X20(c)SOx530

Information:

B&R makes every effort to keep data sheets as current as possible. From a safety point of view, however, the current version of the data sheet must always be used.

The certified, currently valid data sheet can be downloaded from the B&R website www.br-automation.com.

Organization of notices

Safety notices

Contain **only** information that warns of dangerous functions or situations.

Signal word	Description
Danger!	Failure to observe these safety guidelines and notices will result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Caution!	Failure to observe these safety guidelines and notices can result in minor injury or damage to property.
Notice!	Failure to observe these safety guidelines and notices can result in damage to property.

Table 1: Organization of safety notices

General notices

Contain **useful** information for users and instructions for avoiding malfunctions.

Signal word	Description
Information:	Useful information, application tips and instructions for avoiding malfunctions.

Table 2: Organization of general notices

1 General information

The modules are equipped with 2 or 6 safe relay outputs.

The modules can be used for controlling floating actuators in safety-related applications up to PL e or SIL 3.

Safety relays are installed in the module. The positively driven feedback contacts are evaluated internally by the module. The safe digital output modules have a start interlock on error in the event of network errors.

These modules are designed for X20 12-pin terminal blocks.

- 2 or 6 safe relay outputs
- Output type "Relay"
- Relay module for 230 VAC / 24 VDC
- Switching current 6 A
- Normally open contact
- Single-channel isolated outputs

Danger!

Risk of electric shock!

The terminal block is only permitted to conduct voltage when it is connected. It is not permitted to be disconnected or connected while voltage is applied or have voltage applied to it while it is removed under any circumstances.

1.1 Function

Safe relay outputs

The modules are equipped with safe relay outputs for floating control of actuators in safety-related applications up to PL e or SIL 3.

Safety relays are installed in the module. The positively driven feedback contacts are evaluated internally by the module. The B10d values are specified in the technical data for the safety-related perspective of the relay contacts. These values apply up to the specified maximum contact service life.

Safe digital output modules have a start interlock on error in the event of network errors. Function blocks needed to fulfill additional requirements regarding protection against automatic restart are available in SafeDESIGNER. The outputs can also be controlled by the standard application. The combination of safety-related control and standard control is arranged such that the execution of a cutoff request always has top priority. For diagnostic purposes, the outputs are designed to be read back.

openSAFETY

This module uses the protective mechanisms of openSAFETY when transferring data to the various bus systems. Because the data is encapsulated in the openSAFETY container in a fail-safe manner, the components on the network that are involved in the transfer do not require any additional safety-related features. At this point, only the safety-related characteristic values specified for openSAFETY in the technical data are to be consulted. The data in the openSAFETY container undergoes safety-related processing only when received by the remote station; for this reason, only this component is involved from a safety point of view. Read access to the data in the openSAFETY container for applications without safety-related characteristics is permitted at any point in the network without affecting the safety-related characteristics of openSAFETY.

open SAFETY

1.2 Coated modules

Coated modules are X20 modules with a protective coating for the electronics component. This coating protects X20c modules from condensation.
The modules' electronics are fully compatible with the corresponding X20 modules.

> **Information:**
>
> **For simplification purposes, only images and module IDs of uncoated modules are used in this data sheet.**

The coating has been certified according to the following standards:

- Condensation: BMW GS 95011-4, 2x 1 cycle
- Corrosive gas: EN 60068-2-60, Method 4, exposure 21 days

Contrary to the specifications for X20 system modules without safety certification and despite the tests performed, X20 safety modules are **NOT suited for applications with corrosive gases (EN 60068-2-60)!**

2 Overview

Module	X20SO2530	X20SO6530
Relay outputs		
Number of outputs	2	6
Switching voltage range	5 to 24 VDC, 5 to 230 VAC	
Switching current range	5 mA to 6 A	5 mA to 6 A (hardware revision < B5: 2 A)
Overload protection and short-circuit protection	External 6 A gL/gG fuse (blow-out fuse), LS automat C characteristic 1.6 A	

Table 3: Digital output modules

3 Order data

X20SO2530

X20SO6530

Model number	Short description
	Digital output modules
X20SO2530	X20 safe digital output module, 2 relays with 1 normally open contact each, 230 VAC / 6 A, 24 VDC / 6 A
X20cSO2530	X20 safe digital output module, coated, 2 relays with 1 normally open contact each, 230 VAC / 6 A, 24 VDC / 6 A
X20SO6530	X20 safe digital output module, 6 relays with 1 normally open contact each, 230 VAC / 6 A, 24 VDC / 6 A
	Required accessories
	Bus modules
X20BM33	X20 bus module, for X20 SafeIO modules, internal I/O power supply continuous
X20BM36	X20 bus module, for X20 SafeIO modules, with node number switch, internal I/O power supply continuous
X20cBM33	X20 bus module, coated, for X20 SafeIO modules, internal I/O power supply continuous
	Terminal blocks
X20TB72	X20 terminal block, 12-pin, safety-keyed, 240 VAC, red

Table 4: X20SO2530, X20cSO2530, X20SO6530 - Order data

4 Technical data

Model number	X20SO2530	X20cSO2530	X20SO6530
Short description			
I/O module	2 relays with 1 normally open contact each, 230 VAC / 6 A, 24 VDC / 6 A		6 relays with 1 normally open contact each, 230 VAC / 6 A, 24 VDC / 6 A
General information			
B&R ID code	0xD205	0xDD86	0xF22A
System requirements			
Automation Studio	3.0.81.15 or later	4.0.16 or later	4.2.5 or later
Automation Runtime	3.00 or later	V3.08 or later	4.2 or later
SafeDESIGNER	2.70 or later	3.1.0 or later	4.2.0 or later
Safety Release	1.2 or later	1.7 or later	1.10 or later
Status indicators	I/O function per channel, operating state, module status		
Diagnostics			
Module run/error	Yes, using status LED and software		
Outputs	Yes, using status LED and software		
Blackout mode			
Scope	Module		
Function	Module function		
Standalone mode	No		
Max. I/O cycle time	1 ms		
Power consumption			
Bus	0.26 W		
Internal I/O	1.15 W		1.65 W
Electrical isolation			
Channel - Bus	Yes		
Channel - Channel	Yes		
Certifications			
CE	Yes		
EAC	Yes		
UL	cULus E115267 Industrial control equipment		In preparation
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5		-
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X		
DNV GL	In preparation		
Functional safety	cULus FSPC E361559 Energy and industrial systems Certified for functional safety ANSI UL 1998:2013		
Functional safety	IEC 61508:2010, SIL 3 EN 62061:2013, SIL 3 EN ISO 13849-1:2015, Cat. 4 / PL e IEC 61511:2004, SIL 3		
Functional safety	EN 50156-1:2004		-
Relays			
EN 50155	Yes		No
EN 50205	Yes		
Safety characteristics			
EN ISO 13849-1:2015			
MTTFD	2500 years		
Mission time	Max. 20 years		
IEC 61508:2010, IEC 61511:2004, EN 62061:2013			
PFH / PFH_d			
Module	$<1*10^{-10}$		
openSAFETY wired	Negligible		
openSAFETY wireless	$<1*10^{-14}$ * Number of openSAFETY packets per hour		
PFD	$<2*10^{-5}$		
Proof test interval (PT)	20 years		
Safe relay channels			
EN ISO 13849-1:2015			
Category	Cat. 1 if the relay channel is used individually, Cat. 4 if 2 relay channels are connected in series [1]		
PL	PL c if the relay channel is used individually, PL e if 2 relay channels are connected in series [1]		
B10d			
DC1, 24 VDC	6 A / 780,000		6 A / 1,000,000

