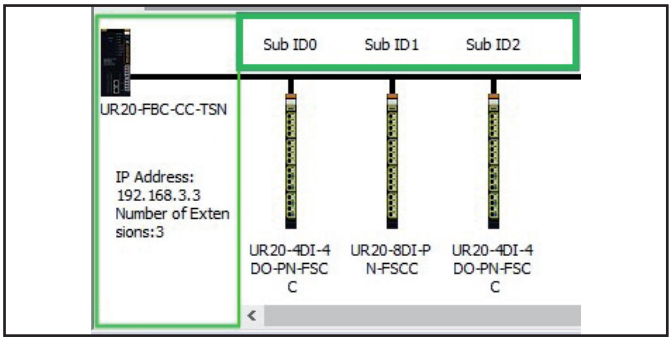
data and 1024 bytes output data, a maximum of 17 CC-Link IE safety modules can be operated on one coupler.

Adapt Communication Period Interval to data volume

If the UR20 station has to transfer more than 1024 byte process data in the CC-Link IE TSN network, the Communication Period Interval must be parametrised to ≥ 1 ms, otherwise the system performance will be degraded. The sum of the process data is: RX + RY + RWr + RWw + (120 Byte * number of CC-Link IE Safety modules).

Ascending order of Sub-CID

GX Works **Extension Module Configuration** automatically assigns a Sub-ID to each safety module in ascending order. This must match the DIP switch setting of the safety modules and be mapped in the same way in the **Safety Communication Setting** in GX Works. Otherwise, the CC-Link IE safety communication cannot be established successfully.



Transmission Interval Monitoring Time Formula & Limits

The minimum u-remote CC-Link IE Safety processing time is defined as:

TM-Min (ETH-Speed) = 2 x Safety station remote refresh processing time

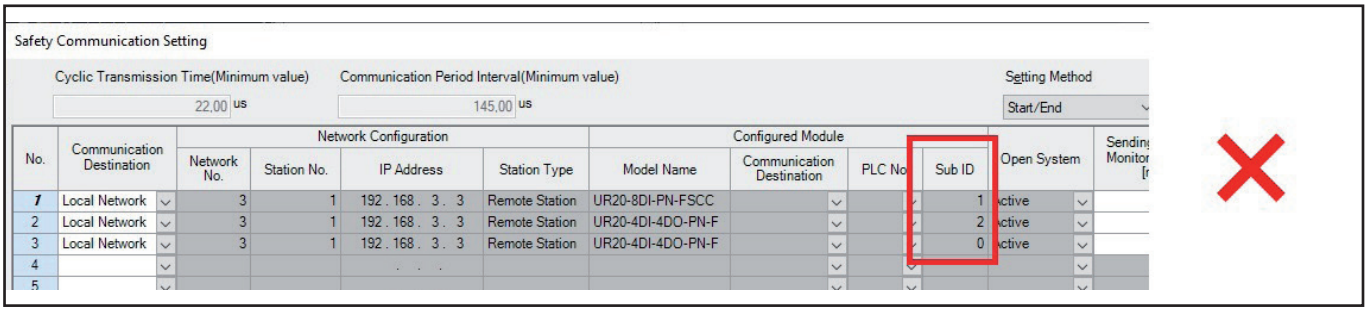
The safety station remote refresh processing time is the sum of Remote Station I/O performance (10 ms) + CC TSN cycle time + u-remote system processing time (3 ms).

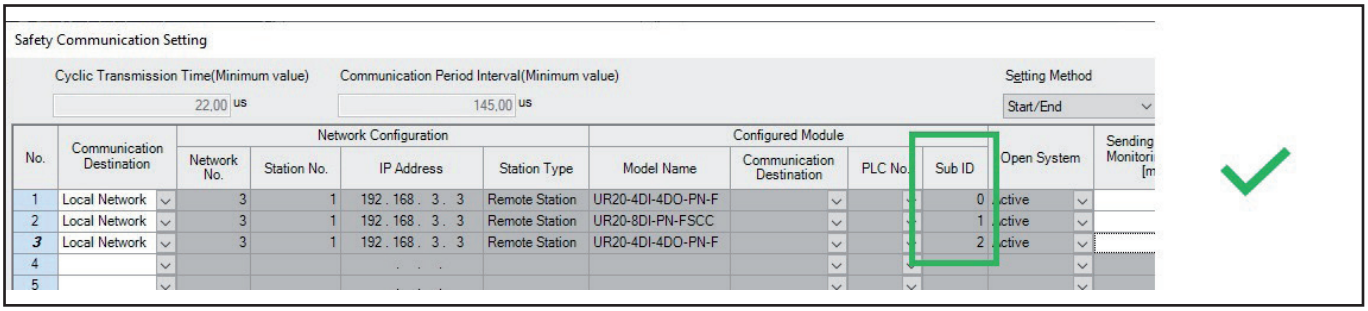
The minimum Transmission Interval Monitoring Time (TM-Min) for a single u-remote-Station is therefore:

- TM-Min (1 Gb/s) = 2 x (10 ms + 0,5 ms + 3 ms) = 27 ms
- TM-Min (100 Mb/s) = 2 x (10 ms + 4 ms + 3 ms) = 34 ms

The respective Transmission Interval Monitoring Time range is therefore:

- 27 ... 1000 ms for 1 Gb/s
- 34 ... 1000 ms for 100 Mb/s





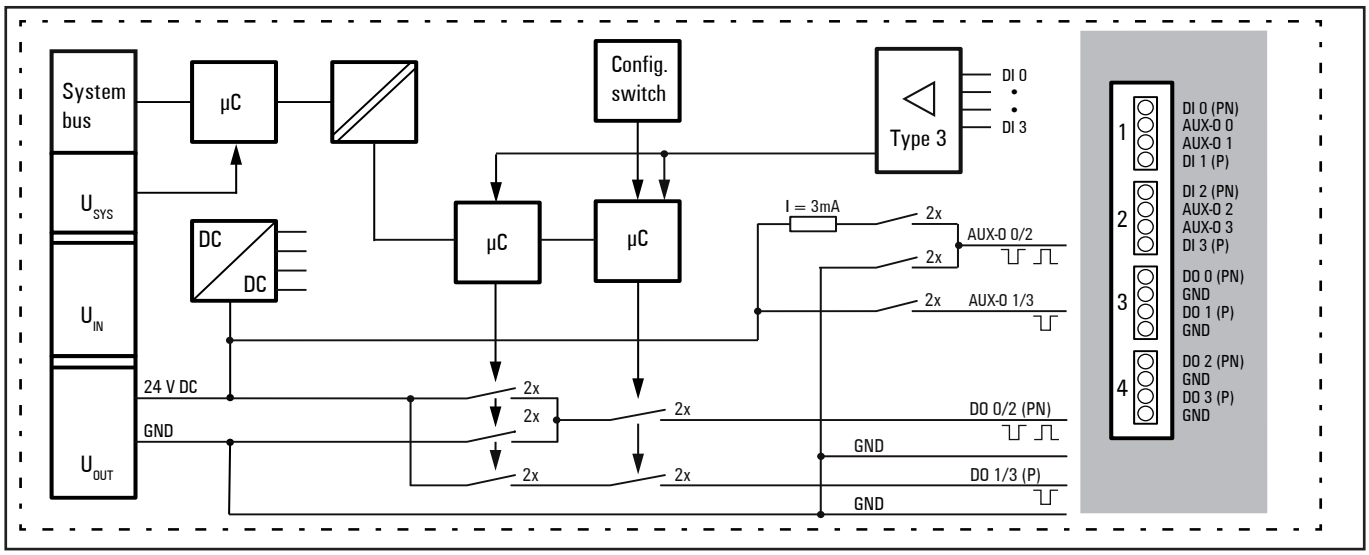
Manual diagnostic acknowledgement with enabled diagnostics

If at least one alarm (diagnostic alarm, process alarm) is activated in the fieldbus coupler parameters, the pending diagnostics and alarms must be processed cyclically in accordance with the alarm message protocol. The retrieval (acknowledgement) must be programmed individually with PLC programme code.
Without a manual diagnostic acknowledgement, commissioning including start-up of the safety modules cannot take place.

Acknowledging a diagnosis via SLMP is described in the u-remote manual (Document No. 1432790000), see Chapter CC-Link-IE-TSN-Fieldbus coupler, section UR20-FBC-CC-TSN Alarm message protocol.
You can find the document in the Weidmüller Support Center.

	Module status LED Green: Communication on system bus 3 s green/1 s red: Waiting for parameters 1 s green/1 s red: Waiting for acknowledgement by safety control 2 s red/2 s off: Station configuration has changed during operation Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.3	Red: Error sensor supply or input 0 or input 1
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.3	Red: Error sensor supply or input 2 or input 3
2.4	Yellow: Input 3 active
3.1	Yellow: Output 0 active
3.2	Red: Error output 0
3.3	Yellow: Output 1 active
3.4	Red: Error output 1
4.1	Yellow: Output 2 active
4.2	Red: Error output 2
4.3	Yellow: Output 3 active
4.4	Red: Error output 3

LED indicators UR20-4DI-4DO-PN-FSCC, error messages see Chapter 8



Block diagram UR20-4DI-4DO-PN-FSCC

Technical data UR20-4DI-4DO-PN-FSCC (Order No. 2742570000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see section 5.2	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)		
Achievable safety level inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	PLd, Categorie 2 PLe, Categorie 4
Achievable safety level outputs		PLe, Categorie 4
Diagnostic Coverage (DC) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	90% 99%
Diagnostic Coverage (DC) outputs		99%
$MTTF_D$ (Mean Time To Failure dangerous) inputs		> 100 Years (840 Years)
$MTTF_D$ (Mean Time To Failure dangerous) outputs		> 100 Years (279 Years)
Safety-related data as per EN 62061 (Regard the entire safety chain!)		
Achievable safety level inputs and outputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SILCL 2 SILCL 3
Achievable safety level outputs		SILCL 3
PFH (Probability of Failure per hour in 1/h) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}94*10^{-9}$
PFH (Probability of Failure per hour in 1/h) outputs		$5{,}56*10^{-9}$
Fault reaction time	Single-channel circuit 1oo1	5 s
Safety-related data as per EN 61508 (Regard the entire safety chain!)		
Achievable safety level inputs and outputs		SIL 3
PFH (Probability of Failure per hour in 1/h) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}17*10^{-10}$
PFH (Probability of Failure per hour in 1/h) outputs		$2{,}17*10^{-10}$
PFD (Probability of Failure per Demand) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	$8{,}77*10^{-4}$ $1{,}85*10^{-5}$
PFD (Probability of Failure per Demand) outputs		$1{,}85*10^{-5}$
HFT (Hardware Failure Tolerance) inputs	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	0 1
HFT (Hardware Failure Tolerance) outputs		1
SFF (Safe Failure Fraction) inputs and outputs		98%
Presumed lifecycle time	20 Years	
Prooftest intervall	No prooftest needed within the life cycle.	
Classification acc. to EN 61508-2	Type B	
Inputs		
Number	4, two of which are parameterisable P- or N-switching	
Input Type	Type 1 and 3[1)] as per IEC 61131-2 (N-switching based on the standard)	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

2) The mentioned switching frequencies only refer to the processing time of the output data in the safety module with a minimum of 50 ms on and off time. This does not include additional times for processing and transmitting the output data via the CC-Link IE Safety PLC over the CC-Link IE TSN network.

Technical data UR20-4DI-4DO-PN-FSCC (Order No. 2742570000)

Input filter	Input delay adjustable from 1 to 100 ms	
Detection time	min. 5 ms active level, min. 3 ms non-active level	
Response time	<10 ms	
Low input voltage	P-switching: < 5 V; N-switching: > -5 V to +24 V	
High input voltage	P-switching: >11 V; N-switching: <-11 V to +24 V	
Sensor supply	Max. 0.8 A per plug, total max. 1.6 A	
Sensor connection	2-wire, 3-wire, 4-wire	
Reverse polarity protection	yes	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Outputs		
Number	4, two of which are parameterisable P- or N-switching	
Type of load	Ohmic, inductive, filament lamp load	
Response time	<10 ms	
Output current	per channel	0.002 to 0.5 A
	per module	max. 2 A
Breaking energy (induktive)	150 mJ/channel	
Switching frequency[2)]	Resistive load (min. 47 Ω)	max. 10 Hz
	Inductive load (DC 13)	max. 0,2 Hz ohne Freilaufdiode max. 10 Hz mit geeigneter Freilaufdiode
	Filament lamp load (12 W)	max. 10 Hz
Actuator connection	2-wire	
Short-circuit-proof	yes	
Protective circuit	Constant current with thermal switch-off approx. 1,1 A (P-switching), approx. 3,5 A (N-switching)	
Response time of the current limiting circuit	<100 µs	
Module diagnosis	yes	
Individual channel diagnosis	yes	
Safe status	P-switching: < 5 V, < 2 mA N-switching: >-2 mA (referred to +24 V DC)	
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 + output current + current consumption from the auxiliary outputs	
General data		
Weight (operational status)	93 g	
Additional general data, see Section 5.1.		

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

2) The mentioned switching frequencies only refer to the processing time of the output data in the safety module with a minimum of 50 ms on and off time. This does not include additional times for processing and transmitting the output data via the CC-Link IE Safety PLC over the CC-Link IE TSN network.

Overview of the editable parameters[1] UR20-4DI-4DO-PN-FSCC

Channel	Description	Options	Default
0	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
1	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
0 + 1	Discrepancy time	5 ... 30.000 ms	500 ms
2	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2	Test pulse	internal (0) / external[1] (1) / from AUX2 (2) / from AUX3 (3)	internal
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
3	Test pulse	internal (0) / external[1] (1) / from AUX3 (3)	internal
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
2 + 3	Discrepancy time	5 ... 30.000 ms	500 ms
4 ... 5	Test pulse	enabled (0) / disabled[1] (1)	enabled
4 ... 5	Output test pulse duration (output 0 ... 1)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
4	Output polarity	P-switching (0) / N-switching (1)	P-switching
4 + 5	Output dual channel mode (outputs 0 + 1)	single channel (0) / dual channel (1)	single channel
6 ... 7	Test pulse	enabled (0) / disabled[1] (1)	enabled
6 ... 7	Output test pulse duration (output 2 ... 3)	0.5 ms (0) / 1 ms (1) / 3 ms (2) / 10 ms (3)	0.5 ms
6	Output polarity	P-switching (0) / N-switching (1)	P-switching
6 + 7	Output dual channel mode (outputs 2 + 3)	single channel (0) / dual channel (1)	single channel

1) Please regard the notes for parameter settings.

Notes for parameter settings

- The module independently performs a plausibility test for the relevant pair of inputs or outputs, if the dual channel mode is parameterised. On this it will be checked if both inputs or outputs become active or inactive simultaneously within the discrepancy time.
- The "test pulse" parameter of an input must be set "external" if a safety relay with OSSD outputs generating own test pulses is connected. The test pulse duration depends on the parameterised input delay:

Input delay [ms]	1	3	10	100
Test pulse duration [ms]	0.5	1	3	10

- Regard the following when parameterising „external" test pulses with an input of UR20-4DI-4DO-PN-FSCC module:
  - An edge transition must occur at least every five minutes at an active input. Otherwise a module error will be signalised.
  - With this setting the module cannot detect any short circuits. The short circuit detection must be realised by the connected OSSD device.

ATTENTION

Please regard the following to ensure that the safety function will not be influenced.

- In the event that the output test pulses of a UR20-4DI-4DO-PN-FSCC module are disabled, output errors will only be detected under the following conditions:
  - No filament lamp load must be connected.
  - The capacitive load at this output may be 250 µF at maximum.

– An antivalent circuit can be parameterised for the module. This means that a valid input signal can be “false”. With two channel parameterisation, both bits in the process data are always the same:
  11 Both inputs are valid and active, with antivalent parameterisation, the first input (IN X) is relevant.
  00 Both inputs are not active or invalid status and error with diagnostic alarm after the discrepancy time has elapsed.

This means for the process data:

Antivalent

IN X	IN Y	Process data	
0	1	00	not active
1	0	11	active
0	0	00	invalid, error after discrepancy time has elapsed
1	1	00	invalid, error after discrepancy time has elapsed

Equivalent

IN X	IN Y	Process data	
0	0	00	not active
1	1	11	active
0	1	00	invalid, error after discrepancy time has elapsed
1	0	00	invalid, error after discrepancy time has elapsed

Diagnostic data UR20-4DI-4DO-PN-FSCC

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	0
		1	Internal error	0
		2	Reserved	0
		3	Channel error	0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	0	0
Module Type	1	0	1	0x03
		1	1	
		2	0	
		3	0	
		4	1	0
		5	0	0
		6	0	0
		7	0	0
Error byte 2	2	0 … 7	Failure code (see attachment)	0
Error byte 3	3	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	Communication fault	0
		5	0	0
		6	0	0
		7	0	0
Channel Type	4	0	1	0x77
		1	1	
		2	1	
		3	0	
		4	1	
		5	1	
		6	1	
		7	0	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
Channel error	8 … 10	0 … 7	Reserved	0

Diagnostic data UR20-4DI-4DO-PN-FSCC

Name	Byte	Bit	Description	Default
Channel 0 error	11	0	Input 0, Short circuit	0
		1	Input 0, Cross connection	0
		2	Input 0, Discrepancy error	0
		3	Input 0, Other error	0
		4 ... 7	Reserved	0
Channel 1 error	12	0	Input 1, Short circuit	0
		1	Input 1, Cross connection	0
		2	Input 1, Discrepancy error	0
		3	Input 1, Other error	0
		4 ... 7	Reserved	0
Channel 2 error	13	0	Input 2, Short circuit	0
		1	Input 2, Cross connection	0
		2	Input 2, Discrepancy error	0
		3	Input 2, Other Error	0
		4 ... 7	Reserved	0
Channel 3 error	14	0	Input 3, Short circuit	0
		1	Input 3, Cross connection	0
		2	Input 3, Discrepancy error	0
		3	Input 3, Other Error	0
		4 ... 7	Reserved	0
Channel 4 error	15	0	Output 0, Short circuit	0
		1	Output 0, Cross connection	0
		2	Output 0, Readback error	0
		3	Output 0, Other Error	0
		4 ... 7	Reserved	0
Channel 5 error	16	0	Output 1, Short circuit	0
		1	Output 1, Cross connection	0
		2	Output 1, Readback error	0
		3	Output 1, Other error	0
		4 ... 7	Reserved	0
Channel 6 error	17	0	Output 2, Short circuit	0
		1	Output 2, Cross connection	0
		2	Output 2, Readback error	0
		3	Output 2, Other error	0
		4 ... 7	Reserved	0
Channel 7 error	18	0	Output 3, Short circuit	0
		1	Output 3, Cross connection	0
		2	Output 3, Readback error	0
		3	Output 3, Other error	0
		4 ... 7	Reserved	0
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Standard process data mapping UR20-4DI-4DO-PN-FSCC

Process data mapping		Data width [Byte]			
		RX	RY	RWr	RWw
Status data					
RWr (n):	Error code	0	0	8	0
RWr (n+1):	Error details				
RWr (n+2):	Reserved				
RWr (n+3):	Reserved				
RWw (n):	Error Acknowledge				
RWw (n+1):	Reserved				
RWw (n+2):	Reserved				
RWw (n+3):	Reserved				

Safety process data mapping UR20-4DI-4DO-PN-FSCC

Process data mapping		Data width [Byte]	
		SA\X	SA\Y
Input data			
SA\X (n):	DI 0	4	4
SA\X (n+1):	DI 1		
SA\X (n+2):	DI 2		
SA\X (n+3):	DI 3		
SA\X (n+4):	Status DO 0		
SA\X (n+5):	Status DO 1		
SA\X (n+6):	Status DO 2		
SA\X (n+7):	Status DO 3		
SA\X (n+8):	Reserved		
...			
SA\X (n+31):	Reserved		
Output data			
SA\Y (n):	DO 0		
SA\Y (n+1):	DO 1		
SA\Y (n+2):	DO 2		
SA\Y (n+3):	DO 3		
SA\Y (n+4):	Reserved		
...			
SA\Y (n+31):	Reserved		

Error Overview

The CC-Link IE Safety I/O modules provide a module error code information, which can be read via RWr data aside the generic safety process data. Bit 16 of the RWr error code indicates if a recoverable error (Mild Error) has been cleared, but the acknowledgement of the error is still pending. In order to clear a Moderate Error, a restart is required.

For example, error 0201H has been detected due to a short circuit. After the short circuit condition has been cleared, the error code changes from 0201H to 8201H. The 8 in the first position of the code indicates that the acknowledgement of the respective error is pending. A PLC or other device is now required to send a SLMP or RWw command FFFAH (see Error Acknowledgment via RWw and SLMP) to let the safety module return into normal operation and leave the failsafe state.

If safety validation is performed while a parameter data error 0500H occurs, the error code RWr0 changes to 0000H even though there are parameters set to invalid values outside the setting range. In this case, the detection of the parameter data error 0500H is displayed again after the device is restarted and blocks an active operating state until the incorrect parameter values have been corrected and the validation is performed again with correct parameter values.

RWr Error codes UR20-4DI-4DO-PN-FSCC

Error code	Classification	Error	Description	Error details
(RWr1)	-	No error	-	-
0100H	Moderate Error	H/W error	An error was detected by the hardware self-diagnostics.	-
0101H	Moderate Error	Self-diagnostic error	An error was detected by the software self-diagnostics.	-
0104H	Moderate Error	Unit power overvoltage error	A unit power supply error was detected (overvoltage).	-
0105H	Moderate Error	Init error	Error in the initialization of the module	-
0106H	Moderate Error	Cross communication error	Error in the communication between the safety controllers (e.g. different firmware versions)	-
0107H	Moderate Error	Sub-CID error	Error in setting the Sub-CID (F-address)	-
0201H	Mild Error	Output read-back error	A discrepancy of an output readback value and an output value was detected.	Indicates error location as 1 in Bits (bx). Y0 (b0) = Digital Output 0 Y1 (b1) = Digital Output 1 Y2 (b2) = Digital Output 2 Y3 (b3) = Digital Output 3
0202H	Mild Error	Unit power undervoltage error	A unit power supply error was detected (undervoltage).	-
0203H	Mild Error	Double input discrepancy detection error	A double input discrepancy was detected in a pair of inputs (X0 and X1, X2 and X3, ...).	Indicates error location as 1 in Bits (bx). X0 (b0) = Digital Input 0/1 X1 (b1) = Digital Input 2/3 X2 (b2) = Digital Input 4/5 X3 (b3) = Digital Input 6/7
0204H	Mild Error	Input dark test error	During an input dark test, test pulses were not detected.	Indicates error location as 1 in Bits (bx). Y0 (b0) = Digital Input 0 Y1 (b1) = Digital Input 1 Y2 (b2) = Digital Input 2 Y3 (b3) = Digital Input 3 Y0 (b4) = Digital Input 4 Y1 (b5) = Digital Input 5 Y2 (b6) = Digital Input 6 Y3 (b7) = Digital Input 7
0205H	Mild Error	Output dark test error	During an output dark test, test pulses were not detected.	Indicates error location as 1 in Bits (bx). X0 (b0) = Digital Output 0 X1 (b1) = Digital Output 1 X2 (b2) = Digital Output 2 X3 (b3) = Digital Output 3

RWr Error codes UR20-4DI-4DO-PN-FSCC

Error code	Classification	Error	Description	Error details
0206H	Mild Error	Module validation failure	The safety module validation failed.	-
0208H	Mild Error	I/O variance error	Input or output image differs between the controllers.	Bit 0 (b0) indicates which image differs: 0 = input image, 1 = output image
0209H	Mild Error	Input current error	Current error of an input detected.	Indicates error location as 1 in Bits (bx). Y0 (b0) = Digital Input 0 Y1 (b1) = Digital Input 1 Y2 (b2) = Digital Input 2 Y3 (b3) = Digital Input 3 Y0 (b4) = Digital Input 4 Y1 (b5) = Digital Input 5 Y2 (b6) = Digital Input 6 Y3 (b7) = Digital Input 7
020AH	Moderate Error	Temperature error	Temperature error detected	-
020BH	Mild Error	Connect/Disconnect error	Error during connecting or disconnecting the connection	Bit 0 (b0) indicates when the error was detected: 0 = connection, 1 = disconnection
0301H	Information	Not activated	Safety module validation has not been completed.	-
0500H	Moderate Error	Parameter data error	An incorrect value or parameter data out of the range is set.	The set value is stored.
0501H	Moderate Error	CC-Link Stack Parameter error	An incorrect value or parameter data out of the range is set regarding the CC-Link parameter.	IEFS_ERRDETAIL_PARAM_001 (b0) IEFS_ERRDETAIL_PARAM_002 (b1) IEFS_ERRDETAIL_PARAM_003 (b2) IEFS_ERRDETAIL_PARAM_004 (b3)
0502H	Moderate Error	New parameter after parameterisation error	Error status after validation of new parameters if there was a valid parameterisation before.	-

Table 12: Error Codes Safety Communication

Error code	Classification	Description
0400H	Communication Error	An error was detected in the safety communication with the master station.
0401H	Communication Error	A communication interrupt has occurred on CC-Link IE TSN and safety communications stopped.
0402H	Communication Error	Response monitoring timeout was detected while the safety connection was being established in the safety communication with the master station.
0403H	Communication Error	Response monitoring timeout was detected while the safety communication was being refreshed in the safety communication with the master station.
0404H	Communication Error	Response monitoring timeout was detected while a safety communication error was being processed in the safety communication with the master station.
0405H	Communication Error	Safety communication data was received with delay.
0406H	Communication Error	Detection of delays in receiving safety communication data.
0407H	Communication Error	Data loss was detected in the safety communication.