Table 5: X20SO2530, X20cSO2530, X20SO6530 - Technical data

Model number	X20SO2530	X20cSO2530	X20SO6530
AC1, 230 VAC	6 A / 780,000		6 A / 200,000
AC15, 230 VAC	3 A / 1,960,000		5 A / 100,000
DC13, 24 VDC	5 A / 780,000		4 A / 300,000 [2]
IEC 61508:2010, IEC 61511:2004, EN 62061:2013			
SIL CL	SIL 1 if the relay channel is used individually, SIL 3 if 2 relay channels are connected in series [1]		
I/O power supply			
Nominal voltage	24 VDC		
Voltage range	24 VDC -15% / +20%		
Integrated protection	Reverse polarity protection		
Relay outputs			
Variant	2 relays, each with 1 normally open contact, internal high-side and low-side control		6 relays, each with 1 normally open contact, internal high-side and low-side control
Diagnostic status	Contact position determined by positively driven contacts		
Max. switching frequency	10 Hz		
Switching delay			
0 → 1	<50 ms		
1 → 0	<50 ms		
Isolation voltage between channel and bus	Safe disconnection of 300 VAC per EN 50178		
Isolation voltage between channel and channel	Tested at 1350 VAC		
Contact resistance (without terminal block)	20 mΩ		
Contact service life	See "Contact service life".		
Short-circuit protection, overload protection	External 6 A gL/gG fuse (blow-out fuse), LS automat C characteristic 1.6 A		
Switching voltage range	5 to 24 VDC, 5 to 230 VAC		
Switching current range	5 mA to 6 A		5 mA to 6 A (hardware revision < B5: 2 A)
Coil voltage	24 VDC -15% / +20%		
Short-circuit proof	Yes, 1000 A (with specified short-circuit / overload protection)		
Max. inrush current	30 A for 20 ms		AC: 50 A for 100 ms, DC: 10 A for 200 ms
Overvoltage category per EN 60664-1	II		
Max. switching capacity			
AC1	230 VAC / 6 A		
AC15	230 VAC / 3 A		230 VAC / 5 A
DC1	24 VDC / 6 A		
DC13	24 VDC / 5 A / 0.1 Hz		24 VDC / 4 A / 0.1 Hz
Operating conditions			
Mounting orientation			
Horizontal	Yes		
Vertical	Yes		
Installation elevation above sea level	0 to 2000 m, no limitation		
Degree of protection per EN 60529	IP20		
Ambient conditions			
Temperature			
Operation			
Horizontal mounting orientation [3]	0 to 60°C	-25 to 60°C	0 to 60°C
Vertical mounting orientation	0 to 50°C	-25 to 50°C	0 to 50°C
Derating	See section "Derating".		
Storage	-40 to 85°C		
Transport	-40 to 85°C		
Relative humidity			
Operation	5 to 95%, non-condensing	Up to 100%, condensing	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing		
Transport	5 to 95%, non-condensing		
Mechanical properties			
Note	Order 1x safety-keyed terminal block separately. Order 1x safety-keyed bus module separately.		
Spacing	$25^{+0.2}$ mm		

Table 5: X20SO2530, X20cSO2530, X20SO6530 - Technical data

1) The related danger warnings in the technical data sheet must also be observed.
2) In this case, a protective circuit (parallel diode via load) is necessary.
3) Compared to the specification in the X20 system user's manual, in which the angle of the horizontal mounting orientation is 70°, this applies only up to an angle of 85° on the X20(c)SO2530. Below this, the derating for face-up installation must be applied.

Danger!

Operation outside the technical data is not permitted and can result in dangerous states.

Information:

For detailed information about installation, see chapter "Installation notes for X20 modules" on page 39.

Derating

The derating curve refers to standard operation and can be shifted to the right by the specified derating bonus or to the left by the derating penalty by the following measures in a horizontal mounting orientation.

Module	X20SO2530	X20SO6530
Derating bonus		
At 24 VDC	+0°C	
Dummy module on the left	+0°C	
Dummy module on the right	+2.5°C	
Dummy module on the left and right	+2.5°C	
With double PFH / PFH_d	+0°C	
Hardware revision < B5	+0°C	-5°C

Table 6: Derating bonus / Derating penalty

The maximum nominal current per channel depends on the operating temperature and mounting orientation. The resulting nominal current per channel is listed in the following diagrams.

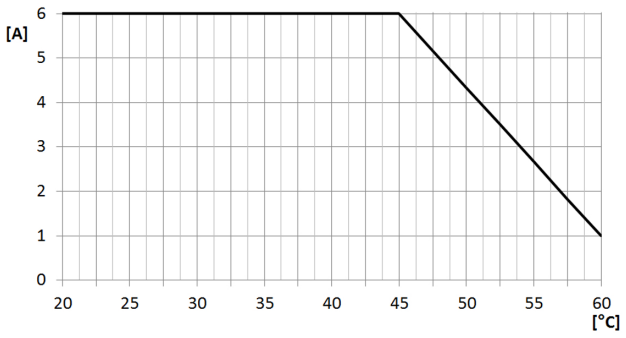
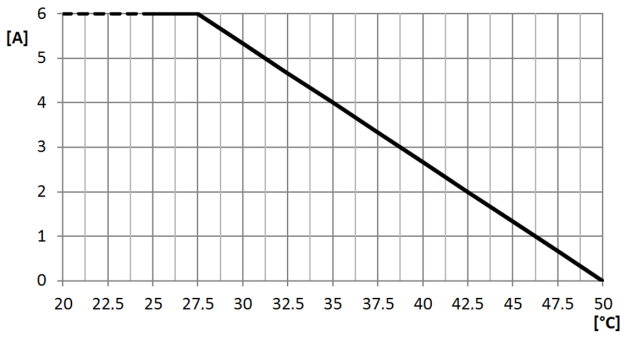
Horizontal (0 to 60°C, coated: -25 to 60°C)	Vertical (0 to 50°C, coated: -25 to 50°C)
X20SO2530	
	

Table 7: Derating in relation to operating temperature and mounting orientation

The max. squared summation current (i.e. sum of the square of the nominal currents) depends on the operating temperature and mounting orientation. The resulting max. squared summation current is listed in the following diagrams.

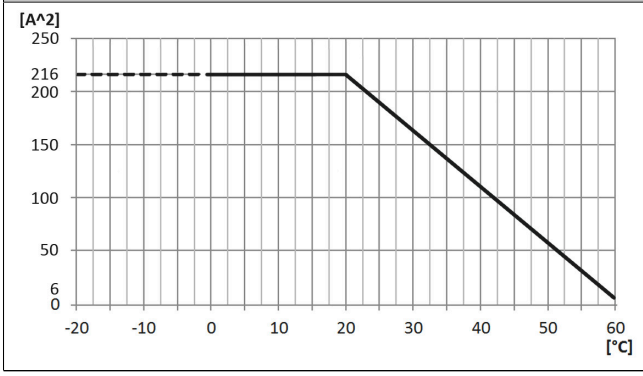
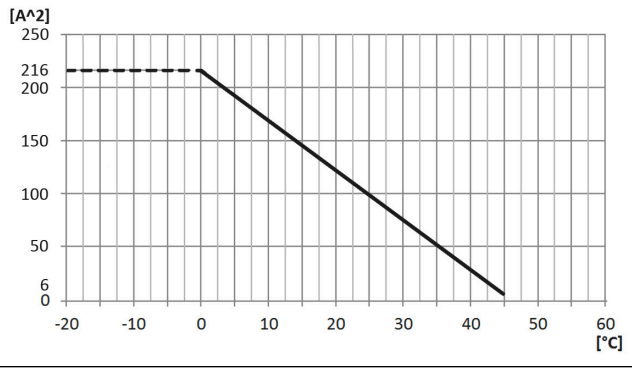
Horizontal (0 to 60°C)	Vertical (0 to 50°C)
X20SO6530	
	

Table 8: Derating in relation to operating temperature and mounting orientation

Information:

Regardless of the values specified in the derating curve, the module cannot be operated above the values specified in the technical data.