Error Acknowledgment via RWw and SLMP

Error acknowledgement for a Mild Error can be done in two ways. One is via RWw0 and the other is via SLMP.

When acknowledging an error via RWw, the hexadecimal value FFFA is sent to the module. To acknowledge a multiple error, RWw0 must be set to 0 and FFFAH must be sent again.

The table below shows the SLMP message format for clearing an existing error acknowledgement for a Mild Error. This function is only available for CC-Link IE Safety Modules. All other modules use the alarm message protocol for error recovery and alarm reporting.

CC-Link IE TSN Error Acknowledgement via SLMP Write Function

Item	Value	Comment
SLMP Command	0x1401	Device Write Function
SLMP Sub Command	0x0082	Sub Command: Command Data
Head Device No.	0x00FFFF	Command Area
Device code	0x00B4	Fixed
Extension specification	SlotNo. (0 begining)	Slot number of safety module 0 ... 63
No. of device points	0x0001 command data size	1 word with command information
	0xFFFA (Error Acknowledgement)	Error Acknowledgment Command

Hot Swap behaviour of CC-Link IE Safety modules

Hot Swap is not intended for safety applications!

Since the u-remote station basically supports Hot Swap, the behaviour of the CC-Link IE Safety moduls should be described.
As soon as a safety module is hot swapped or pulled during operation, all other safety modules change to a safe state due to default parameters sent to the module. The safety module must then be validated again.

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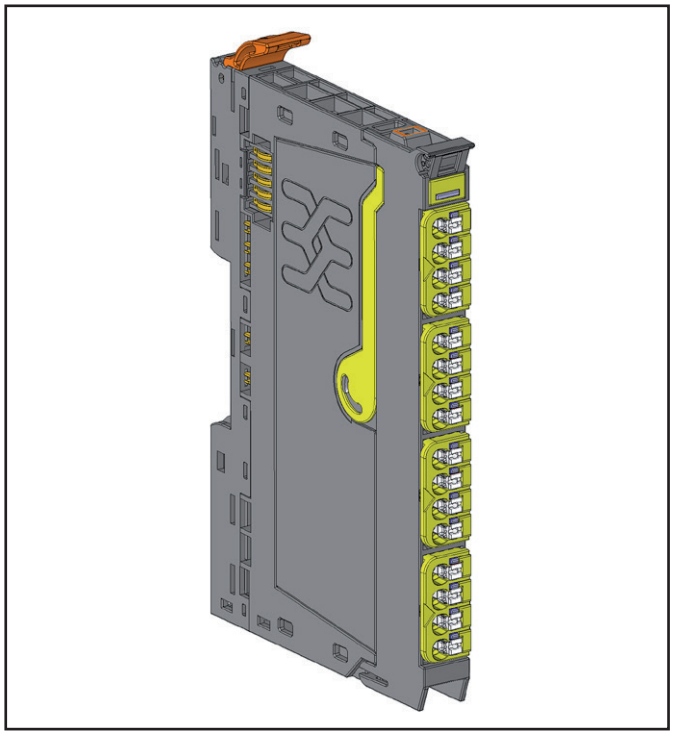
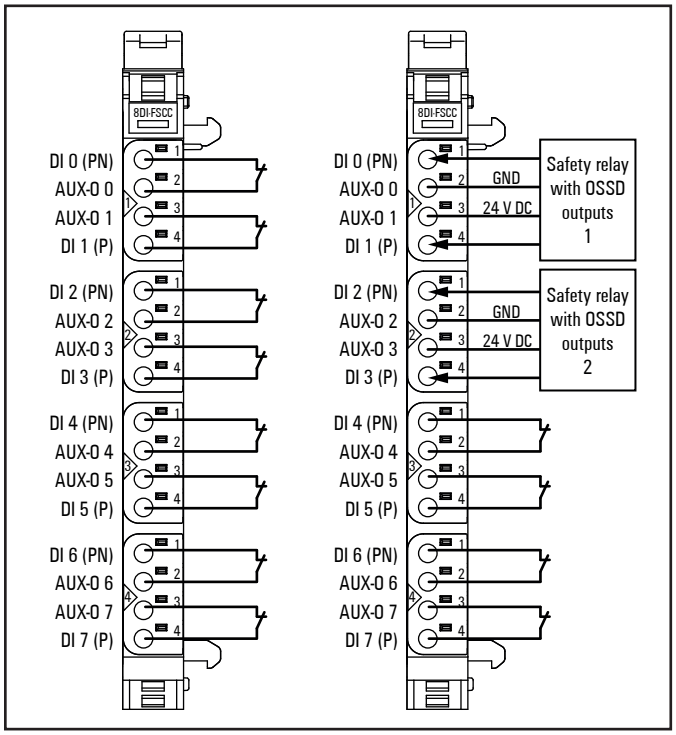
5.8 Digital input module UR20-8DI-PN-FSCC



Digital input module UR20-8DI-PN-FSCC (Order No. 2742580000)



Connection diagram UR20-8DI-PN-FSCC

The UR20-8DI-PN-FSCC digital input module is a safe I/O module for the CC-Link IE Safety protocol. The module can detect up to 8 binary control signals. Two sensors can be connected to each connector using a 2-wire, 3-wire or 4-wire connection. In the event that the available supply current of 0.8 A per plug will not suffice, the sensor supply must be realised using the auxiliary outputs of another module (e.g. potential distribution module) within the same power segment. A status LED is assigned to each channel. The module electronics supply the connected sensors with power from the input current path (I_{IN})
A test pulse check of the inputs can be parameterised as a cross-circuit detection between input singal and supply voltage, between different input signals or other signals. An input only remains active without error when the signal of the dedicated auxiliary output is present. Short circuit detection is not possible when using a 3-wire connection.

If a safety sensor is being connected in a dual channel mode (safety architecture of category 4 acc. to EN ISO 13849), the sensor must allocate the PN and the P-input of one connector.

Dangerous situation due to automatic restart

CC-Link IE safety controllers do not require a start-up acknowledgement after switching the (safety)-CPU from STOP to RUN mode. The safety function is always active regardless of the operation state and only the outputs are set to zero in STOP state.
The operator of the system must analyse whether an automatic restart can cause a hazardous situation and how this can be avoided. Please refer to the relevant documentation for the specific behaviour of the respective control unit.

When switching on the system, the UR20-FSCC-modules expect a one-time start-up acknowledgement before the modules enables their inputs and outputs. This is no longer the case when the PLC operating status changes.

Maximum number of modules per station

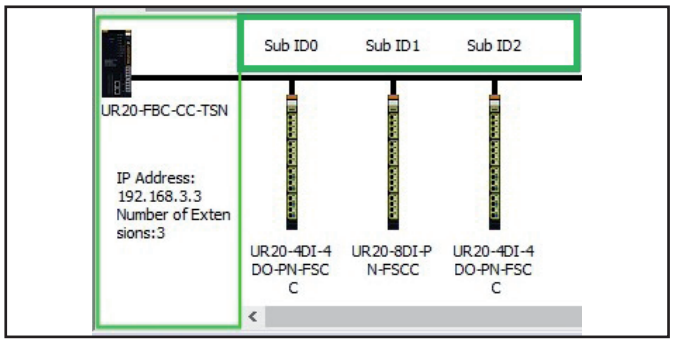
For the structure of the CC-Link IE Safety Frame, the module occupies 60 bytes of input and output process data each. As each coupler can process a maximum of 1024 bytes input data and 1024 bytes output data, a maximum of 17 CC-Link IE safety modules can be operated on one coupler.

Adapt Communication Period Interval to data volume

If the UR20 station has to transfer more than 1024 byte process data in the CC-Link IE TSN network, the Communication Period Interval must be parametrised to ≥ 1 ms, otherwise the system performance will be degraded. The sum of the process data is: RX + RY + RWr + RWw + (120 Byte * number of CC-Link IE Safety modules).

Ascending order of Sub-CID

GX Works **Extension Module Configuration** automatically assigns a Sub-ID to each safety module in ascending order. This must match the DIP switch setting of the safety modules and be mapped in the same way in the **Safety Communication Setting** in GX Works. Otherwise, the CC-Link IE safety communication cannot be established successfully.



Transmission Interval Monitoring Time Formula & Limits

The minimum u-remote CC-Link IE Safety processing time is defined as:

TM-Min (ETH-Speed) = 2 x Safety station remote refresh processing time

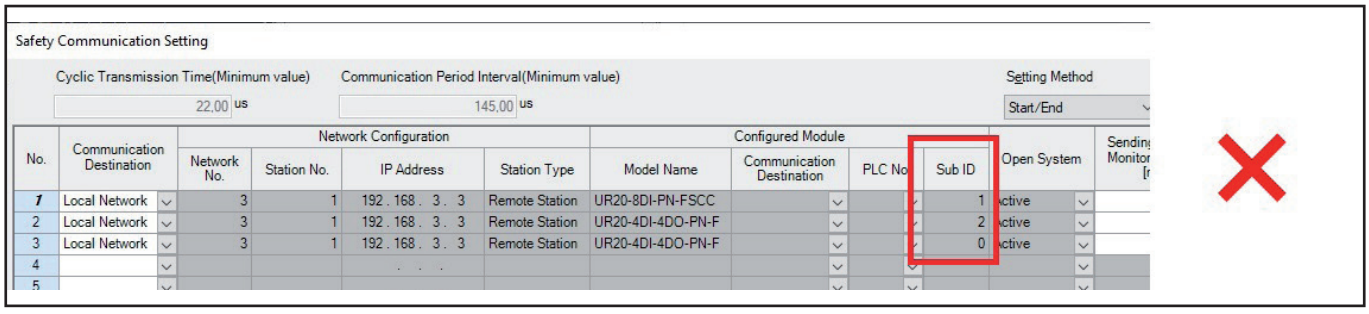
The safety station remote refresh processing time is the sum of Remote Station I/O performance (10 ms) + CC TSN cycle time + u-remote system processing time (3 ms).

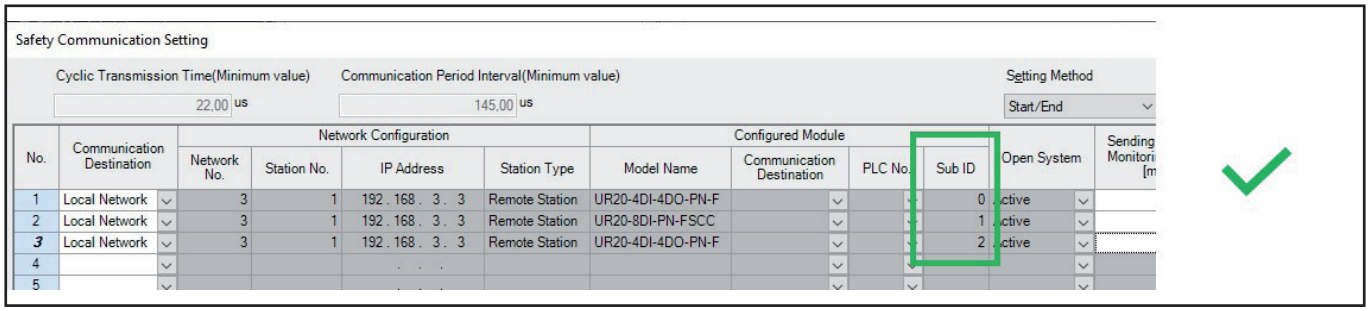
The minimum Transmission Interval Monitoring Time (TM-Min) for a single u-remote-Station is therefore:

- TM-Min (1 Gb/s) = 2 x (10 ms + 0,5 ms + 3 ms) = 27 ms
- TM-Min (100 Mb/s) = 2 x (10 ms + 4 ms + 3 ms) = 34 ms

The respective Transmission Interval Monitoring Time range is therefore:

- 27 ... 1000 ms for 1 Gb/s
- 34 ... 1000 ms for 100 Mb/s





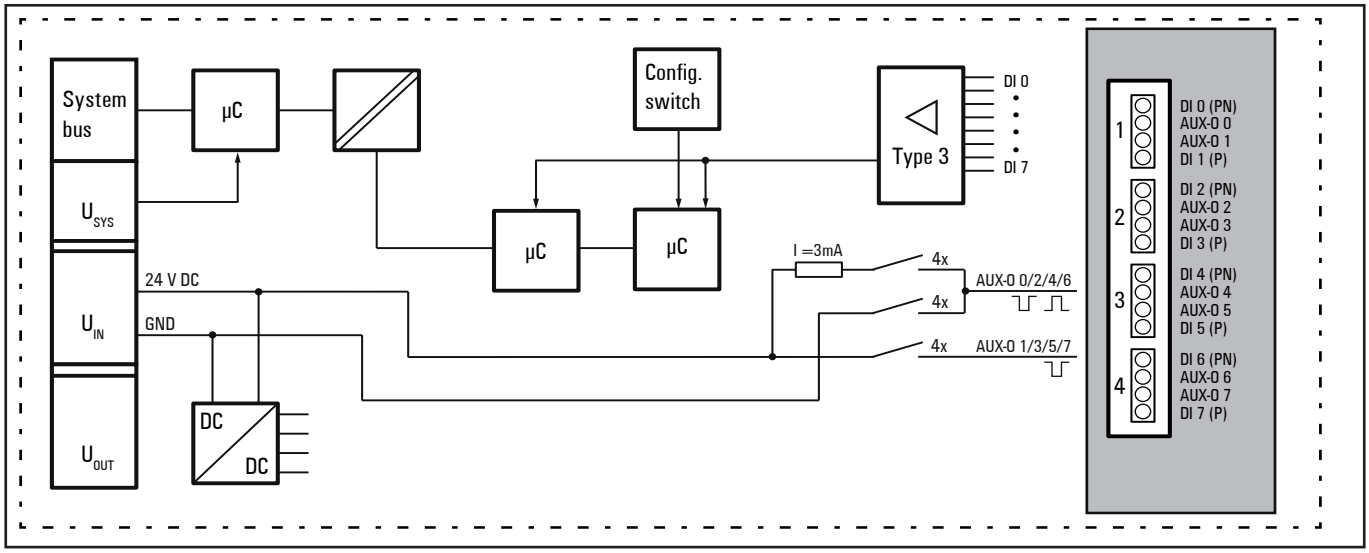
Manual diagnostic acknowledgement with enabled diagnostics

If at least one alarm (diagnostic alarm, process alarm) is activated in the fieldbus coupler parameters, the pending diagnostics and alarms must be processed cyclically in accordance with the alarm message protocol. The retrieval (acknowledgement) must be programmed individually with PLC programme code.
Without a manual diagnostic acknowledgement, commissioning including start-up of the safety modules cannot take place.

Acknowledging a diagnosis via SLMP is described in the u-remote manual (Document No. 1432790000), see Chapter CC-Link-IE-TSN-Fieldbus coupler, section UR20-FBC-CC-TSN Alarm message protocol.
You can find the document in the Weidmüller Support Center.

	Module status LED Green: Communication on system bus 3 s green/1 s red: Waiting for parameters 1 s green/1 s red: Waiting for acknowledgement by safety control 2 s red/2 s off: Station configuration has changed during operation Red: Collective error diagnostic
1.1	Yellow: Input 0 active
1.3	Red: Error sensor supply or input 0 or input 1
1.4	Yellow: Input 1 active
2.1	Yellow: Input 2 active
2.3	Red: Error sensor supply or input 2 or input 3
2.4	Yellow: Input 3 active
3.1	Yellow: Input 4 active
3.3	Red: Error sensor supply or input 4 or input 5
3.4	Yellow: Input 5 active
4.1	Yellow: Input 6 active
4.3	Red: Error sensor supply or input 6 or input 7
4.4	Yellow: Input 7 active

LED indicators UR20-8DI-PN-FSCC, error messages see Chapter 8



Block diagram UR20-8DI-PN-FSCC

Technical data UR20-8DI-PN-FSCC (Order No. 2464590000)

System data		
Data	Process, parameter and diagnostic data depend on the coupler used, see section 5.2	
Interface	u-remote system bus	
System bus transfer rate	48 Mbps	
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	PLd, Categorie 2 PLe, Categorie 4
Diagnostic Coverage (DC)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	90% 99%
$MTTF_D$ (Mean Time To Failure dangerous)		> 100 Years (840 Years)
Safety-related data as per EN 62061 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SILCL 2 SILCL 3
PFH (Probability of Failure per hour in 1/h)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}94*10^{-9}$
Fault reaction time	Single-channel circuit 1oo1	10 s
Safety-related data as per EN 61508 (Regard the entire safety chain!)		
Achievable safety level	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	SIL 2 SIL 3
PFH (Probability of Failure per hour in 1/h)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	10^{-8} $2{,}17*10^{-10}$
PFD (Probability of Failure per Demand)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	$8{,}77*10^{-4}$ $1{,}85*10^{-5}$
HFT (Hardware Failure Tolerance)	Single-channel circuit 1oo1 Dual-channel circuit 1oo2	0 1
SFF (Safe Failure Fraction)	98%	
Presumed lifecycle time	20 Years	
Prooftest intervall	No prooftest needed within the life cycle.	
Classification acc. to EN 61508-2	Type B	
Inputs		
Number	8, four of which are parameterisable P- or N-switching	
Input Type	Type 1 and 3[1)] as per IEC 61131-2 (N-switching based on the standard)	
Input filter	Input delay adjustable from 1 to 100 ms	
Detection time	min. 5 ms active level, min. 3 ms non-active level	
Response time	< 10 ms	
Low input voltage	P-switching: < 5 V; N-switching: > -5 V to +24 V	
High input voltage	P-switching: >11 V; N-switching: <-11 V to +24 V	
Sensor supply	Max. 0.8 A per plug, total max. 3.2 A	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Technical data UR20-8DI-PN-FSCC (Order No. 2464590000)

Sensor connection	2-wire, 3-wire, 4-wire
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 + current consumption from the auxiliary outputs
General data	
Weight (operational status)	93 g
Additional general data, see Section 5.1.	

1) Minimum rate of change in transition range: 1 V/s. Deviating from EN 61131-2 the following applies for PN-inputs in P-switching mode: The voltage at the digital input must not be higher than 4 V above the module supply voltage.

Overview of the editable parameters[1] UR20-8DI-PN-FSCC

Channel	Description	Options	Default
0	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
0	Test pulse	internal (0) / external (1) / from AUX0 (2) / from AUX1 (3)	internal
0	Input polarity	P-switching (0) / N-switching (1)	P-switching
1	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
1	Test pulse	internal (0) / external (1) / from AUX1 (3)	internal
0 + 1	Input dual channel mode (inputs 0 + 1)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
0 + 1	Discrepancy time	5 ... 30.000 ms	500 ms
2	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
2	Test pulse	internal (0) / external (1) / from AUX2 (2) / from AUX3 (3)	internal
2	Input polarity	P-switching (0) / N-switching (1)	P-switching
3	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
3	Test pulse	internal (0) / external (1) / from AUX3 (3)	internal
2 + 3	Input dual channel mode (inputs 2 + 3)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
2 + 3	Discrepancy time	5 ... 30.000 ms	500 ms
4	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
4	Test pulse	internal (0) / external (1) / from AUX4 (2) / from AUX5 (3)	internal
4	Input polarity	P-switching (0) / N-switching (1)	P-switching
5	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
5	Test pulse	internal (0) / external (1) / from AUX5 (3)	internal
4 + 5	Input dual channel mode (inputs 4 + 5)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
4 + 5	Discrepancy time	5 ... 30.000 ms	500 ms
6	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
6	Test pulse	internal (0) / external (1) / from AUX6 (2) / from AUX7 (3)	internal
6	Input polarity	P-switching (0) / N-switching (1)	P-switching
7	Input delay	1 ms (0) / 3 ms (1) / 10 ms (2) / 100 ms (3)	1 ms
7	Test pulse	internal (0) / external (1) / from AUX7 (3)	internal
6 + 7	Input dual channel mode (inputs 6 + 7)	single channel (0) / dual channel equivalent (1) / dual channel antivalent (2)	single channel
6 + 7	Discrepancy time	5 ... 30.000 ms	500 ms

1) Please regard the notes for parameter settings.

Notes for parameter settings

- The module independently performs a plausibility test for the relevant pair of inputs, if the dual channel mode is parameterised. On this it will be checked if both inputs become active or inactive simultaneously within the discrepancy time.
- The “test pulse” parameter of an input must be set “external” if a safety relay with OSSD outputs generating own test pulses is connected. The test pulse duration depends on the parameterised input delay:

Input delay [ms]	1	3	10	100
Test pulse duration [ms]	0.5	1	3	10

- Please regard the following when parameterising “external” test pulses with a UR20-8DI-PN-FSCC module:
  - An edge transition must occur at least every five minutes at an active input. Otherwise a module error will be signalised.
  - With this setting the module cannot detect any short circuits. The short circuit detection must be realised by the connected OSSD device.

– An antivalent circuit can be parameterised for the module. This means that a valid input signal can be "false". With two channel parameterisation, both bits in the process data are always the same:
  11 Both inputs are valid and active, with antivalent parameterisation, the first input (IN X) is relevant.
  00 Both inputs are not active or invalid status and error with diagnostic alarm after the discrepancy time has elapsed.

This means for the process data:

Antivalent

IN X	IN Y	Process data	
0	1	00	not active
1	0	11	active
0	0	00	invalid, error after discrepancy time has elapsed
1	1	00	invalid, error after discrepancy time has elapsed

Equivalent

IN X	IN Y	Process data	
0	0	00	not active
1	1	11	active
0	1	00	invalid, error after discrepancy time has elapsed
1	0	00	invalid, error after discrepancy time has elapsed

Diagnostic data UR20-8DI-PN-FSCC

Name	Byte	Bit	Description	Default
Error indicator	0	0	Module error	0
		1	Internal error	0
		2	Reserved	0
		3	Channel error	0
		4	Reserved	0
		5	Reserved	0
		6	Reserved	0
		7	0	0
Module Type	1	0	1	0x03
		1	1	
		2	0	
		3	0	
		4	1	1
		5	0	0
		6	0	0
		7	0	0
Error byte 2	2	0 … 7	Failure code (see attachment)	0
Error byte 3	3	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	Communication fault	0
		5	0	0
		6	0	0
		7	0	0
Channel Type	4	0	0	0x7A
		1	1	
		2	0	
		3	1	
		4	1	
		5	1	
		6	1	
		7	0	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
Channel error	8 … 10	0 … 7	Reserved	0

Diagnostic data UR20-8DI-PN-FSCC

Name	Byte	Bit	Description	Default
Channel 0 error	11	0	Input 0, Short circuit	0
		1	Input 0, Cross connection	0
		2	Input 0, Discrepancy error	0
		3	Input 0, Other error	0
		4 ... 7	Reserved	0
Channel 1 error	12	0	Input 1, Short circuit	0
		1	Input 1, Cross connection	0
		2	Input 1, Discrepancy error	0
		3	Input 1, Other error	0
		4 ... 7	Reserved	0
Channel 2 error	13	0	Input 2, Short circuit	0
		1	Input 2, Cross connection	0
		2	Input 2, Discrepancy error	0
		3	Input 2, Other error	0
		4 ... 7	Reserved	0
Channel 3 error	14	0	Input 3, Short circuit	0
		1	Input 3, Cross connection	0
		2	Input 3, Discrepancy error	0
		3	Input 3, Other error	0
		4 ... 7	Reserved	0
Channel 4 error	15	0	Input 4, Short circuit	0
		1	Input 4, Cross connection	0
		2	Input 4, Discrepancy error	0
		3	Input 4, Other error	0
		4 ... 7	Reserved	0
Channel 5 error	16	0	Input 5, Short circuit	0
		1	Input 5, Cross connection	0
		2	Input 5, Discrepancy error	0
		3	Input 5, Other error	0
		4 ... 7	Reserved	0
Channel 6 error	17	0	Input 6, Short circuit	0
		1	Input 6, Cross connection	0
		2	Input 6, Discrepancy error	0
		3	Input 6, Other error	0
		4 ... 7	Reserved	0
Channel 7 error	18	0	Input 7, Short circuit	0
		1	Input 7, Cross connection	0
		2	Input 7, Discrepancy error	0
		3	Input 7, Other error	0
		4 ... 7	Reserved	0
Channel 8 error ... Channel 31 error	19 ... 42	0 ... 7	Reserved	0
Time stamp	43-46		time stamp [µs] (32bit)	

Standard process data mapping UR20-8DI-PN-FSCC

Process data mapping		Data width [Byte]			
		RX	RY	RWr	RWw
Status data					
RWr (n):	Error code	0	0	8	0
RWr (n+1):	Error details				
RWr (n+2):	Reserved				
RWr (n+3):	Reserved				
RWw (n):	Error Acknowledge				
RWw (n+1):	Reserved				
RWw (n+2):	Reserved				
RWw (n+3):	Reserved				

Safety process data mapping UR20-8DI-PN-FSCC

Process data mapping		Data width [Byte]	
		SA\X	SA\Y
Input data			
SA\X (n):	DI 0	4	4
SA\X (n+1):	DI 1		
SA\X (n+2):	DI 2		
SA\X (n+3):	DI 3		
SA\X (n+4):	DI 4		
SA\X (n+5):	DI 5		
SA\X (n+6):	DI 6		
SA\X (n+7):	DI 7		
SA\X (n+8):	Reserved		
...			
SA\X (n+31):	Reserved		
Output data			
SA\Y (n):	Reserved		
...			
SA\Y (n+31):	Reserved		

Error Overview

The CC-Link IE Safety I/O modules provide a module error code information, which can be read via RWr data aside the generic safety process data. Bit 16 of the RWr error code indicates if a recoverable error (Mild Error) has been cleared, but the acknowledgement of the error is still pending. In order to clear a Moderate Error, a restart is required.

For example, error 0201H has been detected due to a short circuit. After the short circuit condition has been cleared, the error code changes from 0201H to 8201H. The 8 in the first position of the code indicates that the acknowledgement of the respective error is pending. A PLC or other device is now required to send a SLMP or RWw command FFFAH (see Error Acknowledgment via RWw and SLMP) to let the safety module return into normal operation and leave the failsafe state.

If safety validation is performed while a parameter data error 0500H occurs, the error code RWr0 changes to 0000H even though there are parameters set to invalid values outside the setting range. In this case, the detection of the parameter data error 0500H is displayed again after the device is restarted and blocks an active operating state until the incorrect parameter values have been corrected and the validation is performed again with correct parameter values.

RWr Error codes UR20-8DI-PN-FSCC

Error code	Classification	Error	Description	Error details
(RWr1)	-	No error	-	-
0100H	Moderate Error	H/W error	An error was detected by the hardware self-diagnostics.	-
0101H	Moderate Error	Self-diagnostic error	An error was detected by the software self-diagnostics.	-
0104H	Moderate Error	Unit power overvoltage error	A unit power supply error was detected (overvoltage).	-
0105H	Moderate Error	Init error	Error in the initialization of the module	-
0106H	Moderate Error	Cross communication error	Error in the communication between the safety controllers (e.g. different firmware versions)	-
0107H	Moderate Error	Sub-CID error	Error in setting the Sub-CID (F-address)	-
0201H	Mild Error	Output read-back error	A discrepancy of an output readback value and an output value was detected.	Indicates error location as 1 in Bits (bx). Y0 (b0) = Digital Output 0 Y1 (b1) = Digital Output 1 Y2 (b2) = Digital Output 2 Y3 (b3) = Digital Output 3
0202H	Mild Error	Unit power undervoltage error	A unit power supply error was detected (undervoltage).	-
0203H	Mild Error	Double input discrepancy detection error	A double input discrepancy was detected in a pair of inputs (X0 and X1, X2 and X3, ...).	Indicates error location as 1 in Bits (bx). X0 (b0) = Digital Input 0/1 X1 (b1) = Digital Input 2/3 X2 (b2) = Digital Input 4/5 X3 (b3) = Digital Input 6/7
0204H	Mild Error	Input dark test error	During an input dark test, test pulses were not detected.	Indicates error location as 1 in Bits (bx). Y0 (b0) = Digital Input 0 Y1 (b1) = Digital Input 1 Y2 (b2) = Digital Input 2 Y3 (b3) = Digital Input 3 Y0 (b4) = Digital Input 4 Y1 (b5) = Digital Input 5 Y2 (b6) = Digital Input 6 Y3 (b7) = Digital Input 7

RWr Error codes UR20-8DI-PN-FSCC

Error code	Classification	Error	Description	Error details
0205H	Mild Error	Output dark test error	During an output dark test, test pulses were not detected.	Indicates error location as 1 in Bits (bx). X0 (b0) = Digital Output 0 X1 (b1) = Digital Output 1 X2 (b2) = Digital Output 2 X3 (b3) = Digital Output 3
0206H	Mild Error	Module validation failure	The safety module validation failed.	-
0208H	Mild Error	I/O variance error	Input or output image differs between the controllers.	Bit 0 (b0) indicates which image differs: 0 = input image, 1 = output image
0209H	Mild Error	Input current error	Current error of an input detected.	Indicates error location as 1 in Bits (bx). Y0 (b0) = Digital Input 0 Y1 (b1) = Digital Input 1 Y2 (b2) = Digital Input 2 Y3 (b3) = Digital Input 3 Y0 (b4) = Digital Input 4 Y1 (b5) = Digital Input 5 Y2 (b6) = Digital Input 6 Y3 (b7) = Digital Input 7
020AH	Moderate Error	Temperature error	Temperature error detected	-
020BH	Mild Error	Connect/Disconnect error	Error during connecting or disconnecting the connection	Bit 0 (b0) indicates when the error was detected: 0 = connection, 1 = disconnection
0301H	Information	Not activated	Safety module validation has not been completed.	-
0500H	Moderate Error	Parameter data error	An incorrect value or parameter data out of the range is set.	The set value is stored.
0501H	Moderate Error	CC-Link Stack Parameter error	An incorrect value or parameter data out of the range is set regarding the CC-Link parameter.	IEFS_ERRDETAIL_PARAM_001 (b0) IEFS_ERRDETAIL_PARAM_002 (b1) IEFS_ERRDETAIL_PARAM_003 (b2) IEFS_ERRDETAIL_PARAM_004 (b3)
0502H	Moderate Error	New parameter after parameterisation error	Error status after validation of new parameters if there was a valid parameterisation before.	-

Table 12: Error Codes Safety Communication

Error code	Classification	Description
0400H	Communication Error	An error was detected in the safety communication with the master station.
0401H	Communication Error	A communication interrupt has occurred on CC-Link IE TSN and safety communications stopped.
0402H	Communication Error	Response monitoring timeout was detected while the safety connection was being established in the safety communication with the master station.
0403H	Communication Error	Response monitoring timeout was detected while the safety communication was being refreshed in the safety communication with the master station.
0404H	Communication Error	Response monitoring timeout was detected while a safety communication error was being processed in the safety communication with the master station.
0405H	Communication Error	Safety communication data was received with delay.
0406H	Communication Error	Detection of delays in receiving safety communication data.
0407H	Communication Error	Data loss was detected in the safety communication.

Error Acknowledgment via RWw and SLMP

Error acknowledgement for a Mild Error can be done in two ways. One is via RWw0 and the other is via SLMP.

When acknowledging an error via RWw, the hexadecimal value FFFA is sent to the module. To acknowledge a multiple error, RWw0 must be set to 0 and FFFAH must be sent again.

The table below shows the SLMP message format for clearing an existing error acknowledgement for a Mild Error. This function is only available for CC-Link IE Safety Modules. All other modules use the alarm message protocol for error recovery and alarm reporting.

CC-Link IE TSN Error Acknowledgement via SLMP Write Function

Item	Value	Comment
SLMP Command	0x1401	Device Write Function
SLMP Sub Command	0x0082	Sub Command: Command Data
Head Device No.	0x00FFFF	Command Area
Device code	0x00B4	Fixed
Extension specification	SlotNo. (0 begining)	Slot number of safety module 0 ... 63
No. of device points	0x0001 command data size	1 word with command information
	0xFFFA (Error Acknowledgement)	Error Acknowledgment Command

Hot Swap behaviour of CC-Link IE Safety modules

Hot Swap is not intended for safety applications!

Since the u-remote station basically supports Hot Swap, the behaviour of the CC-Link IE Safety moduls should be described.
As soon as a safety module is hot swapped or pulled during operation, all other safety modules change to a safe state due to default parameters sent to the module. The safety module must then be validated again.

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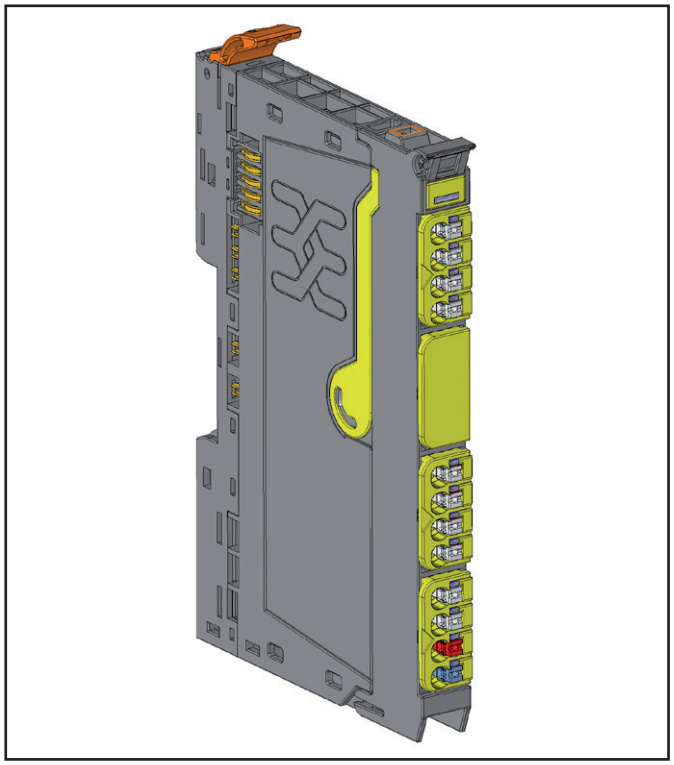
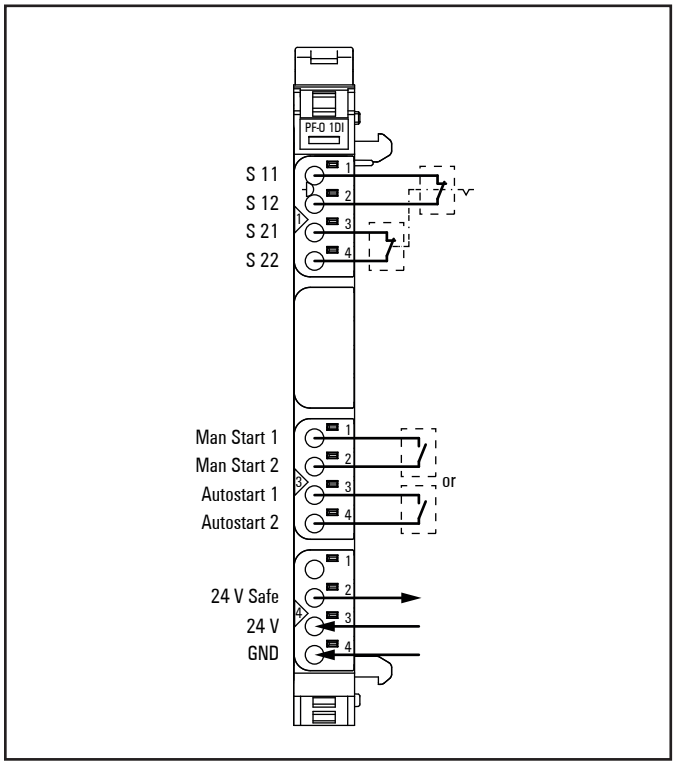
5.9 Safe power-feed module UR20-PF-O-1DI-SIL



Safe power-feed module UR20-PF-O-1DI-SIL (Order No. 1335030000)



Connection diagram UR20-PF-O-1DI-SIL

The power-feed module UR20-PF-O-1DI-SIL enables the safe feed-in for the output current path. This can be used to monitor a two-channel emergency stop command device.
With the 24 V Safe output, the current status of the output current path can be forwarded to a PLC, to a switching device (e.g. a relay) or also cascaded to a further u-remote station. Almost all types of output modules will be safely switched-off (SIL 3/PIe/Cat. 4) when they are placed within the safety segment (see survey of switchable modules in section 4.3).
Each time the supply voltage of the module has been switched on the module has to be initialised manually by giving a pulse of 0.1 to 2 seconds to the “Man Start” input. As long as the supply voltage of the module has not been interrupted the 24 V Safe output path will be reactivated automatically when the “Autostart” input is used. In case the “Man Start” input is used there is a pulse needed for the reactivation.
The evaluation of test pulses in the safety circuits provides the detection of faults or manipulations of the wiring. Therefore every second a low pulse of 1 ms is being generated in each circuit, these pulses are phase-shifted.
The connections Safety Input 0 (S 11, S 21), Man Start 1 and Autostart 1 are digital inputs Type 3 according to EN 61131-2. The Man Start 1 input can also be controlled by a standard PLC output.

The auxiliary outputs S 12, S 22, Man Start 2 and Autostart 2 must only be used for refeeding the allocated inputs.
The maximum feed-in current in the output current path is 8 A.

ATTENTION

Risk of material damage!
In the case of a maximum power supply of 8 A and a maximum temperature of +60 °C, all wired contacts on the fourth connector must be connected with 1.5 mm² wiring!

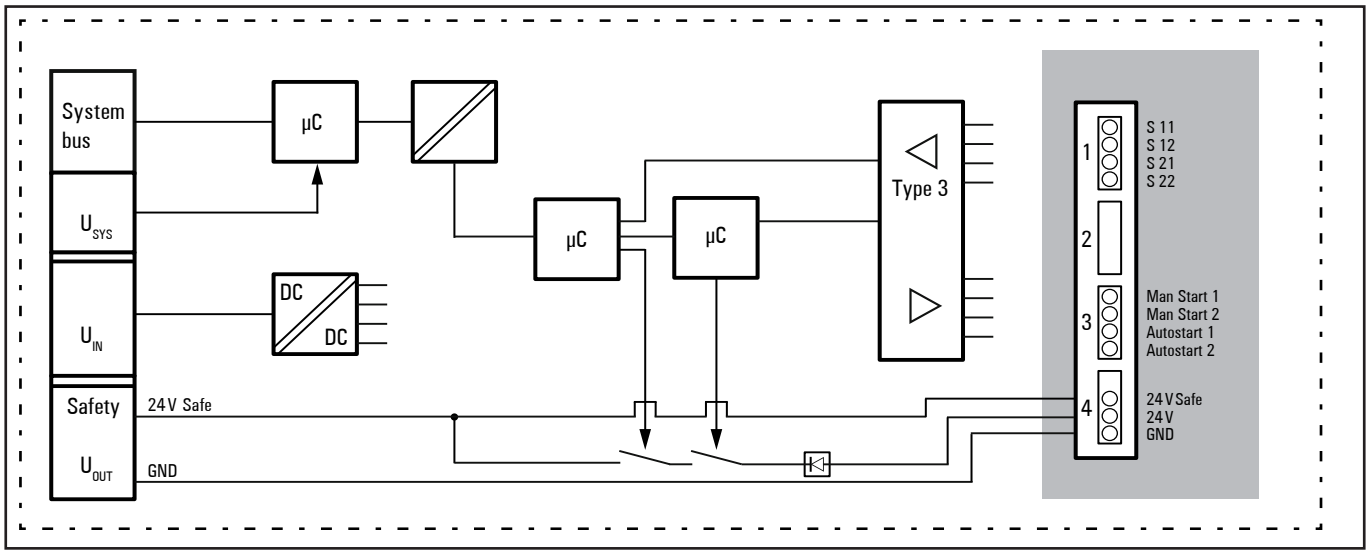
	Module status LED Green: Communication on system bus
1.1	Yellow: Safety circuit 0 OK
4.2	Yellow: 24 V Safe output active
4.3	Green: Feed-in voltage in valid range

LED indicators UR20-PF-O-1DI-SIL, error messages see Chapter 8

Starting up a safe power-feed module

Please proceed as follows to start-up a UR20-PF-O-1DI-SIL module:

- ► Connect the 24 V DC voltage supply to 4.3 and 4.4 of the module.
- ► Connect the provided safety device to S11 to S22 and release the device (unlock).
- ► Switch on the u-remote station.
- ► Operate the manual start.
- ► Operate the manual start once more for each cascaded UR20-PF-O-X-SIL-Modul.



Block diagram UR20-PF-O-1DI-SIL (see also sample design in chapter 4.1)

Technical data UR20-PF-O-1DI-SIL Order No. 1335030000)

System data	
Data	Process and diagnostic data depend on the coupler used, see section 5.2
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)	
Achievable safety level	PLe und Categorie 4
Diagnostic Coverage (DC)	96,64 %
$MTTF_D$ (Mean Time To Failure dangerous)	> 100 Years
Safety-related data as per EN 62061 (Regard the entire safety chain!)	
Achievable safety level	SILCL 3
PFH (Probability of Failure per hour in 1/h)	$1{,}35*10^{-9}$
SFF (Safe Failure Fraction)	98,58 %
Fault reaction time	10 s
HFT (Hardware Failure Tolerance)	1
Presumed lifecycle time	20 Years
Safety-related data as per EN 61508 (Regard the entire safety chain!)	
Achievable safety level	SIL 3
PFH (Probability of Failure per hour in 1/h)	$6{,}27*10^{-9}$
SFF (Safe Failure Fraction)	98,58 %
Prooftest intervall	No prooftest needed within the life cycle.
Classification acc. to EN 61508-2	Type B
Inputs	
Safety inputs	1 x dual channel
Input Type	Type 3 as per IEC 61131-2
Inputs for start function	2 (manual start and autostart)
Input Type	Type 3 as per IEC 61131-2
Outputs	
Safety output (24 V Safe)	1
Output current	8 A
Breaking energy (inductive)	150 mJ per channel
Overload protection	excess temperature proof and overload-proof, short circuit proof with external fuse (see below)
Response time for turn-off	<20 ms
Response time for activating the output	<2 s
Auxiliary outputs	2 x 2 (S12, S22, Man Start 2, Autostart 2)
Output current	max. 10 mA (only to support the dedicated inputs)

Technical data UR20-PF-O-1DI-SIL Order No. 1335030000)

Diagnosis	
Module diagnosis	yes
Individual channel diagnosis	yes
Supply	
Supply voltage	24 V DC +20 %/-15 % via system bus
External pre-fusing	Mandatory: super fast, max. 8 A
Reverse battery protection	yes
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	45 mA
General data	
Weight (operational status)	80 g
Additional general data, see Section 5.1.	

Process data UR20-PF-O-1DI-SIL

Byte	Bit definition	Description	Status	Connection
0	0	Safety input 0	0 - inactive, 1 - active	S 11 ... S 22
	1	Reserved		
	2	Autostart	0 - inactive, 1 - active	Autostart 1/2
	3	Manual start	0 - inactive, 1 - active	Man Start 1/2
	4	Safety input 0, channel 1	0 - inactive, 1 - active	S 11/S 12
	5	Safety input 0, channel 2	0 - inactive, 1 - active	S 21/S 22
	6	Reserved		
	7	Reserved		
1	0	24 V Safe output	0 - inactive, 1 - active	24 V Safe
	1	Reserved		
	2	24 V DC	0 - no feed-in, 1 - power feed-in pending	24 V
	3–7	Reserved		
2	0–7	Reserved		
3	0–7	Reserved		

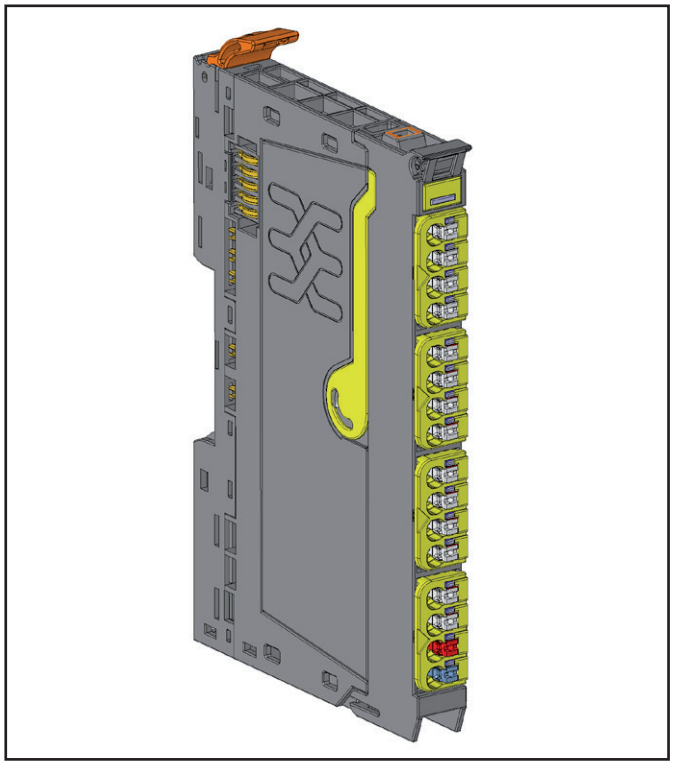
Diagnostic data UR20-PF-O-1DI-SIL

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		
Module Type	1	0	Module Type	0x03
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0 ... 7	Failure code (see attachment)	
Error byte 3	3	0	Temperature Error	
		1	Internal Error	
		2	Fuse Error	
		3	Reserved	0
		4	Communication fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel Type	4	0 ... 6	Channel Type	0x78
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bits per channel	4
Number of channels	6		Number of similar channels per module	9
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4	Error at channel 4	
		5	Error at channel 5	
		6	Error at channel 6	
		7	Error at channel 7	
Channel error	8	8	Error at channel 8	
		9 ... 15	Reserved	0
Channel error	9	16 ... 23	Reserved	0
Channel error	10	24 ... 31	Reserved	0
Safety input 0	11	0	Input Discrepancy Error	
		1	Input Pulse Error	
		2	Input Test Error	
		3 ... 7	Reserved	0
Error at channel 1	12	0 ... 7	Reserved	0

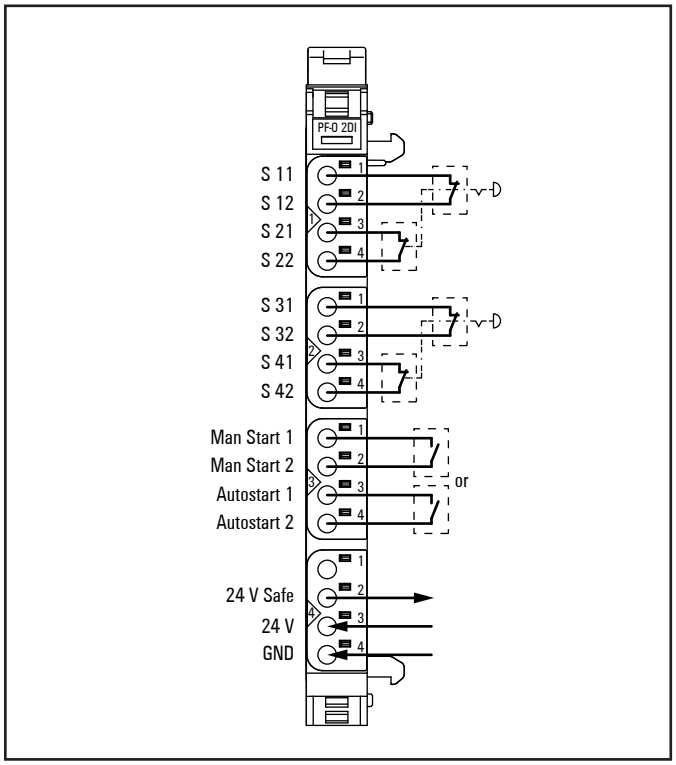
Diagnostic data UR20-PF-O-1DI-SIL

Name	Byte	Bit	Description	Default
Autostart	13	0 ... 7	Reserved	0
Man Start	14	0 ... 7	Reserved	0
Safety input 0 Value	15	0	Input Discrepancy Error	
		1 ... 7	Reserved	0
Error at channel 5	16	0 ... 7	Reserved	0
SS1 Output	17	0 ... 7	Reserved	0
24 V Safe Output	18	0	24 V Safe switch test failure	0
		1	24 V Safe voltage too high	
		2	24 V Safe voltage too low	
		3	24 V Safe overload	
		4 ... 7	Reserved	0
24 V Safe Input	19	0 ... 7	Reserved	0
Error at channel 9 to Error at channel 31	20 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		Time stamp [µs] (32 bits)	

5.10 Safe power-feed module UR20-PF-O-2DI-SIL



Safe power-feed module UR20-PF-O-2DI-SIL (Order No. 1335050000)



Connection diagram UR20-PF-O-2DI-SIL

The power-feed module UR20-PF-O-2DI-SIL enables the safe feed-in for the output current path. This can be used to monitor two two-channel emergency stop command devices. With the 24 V Safe output, the current status of the output current path can be forwarded to a PLC, to a switching device (e.g. a relay) or also cascaded to a further u-remote station. Almost all types of output modules will be safely switched-off (SIL 3/PIe/Cat. 4) when they are placed within the safety segment (see survey of switchable modules in section 4.3).
Each time the supply voltage of the module has been switched on the module has to be initialised manually by giving a pulse of 0.1 to 2 seconds to the “Man Start” input. As long as the supply voltage of the module has not been interrupted the 24 V Safe output path will be reactivated automatically when the “Autostart” input is used. In case the “Man Start” input is used there is a pulse needed for the reactivation.
The evaluation of test pulses in the safety circuits provides the detection of faults or manipulations of the wiring. Therefore every second a low pulse of 1 ms is being generated in each circuit, these pulses are phase-shifted.
The connections Safety Input 0 (S 11, S 21), Safety Input 1 (S 31, S 41), Man Start 1 and Autostart 1 are digital inputs Type 3 according to EN 61131-2. The Man Start 1 input can also be controlled by a standard PLC output.