Contact service life of relay outputs

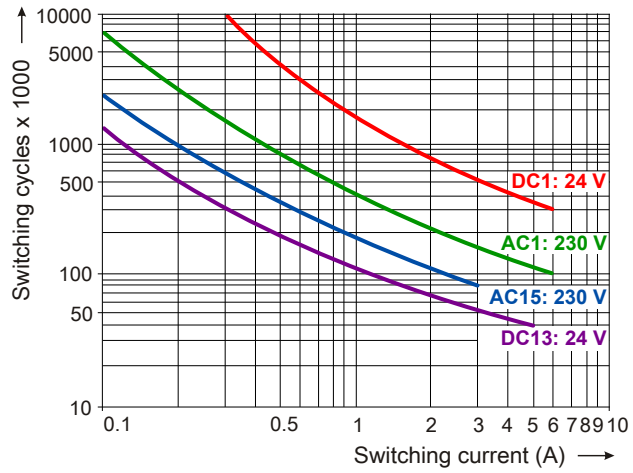
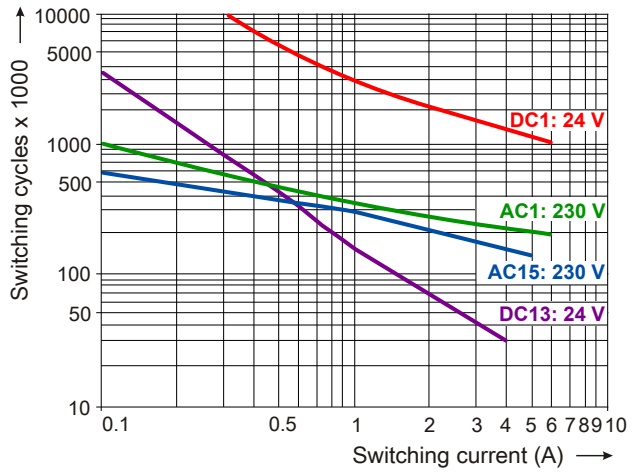
Contact service life of relay outputs	
X20SO2530	**X20SO6530**
	

Table 9: Contact service life of relay outputs

5 LED status indicators

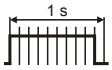
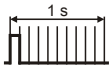
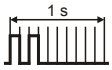
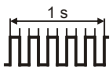
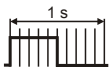
Figure	LED	Color	Status	Description
 X20SO2530  X20SO6530	r	Green	Off	No power to module
			Single flash	Mode "Reset"
			Double flash	Updating firmware
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			Pulsating	Bootloader mode
			Triple flash	Updating safety-related firmware
			On	Error or I/O component not provided with voltage
	e + r	Solid red / Single green flash		Invalid firmware
	1 to 6	Output state of the corresponding digital output		
		Red	On	Warning/Error on an output channel
			All on	Error on all channels, connection to the SafeLOGIC controller not OK or startup not yet completed
		Orange	On	Output set
	SE	Red	Off	Mode RUN or I/O component not provided with voltage
				Boot phase, missing X2X Link or defective processor
				Safety PREOPERATIONAL state Modules that are not used in the SafeDESIGNER application remain in state PREOPERATIONAL.
				Safe communication channel not OK
				The firmware for this module is a non-certified pilot customer version.
				Boot phase, faulty firmware
			On	Safety state active for the entire module (= state "FailSafe")
		The "SE" LEDs separately indicate the status of safety processor 1 (LED "S") and safety processor 2 (LED "E").		

Table 10: Status indicators

Danger!

Constantly lit "SE" LEDs indicate a defective module that must be replaced immediately.
It is your responsibility to ensure that all necessary repair measures are initiated after an error occurs since subsequent errors can result in a hazard!

6 Pinouts

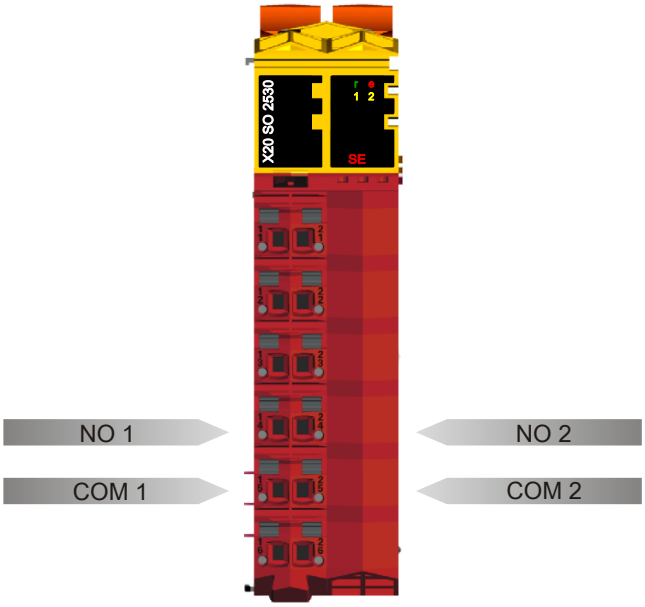


Figure 1: X20SO2530 - Pinout

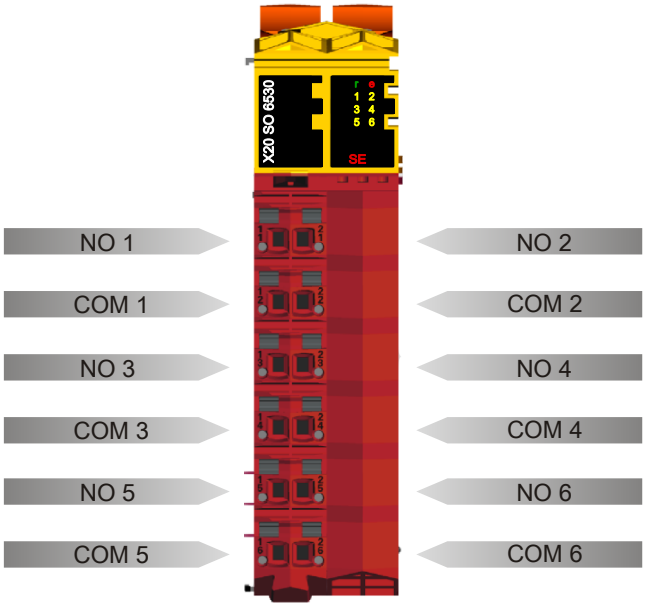


Figure 2: X20SO6530 - Pinout

7 Connection examples

The typical connection examples in this section only represent a selection of the different wiring methods. The user must take error detection into account in each case.

Information:

For details about connection examples (such as circuit examples, compatibility class, max. number of supported channels, terminal assignments, etc.), see chapter Connection examples of the "Integrated safety technology" user's manual (MASAFETY-ENG).

7.1 Connecting safety-oriented actuators for relay outputs

The connection example shown here only represents a selection of the possible wiring methods. However, the following must always be taken into consideration:

- Two relay channels must be connected in series for applications that correspond to EN ISO 13849-1:2015 above category 1.
- Relay contacts must be protected with a fuse (see technical data for the module).