The auxiliary outputs S 12, S 22, S 32, S 42, Man Start 2 and Autostart 2 must only be used for refeeding the allocated inputs.
The maximum feed-in current in the output current path is 8 A.

ATTENTION

Risk of material damage!
In the case of a maximum power supply of 8 A and a maximum temperature of +60 °C, all wired contacts on the fourth connector must be connected with 1.5 mm² wiring!

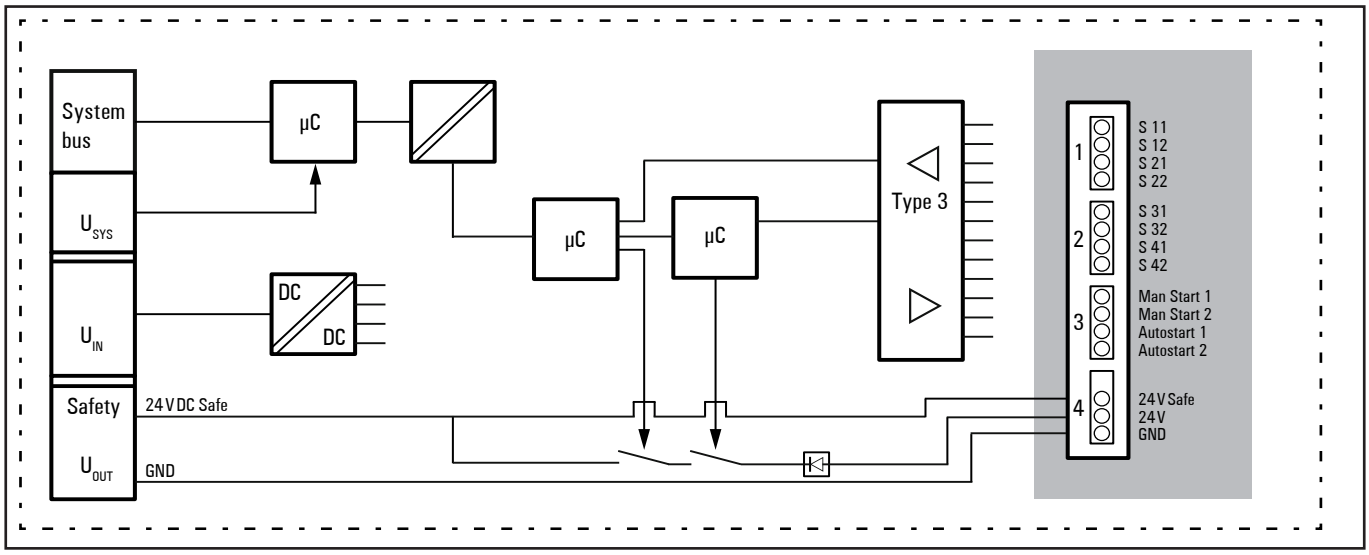
	Module status LED Green: Communication on system bus
1.1	Yellow: Safety circuit 0 OK
2.1	Yellow: Safety circuit 1 OK
4.2	Yellow: 24 V Safe output active
4.3	Green: Feed-in voltage in valid range

LED indicators UR20-PF-O-2DI-SIL, error messages see Chapter 8

Starting up a safe power-feed module

Please proceed as follows to start-up a UR20-PF-O-2DI-SIL module:

- ► Connect the 24 V DC voltage supply to 4.3 and 4.4 of the module.
- ► Connect the provided safety device to S11 to S42 and release the device (unlock).
- ► Switch on the u-remote station.
- ► Operate the manual start.
- ► Operate the manual start once more for each cascaded UR20-PF-O-X-SIL-Modul.



Block diagram UR20-PF-O-2DI-SIL (see also sample design in chapter 4.1)

Technical data UR20-PF-O-2DI-SIL (Order No. 1335050000)

System data	
Data	Process and diagnostic data depend on the coupler used, see section 5.2
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)	
Achievable safety level	PLe und Categorie 4
Diagnostic Coverage (DC)	96,64%
$MTTF_D$ (Mean Time To Failure dangerous)	> 100 Years
Safety-related data as per EN 62061 (Regard the entire safety chain!)	
Achievable safety level	SILCL 3
PFH (Probability of Failure per hour in 1/h)	$1{,}35*10^{-9}$
SFF (Safe Failure Fraction)	98,58 %
Fault reaction time	10 s
HFT (Hardware Failure Tolerance)	1
Presumed lifecycle time	20 Years
Safety-related data as per EN 61508 (Regard the entire safety chain!)	
Achievable safety level	SIL 3
PFH (Probability of Failure per hour in 1/h)	$6{,}27*10^{-9}$
SFF (Safe Failure Fraction)	98,58 %
Prooftest intervall	No prooftest needed within the life cycle.
Classification acc. to EN 61508-2	Type B
Inputs	
Safety inputs	2 x dual channel
Input Type	Type 3 as per IEC 61131-2
Inputs for start function	2 (manual start and autostart)
Input Type	Type 3 as per IEC 61131-2
Outputs	
Safety output (24 V Safe)	1
Output current	8 A
Breaking energy	150 mJ per channel
Overload protection	Excess temperature proof and overload-proof, short circuit proof with external fuse (see below)
Response time for turn-off	< 20 ms
Response time for activating the output	< 2 s
Auxiliary outputs	3 x 2 (S12, S22, S32, S42, Man Start 2, Autostart 2)
Output current	Max. 10 mA (only to support the inputs dedicated inputs)

Technical data UR20-PF-O-2DI-SIL (Order No. 1335050000)

Diagnosis	
Module diagnosis	yes
Individual channel diagnosis	yes
Supply	
Supply voltage	24 V DC +20 %/-15 %
External pre-fusing	Mandatory: super fast, max. 8 A
Reverse battery protection	yes
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	45 mA
General data	
Weight (operational status)	82 g
Additional general data, see Section 5.1.	

Process data UR20-PF-O-2DI-SIL

Byte	Bit definition	Description	Status	Conncection
0	0	Safety input 0	0 - inactive, 1 - active	S 11 ... S 22
	1	Safety input 1	0 - inactive, 1 - active	S 31 ... S 42
	2	Automatic start	0 - inactive, 1 - active	Autostart 1/2
	3	Manual start	0 - inactive, 1 - active	Man Start 1/2
	4	Safety input 0, channel 1	0 - inactive, 1 - active	S 11/S 12
	5	Safety input 0, channel 2	0 - inactive, 1 - active	S 21/S 22
	6	Safety input 1, channel 1	0 - inactive, 1 - active	S 31/S 32
	7	Safety input 1, channel 2	0 - inactive, 1 - active	S 41/S 42
1	0	24 V Safe output	0 - inactive, 1 - active	24 V Safe
	1	Reserved		
	2	24 V DC feed-in	0 - no feed-in, 1 - power feed-in pending	24 V
	3 ... 7	Reserved		
2	0–7	Reserved		
3	0–7	Reserved		

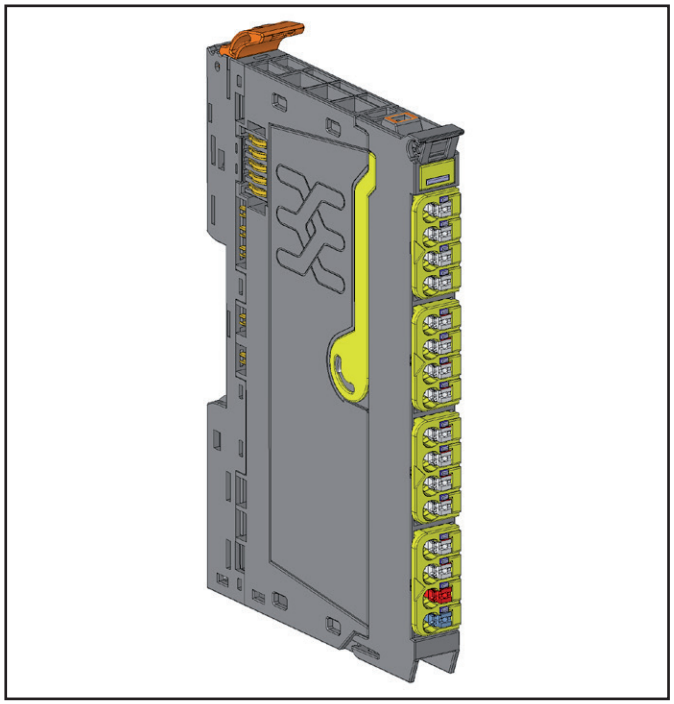
Diagnostic data UR20-PF-O-2DI-SIL

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	0	
Module Type	1	0	Module Type	0x03
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0	Failure code (see attachment)	
Error byte 3	3	0	Temperature Error	
		1	Internal Error (self-test, LDO, etc)	
		2	Fuse error	0
		3	Reserved	0
		4	Communication fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel Type	4	0 … 6	Channel Type	0x78
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bits per channel	4
Number of channels	6		Number of similar channels per module	9
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4	Error at channel 4	
		5	Error at channel 5	
		6	Error at channel 6	
		7	Error at channel 7	
Channel error	8	8	Error at channel 8	
		9 … 15	Reserved	0
Channel error	9	16 … 23	Reserved	0
Channel error	10	24 … 31	Reserved	0
Safety input 0	11	0	Input Discrepancy Error	
		1	Input Pulse Error	
		2	Input Test Error	
		3 … 7	Reserved	0

Diagnostic data UR20-PF-O-2DI-SIL

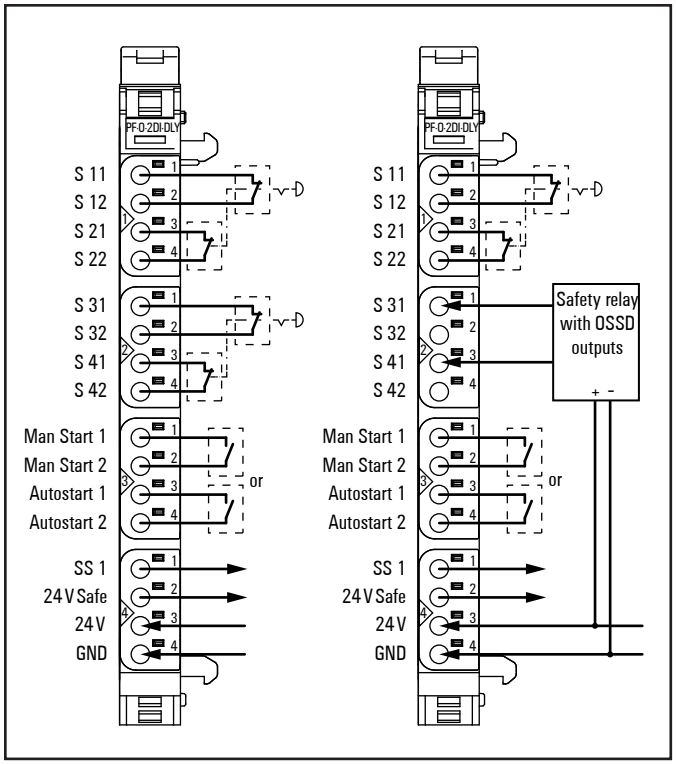
Name	Byte	Bit	Description	Default
Safety input 1	12	0	Input Discrepancy Error	
		1	Input Pulse Error	
		2	Input Test Error	
		3 … 7	Reserved	0
Autostart	13	0 … 7	Reserved	0
Man Start	14	0 … 7	Reserved	0
Safety input 0 Value	15	0	Input Discrepancy Error	
		1 … 7	Reserved	0
Safety input 1 Value	16	0	Input Discrepancy Error	
		1 … 7	Reserved	0
SS1 Output	17	0 … 7	Reserved	0
24 V Safe Output	18	0	24 V Safe switch test failure	0
		1	24 V Safe voltage too high	
		2	24 V Safe voltage too low	
		3	24 V Safe overload	
		4 … 7	Reserved	0
24 V DC	19	0 … 7	Reserved	0
Error at channel 9 to Error at channel 31	20 … 42	0 … 7	Reserved	0
Time stamp	43 … 46		Time stamp [µs] (32 bits)	

5.11 Safe power-feed module UR20-PF-O-2DI-DELAY-SIL



Safe power-feed module UR20-PF-O-2DI-DELAY-SIL (Order No. 1335040000)

The power-feed module UR20-PF-O-2DI-DELAY-SIL enables the safe feed-in for the output current path. This can be used to monitor two two-channel emergency stop command devices. A switch-off delay of the 24 V Safe output and the output current path can be set using the DIP switches on the module.
With the 24 V Safe output, the current status of the output current path can be forwarded to a PLC, to a switching device (e.g. a relay) or also cascaded to a further u-remote station. Almost all types of output modules will be safely switched-off (SIL 3/PIe/Cat. 4) when they are placed within the safety segment (see survey of switchable modules in section 4.3). Apart from this, the standard signal output SS1 always switches off without delay. The SS1 output can be used to forward an emergency stop request to a PLC or a drive control, e.g. to trigger the controlled stopping of a motor within the switch-off delay.
Each time the supply voltage of the module has been switched on the module has to be initialised manually by giving a pulse of 0.1 to 2 seconds to the “Man Start” input. As long as the supply voltage of the module has not been interrupted the 24 V Safe output path will be reactivated automatically when the “Autostart” input is used. In case the “Man Start” input is used there is a pulse needed for the reactivation.
The evaluation of test pulses in the safety circuits provides the detection of faults or manipulations of the wiring. Therefore every second a low pulse of 1 ms is being generated in each circuit, these pulses are phase-shifted. The evaluation of the test pulses can be activated or deactivated by setting DIP-switches.



Connection diagram UR20-PF-O-2DI-DELAY-SIL

Safety sensors with OSSD outputs or standard PLC outputs can be connected if the safety inputs are used in mode “no test pulses”. In this case another safety review is obligatory. The auxiliary outputs S 12, S 22, S 32, S 42, Man Start 2 and Autostart 2 must only be used for refeeding the allocated inputs.
The connections Safety Input 0 (S 11, S 21), Safety Input 1 (S 31, S 41), Man Start 1 and Autostart 1 are digital inputs Type 3 according to EN 61131-2. The Man Start 1 input can also be controlled by a standard PLC output.
In the case that several UR20-PF-O-xDI-SIL modules are used in cascades please regard that the triggering of a UR20-PF-O-xDI-SIL module will switch off the power supply of all subsequent power-feed modules. A delay of these modules is no longer effective.
The maximum feed-in current in the output current path is 8 A.

ATTENTION

Risk of material damage!
In the case of a maximum power supply of 8 A and a maximum temperature of +60 °C, all wired contacts on the fourth connector must be connected with 1.5 mm² wiring!

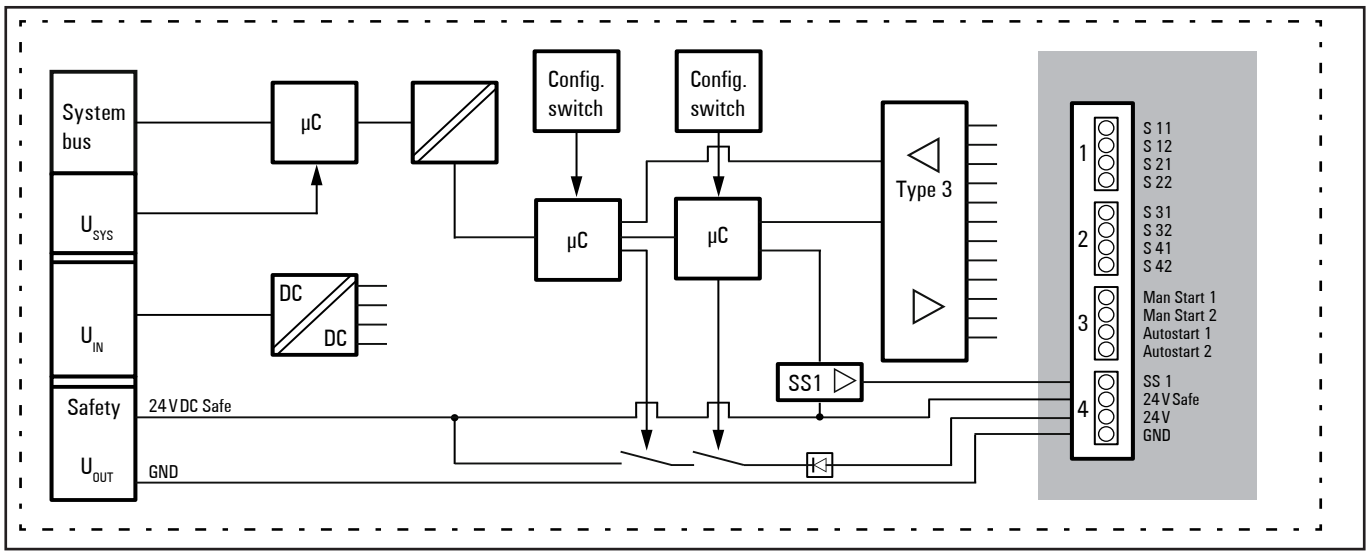
	Module status LED Green: Communication on system bus
1.1	Yellow: Safety circuit 0 OK
2.1	Yellow: Safety circuit 1 OK
4.1	Yellow: SS1 output active
4.2	Yellow: 24 V Safe output active
4.3	Green: Feed-in voltage in valid range

LED indicators UR20-PF-O-2DI-DELAY-SIL, error messages see Chapter 8

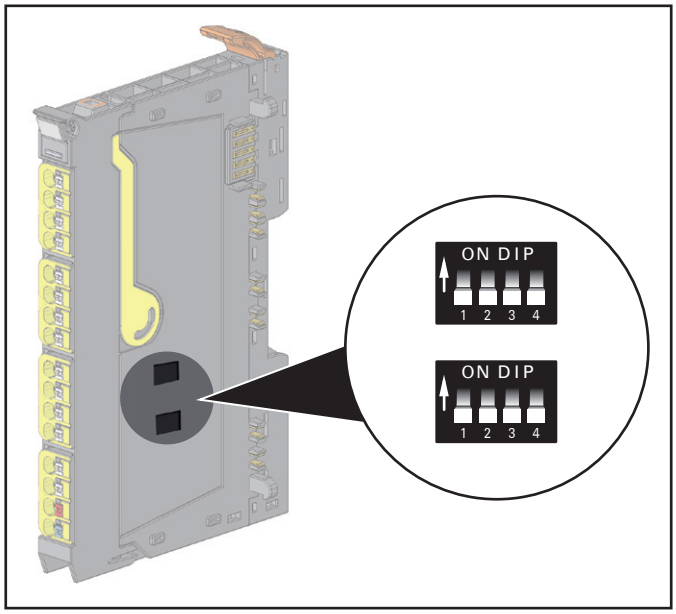
Starting up a safe power-feed module

Please proceed as follows to start-up a UR20-PF-O-2DI-DELAY-SIL module:

- ► Connect the 24 V DC voltage supply to 4.3 and 4.4 of the module.
- ► Connect the provided safety device to S11 to S42 and release the device (unlock).
- ► Switch on the u-remote station.
- ► Operate the manual start.
- ► Operate the manual start once more for each cascaded UR20-PF-O-X-SIL-Modul.



Block diagram UR20-PF-O-2DI-DELAY-SIL (see also sample design in chapter 4.1)



DIP switch on the UR20-PF-O-2DI-DELAY-SIL

ATTENTION

To ensure the safety functions regard the following instructions for adjustment:

- DIP switches of equal numbers must have identical positions in both rows.
- If an external device generating pulses is connected to a safety input of the UR20-PF-O-2DI-DELAY-SIL, this input must be operated in mode “no test pulses” (DIP switch setting “ON”).

- When operating in mode “no test pulses”:
  - The test pulses of the external device must be shorter than 2 ms, otherwise the safe output will be deactivated.
  - A safe laying of cables can be neccessary depending on the required safety level.

Input		Delay		Function
1	2	3	4	
▮	X	X	X	Safety input 0 evaluating own test pulses
▯	X	X	X	Safety input 0 no test pulses
X	▮	X	X	Safety input 1 evaluating own test pulses
X	▯	X	X	Safety input 1 no test pulses
X	X	▮	▮	24 V Safe: no delay
X	X	▯	▮	24 V Safe: delay 1 second
X	X	▮	▯	24 V Safe: delay 30 seconds
X	X	▯	▯	24 V Safe: delay 60 seconds

Setting options for the DIP switch

▮ = ON

▯ = OFF

X = setting not relevant

► Please use e.g. a ball pen to set the DIP switches and avoid spiky or sharp-edged tools.

Technical data UR20-PF-O-2DI-DELAY-SIL Order No. 1335040000)

System data	
Data	Process and diagnostic data depend on the coupler used, see section 5.2
Interface	u-remote system bus
System bus transfer rate	48 Mbps
Safety-related data as per EN ISO 13849 (Regard the entire safety chain!)	
Achievable safety level	PLe und Categorie 4
Diagnostic Coverage (DC)	96,64 %
$MTTF_D$ (Mean Time To Failure dangerous)	> 100 Years
Safety-related data as per EN 62061 (Regard the entire safety chain!)	
Achievable safety level	SILCL 3
PFH (Probability of Failure per hour in 1/h)	$1{,}35*10^{-9}$
SFF (Safe Failure Fraction)	98,58 %
Fault reaction time	10 s
HFT (Hardware Failure Tolerance)	1
Presumed lifecycle time	20 Years
Safety-related data as per EN 61508 (Regard the entire safety chain!)	
Achievable safety level	SIL 3
PFH (Probability of Failure per hour in 1/h)	$6{,}27*10^{-9}$
SFF (Safe Failure Fraction)	98,58 %
Prooftest intervall	No prooftest needed within the life cycle.
Classification acc. to EN 61508-2	Type B
Inputs	
Safety inputs	2 x dual channel
Input Type	Type 3 as per IEC 61131-2
Inputs for start function	2 (manual start and autostart)
Input Type	Type 3 as per IEC 61131-2
Outputs	
Safety output (24 V Safe)	1
Output current	8 A
Breaking energy	150 mJ per channel
Overload protection	Excess temperature proof and overload-proof, short circuit proof with external fuse (see below)
Response time for turn-off	< 20 ms
Response time for activating the output	< 2 s
Standard signal output SS1	1
Output current	0.5 A, overload behaviour as per IEC 61131-2
Overload protection	Excess temperature proof and overload-proof, short circuit proof with external fuse (see below)

Technical data UR20-PF-O-2DI-DELAY-SIL Order No. 1335040000)

Auxiliary outputs	3 x 2 (S12, S22, S32, S42, Man Start 2, Autostart 2)
Output current	Max. 10 mA (only to support the inputs dedicated inputs)
Diagnosis	
Module diagnosis	yes
Individual channel diagnosis	yes
Supply	
Supply voltage	24 V DC +20 %/-15 %
External pre-fusing	Mandatory: super fast, max. 8 A
Reverse battery protection	yes
Current consumption from system current path I_{SYS}	8 mA
Current consumption from input current path I_{IN}	45 mA
General data	
Weight (operational status)	84 g
Additional general data, see Section 5.1	

Prozess data UR20-PF-O-2DI-DELAY-SIL

Byte	Bit	Description	Status	Connection
0	0	Safety Input 0	0 - inactive, 1 - active	S 11 ... S 22
	1	Safety Input 1	0 - inactive, 1 - active	S 31 ... S 42
	2	Automatic start	0 - inactive, 1 - active	Autostart 1/2
	3	Manual start	0 - inactive, 1 - active	Man Start 1/2
	4	Safety Input 0, Channel 1	0 - inactive, 1 - active	S 11/S 12
	5	Safety Input 0, Channel 2	0 - inactive, 1 - active	S 21/S 22
	6	Safety Input 1, Channel 1	0 - inactive, 1 - active	S 31/S 32
	7	Safety Input 1, Channel 2	0 - inactive, 1 - active	S 41/S 42
1	0	24 V Safe output	0 - inactive, 1 - active	24 V Safe
	1	SS1 output	0 - inactive, 1 - active	SS 1
	2	24 V feed-in	0 - no feed-in, 1 - power feed-in pending	24 V
	3 ... 7	reserved		
2	0 ... 7	reserved		
3	0	DIP-Switch configuration	Safety input 0: 0 - Pulse,1 - No Pulse	
	1	DIP-Switch configuration	Safety input 1: 0 - Pulse,1 - No Pulse	
	2	DIP-Switch configuration	24 V Safe output: 00 - No delay, 01 - Delay 1 s, 10 - Delay 30 s, 11 - Delay 60 s	
	3			
	4 ... 7	reserved		

Diagnostic data UR20-PF-O-2DI-DELAY-SIL

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	0	
Module Type	1	0	Module Type	0x03
		1		
		2		
		3		
		4	Channel information available	1
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Error byte 2	2	0	Failure code (see attachment)	0
Error byte 3	3	0	Temperature Error	
		1	Internal Error	
		2	Fuse Error	0
		3	Reserved	0
		4	Communication fault	
		5	Reserved	0
		6	Reserved	0
		7	Reserved	0
Channel Type	4	0 ... 6	Channel Type	0x78
		7	Reserved	0
Diagnostic bits per channel	5		Number of diagnostic bits per channel	4
Number of channels	6		Number of similar channels per module	12
Channel error	7	0	Error at channel 0	
		1	Error at channel 1	
		2	Error at channel 2	
		3	Error at channel 3	
		4	Error at channel 4	
		5	Error at channel 5	
		6	Error at channel 6	
		7	Error at channel 7	
Channel error	8	8	Error at channel 8	
		9	Error at channel 9	
		10	Error at channel 10	
		11	Error at channel 11	
		12 ...15	Reserved	0
Channel error	9	16 ... 23	Reserved	0
Channel error	10	24 ... 31	Reserved	0

Diagnostic data UR20-PF-O-2DI-DELAY-SIL

Name	Byte	Bit	Description	Default
Safety input 0	11	0	Input Discrepancy Error	
		1	Input Pulse Error	
		2	Input Test Error	
		3 ... 7	Reserved	0
Safety input 1	12	0	Input Discrepancy Error	
		1	Input Pulse Error	
		2	Input Test Error	
		3 ... 7	Reserved	0
Autostart	13	0 ... 7	Reserved	0
Man Start	14	0 ... 7	Reserved	0
Safety input 0 Value	15	0	Input Discrepancy Error	
		1 ... 7	Reserved	0
Safety input 1 Value	16	0	Input Discrepancy Error	
		1 ... 7	Reserved	0
SS1 Output	17	0 ... 7	Reserved	0
24 V Safe Output	18	0	24 V Safe switch test failure	0
		1	24 V Safe voltage too high	
		2	24 V Safe voltage too low	
		3	24 V Safe overload	
		4 ... 7	Reserved	0
24 V DC	19	0 ... 7	Reserved	0
Error at channel 9	20	0 ... 7	Reserved	0
Error at channel 10	21	0 ... 7	Reserved	0
Config Switch	22	0	DIP switch configuration	0
		1 ... 7	Reserved	0
Error at channel 12 to Error at channel 31	23 ... 42	0 ... 7	Reserved	0
Time stamp	43 ... 46		Time stamp [µs] (32 bits)	

6 Installation and replacement

WARNING

Explosion risk!

- ► Before assembly or replacement, 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!

- ► 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 sufficiently earthed!

► Carry out all work during the installation and removal as well as replacement of components as described in the u-remote manual.

When using modules for functional safety (safe I/O modules or safe power-feed modules), please observe the following additional notes:

- The modules may only be installed in lockable switch cabinets which meet protection class IP54.
- Please use wire-end ferrules in combination with flexible/multi-conductor cables.
- Ensure that external short circuits due to the cabling cannot occur for safety inputs in the configuration without test pulses (see DIN EN ISO 13849-2 Table D.4).

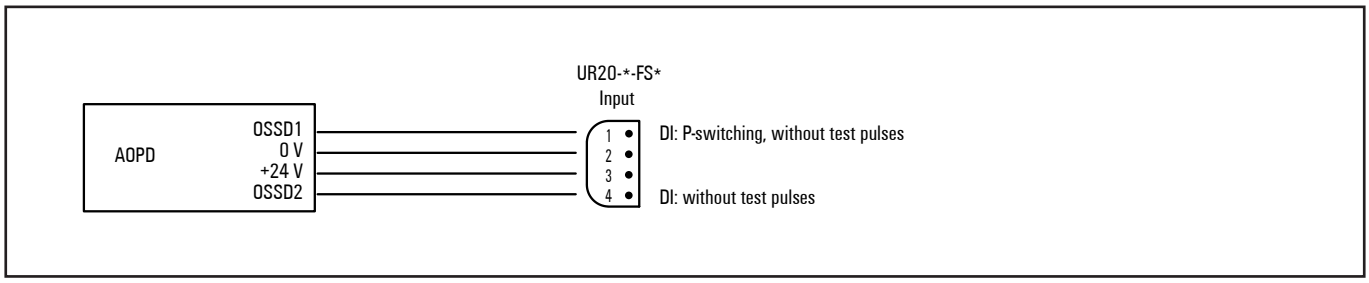
Once an electronic unit is removed from a safe power-feed module, the inputs and outputs of the subsequent modules are no longer supplied with power. This is equivalent to triggering the connected safety equipment!

7 Example applications

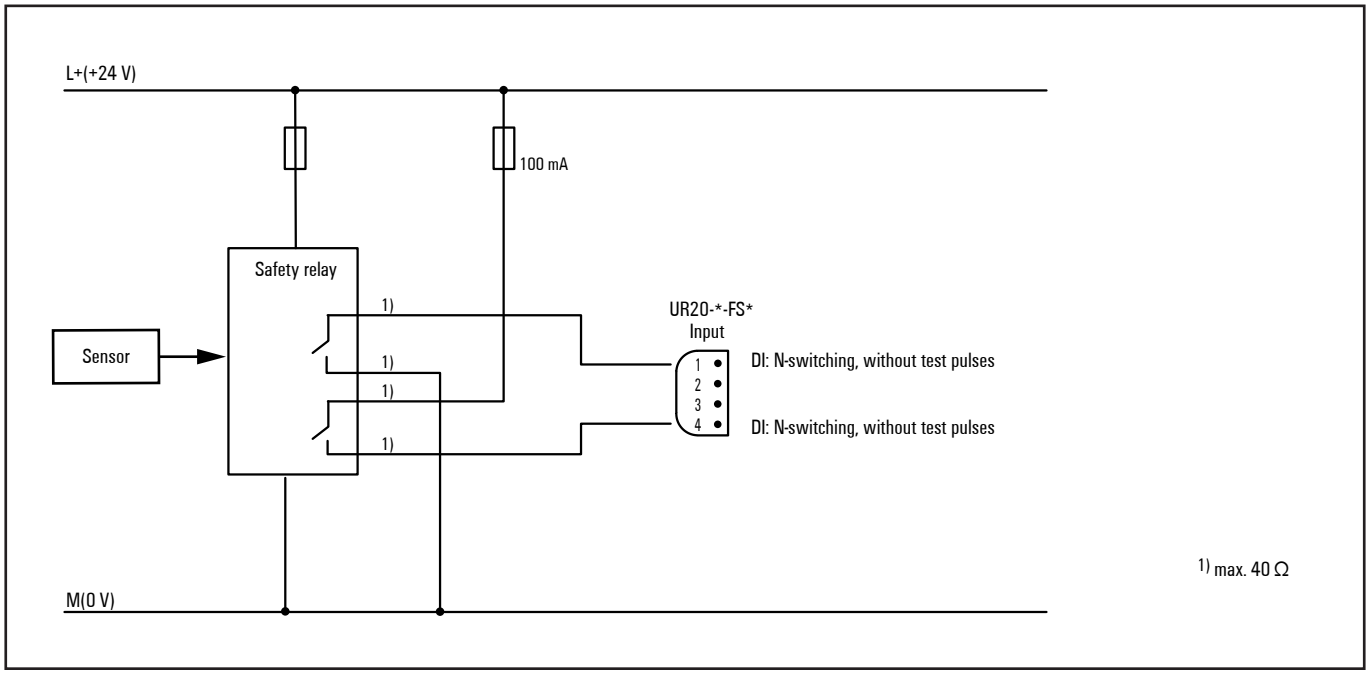
In section 7.1 you will find example applications for safe I/O modules, the sections 7.2 to 7.12 show example applications of safe power-feed modules.

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

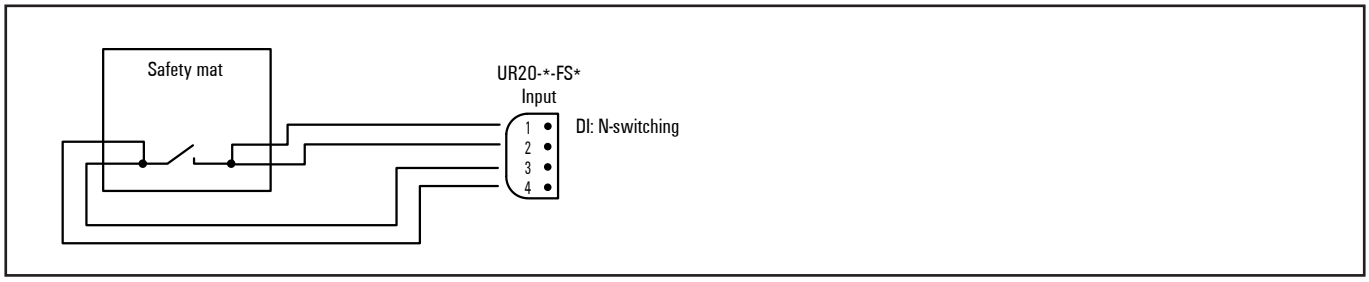
7.1 Example applications for safe I/O modules



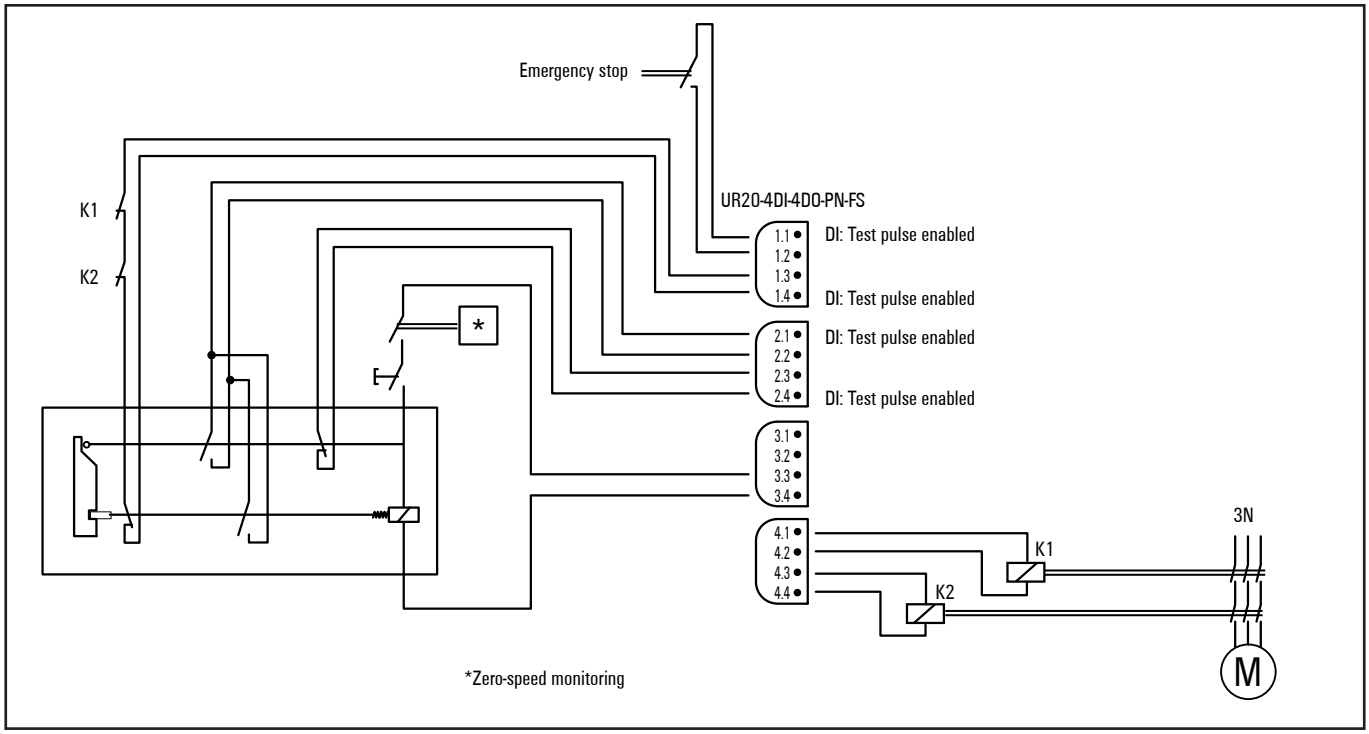
Example application with active optoelectronic protective device (AOPD)



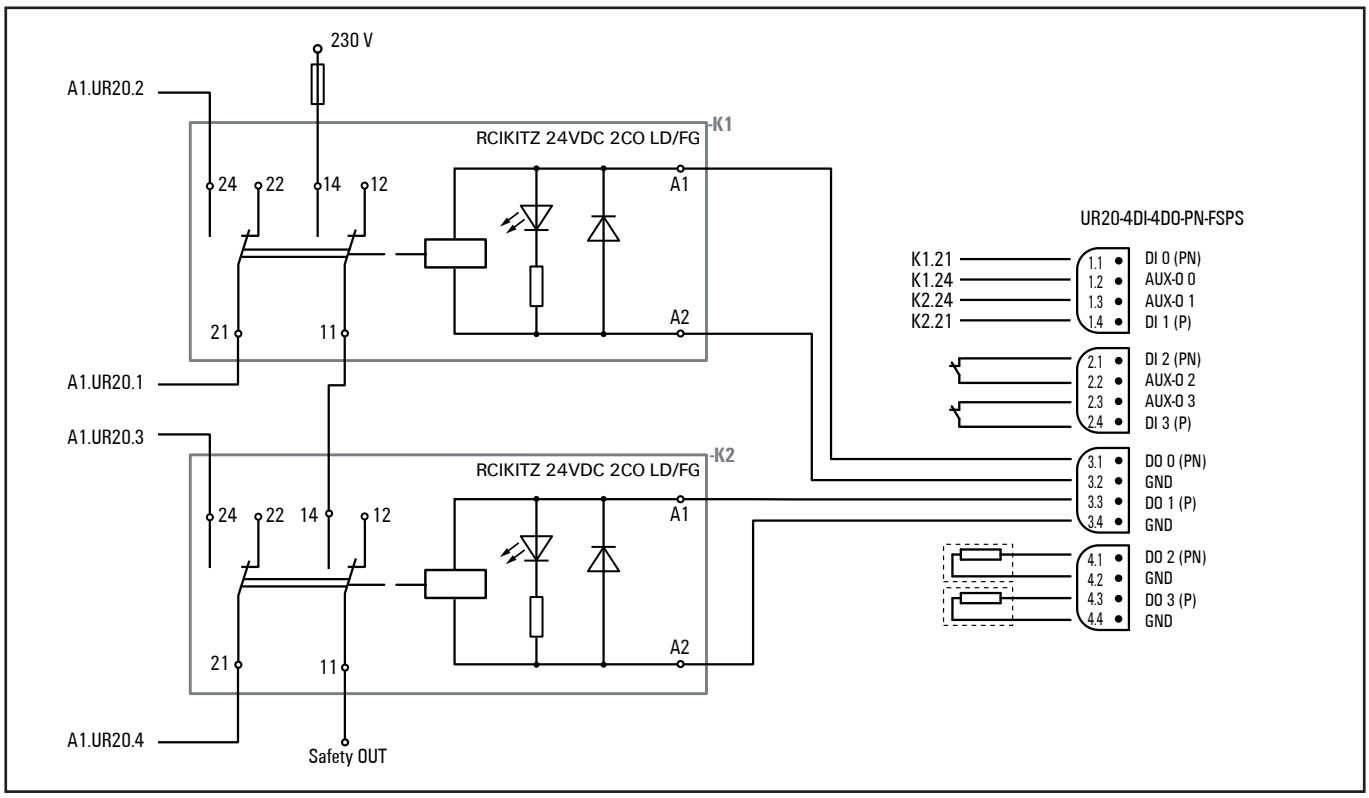
Example application cross-circuiting detection without test pulses



Example application with safety mat



Example application safety door with guard control and zero-speed monitoring



Example application with two relay couplers RCIKITZ 24VDC 2CO LD/FG (Order No. 1218390000)

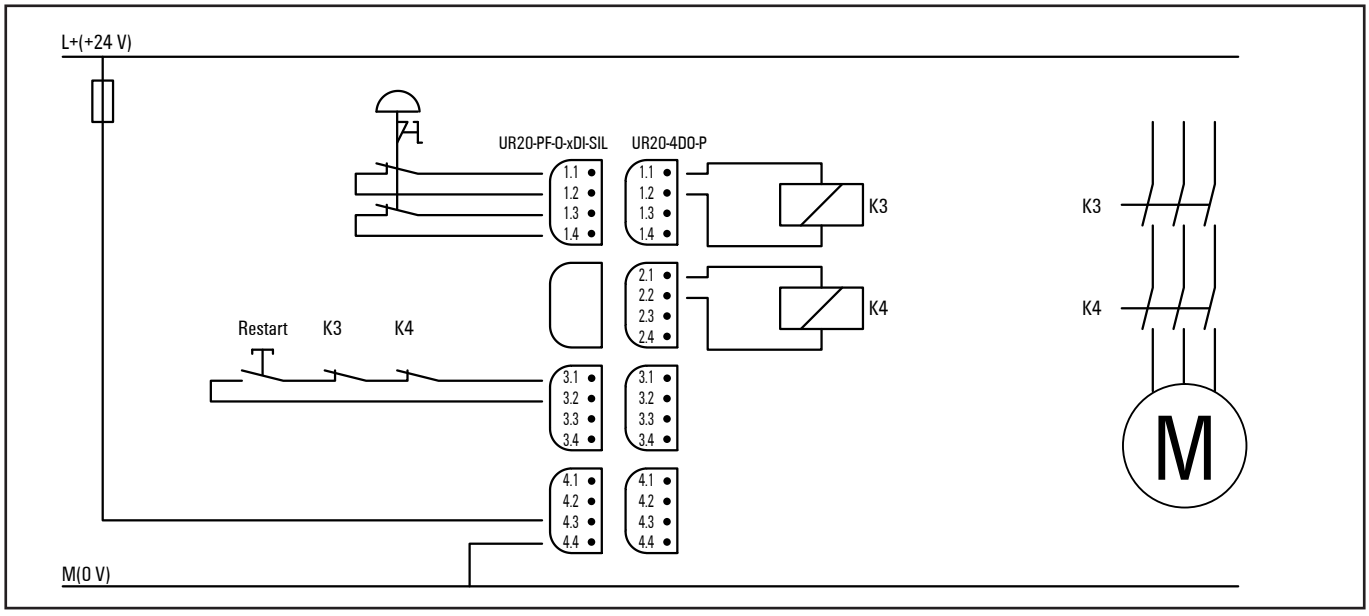
7.2 Dual-channel emergency stop monitoring

Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Manual reset – Monitoring of external contactors (EDM)	
Safety sensor / operating mechanism	Emergency stop button	
Notes	Autostart is possible if the NC circuits from K3 and K4 are attached to 3.3 and 3.4.	

When the emergency stop button is pushed, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1)] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or a cross-circuit in its supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
The UR20-PF-O-xDI-SIL switches on the 24 V supply for the modules[1)] within the safety segment if:
– the emergency stop button is unlocked
– and the feedback circuit (NC contacts of K3 and K4) is closed
– and the start push button has been pushed and released again.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply.

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.



Example application for dual-channel emergency stop monitoring

[1)] Switchable modules see section 4.3

7.3 Dual-channel light curtain monitoring (AOPD type 4) and emergency stop monitoring

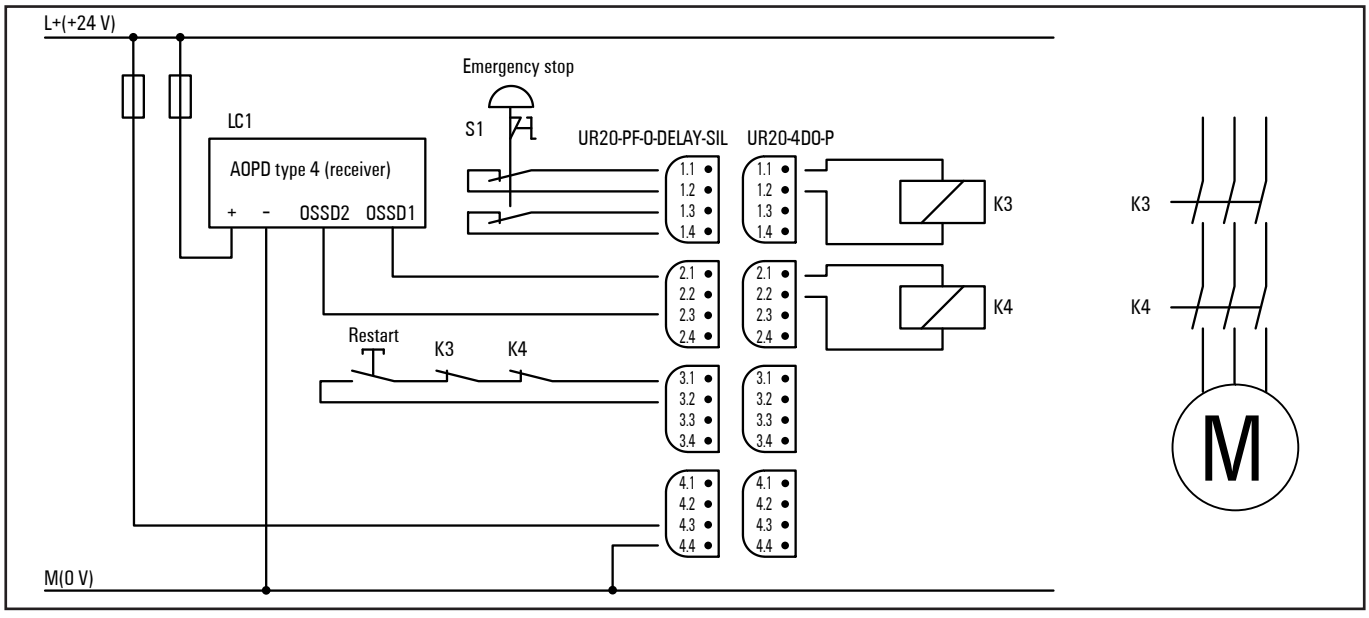
Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Start button – Monitoring of external contactors (EDM) – Self-test of the OSSD in the AOPD	
Safety sensor/operating mechanism	– Emergency stop button – AOPD type 4 (2 semiconductor outputs, P-switching)	
Notes	Autostart is possible if the NC circuits from K3 and K4 are attached to 3.3 and 3.4.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed or the active optoelectronic protective device (AOPD) reacts, the UR20-PF-O-2DI-DELAY-SIL switches off the 24 V supply for the modules[1)] within the safety segment and thus also for contactors K3 and K4. The failure of a switching element in the emergency stop button or the AOPD as well as a cross-circuit in their supply lines does not result in the failure of the corresponding safety device and is detected within the fault-reaction time. For this purpose, the AOPD must generate a test pulse on its safety outputs at least once per second.
When using a UR20-PF-O-2DI-DELAY-SIL: If the DIP switch which is assigned to the corresponding safety circuit is switched on (in the example DIP switch 2 for LC1) so that an AOPD generating own test pulses can be connected, it might be necessary to have a shielded cable installation and cross-circuit fault detection via the AOPD, depending on the required safety level.
The UR20-PF-O-2DI-DELAY-SIL switches on the 24 V supply for the modules[1)] within the safety segment if:

- the emergency stop button is unlocked
- and the active optoelectronic protective device (AOPD) is free
- and the feedback circuit (NC contacts of K3 and K4) is closed
- and the start push button has been pushed and released again.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-2DI-DELAY-SIL has switched on the 24 V supply.