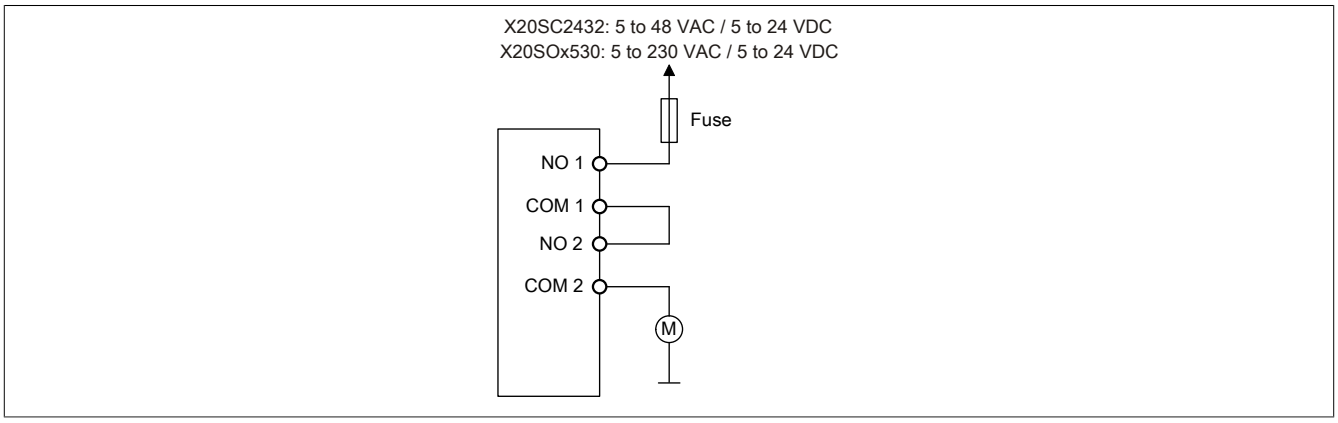


Figure 3: Connecting safety-oriented actuators for relay outputs

Danger!

Make sure that a proper protective circuit is used for the relay contacts (see technical data for the module). Also consider that operation outside of the specification is not permitted.

Operating outside of the specification or not using a protective circuit can cause the relay contacts to melt simultaneously, resulting in a loss of safety functionality.

Danger!

To prevent possible faults caused by short circuits to other voltage levels, wiring that protects against short circuits is needed for the actuator connection. The measures referenced in EN ISO 13849-2:2012, appendix D.2.4, table D.4 must be selected.

Danger!

For applications above category 1 per EN ISO 13849-1:2015, the two relay contacts of both relays must be connected in series. In this type of application, the two relays must be controlled using signal "SafeDigitalOutputxxyy".

Controlling the two relay contacts using only the single signals "SafeDigitalOutputxx" is not permitted for applications above category 1 per EN ISO 13849-1:2015 since certain operating states can cause the two relay contacts to melt simultaneously in this case.

Information:

Using signal "SafeDigitalOutputxxyy" and "SafeDigitalOutputxx" at the same time is not permitted and prevented by the system.

Using signal "SafeDigitalOutputxxyy" causes a switch-on sequence to be activated that switches on relay 2 with a 20 ms delay. This behavior is necessary to prevent simultaneous melting of the two relay contacts in certain operating states. Controlling two independent EN ISO 13849-1:2015 Category 1 actuators using signal "SafeDigitalOutputxxyy" must therefore be avoided since this causes delayed activation of the actuator on channel 2.

8 Error detection

8.1 Internal module errors

The red "SE" LED makes it possible to evaluate the following error states:

- Module error, e.g. defective RAM, defective CPU, etc.
- Overtemperature/Undertemperature
- Overvoltage/Undervoltage
- Incompatible firmware version

Errors that occur within the module are detected according to the requirements of the standards listed in the certificate and within the minimum safety response time specified in the technical data. After this occurs, the module enters a safe state.

The internal module tests needed for this are only performed, however, if the module's firmware has been booted and the module is in either the PREOPERATIONAL state or the OPERATIONAL state. If this state is not achieved (for example, because the module has not been configured in the application), then the module will remain in the boot state.

BOOT mode on a module is clearly indicated by a slowly blinking SE LED (2 Hz or 1 Hz).

The error detection time specified in the technical data is relevant only for detecting external errors (i.e. wiring errors) in single-channel structures.

Danger!

Operating the safety module in BOOT mode is not permitted.

Danger!

A safety-related output channel is only permitted to be switched off for a maximum of 24 hours. The channel must be switched on by the end of this period so that the module's internal channel test can be performed.

8.2 Wiring errors

The wiring errors described in section "Error detection" are indicated by the red channel LED according to the application.

If a module detects an error, then:

- The channel LED is lit constantly red.
- Status signal (e.g. (Safe)ChannelOK, (Safe)InputOK, (Safe)OutputOK, etc.) is set to (SAFE)FALSE.
- Signal "SafeDigitalInputxx" or "SafeDigitalOutputxx" is set to SAFEFALSE.
- An entry is generated in the logbook.

Danger!

Recognizable errors (see the following chapters) are detected by the module within the error detection time. Errors not recognized by the module (or not recognized on time) that can lead to safety-critical states must be detected using additional measures.

Danger!

It is your responsibility to ensure that all necessary repair measures are initiated after an error occurs since subsequent errors can result in a hazard!

8.2.1 Connecting safety-oriented actuators for relay outputs

Danger!

A relay channel does not have error detection for wiring problems. All errors resulting from incorrect or faulty wiring must be handled through supplementary measures or by the connected device.

Danger!

The user is responsible for ensuring that each relay channel is cut off at least 1x per week so that the appropriate internal tests can be completed.