Example application for dual-channel light curtain monitoring (AOPD type 4) and emergency stop monitoring

[1)] Switchable modules see section 4.3

7.4 Dual-channel emergency stop and cable-pull switch monitoring

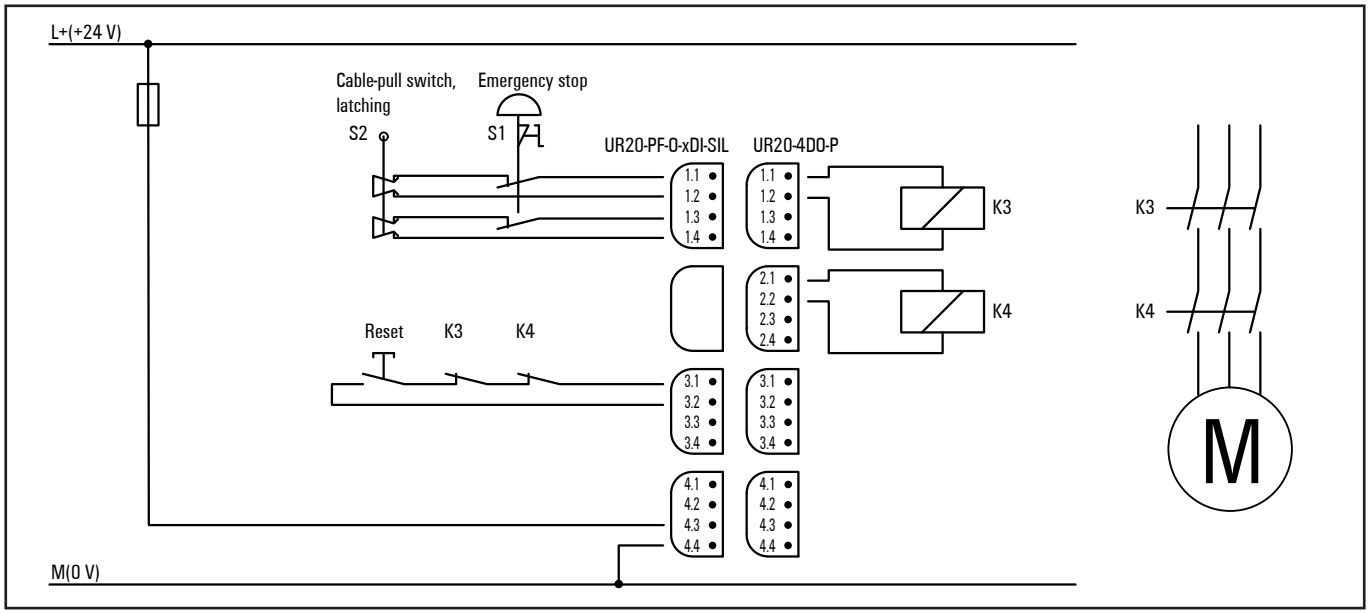
Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Start button – Monitoring of external contactors (EDM)	
Safety sensor / operating mechanism	– Emergency stop button – Cable-pull switch, latching	
Notes	– Manual reset – Autostart is possible if the NC circuits from K3 and K4 are connected to 3.3 and 3.4.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed or the cable-pull switch is activated, the UR20-PF-O-2DI-DELAY-SIL switches off the 24 V supply for the modules[1)] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or the cable-pull switch as well as a cross-circuit in their supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time. The UR20-PF-O-2DI-DELAY-SIL module switches on the 24 V supply for the modules[1)] within the safety segment if

- the emergency stop button is unlocked
- and the cable-pull switch is unlocked
- and the feedback circuit (NC contacts of K3 and K4) is closed
- and the start push button has been pushed and released again.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-2DI-DELAY-SIL has switched on the 24 V supply.



Example application for dual-channel emergency stop and cable-pull switch monitoring

[1)] Switchable modules see section 4.3

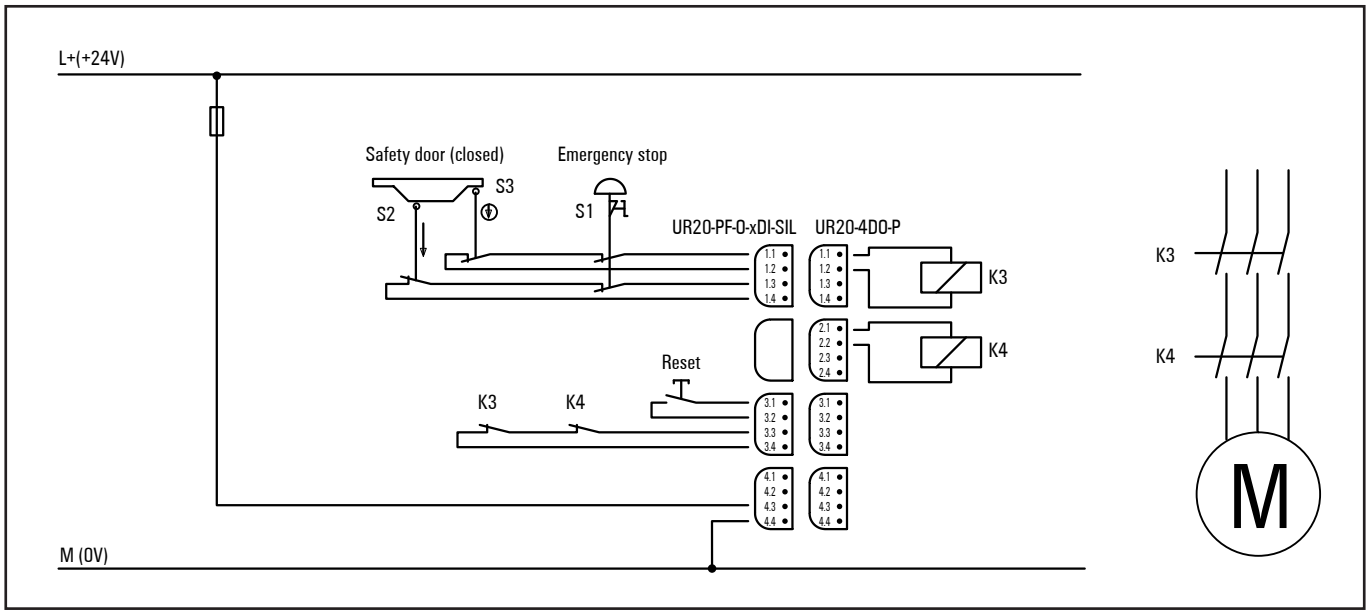
7.5 Dual-channel safety door monitoring with automatic reset and emergency stop

Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Automatic reset – Monitoring of external contactors (EDM)	
Safety sensor / operating mechanism	– Emergency stop button – Position switch	
Notes	The application must be compatible with the automatic start-up function.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed or the safety door is opened, the UR20-PF-O-2DI-DELAY-SIL switches off the 24 V supply for the modules[1] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or the safety door contacts as well as a cross-circuit in their supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
The UR20-PF-O-2DI-DELAY-SIL switches on the 24 V supply for the following modules[1] within the safety segment if:
– the emergency stop button is unlocked
– and the safety door is closed
– and the feedback circuit (NC contacts of K3 and K4) is closed.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-2DI-DELAY-SIL module has switched on the 24 V supply. To reset the system, press the reset button for 0.1 to 2 s after switching on the power supply, even when automatic reset is used.



Example application for dual-channel safety door monitoring with automatic reset and emergency stop

[1] Switchable modules see section 4.3

7.6 Safety mat

Achievable safety rating	Category 3	EN ISO 13849-1
	PLd	EN ISO 13849-1
	SIL 2	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Single-channel monitoring – Cross-connection detection – Wire break detection – Monitoring of external contactors (EDM)	
Safety sensor/operating mechanism	Safety mat	
Notes	– Manual reset – Observe EN 1760-1 and EN ISO 13856-1! – The same interface is also possible for pressure-sensitive buffers and pressure-sensitive strips; however check the safety ratings during use! – K5: Weidmüller RCIKIT(Z) 24 VDC 2CO LD/FG (connect the coil connection at the UR20-PF-O-2DI-DELAY-SIL to 4.1 instead of to 4.2)	

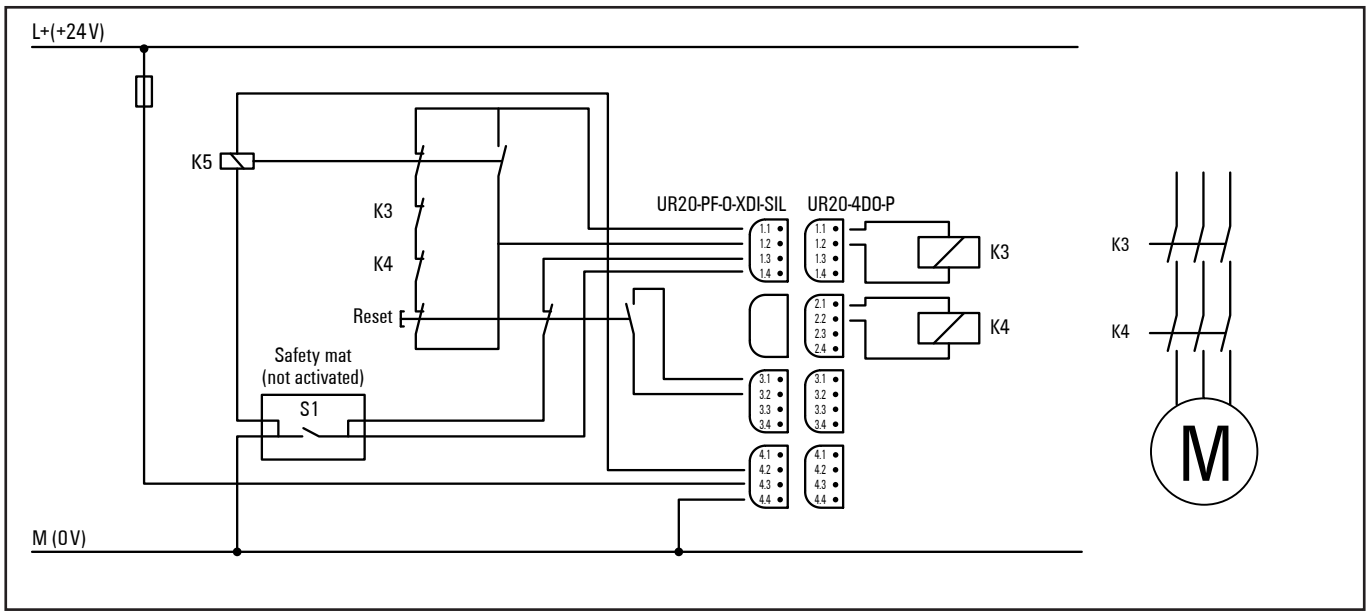
All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the safety mat is stepped on, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1] within the safety segment and thus also contactors K3 and K4. An interruption or a cross-connection in the supply lines for the safety mat do not result in the failure of the safety function and is detected within before the next starting cycle.
As an alternative to both NC contacts for the reset switch, an NO contact can be used there. One of its contacts is set at M (0 V) and the other contact is wired through a diode to connection 1.1 and through a diode to connection 1.3 (both cathodes to the switch).
The UR20-PF-O-xDI-SIL switches on the 24 V supply for modules[1] within the safety segment if

- the safety mat has not been actuated
- and the feedback circuit (NC contacts of K3 and K4) is closed
- and the start push button has been pushed and released again.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply. To reset the system, press the reset button for 0.1 to 2 s after switching on the power supply, even when automatic reset is used.

Combined with a safety mat UR20-PF-O-xDI-SIL modules attain safety rating Category 3 only.



Example application for safety mat

[1] Switchable modules see section 4.3

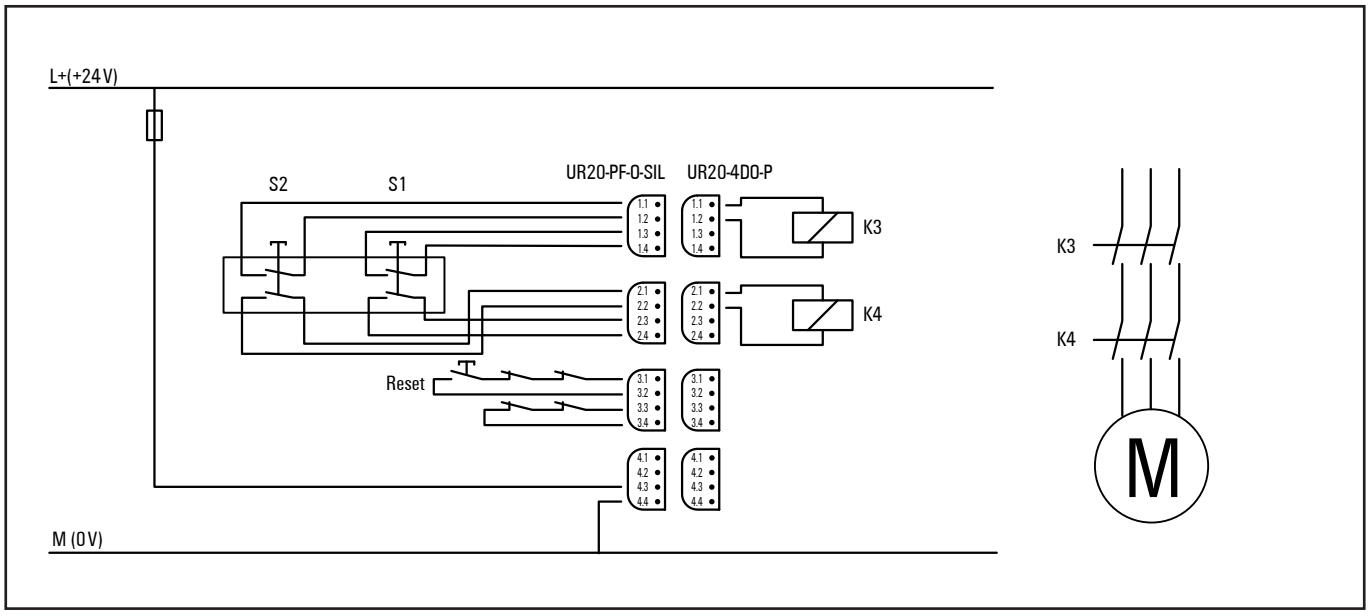
7.7 Dual-channel two-hand monitoring with automatic start

Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Automatic restart – Monitoring of external contactors (EDM)	
Safety sensor/operating mechanism	Two-hand switch	
Notes	The application must be compatible with the automatic reset function.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

If one or both switches of the two-hand switch are released, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1)] inside the safety segment and thus also for contactors K3 and K4. The failure of a switching element in the two-hand switch or a cross-circuit in its supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time. An interruption of the NC contact by S2 is detected before the next switching cycle and by S1 when the power is switched on.
The UR20-PF-O-xDI-SIL module switches on the 24 V supply for the following modules[1)] within the safety segment if
– the two-hand switch is pressed synchronously within 0.5 seconds
– and the feedback circuit (NC contacts of K3 and K4) is closed.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply. To reset the system, press the reset button for 0.1 to 2 s after switching on the power supply, even when automatic reset is used.



Example application for dual-channel two-hand monitoring with automatic start

[1)] Switchable modules see section 4.3

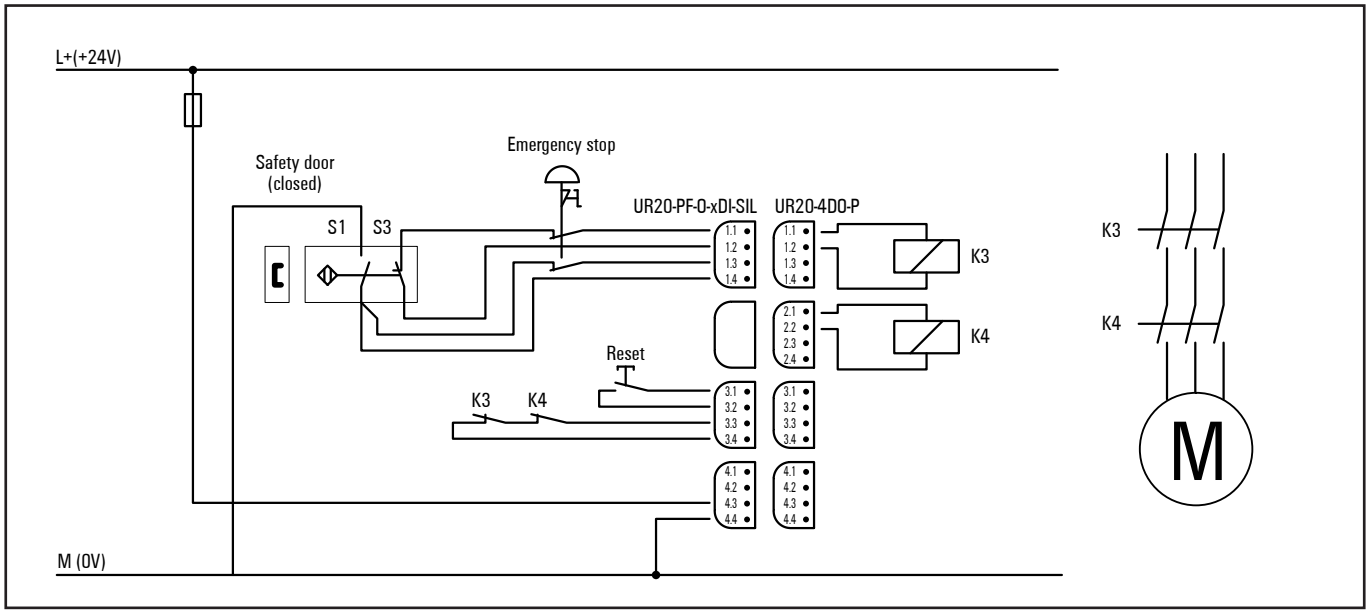
7.8 Dual-channel safety door monitoring with magnetic switch, automatic reset and emergency stop

Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring PDF-M (as per EN 60947-5-3) – Cross-connection detection – Automatic restart – Monitoring of external contactors (EDM)	
Safety sensor/operating mechanism	– Emergency stop button – Magnetic switch with coded magnet	
Notes	The application must be compatible with the automatic start-up function.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed or the safety door is opened, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or the safety door as well as a cross-circuit in their supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
The UR20-PF-O-xDI-SIL switches on the 24 V supply for the modules[1] within the safety segment if:
– the emergency stop button is unlocked
– and the safety door is closed
– and the feedback circuit (NC contacts of K3 and K4) is closed.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply. To reset the system, press the reset button for 0.1 to 2 s after switching on the power supply, even when automatic reset is used.



Example application for dual-channel safety door monitoring with magnetic switch, automatic reset and emergency stop

[1] Switchable modules see section 4.3

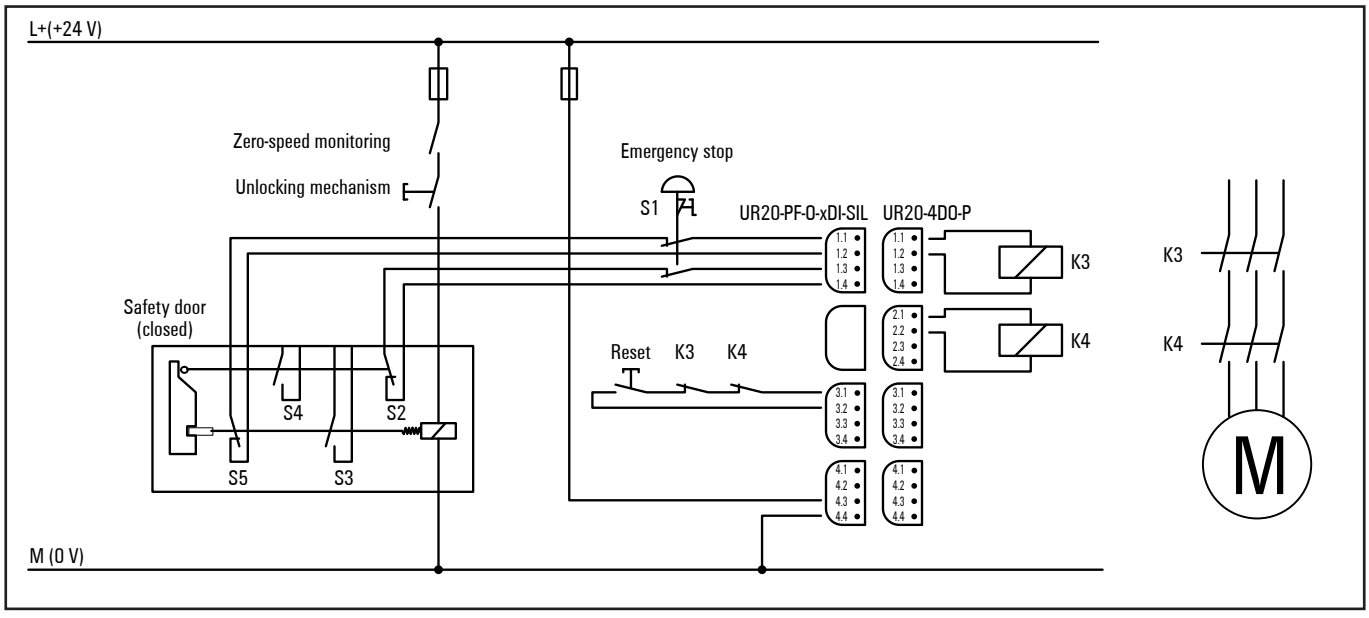
7.9 Dual-channel safety door monitoring, spring-operated interlock with manual reset and emergency stop

Achievable safety rating	Category 3	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Manual reset – Monitoring of external contactors (EDM)	
Safety sensor/operating mechanism	– Emergency stop button – Position switch with interlock – Zero-speed monitor – Manual unlocking	
Notes	Exclusion of the fault "Interruption or releasing of the activator, error in the safety interlock"	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or the safety door contact as well as a cross-circuit in their supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
A stop is performed by switching off K3 and K4 via the PLC. After the motor comes to a stop, as observed by the zero-speed monitor, the spring-operated interlock can be activated via the unlocking button and the safety door can be opened. When the power supply is turned off, the safety door cannot be opened if the locking mechanism is engaged. We recommend using switches with mechanical unlocking capabilities.
The UR20-PF-O-xDI-SIL switches on the 24 V supply for the following modules[1] within the safety segment if:
- the emergency stop button is unlocked
- and the safety door is closed
- and the locking mechanism is engaged
- and the feedback circuit (NC contacts of K3 and K4) is closed
- and the start push button has been pushed and released again.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply.



Example application for dual-channel emergency stop monitoring

[1] Switchable modules see section 4.3

7.10 Dual-channel safety door monitoring, magnetically operated interlock with manual reset and emergency stop

Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Manual reset – Monitoring of external contactors (EDM) – Off-delay via PLC	
Safety sensor/operating mechanism	– Emergency stop button – Position switch with interlock	
Notes	– Exclusion of the fault "Interruption or releasing of the activator, error in the safety interlock" – The PLC must activate the interlock directly after the safety door is closed	

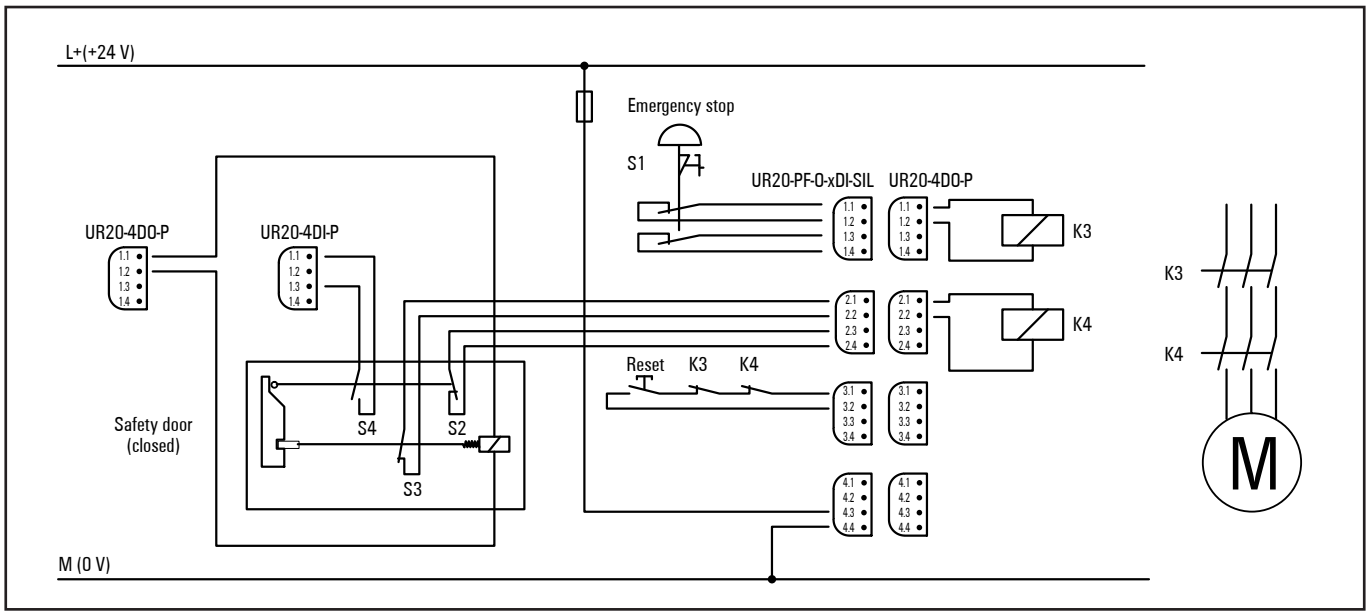
All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1)] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or the safety door contact as well as a cross-circuit in their supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
A stop is performed by switching off K3 and K4 via the PLC. The door can be opened when the PLC releases the interlock.

With opening of the safety door a discrepancy error between S2 and S3 occurs. This error has to be reset with S1.

The UR20-PF-O-xDI-SIL switches on the 24 V supply for modules[1)] within the safety segment if
– the emergency stop button is unlocked
– and the safety door is closed
– and the PLC has activated and engaged the interlock
– and the feedback circuit (NC contacts of K3 and K4) is closed
– and the start push button has been pushed and released again.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply.



Example application for dual-channel safety door monitoring, magnetically operated interlock with manual reset, stop and emergency stop

[1)] Switchable modules see section 4.3

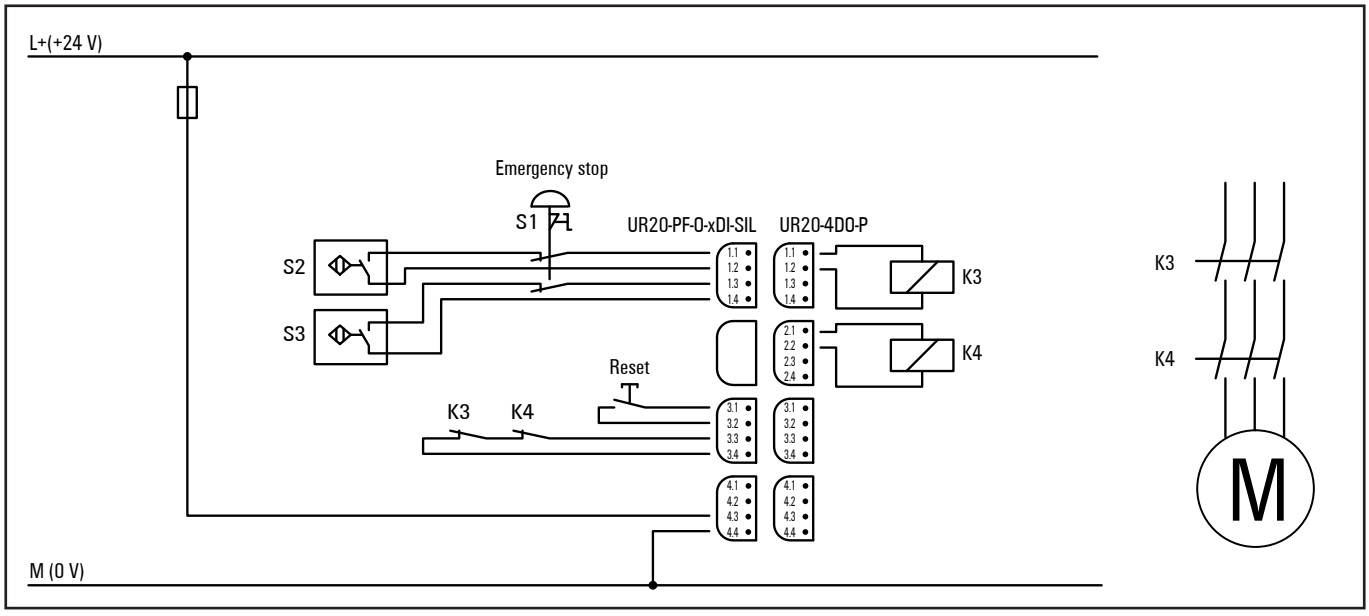
7.11 Dual-channel safety door monitoring with proximity sensors, automatic reset and emergency stop

Achievable safety rating	Category 3	EN ISO 13849-1
	PLd	EN ISO 13849-1
	SIL 2	EN 62061/61508
Stop category	0	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Automatic reset – Monitoring of external contactors (EDM)	
Safety sensor/operating mechanism	– Emergency stop button – 2 proximity switches	
Notes	– The power supply for the proximity switches is not shown! – The application must be compatible with the automatic start-up function.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

If the emergency stop button is pushed or at least one magnetic switch is opened, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1)] within safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or a cross-circuit in its supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
The UR20-PF-O-xDI-SIL switches on the 24 V supply for modules[1)] within the safety segment if
– the emergency stop button is unlocked
– and both magnetic contacts are closed
– and the feedback circuit (NC contacts of K3 and K4) is closed.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply. To reset the system, press the reset button for 0.1 to 2 s after switching on the power supply, even when automatic reset is used.



Example application for dual-channel safety door monitoring with proximity detectors, automatic reset and emergency stop

[1)] Switchable modules see section 4.3

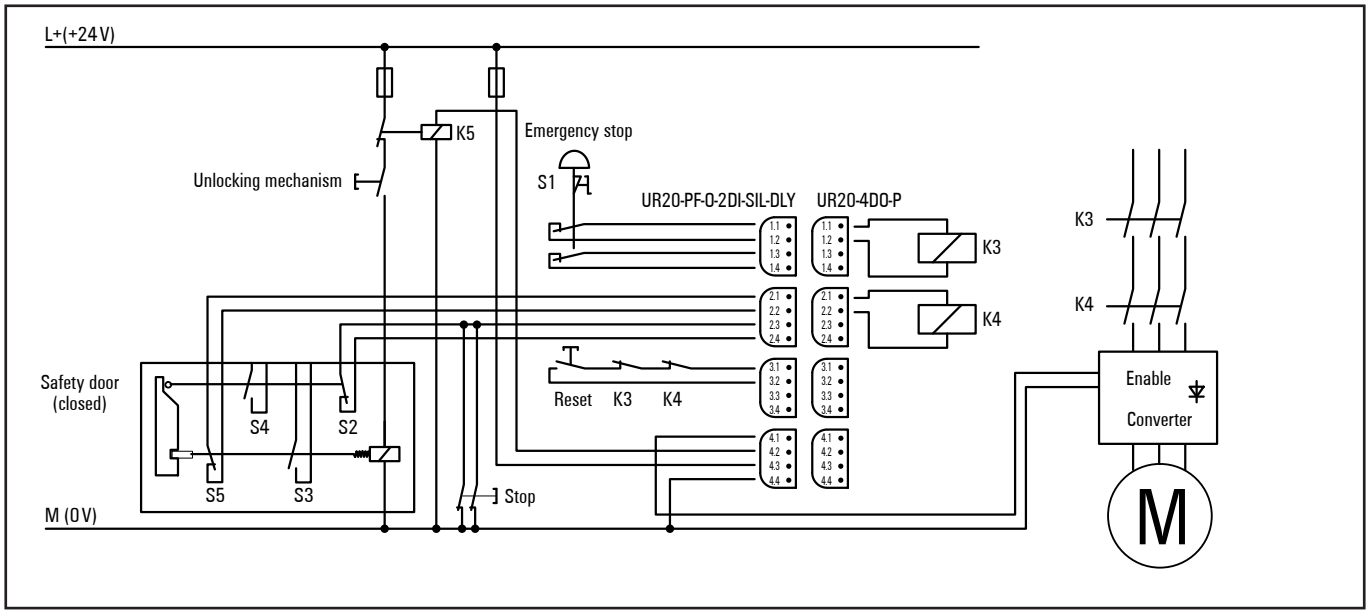
7.12 Dual-channel safety door monitoring, spring-operated interlock, controlled shutdown with manual reset and emergency stop

Achievable safety rating	Category 3	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	1	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Manual reset – Monitoring of external contactors (EDM)	
Safety sensor / operating mechanism	– Emergency stop button – Position switch with interlock – Manual unlocking	
Notes	– Exclusion of the fault “Interruption or releasing of the activator, error in the safety interlock” – As soon as the enabling on the frequency converter is withdrawn, the converter must execute a controlled shutdown.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1)] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or the safety door contact as well as a cross-circuit in their supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
After pressing the stop button and the delay time set in the UR20-PF-O-2DI-SIL-DELAY, the spring-operated interlock can be activated with the unlock button and the safety door can be opened. When the power supply is turned off, the safety door cannot be opened if the locking mechanism is engaged. We recommend using switches with mechanical unlocking capabilities.
The UR20-PF-O-xDI-SIL switches on the 24 V supply for modules[1)] within the safety segment if
– the emergency stop button is unlocked
– and the safety door is closed
– and the locking mechanism is engaged
– and the feedback circuit (NC contacts of K3 and K4) is closed
– and the start push button has been pushed and released again.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply.



Example application for dual-channel safety door monitoring, spring-operated interlock, controlled shutdown with manual reset and emergency stop

[1)] Switchable modules see section 4.3

7.13 Dual-channel safety door monitoring with automatic reset and controlled shutdown and emergency stop

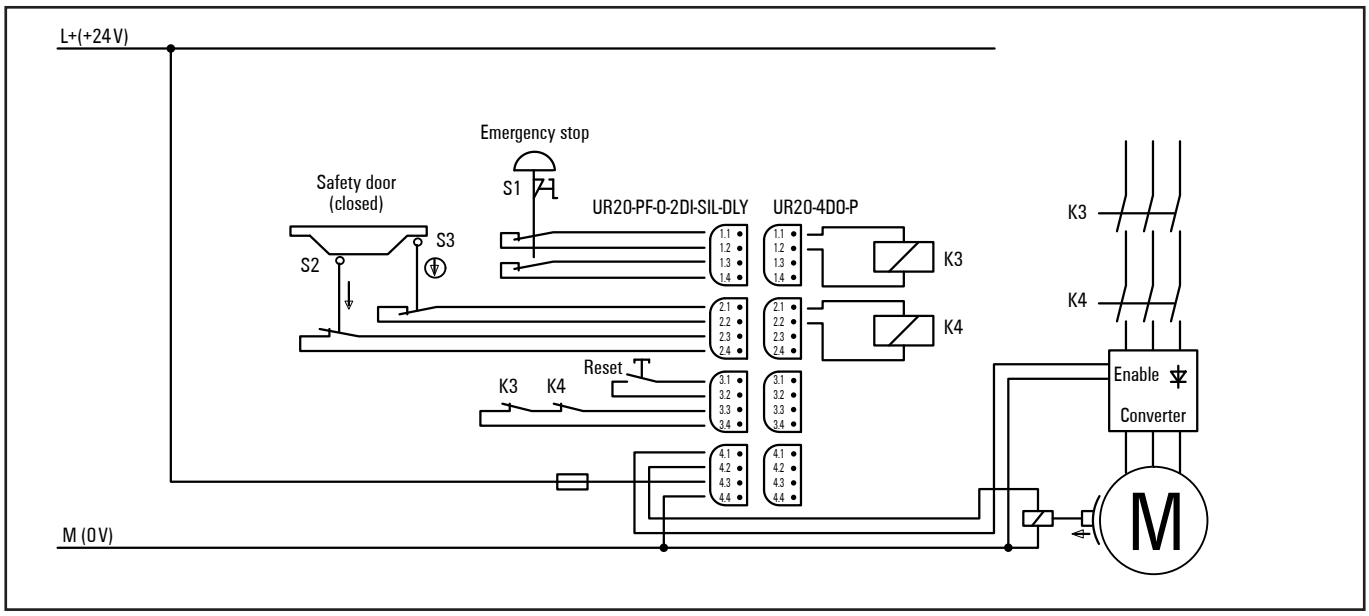
Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Stop category	1	EN 60204-1
Features	– Dual-channel monitoring – Cross-connection detection – Automatic reset – Monitoring of external contactors (EDM)	
Safety sensor / operating mechanism	– Emergency stop button – Position switch – Optional: brake	
Notes	– Autostart is also possible if the NC circuits from K3 and K4 are connected to 3.3 and 3.4. – As soon as the enabling on the frequency converter is withdrawn, the converter must execute a controlled shutdown. – Exclusion of fault: No external energy might be fed into the control line of the brake (e. g. caused by cable fault)	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

When the emergency stop button is pushed, the UR20-PF-O-xDI-SIL switches off the 24 V supply for the modules[1] within the safety segment and thus also contactors K3 and K4. The failure of a switching element in the emergency stop button or the safety door contact as well as a cross-circuit in their supply lines does not result in the failure of the emergency stop mechanism and is detected within the fault-reaction time.
After opening the safety door and the expiration of the delay time set in the UR20-PF-O-2DI-SIL-DELAY, the spring-operated interlock can be activated with the unlock button and the safety door can be opened. When the power supply is turned off, the safety door cannot be opened if the locking mechanism is engaged. We recommend using switches with mechanical unlocking capabilities.
The UR20-PF-O-xDI-SIL module switches the 24 V power supply for the following modules[1] within the safety segment if

- the emergency stop button is unlocked
- and the safety door is closed
- and the feedback circuit (NC contacts of K3 and K4) is closed.

Contactors K3 and K4 are controlled by the PLC and can switch on as soon as the UR20-PF-O-xDI-SIL has switched on the 24 V supply. To reset the system, press the reset button for 0.1 to 2 s after switching on the power supply, even when automatic reset is used.



Example application for dual-channel safety door monitoring with automatic reset and controlled shutdown and emergency stop

[1] Switchable modules see section 4.3

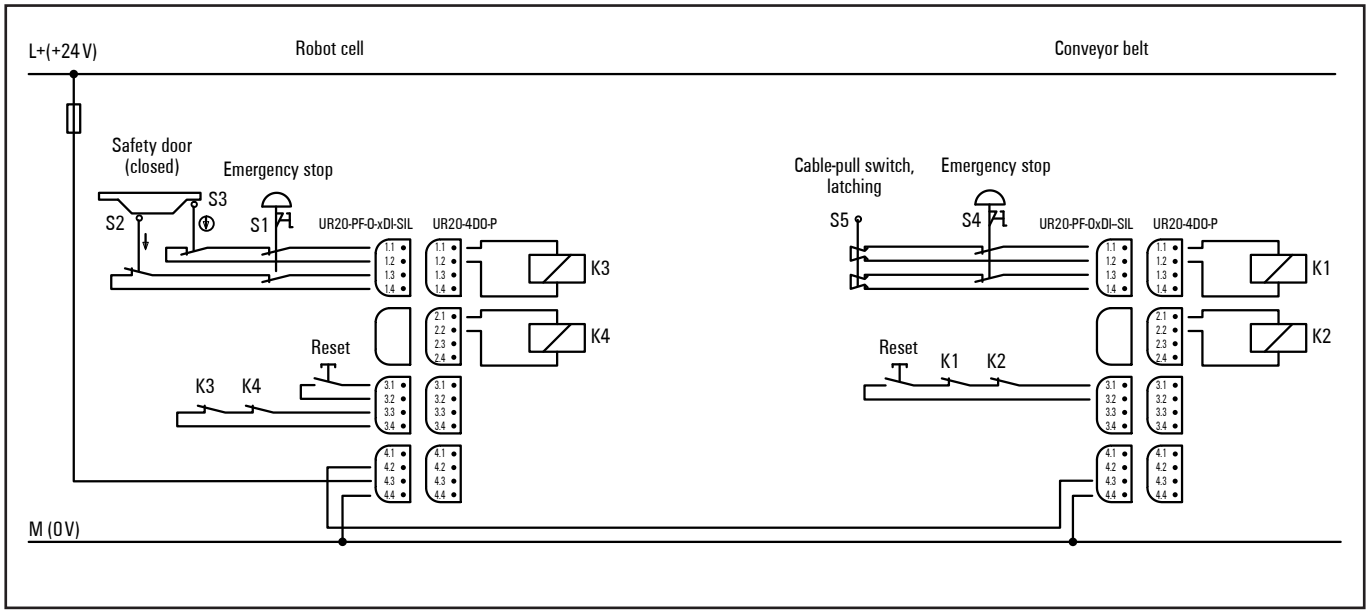
7.14 Cascading

Achievable safety rating	Category 4	EN ISO 13849-1
	PLe	EN ISO 13849-1
	SIL 3	EN 62061/61508
Notes	A shielded cable installation is neccessary if the safely switched-off line (24 V Safe at 4.2) runs outside the switch cabinet.	

All examples shown are proposals without warranty. In any case the operator has to perform a safety review of the entire site.

The following shows the cascading of UR20-PF-O-xDI-SIL modules. When the safety door for the robot cell is opened in the example, the conveyor belt is also switched off at the same time. In contrast, switching off the conveyor belt, e.g. with the cable-pull switch, does not automatically switch off the robot cell.
Multiple cascade levels and also multiple UR20-PF-O-xDI-SIL modules can be used on a single level. Be aware that the triggering of an UR20-PF-O-xDI-SIL module immediately switches off the 24 V supply of all subsequent safe power-feed modules. A delay of these modules is then no longer effective.

Please regard during commissioning:
After switching on the u-remote station the manual start has to be operated once for each single cascaded UR20-PF-O-xDI-SIL module.



Example application for cascading

8 LED displays 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, please send the affected product to Weidmüller.

Weidmüller does not assume any liability if the base or electronic module has been tampered with!

8.1 Safe I/O modules

UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2, UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2, UR20-4DI-4DO-PN-FSCC

LED		Status	Recommended action	Resetting procedure
Status LED	Red	– Module has not been snapped properly	– Check that the module has been snapped into place properly	After the module has been snapped into place correctly: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Error in the supply voltage	– Check supply voltage: check the +24 V output current path	After the system voltage has been re-established: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Internal error detected	– Module might have switched off caused by overtemperature; check the temperature inside the switch cabinet If the error has not been fixed, send the module to Weidmüller for a technical examination.	After the module has cooled down : – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Safety address (DIP switches) not set correctly (V1 modules only)	– Check the address settings in the safety project	After the DIP switches has been set according to the desired address: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Communication failure	Internal communication disrupted (critical status) – Check wiring – Check power supply – Check overtemperature	After the error has been fixed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Critical safety fault – safe status	– Power interruption required	
Status LED and min. 1 channel-LED	Red	– Channel error	– Check wiring of the module and the single channels	After the error has been fixed: – Reset the inputs (passivation)
1.3 2.3	Red Red	Error input 0 / 1 Error input 2 / 3 – At least one AUX-0 is overloaded or short circuited with the supply voltage – Short circuit of input with active level (P or N) with activated test pulses – Inputs in test pulse mode cross-connected with AUX-0...	– Check wiring – Check parameterisation If the error has not been fixed, send the module to Weidmüller for a technical examination.	After the error has been fixed: – Reset the inputs (passivation) – Acknowledgment by the safety control required (Operator Acknowledge)
		– Error on detection of external testpulses (external testpulse mode active)	– Check wiring – Check external test pulses	After the error has been fixed: – Reset the inputs (passivation) – Acknowledgment by the safety control required (Operator Acknowledge)
		– The parameterised discrepancy time of this pair of inputs has been exceeded	– Check wiring – Check the safety switch	After the error has been fixed: – Reset the inputs (passivation) – Acknowledgment by the safety control required (Operator Acknowledge)

UR20-4DI-4DO-PN-FSOE, UR20-4DI-4DO-PN-FSOE-V2, UR20-4DI-4DO-PN-FSPS, UR20-4DI-4DO-PN-FSPS-V2, UR20-4DI-4DO-PN-FSCC

LED		Status	Recommended action	Resetting procedure
3.2 / 3.4 4.2 / 4.4	Red Red	Error output 0 / 1 Error output 2 / 3 – Short circuit with the supply voltage or ground or cross-fault with another channel – Readback error	– Check wiring	After the error has been fixed: – Acknowledgment by the safety control required (Operator Acknowledge)
		– Minimum load has been underrun (e.g. after wire break)	– Check wiring – If needed, deactivate the wire break detection by longer test pulse duration	After the error has been fixed: – Acknowledgment by the safety control required (Operator Acknowledge)
Status LED	Flashes alternating 3 s green / 1 s red:	– Module is waiting for parameters from the safety control (e. g. after the power up) – Safety address is not set according to the project plan (only V2 modules and UR20-...-FSCC modules)	Intervention required on the safety control – Set the correct safety address – Check the parameter check sum in the project planning	After the error has been fixed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
	Flashes alternating 1 s green / 1 s red:	– Errors have been fixed and faulty channel has been passivated		– Status must be acknowledged via the safety control (Operator Acknowledge)
	Flashes red 2 s on, 2 s off	– A mismatch between the start-up station setup and the operated station setup was detected	– Remove the wrong module from the station	
Status LED	Green	Standard operation		
1.1 / 1.4 2.1 / 2.4 3.1 / 3.3 4.1 / 4.3	Yellow Yellow Yellow Yellow	Input 0 / 1 active Input 2 / 3 active Output 0 / 1 active Output 2 / 3 active		

UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2, UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2, UR20-8DI-PN-FSCC

LED		Status	Recommended action	Resetting procedure
Status LED	Red	– Module has not been snapped properly	– Check that the module has been snapped into place properly	After the module has been snapped into place correctly: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Error in the supply voltage	– Check supply voltage: check the +24 V output current path	After the system voltage has been re-established: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Internal error detected	– Module might have switched off caused by overtemperature; check the temperature inside the switch cabinet If the error has not been fixed, send the module to Weidmüller for a technical examination.	After the module has cooled down : – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Safety address (DIP switches) not set correctly (V1 modules only)	– Check the address settings in the safety project	After the DIP switches has been set according to the desired address: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Communication failure	Internal communication disrupted (critical status) – Check wiring – Check power supply – Check overtemperature	After the error has been fixed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Critical safety fault – safe status	– Power interruption required	
Status LED and min. 1 channel-LED	Red	– Channel error	– Check wiring of the module and the single channels	After the error has been fixed: – Reset the inputs (passivation)
1.3 2.3 3.3 4.3	Red Red Red Red	Error input 0 / 1 Error input 2 / 3 Error input 4 / 5 Error input 6 / 7		
		– At least one AUX-0 is overloaded or short circuited with the supply voltage – Short circuit of input with active level (P or N) with activated test pulses – Inputs in test pulse mode cross-connected with AUX-0...	– Check wiring – Check parameterisation If the error has not been fixed, send the module to Weidmüller for a technical examination.	After the error has been fixed: – Reset the inputs (passivation) – Acknowledgment by the safety control required (Operator Acknowledge)
		– Error on detection of external testpulses (external testpulse mode active)	– Check wiring – Check external test pulses	After the error has been fixed: – Reset the inputs (passivation) – Acknowledgment by the safety control required (Operator Acknowledge)
		– The parameterised discrepancy time of this pair of inputs has been exceeded	– Check wiring – Check the safety switch	After the error has been fixed: – Reset the inputs (passivation) – Acknowledgment by the safety control required (Operator Acknowledge)

UR20-8DI-PN-FSOE, UR20-8DI-PN-FSOE-V2, UR20-8DI-PN-FSPS, UR20-8DI-PN-FSPS-V2, UR20-8DI-PN-FSCC

LED		Status	Recommended action	Resetting procedure
Status LED	Flashes alternating 3 s green / 1 s red:	– Module is waiting for parameters from the safety control (e. g. after the power up) – Safety address is not set according to the project plan (only V2 modules and UR20-...-FSCC modules)	Intervention required on the safety control – Set the correct safety address – Check the parameter check sum in the project planning	After the error has been fixed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
	Flashes alternating 1 s green / 1 s red:	– Errors have been fixed and faulty channel has been passivated		– Status must be acknowledged via the safety control (Operator Acknowledge)
	Flashes red 2 s on, 2 s off	– A mismatch between the start-up station setup and the operated station setup was detected	– Remove the wrong module from the station	
Status LED	Green	Standard operation		
1.1 / 1.4	Yellow	Input 0 / 1 active		
2.1 / 2.4	Yellow	Input 2 / 3 active		
3.1 / 3.4	Yellow	Input 4 / 5 active		
4.1 / 4.4	Yellow	Input 6 / 7 active		