9 Output circuit diagram

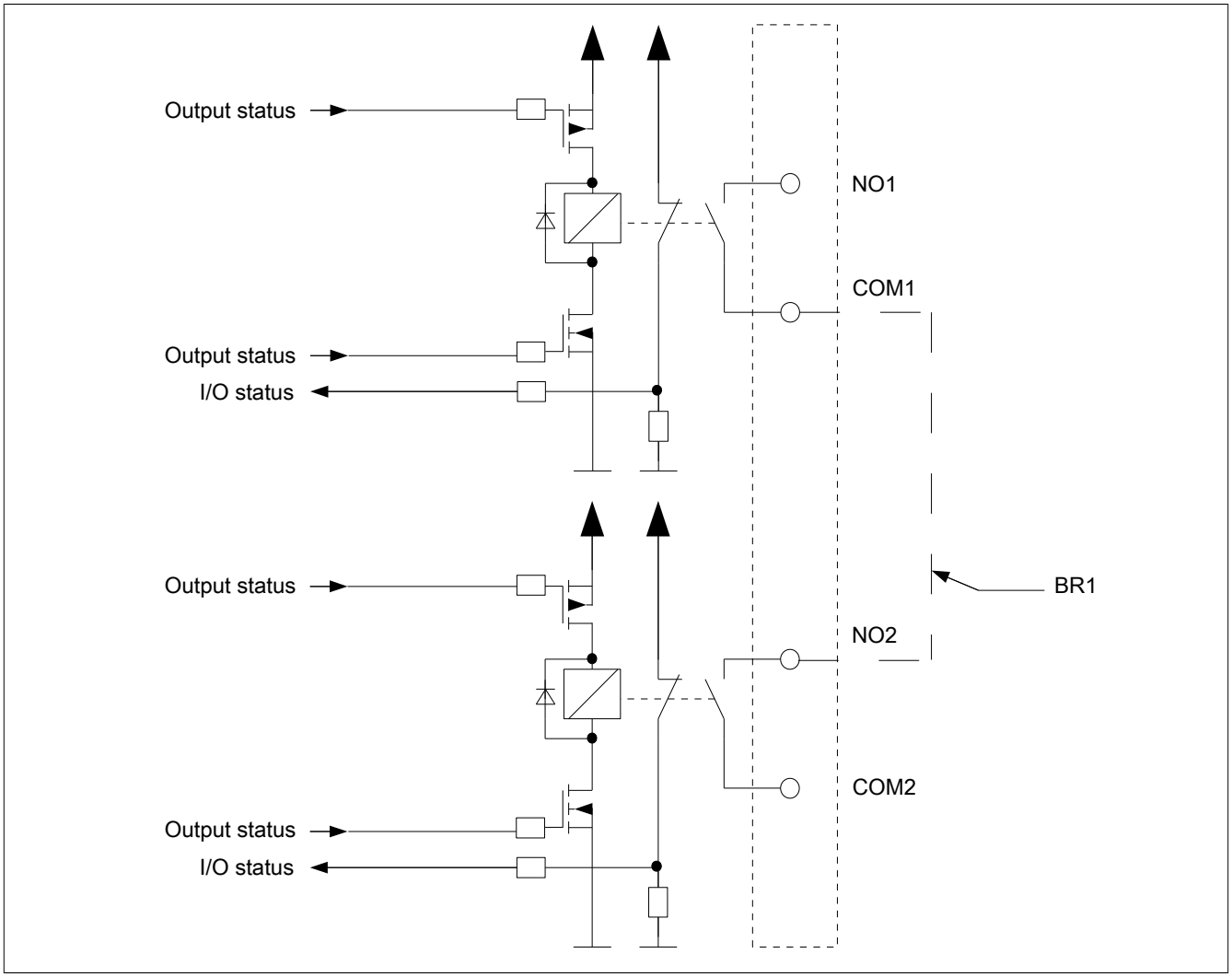


Figure 4: Output circuit diagram

10 Minimum cycle time

The minimum cycle time specifies the time up to which the bus cycle can be reduced without communication errors occurring.

Minimum cycle time
200 µs

11 I/O update time

The time needed by the module to generate a sample is specified by the I/O update time.

Minimum I/O update time	
X20SO2530	X20SO6530
500 µs	

Maximum I/O update time	
X20SO2530	X20SO6530
1000 µs + 50 ms	

12 Enabling principle

Each output channel has an additional standard switching signal that can be used to access the output channel from the standard application. As soon as the output channel has been enabled from a safety-related point of view (the setting of the channel is enabled from the point of view of the safety technology), the output channel can be set or cleared in the standard application independently of the additional safety-related runtime and jitter times.

Use of the enabling principle is specified in the I/O configuration in Automation Studio.

13 Restart behavior

Each digital input channel is not equipped with an internal start interlock on error, which means that the associated channel data reverts back to the proper state automatically after an error situation on the module and/or network. It is the responsibility of the user to connect the channel data of the safe input channels correctly and to provide them with a restart interlock. The restart interlocks of PLCopen function blocks can be used here, for example. Using input channels without a correctly connected restart interlock can result in an automatic restart.

Each output channel is equipped with an internal "start interlock on error", which means that the following sequence must be followed in order to switch on a channel after an error situation on the module/network and/or after ending the safety function:

- Correct all module, channel or communication errors.
- Enable the output as described in section ""Start interlock on error" state diagram".

This sequence is necessary in the following situations:

- After switching on
- After correcting an error on the safe communication channel
- After correcting a channel error

For switching the release signal, the notes for manual reset function in EN ISO 13849-1:2015 must be observed.

14 X20SO2530 - Register description

14.1 Parameters in the I/O configuration

Group: Function model

Parameter	Description	Default value	Unit
Function model	This parameter is reserved for future functional expansions.	Default	-

Table 11: I/O configuration parameters: Function model

Group: General

Parameter	Description	Default value	Unit
Module supervised	System behavior when a module is missing	On	-
	Parameter value / **Description** On: A missing module triggers service mode. Off: A missing module is ignored.		
Module information (up to AS 3.0.90)	This parameter enables/disables the module-specific information in the I/O mapping: • SerialNumber • ModuleID • HardwareVariant • FirmwareVersion	Off	-
Blackout mode (hardware upgrade 1.10.0.6 or later)	This parameter enables blackout mode (see section Blackout mode in Automation Help under: Hardware → X20 system → Additional information → Blackout mode).	Off	-
	Parameter value / **Description** On: Blackout mode is enabled. Off: Blackout mode is disabled.		
Channel status information	This parameter enables/disables the channel-specific status information in the I/O mapping.	On	-
Restart inhibit state numbers	This parameter enables/disables restart interlock status information.	Off	-
SafeLOGIC ID	In applications with multiple SafeLOGIC controllers, this parameter defines the module's association with a particular SafeLOGIC controller. • Permissible values: 1 to 1024	Assigned automatically	-
SafeMODULE ID	Unique safety address of the module • Permissible values: 2 to 1023	Assigned automatically	-

Table 12: I/O configuration parameters: General

Group: Output signal path

Parameter	Description	Default value	Unit
DigitalOutputxx DigitalOutputxxyy	This parameter specifies the mode that can be used by the standard application to access the output channel.	Direct	-
	Parameter value / **Description** Direct: The output channel can be accessed directly by the standard application. Signals "DigitalOutputxx" and "DigitalOutputxxyy" are available in the I/O mapping accordingly. Via SafeLOGIC: The output channel cannot be accessed directly by the standard application. Signals "DigitalOutputxx" and "DigitalOutputxxyy" are not available in the I/O mapping accordingly. It is only possible for the standard application to influence the output channel via the communication channels from the CPU to the SafeLOGIC controller.		

Table 13: I/O configuration parameters: Output signal path

14.2 Parameters in SafeDESIGNER - up to Release 1.9

Group: Basic

Parameter	Description	Default value	Unit
Min_required_FW_Rev	This parameter is reserved for future functional expansions.	Basic Release	-
Optional	This parameter can be used to configure the module as "optional". Optional modules do not have to be present, i.e. the SafeLOGIC controller will not indicate that these modules are not present. However, this parameter does not influence the module's signal or status data.	No	-

Parameter value	Description
No	This module is mandatory for the application. The module must be in OPERATIONAL mode after startup, and safe communication to the SafeLOGIC controller must be established without errors (SafeModuleOK = SAFETRUE). Processing of the safety application on the SafeLOGIC controller is delayed after startup until this state is achieved for all modules with "Optional = No". After startup, module problems are indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is also made in the logbook.
Yes	The module is not required for the application. The module is not taken into account during startup, which means the safety application is started regardless of whether the modules with "Optional = Yes" are in OPERATIONAL mode or if safe communication is properly established between these modules and the SafeLOGIC controller. After startup, module problems are NOT indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is NOT made in the logbook.
Startup	This module is optional. The system determines how the module will proceed during startup. If it is determined that the module is physically present during startup (regardless of whether it is in OPERATIONAL mode or not), then the module behaves as if "Optional = No" is set. If it is determined that the module is not physically present during startup, then the module behaves as if "Optional = Yes" is set.
Not_Present (Release 1.9 and later)	The module is not required for the application. The module is ignored during startup, which means the safety application is started regardless of whether the modules with "Optional = Not_Present" are physically present. Unlike when "Optional = Yes" is configured, the module is not started with "Optional = Not_Present", which optimizes system startup behavior. After startup, module problems are NOT indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is NOT made in the logbook.