8.2 Safe power-feed modules

UR20-PF-O-1DI-SIL

LED		Status	Recommended action	Resetting procedure
Status LED	Red	– Module has not been snapped properly	– Check that the module has been snapped into place properly	After the module has been snapped into place correctly: – Automatic restart of the module
		– Error in the supply voltage	– Check supply voltage: 1. check +24 V input current path 2. check voltage on plug 4.3; in case of cascading 0 V might be properly, therefore this is not an error	After the system voltage has been re-established: – Automatic restart of the module
		– 24 V DC feed-in too high or too low	– Apply the permissible voltage	– Procede manual or auto start
		– OSSD switch test error	– Reset or voltage interruption required	
		– Critical safety error – safe status	– Voltage interruption required	
		– Overload at the 24 V Safe output level	– Remove cross connection at 24 V Safe	After the overload has been removed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Internal error detected	– Module might have switched off caused by overtemperature; check the temperature inside the switch cabinet – Perform a cold start within 24 hours If the error has not been fixed, send the module to Weidmüller for a technical examination	After the module has cooled down: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
Status LED and min. 1 channel-LED	Red	– Discrepancy error – Test pulse error – Selftest error – Short circuit	– Passivate the faulty channel – Check channel error – Check wiring of the module and each single channel	After the error has been fixed: – Reset the inputs (passivation) – Set an reset manual start (MAN start input) within two seconds
		– Cross connection between the safety loops for at least three seconds.	– Check safety circuit for cross connections	After the error has been fixed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
Status LED	Green	Standard operation		
1.1	Off Yellow	Safety circuit 1 interrupted Safety circuit 1 OK	Check safety circuit 1	
4.2	Off Yellow	24 V Safe not active 24 V Safe active, 24 V DC at output		
4.3	Green	Feed-in voltage in valid range		

UR20-PF-O-2DI-SIL, UR20-PF-O-2DI-DELAY-SIL

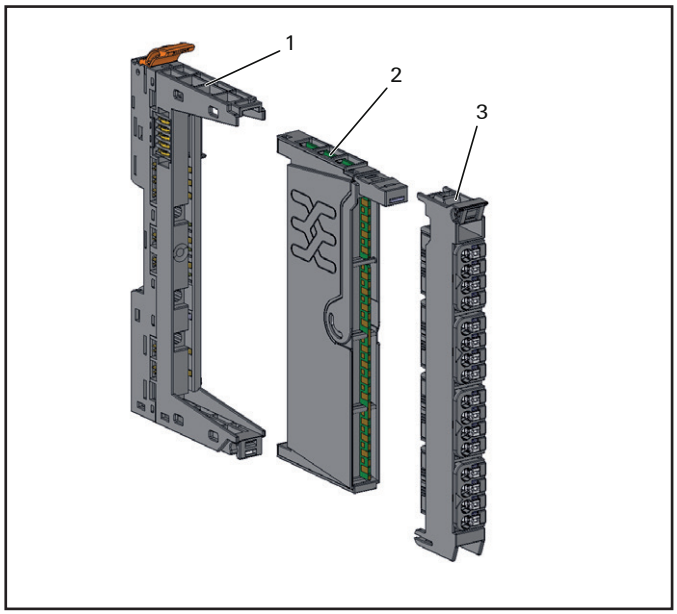
LED		Status	Recommended action	Resetting procedure
Status LED	Red	– Module has not been snapped properly	– Check that the module has been snapped into place properly	After the module has been snapped into place correctly: – Automatic restart of the module
		– Error in the supply voltage	– Check supply voltage: 1. check +24 V input current path 2. check voltage on plug 4.3; in case of cascading 0 V might be properly, therefore this is not an error	After the system voltage has been re-established: – Automatic restart of the module
		– DIP switches set incorrect (DELAY only)	– Check and correct the DIP switch setting	After the DIP switches have been set according to the desired configuration: – Automatic restart of the module
		– 24 V DC feed-in too high or too low	– Apply the permissible voltage	– Procede manual or auto start
		– OSSD switch test error	– Reset or voltage interruption required	
		– Critical safety error – safe status	– Voltage interruption required	
		– Overload at the 24 V Safe output level	– Remove cross connection at 24 V Safe	After the overload has been removed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
		– Internal error detected	– Module might have switched off caused by overtemperature; check the temperature inside the switch cabinet – Perform a cold start within 24 hours If the error has not been fixed, send the module to Weidmüller for a technical examination	After the module has cooled down: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
Status LED and min. 1 channel-LED	Red	– Discrepancy error – Test pulse error – Selftest error – Short circuit	– Passivate the faulty channel – Check channel error – Check wiring of the module and each single channel	After the error has been fixed: – Reset the inputs (passivation) – Set an reset manual start (MAN start input) within two seconds
		– Cross connection between the safety loops for at least three seconds.	– Check safety circuit for cross connections	After the error has been fixed: – Switch off the system (fieldbus coupler) – Switch on the system voltage again
Status LED	Green	Standard operation		
1.1	Off Yellow	Safety circuit 1 interrupted Safety circuit 1 OK	Check safety circuit 1	
2.1	Off Yellow	Safety circuit 2 interrupted Safety circuit 2 OK	Check safety circuit 2	
4.1 (DELAY only)	Off Yellow	SS1 not active SS1 active, 24 V DC at output		
4.2	Off Yellow	24 V Safe not active 24 V Safe active, 24 V DC at output		
4.3	Green	Feed-in voltage in valid range		

9 Accessories and replacement parts

9.1 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	Tag holder EM 8/30 for end bracket marker	Marks the station at the end bracket
1045570000	Marker ELS 6/30, white, PA 66	Marking end brackets, can be printed with Weidmüller PrintJet ADVANCED
1045580000	Marker ELS 6/30, yellow, PA 66	Marking end brackets, can be printed with Weidmüller PrintJet ADVANCED
2009980000	Marker ELS 6/30 MM, white, polyester	Marking end brackets, can be printed with Weidmüller THM MMP
2010620000	Marker ELS 6/30 MM, yellow, polyester	Marking end brackets, can be printed with Weidmüller THM MMP
1607720000	Labels ESO 7 white, paper	Marking end brackets, can be printed with laser printers
1634780000	Labels ESO 7 yellow, paper	Marking end brackets, can be printed with laser printers
1670390000	Labels ESO 7 P white, polyester	Marking end brackets, can be printed with laser printers
1670400000	Labels ESO 7 P yellow, polyester	Marking end brackets, can be printed with laser printers
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

9.2 Replacement parts



1 Base module
2 Electronic unit
3 Plug-in unit

Replacement parts for safe u-remote modules

Module	Order No.	Base module Order No.	Electronic unit Order No.	Plug-in unit Order No.
Safe I/O modules				
UR20-4DI-4DO-PN-FSOE	1529780000	UR20-BM-SP 1350930000	UR20-EM-1529780000-SP 1993030000	UR20-PK-1529780000-SP 1992960000
UR20-4DI-4DO-PN-FSOE-V2	2464580000	UR20-BM-SP 1350930000	UR20-EM-2464580000-SP 2465140000	UR20-PK-2464580000-SP 2465990000
UR20-8DI-PN-FSOE	1529800000	UR20-BM-SP 1350930000	UR20-EM-1529800000-SP 1993040000	UR20-PK-1529800000-SP 1992970000
UR20-8DI-PN-FSOE-V2	2464600000	UR20-BM-SP 1350930000	UR20-EM-2464600000-SP 2465150000	UR20-PK-2464600000-SP 2465940000
UR20-4DI-4DO-PN-FSPS	1335060000	UR20-BM-SP 1350930000	UR20-EM-1335060000-SP 1347550000	UR20-PK-1335060000-SP 1992940000
UR20-4DI-4DO-PN-FSPS-V2	2464570000	UR20-BM-SP 1350930000	UR20-EM-2464570000-SP 2465110000	UR20-PK-2464570000-SP 2466000000
UR20-8DI-PN-FSPS	1335070000	UR20-BM-SP 1350930000	UR20-EM-1335070000-SP 1347570000	UR20-PK-1335070000-SP 1992950000
UR20-8DI-PN-FSPS-V2	2464590000	UR20-BM-SP 1350930000	UR20-EM-2464590000-SP 2465130000	UR20-PK-2464590000-SP 2465950000
UR20-4DI-4DO-PN-FSCC	2742570000	UR20-BM-SP 1350930000	UR20-EM-2742570000-SP 2802460000	UR20-PK-2742570000-SP 2781100000
UR20-8DI-PN-FSCC	2742580000	UR20-BM-SP 1350930000	UR20-EM-2742580000-SP 2799990000	UR20-PK-2742580000-SP 2781090000

Replacement parts for safe u-remote modules

Module	Order No.	Base module Order No.	Electronic unit Order No.	Plug-in unit Order No.
Safe power-feed modules				
UR20-PF-O-1DI-SIL	1335030000	UR20-BM-SIL-SP 1350970000	UR20-EM-1335030000-SP 1347520000	UR20-PK-1335030000-SP 1346560000
UR20-PF-O-2DI-SIL	1335050000	UR20-BM-SIL-SP 1350970000	UR20-EM-1335050000-SP 1347540000	UR20-PK-1335050000-SP 1346570000
UR20-PF-O-2DI-DELAY-SIL	1335040000	UR20-BM-SIL-SP 1350970000	UR20-EM-1335040000-SP 1347530000	UR20-PK-1335040000-SP 1484100000

ANNEX

Checklist for the use of u-remote safety modules

Sheet 1/3: Planning

Equipment type / equipment ID	
Version: HW/FW	**Date:**
Reviewer 1:	**Reviewer 2:**
Notes:	

No.	Requirement (mandatory)	yes	Remark
1	The corresponding manuals were consulted during planning ("u-remote Manual " and "Modules for functional safety manual").		
2	The sensors/control devices are approved for connection to the respective module.		
3	The power supply was planned as per the safety extra-low voltage guidelines in accordance with PELV or SELV.		
4	The module was externally fused according to the guidelines in the "Modules for functional safety manual".		
5	Measures to prevent simple manipulations have been planned.		
6	Measures against plug mix-ups have been planned.		
7	The requirements for the sensors and installation of cables correspond to the applicable safety standards (SIL, Cat., PL) and the planned implementation takes these standards into consideration.		
8	The guidelines for per-channel configuration have been defined.		
9	The intentional starting up of potentially hazardous processes is only possible while looking into the danger zone at the same time.		
10	If the installation requires exclusions of faults: the measures have been realized.		
11	The planned use corresponds to the intended use.		
12	The environmental conditions meet the guidelines that are specified in the technical data.		
	Requirement (optional)	**yes/no**	**Remark**
13	The accessories to be used were selected according to the order data in the "Modules for functional safety manual".		
14	The guidelines for installation and electrical set-up were defined and handed over to the departments performing the work.		
15	The guidelines for commissioning were defined and handed over to the departments performing the work.		

Date / Signature of Reviewer 1:

Date / Signature of Reviewer 2:

Sheet 2/3: Assembly and electrical installation

Equipment type / equipment ID	
Version: HW/FW	**Date:**
Reviewer 1:	**Reviewer 2:**
Notes:	

No.	Requirement (mandatory)	yes	Remark
1	Installation was carried out in accordance with the guidelines from the planning stage and/or the (“u-remote Manual “ and “Modules for functional safety manual”).		
2	The safety module(s) was(were) installed in a switch cabinet (IP 54).		
3	All conductor cross-sections meet the guidelines.		

Date / Signature of Reviewer 1:

Date / Signature of Reviewer 2:

Sheet 3/3: Commissioning and configuration

Equipment type / equipment ID	
Version: HW/FW	**Date:**
Reviewer 1:	**Reviewer 2:**
Notes:	

No.	Requirement (mandatory)	yes	Remark
1	During commissioning, the intentional starting up of potentially hazardous processes is only possible while looking into the danger zone at the same time.		
2	Commissioning is carried out according to the guidelines from the planning stage and/or the “Modules for functional safety manual”.		
3	All inputs were configured.		
	Requirement (optional)	**yes/no**	**Remark**
4	The safety clearances to be maintained are measured according to the implemented reaction and delay times.		

Date / Signature of Reviewer 1:

Date / Signature of Reviewer 2:

Failure codes for error byte 2 in the diagnostic data

UR20-XX-FSPS/FSOE

Number (ERR_C)	Corresponding failure code
0x00	OK (no error)
0x01	NULL Pointer occurred
0x02	Component not initialized
0x03	Paramater unexpected
0x04	Error during hardware init
0x05	Error during startup sync
0x06	Error concerning software versions
0x07	USART busy
0x08	Received complete message.
0x09	Receive of message in progress
0x0A	No message received yet
0x0B	CRC Error
0x0C	Error in sequence-number
0x0D	Error in CCom
0x0E	Timeout in CCom
0x0F	I2C Error
0x10	I2C Transmission still running
0x11	I2C Module busy
0x12	Error at ADC
0x13	ADC still running
0x14	ADC channel invalid
0x15	Systemstatus Error
0x16	Watchdog Error
0x17	Critical HW-Error (CPU, RAM, ROM, ...)
0x18	I/O-Error, Shortcut
0x19	I/O-Error, Crosstalk/Crosscut
0x1A	I/O-Error, wire-break
0x1B	I/O-Error, readback-line
0x1C	Discrepancy-error
0x1D	IO Statussignal of single switch IC wrong
0x1E	Diagnostics-memory full
0x1F	Systemstati differ
0x20	µC2 reports safety error
0x21	End of diagnostics-data in log
0x22	Quartz-oscillators tolerance-violation
0x23	Voltage-monitoring on supply line failed (external, 24V)
0x24	Input-images differ
0x25	Undefined error
0x26	Not all hw-tests could be performed in at least in 2hrs.
0x27	Module not calibrated or temperature-violation
0x28	24V not detected any longer or diagnostics-circuit has been failed
0x29	output activation test error
0x2A	Cross communication ok, but no additional stack data
0x2B	Error in safety stack
0x2C	no input val changed within 5 min, external testpulse configured
0x2D	reserved

UR20-XX-FSPS/FSOE

Number (ERR_C)	Corresponding failure code
0x2E	Over current at in or out detected
0x2F	reserved
0x30	reserved
0x31	reserved
0x32	Voltage-monitoring failed (internal, while(1))
0x33	Error in ProfiSafe stack
0x34	Error in FAdress
0x35	Error in FAdress (Adress Mismatch)
0x36	Failsafe values requested by safety stack
0x37	Parameters rejected by safety stack
0x38	Stop rejected by safety stack
0x39	Run rejected by safety stack
0x3A	Operator acknowledge requested
0x3B	Mode Feedback N error
0x3C	Mode Feedback P error
0x3D	Mode Feedback TriState test pulse error
0x3E	Highside current exceeds limit
0x3F	Lowside current exceeds limit
0x40	Auxiliary current exceeds limit

UR20-XX-FSCC

Number (ERR_C)	Corresponding failure code
0x00	OK (no error)
0x01	NULL Pointer occurred
0x02	Component not initialized
0x03	Paramater unexpected
0x04	Error during hardware init
0x05	Error during startup sync
0x06	Error concerning software versions
0x07	USART busy
0x08	Received complete message.
0x09	Receive of message in progress
0x0A	No message received yet
0x0B	CRC Error
0x0C	Error in sequence-number
0x0D	Error in CCom
0x0E	Timeout in CCom
0x0F	I2C Error
0x10	I2C Transmission still running
0x11	I2C Module busy
0x12	Error at ADC
0x13	ADC still running
0x14	ADC channel invalid
0x15	Systemstatus Error
0x16	Watchdog Error
0x17	Critical HW-Error (CPU, RAM, ROM, ...)
0x18	I/O-Error, Shortcut
0x19	I/O-Error, Crosstalk/Crosscut
0x1A	I/O-Error, wire-break
0x1B	I/O-Error, readback-line
0x1C	Discrepancy-error
0x1D	IO Statussignal of single switch IC wrong
0x1E	Diagnostics-memory full
0x1F	Systemstati differ
0x20	µC2 reports safety error
0x21	End of diagnostics-data in log
0x22	Quartz-oscillators tolerance-violation
0x23	Voltage-monitoring on supply line failed (external, 24V)
0x24	Input-images differ
0x25	Undefined error
0x26	Not all hw-tests could be performed in at least in 2hrs.
0x27	Module not calibrated or temperature-violation
0x28	24V not detected any longer or diagnostics-circuit has been failed
0x29	output activation test error
0x2A	Cross communication ok, but no additional stack data
0x2B	Error in safety stack
0x2C	no input val changed within 5 min, external testpulse configured
0x2D	reserved

UR20-XX-FSCC

Number (ERR_C)	Corresponding failure code
0x2E	Over current at in or out detected
0x2F	reserved
0x30	reserved
0x31	reserved
0x32	Voltage-monitoring failed (internal, while(1))
0x33	Error in ProfiSafe stack
0x34	Error in FAdress
0x35	Error in FAdress (Adress Mismatch)
0x36	Failsafe values requested by safety stack
0x37	Parameters rejected by safety stack
0x38	Stop rejected by safety stack
0x39	Run rejected by safety stack
0x3A	Operator acknowledge requested
0x3B	Mode Feedback N error
0x3C	Mode Feedback P error
0x3D	Mode Feedback TriState test pulse error
0x3E	Highside current exceeds limit
0x3F	Lowside current exceeds limit
0x40	Auxiliary current exceeds limit
0x41	Parameter validation error
0x42	FSCC-Stack communication parameter error
0x43	Processdata size exceeded (initiated by Coupler)

UR20-PF-SIL

Number (ERR_C)	Corresponding failure code
0x00	GLOB_FAILCODE_NO_FAILURE
0x01	GLOB_FAILCODE_ROM_TEST
0x02	GLOB_FAILCODE_RAM_TEST
0x03	GLOB_FAILCODE_MARCHC_TEST
0x04	GLOB_FAILCODE_STACK_TEST
0x05	GLOB_FAILCODE_OPCODE_TEST
0x06	GLOB_FAILCODE_SFR_TEST
0x07	GLOB_FAILCODE_COREREG_TEST
0x08	GLOB_FAILCODE_PFLOW_SIGNATURE
0x09	GLOB_FAILCODE_SAFCON_CRC
0x0A	GLOB_FAILCODE_VARIABLE_ERR
0x0B	GLOB_FAILCODE_NMI
0x0C	GLOB_FAILCODE_HARD_FAULT
0x0D	GLOB_FAILCODE_MEMMANAGE_FAULT
0x0E	GLOB_FAILCODE_BUS_FAULT
0x0F	GLOB_FAILCODE_USAGE_FAULT
0x10	GLOB_FAILCODE_SVC
0x11	GLOB_FAILCODE_DEBUGMON_FAULT
0x12	GLOB_FAILCODE_PENDSV
0x13	GLOB_FAILCODE_SYSTICK
0x14	GLOB_FAILCODE_MODULE_INIT
0x15	GLOB_FAILCODE_MODULE_NOINIT
0x16	GLOB_FAILCODE_IPCS_SYNC_TIMEOUT
0x17	GLOB_FAILCODE_IPCX_CRC
0x18	GLOB_FAILCODE_IPCX_CONTROLLER_ID
0x19	GLOB_FAILCODE_IPCX_IPC_ID
0x1A	GLOB_FAILCODE_IPCX_RETURN_ERR
0x1B	GLOB_FAILCODE_DIP_SWITCH_FAIL
0x1C	GLOB_FAILCODE_INVALID_CONFIG
0x1D	GLOB_FAILCODE_INVALID_PARAM
0x1E	GLOB_FAILCODE_POINTER_INVALID
0x1F	GLOB_FAILCODE_ERROR_CONTAINER_FULL
0x20	GLOB_FAILCODE_ADC_CONV_TIMEOUT
0x21	GLOB_FAILCODE_ADC_CALIB_TIMEOUT
0x22	GLOB_FAILCODE_ILLEGAL_CONTROLLER_ID
0x23	GLOB_FAILCODE_DMABUFFER_DOUBLE_READ
0x24	GLOB_FAILCODE_COUNTER_OVERFLOW
0x25	GLOB_FAILCODE_SCHEDULER_TIMEOUT
0x26	GLOB_FAILCODE_CLOCK_DERIVATION
0x27	GLOB_FAILCODE_STATE_MACHINE
0x28	GLOB_FAILCODE_SAVE_OVERVOLTAGE
0x29	GLOB_FAILCODE_SAVE_ENTER_UPDATEMODE
0x2A	GLOB_FAILCODE_CHARGE_PUMP

Declaration of conformity

Weidmüller

EU-Konformitätserklärung
EU Declaration of Conformity

Original

Dokument-Nr. Document No.	**DE PC73 250812 001 ISS 09**
Hersteller / Manufacturer Dokumentationsbevollmächtigter/ Documentation representative	**Weidmüller Interface GmbH & Co. KG**
Anschrift / Address	**Klingenbergstr. 26** **32758 Detmold, Germany**
Gegenstand der Erklärung / Object of the declaration	**Remote I/O-System IP20 – Sichere I/O- und Einspeisemodule** **Remote I/O-System IP20 – Safe I/O modules and safe power-feed modules** ☒ Fortsetzung auf Seite 2 / Continued on page 2

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):

		Richtlinie / Directive	Bezug Amtsblatt / Reference OJ
☐	Niederspannungsrichtlinie (NSR) / Low Voltage Directive (LVD)	2014/35/EU	L96/357-374
☒	Elektromagnetische Verträglichkeit (EMV) / Electromagnetic Compatibility (EMC)	2014/30/EU	L 96/79-106
☒	Maschinenrichtlinie (MRL) / Mechanical Equipment – Machinery (MAD)	2006/42/EG 2006/42/EC	L 157/24-86
☐	Funkanlagenrichtlinie / Radio Equipment Directive (RED)	2014/53/EU	L 153/62-106
☒	RoHS Richtlinie (RoHS) RoHS directive (RoHS)	2011/65/EU	L 174/88-110
☒	ATEX-Richtlinie (ATEX)/ ATEX Directive (ATEX) Kennzeichnung (Gerätegruppe, Kategorie, Atmosphäre) / Marking (Equipment Group, Category, Atmosphere) ⟨Ex⟩ II 3 G	2014/34/EU	L 96/ 309-356

Herausgegebene Zertifikate benannter Stellen / Issued certificates from notified bodies:

Benannte Stelle / Notified Body	Beschreibung der Einbindung Description of intervention	Zertifikat / Certificate
TÜV Nord Cert GmbH Am TÜV 1 45307 Essen Deutschland Notified Body # 0044	EG-Baumusterprüfung MRL / EC-Type Examination MAD	Siehe Produkttabelle / See product table

F_WV_EU-Konformitätserklärung 2.4; 1607

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Weidmüller

EU-Konformitätserklärung
EU Declaration of Conformity

Original

Dokument-Nr.
Document No.

DE PC73 250812 001 ISS 09

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:

NSR / LVD:
EN 61010-1:2010+A1:2019+A1:2019/AC:2019-04
EN IEC 61010-2-201:2018 (IEC 61010-2-201:2017)

EMV / EMC:
EN 61000-6-2:2005 + AC:2005
EN 61000-6-4:2007 + A1:2011

MRL / MAD:
EN ISO 13849-1:2023
EN IEC 62061:2021

RoHS:
EN IEC 63000:2018

ATEX:
EN IEC 60079-0:2018
EN IEC 60079-7: 2015 +A1:2018

zusätzlich angewandte Normen / additional applied standards:
EN 61508:2010

Gegenstand der Erklärung (Fortsetzung von Seite 1)/
Object of the declaration (continued from page 1)

Artikelnummer	Artikelname	EG Baumusterprüfbescheinigung
2464570000	UR20-4DI-4DO-PN-FSPS-V2	44 205 13773711
2464590000	UR20-8DI-PN-FSPS-V2	44 205 13773711
2742570000	UR20-4DI-4DO-PN-FSCC	44 205 13773726
2464580000	UR20-4DI-4DO-PN-FSOE-V2	44 205 13773711
2464600000	UR20-8DI-PN-FSOE-V2	44 205 13773711
2742580000	UR20-8DI-PN-FSCC	44 205 13773726
1335030000	UR20-PF-O-1DI-SIL	44 205 13773702
1335050000	UR20-PF-O-2DI-SIL	44 205 13773702
1335040000	UR20-PF-O-2DI-DELAY-SIL	44 205 13773702

Detmold, 12.08.2025
Ort, Datum / place, date

Rechtsverbindliche Unterschrift / legally binding signature

Hoffmann, Andreas, Leiter BU u-mation und Industrial Ethernet / Vice President BU u-mation and Industrial Ethernet
Name und Funktion / name and function

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.

F_WV_EU-Konformitätserklärung 2.4; 1607

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