External_UDID	This parameter enables the option on the module for the expected UDID to be specified externally by the CPU.	No	-

Parameter value	Description
Yes-ATTENTION	The UDID is determined by the CPU. The SafeLOGIC controller must be restarted if the UDID is changed.
No	The UDID is specified by a teach-in procedure during startup.

Table 14: SafeDESIGNER parameters: Basic

Danger!

If function "External_UDID = Yes-ATTENTION" is used, incorrect specifications from the CPU can lead to safety-critical situations.
Perform an FMEA (Failure Mode and Effects Analysis) in order to detect these situations and implement additional safety measures to handle them.

Group: Safety_Response_Time

Parameter	Description	Default value	Unit
Manual_Configuration	This parameter makes it possible to manually and individually configure the safety response time for the module. The parameters for the safety response time are generally set in the same way for all stations involved in the application. For this reason, these parameters are configured for the SafeLOGIC controller in SafeDESIGNER. For application situations in which individual safety functions require optimal response time behavior, the parameters for the safety response time can be configured individually on the respective module.	No	-
	Parameter value / **Description** Yes: Data from the module's "Safety_Response_Time" group is used to calculate the safety response time for the module's signals. No: The parameters for the safety response time are taken from the "Safety_Response_Time" group on the SafeLOGIC controller.		
Synchronous_Network_Only	This parameter describes the synchronization characteristics of the network being used. They are defined in Automation Studio / Automation Runtime.	Yes	-
	Parameter value / **Description** Yes: In order to calculate the safety response time, networks must be synchronous and their cycle times must either be the same or an integer ratio of the cycle times. No: No requirement for synchronization of the networks		
Max_X2X_CycleTime_us	This parameter specifies the maximum X2X cycle time used to calculate the safety response time. • Permissible values: 200 to 25,000 µs (corresponds to 0.2 to 25 ms)	5000	µs
Max_Powerlink_CycleTime_us	This parameter specifies the maximum POWERLINK cycle time used to calculate the safety response time. • Permissible values: 200 to 25,000 µs (corresponds to 0.2 to 25 ms)	5000	µs
Max_CPU_CrossLinkTask_ CycleTime_us	This parameter specifies the maximum cycle time for the copy task on the CPU used to calculate the safety response time. The value 0 indicates that a copy task is not included for the response time. • Permissible values: 0 to 25,000 µs (corresponds to 0 to 25 ms)	5000	µs
Min_X2X_CycleTime_us	This parameter specifies the minimum X2X cycle time used to calculate the safety response time. • Permissible values: 200 to 25,000 µs (corresponds to 0.2 to 25 ms)	200	µs
Min_Powerlink_CycleTime_us	This parameter specifies the minimum POWERLINK cycle time used to calculate the safety response time. • Permissible values: 200 to 25,000 µs (corresponds to 0.2 to 25 ms)	200	µs
Min_CPU_CrossLinkTask_ CycleTime_us	This parameter specifies the minimum cycle time for the copy task on the CPU used to calculate the safety response time. The value 0 indicates that configurations without a copy task are also included for the response time. • Permissible values: 0 to 25,000 µs (corresponds to 0 to 25 ms)	0	µs
Worst_Case_Response_Time_us	This parameter specifies the limit value for monitoring the safety response time. • Permissible values: 3000 to 5,000,000 µs (corresponds to 3 ms to 5 s)	50000	µs
Node_Guarding_Lifetime	This parameter specifies the maximum number of attempts to be made during the time set with parameter "Node_Guarding_Timeout_s". The purpose of these attempts is to ensure that the module is available. • Permissible values: 1 to 255 **Note** • The larger the configured value, the greater the amount of asynchronous data traffic. • This setting is not critical to safety functionality. The time for safely cutting off actuators is determined independently using parameter "Worst_Case_Response_Time_us".	5	-

Table 15: SafeDESIGNER parameters: Safety_Response_Time

Group: SafeDigitalOutputxx, SafeDigitalOutputxxyy

Parameter	Description	Default value	Unit
Auto_Restart	This parameter can be used to configure an automatic restart on the module (see section "Restart behavior").	No	-

Parameter value	Description
Yes-ATTENTION	"Automatic restart" function is activated.
No	"Automatic restart" function is not activated.

Table 16: SafeDESIGNER parameters: SafeDigitalOutputxx, SafeDigitalOutputxxyy

Danger!

Configuring an automatic restart can result in critical safety conditions. Take additional measures to ensure proper safety-related functionality.

14.3 Parameters in SafeDESIGNER - Release 1.10 and later

Group: Basic

Parameter	Description	Default value	Unit
Min required FW Rev	This parameter is reserved for future functional expansions.	Basic Release	-
Optional	This parameter can be used to configure the module as "optional". Optional modules do not have to be present, i.e. the SafeLOGIC controller will not indicate that these modules are not present. However, this parameter does not influence the module's signal or status data.	No	-

Parameter value	Description
No	This module is absolutely necessary for the application. The module must be in OPERATIONAL mode after startup, and safe communication to the SafeLOGIC controller must be established without errors (SafeModuleOK = SAFETRUE). Processing of the safety application on the SafeLOGIC controller is delayed after startup until this state is achieved for all modules with "Optional = No". After startup, module problems are indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is also made in the logbook.
Yes	This module is not necessary for the application. The module is not taken into account during startup, which means the safety application is started regardless of whether the modules with "Optional = Yes" are in OPERATIONAL mode or if safe communication is properly established between these modules and the SafeLOGIC controller. After startup, module problems are NOT indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is NOT made in the logbook.
Startup	This module is optional. The system determines how the module will proceed during startup. If it is determined that the module is physically present during startup (regardless of whether it is in OPERATIONAL mode or not), then the module behaves as if "Optional = No" is set. If it is determined that the module is not physically present during startup, then the module behaves as if "Optional = Yes" is set.
NotPresent	This module is not necessary for the application. The module is ignored during startup, which means the safety application is started regardless of whether the modules with "Optional = NotPresent" are physically present. Unlike when "Optional = Yes" is configured, the module is not started with "Optional = NotPresent", which optimizes system startup behavior. After startup, module problems are NOT indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is NOT made in the logbook.

External UDID	This parameter enables the option on the module for the expected UDID to be specified externally by the CPU.	No	-

Parameter value	Description
Yes-ATTENTION	The UDID is determined by the CPU. The SafeLOGIC controller must be restarted if the UDID is changed.
No	The UDID is specified by a teach-in procedure during startup.

Table 17: SafeDESIGNER parameters: Basic

Danger!

If function "External UDID = Yes-ATTENTION" is used, incorrect specifications from the CPU can lead to safety-critical situations.
Perform an FMEA (Failure Mode and Effects Analysis) in order to detect these situations and implement additional safety measures to handle them.

Group: Safety Response Time

Parameter	Description	Default value	Unit
Manual Configuration	This parameter makes it possible to manually and individually configure the safety response time for the module. The parameters for the safety response time are generally set in the same way for all stations involved in the application. For this reason, these parameters are configured for the SafeLOGIC controller in SafeDESIGNER. For application situations in which individual safety functions require optimal response time behavior, the parameters for the safety response time can be configured individually on the respective module.	No	-
	Parameter value / **Description** Yes: Data from the module's "Safety Response Time" group is used to calculate the safety response time for the module's signals. No: The parameters for the safety response time are taken from the "Safety Response Time" group on the SafeLOGIC controller.		
Safe Data Duration	This parameter specifies the maximum permissible data transmission time between the SafeLOGIC controller and SafeIO module. For more information about the actual data transmission time, see section Diagnostics and service → Diagnostics tools → Network analyzer → Editor → Calculation of safety runtime of Automation Help. The cycle time of the safety application must also be added. • Permissible values: 2000 to 10,000,000 µs (corresponds to 2 ms to 10 s)	20000	µs
Additional Tolerated Packet Loss	This parameter specifies the number of additional tolerated lost packets during data transfer. • Permissible values: 0 to 10	0	Packets
Packets per Node Guarding	This parameter specifies the maximum number of packets used for node guarding. • Permissible values: 1 to 255 **Note** • The larger the configured value, the greater the amount of asynchronous data traffic. • This setting is not critical to safety functionality. The time for safely cutting off actuators is determined independently of this.	5	Packets

Table 18: SafeDESIGNER parameters: Safety Response Time

Group: SafeDigitalOutputxx, SafeDigitalOutputxxyy

Parameter	Description	Default value	Unit
Auto Restart	This parameter can be used to configure an automatic restart on the module (see section "Restart behavior").	No	-
	Parameter value / **Description** Yes-ATTENTION: "Automatic restart" function is activated. No: "Automatic restart" function is not activated.		

Table 19: SafeDESIGNER parameters: SafeDigitalOutputxx, SafeDigitalOutputxxyy

Danger!

Configuring an automatic restart can result in critical safety conditions. Take additional measures to ensure proper safety-related functionality.

14.4 Channel list

<table>
<tr><th>Channel name</th><th>Access via Automation Studio</th><th>Access via SafeDESIGNER</th><th>Data type</th><th>Description</th></tr>
<tr><td>ModuleOk</td><td>Read</td><td>-</td><td>BOOL</td><td>Indicates if the module is OK</td></tr>
<tr><td>SerialNumber</td><td>Read</td><td>-</td><td>UDINT</td><td>Module serial number</td></tr>
<tr><td>ModuleID</td><td>Read</td><td>-</td><td>UINT</td><td>Module ID</td></tr>
<tr><td>HardwareVariant</td><td>Read</td><td>-</td><td>UINT</td><td>Hardware variant</td></tr>
<tr><td>FirmwareVersion</td><td>Read</td><td>-</td><td>UINT</td><td>Firmware version of the module</td></tr>
<tr><td>UDID_low</td><td>(Read) 1)</td><td>-</td><td>UDINT</td><td>UDID, lower 4 bytes</td></tr>
<tr><td>UDID_high</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>UDID, upper 2 bytes</td></tr>
<tr><td>SafetyFWversion1</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>Firmware version - Safety processor 1</td></tr>
<tr><td>SafetyFWversion2</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>Firmware version - Safety processor 2</td></tr>
<tr><td>SafetyFWcrc1
(hardware upgrade 1.10.1.0 or later)</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>CRC of firmware header on safety processor 1</td></tr>
<tr><td>SafetyFWcrc2
(hardware upgrade 1.10.1.0 or later)</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>CRC of firmware header on safety processor 2</td></tr>
<tr><td>Bootstate
(hardware upgrade 1.10.1.0 or later)</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>Startup state of the module.
Notes:
Some of the boot states do not occur during normal startup or are cycled through so quickly that they are not visible externally.
The boot states usually cycle through in ascending order. There are cases, however, in which a previous value is captured.
<table><tr><th>Value</th><th>Description</th></tr><tr><td>0x0003</td><td>Startup communication processor OK, no communication to the safety processors (check 24 V supply voltage!)</td></tr><tr><td>0x0010</td><td>FAILSAFE. At least one of the safety processors is in the safe state.</td></tr><tr><td>0x0020</td><td>Internal communication to safety processors started</td></tr><tr><td>0x0024</td><td>Firmware update of safety processors</td></tr><tr><td>0x0040</td><td>Firmware of safety processors started</td></tr><tr><td>0x0440</td><td>Firmware of safety processors running</td></tr><tr><td>0x0840</td><td>Waiting for openSAFETY "Operational" (loading SafeDESIGNER application or no valid application exists, waiting on acknowledgments such as module exchange)</td></tr><tr><td>0x1040</td><td>Evaluating the configuration according to the SafeDESIGNER application</td></tr><tr><td>0x3440</td><td>Stabilizing cyclic openSAFETY data exchange.
Note:
If the boot state remains here, check SafeDESIGNER parameters "(Default) Safe Data Duration", "(Default) Additional Tolerated Packet Loss".</td></tr><tr><td>0x4040</td><td>RUN. Final state, startup completed.</td></tr></table></td></tr>
<tr><td>Diag1_Temp</td><td>(Read) 1)</td><td>-</td><td>INT</td><td>Module temperature in °C</td></tr>
<tr><td>SafeModuleOK</td><td>-</td><td>Read</td><td>SAFEBOOL</td><td>Indicates if the safe communication channel is OK</td></tr>
<tr><td>DigitalOutputxx</td><td>Write</td><td>-</td><td>BOOL</td><td>Enable signal - Channel SO xx</td></tr>
<tr><td>DigitalOutputxxyy</td><td>Write</td><td>-</td><td>BOOL</td><td>Enable signal for combined channel SO xx/yy</td></tr>
<tr><td>SafeDigitalOutputxx</td><td>-</td><td>Write</td><td>SAFEBOOL</td><td>Safe channel SO xx</td></tr>
<tr><td>SafeDigitalOutputxxyy</td><td>-</td><td>Write</td><td>SAFEBOOL</td><td>Safe combined channel SO xx/yy</td></tr>
<tr><td>SafeOutputOKxx</td><td>Read</td><td>Read</td><td>SAFEBOOL</td><td>Status of channel SO xx</td></tr>
<tr><td>ReleaseOutputxx</td><td>-</td><td>Write</td><td>BOOL</td><td>Release signal for the restart interlock of channel SO xx</td></tr>
<tr><td>ReleaseOutputxxyy</td><td>-</td><td>Write</td><td>BOOL</td><td>Release signal for the restart interlock of combined channel SO xx/yy</td></tr>
<tr><td>PhysicalStateChannelxx</td><td>Read</td><td>Read</td><td>BOOL</td><td>Read-back value of physical channel SO xx</td></tr>
<tr><td>FBK_Status_1</td><td>Read</td><td>-</td><td>UINT</td><td>State number of the restart interlock of channel x. See "Restart interlock state diagram".<table><tr><th>Bit 15 to 12</th><th>Bit 11 to 8</th><th>Bit 7 to 4</th><th>Bit 3 to 0</th></tr><tr><td>Reserved</td><td>Reserved</td><td>Channel 2</td><td>Channel 1</td></tr></table></td></tr>
</table>

Table 20: Channel list

1) This data is accessed in Automation Studio using the ASIOACC library.

Danger!

For applications above category 1 per EN ISO 13849-1:2015, the two relay contacts of both relays must be connected in series. In this type of application, the two relays must be controlled using signal "SafeDigitalOutputxxyy".

Controlling the two relay contacts using only the single signals "SafeDigitalOutputxx" is not permitted for applications above category 1 per EN ISO 13849-1:2015 since certain operating states can cause the two relay contacts to melt simultaneously in this case.

Information:

Using signal "SafeDigitalOutputxxyy" and "SafeDigitalOutputxx" at the same time is not permitted and prevented by the system.

Using signal "SafeDigitalOutputxxyy" causes a switch-on sequence to be activated that switches on relay 2 with a 20 ms delay. This behavior is necessary to prevent simultaneous melting of the two relay contacts in certain operating states. Controlling two independent EN ISO 13849-1:2015 Category 1 actuators using signal "SafeDigitalOutputxxyy" must therefore be avoided since this causes delayed activation of the actuator on channel 2.

Restart interlock state diagram

The following state diagram illustrates the effect of the restart interlock integrated in the module. The hexadecimal value in parentheses corresponds to the state number that is provided via the channel "FBK_Status_1".
For detailed information regarding restart interlock, see section "Restart behavior".

Information:

To set an output channel, a positive edge on signal "ReleaseOutput0x" is required after signal "SafeDigitalOutput0x". This edge must occur at least 1 network cycle after signal "SafeDigitalOutput0x". If this timing is not adhered to, the output channel remains inactive.

Information:

For the maximum switching frequency, see the technical data for the module.

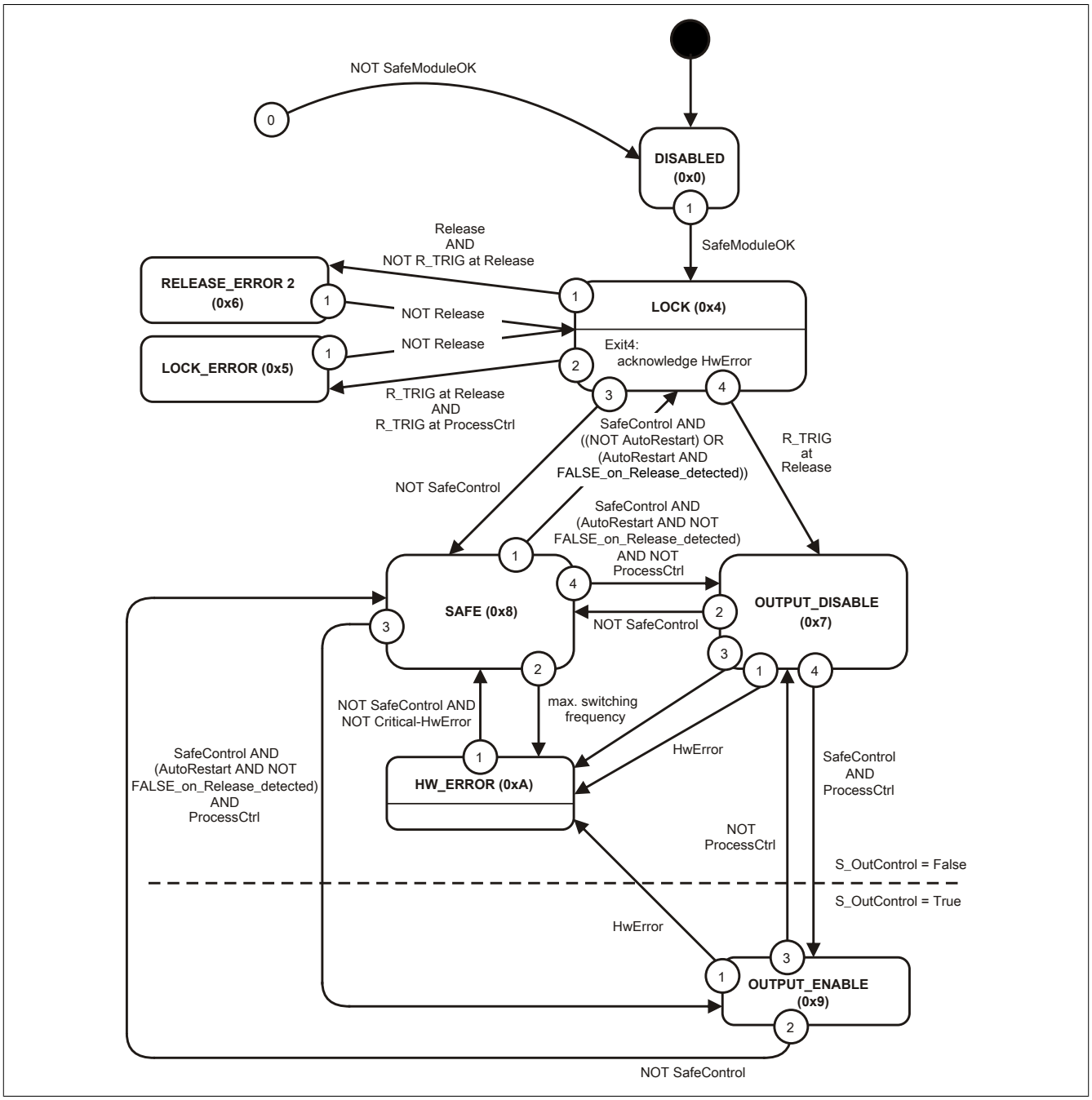


Figure 5: Restart interlock - State diagram

15 X20SO6530 - Register description

15.1 Parameters in the I/O configuration

Group: Function model

Parameter	Description	Default value	Unit
Function model	This parameter is reserved for future functional expansions.	Default	-

Table 21: I/O configuration parameters: Function model

Group: General

Parameter	Description	Default value	Unit
Module supervised	System behavior when a module is missing	On	-
	Parameter value / **Description** On / A missing module triggers service mode. Off / A missing module is ignored.		
Blackout mode	This parameter enables blackout mode (see section Blackout mode in Automation Help under: Hardware → X20 system → Additional information → Blackout mode).	Off	-
	Parameter value / **Description** On / Blackout mode is enabled. Off / Blackout mode is disabled.		
Channel state information	This parameter enables/disables the channel-specific status information in the I/O mapping.	On	-
State number for start interlock on error	This parameter enables/disables the status information for the start interlock on error.	Off	-
SafeDOMAIN ID	In applications with multiple SafeLOGIC controllers, this parameter defines the module's association with a particular SafeLOGIC controller. • Permissible values: 1 to 1024	Assigned automatically	-
SafeNODE ID	Unique safety address of the module • Permissible values: 2 to 1023	Assigned automatically	-

Table 22: I/O configuration parameters: General

Group: Output signal path

Parameter	Description	Default value	Unit
Digital output xx Digital output xxyy	This parameter specifies the mode that can be used by the standard application to access the output channel.	Direct	-
	Parameter value / **Description** Direct / The output channel can be accessed directly by the standard application. Signals "DigitalOutputxx" and "DigitalOutputxxyy" are available in the I/O mapping accordingly. Via SafeLOGIC / The output channel cannot be accessed directly by the standard application. Signals "DigitalOutputxx" and "DigitalOutputxxyy" are not available in the I/O mapping accordingly. It is only possible for the standard application to influence the output channel via the communication channels from the CPU to the SafeLOGIC controller.		

Table 23: I/O configuration parameters: Output signal path

15.2 Parameters in SafeDESIGNER

Group: Basic

<table>
<tr><th>Parameter</th><th>Description</th><th>Default value</th><th>Unit</th></tr>
<tr><td>Min required FW Rev</td><td>This parameter is reserved for future functional expansions.</td><td>Basic Release</td><td>-</td></tr>
<tr><td>Optional</td><td>This parameter can be used to configure the module as "optional". Optional modules do not have to be present, i.e. the SafeLOGIC controller will not indicate that these modules are not present. However, this parameter does not influence the module's signal or status data.</td><td>No</td><td>-</td></tr>
<tr><td></td><td colspan="3">
<table>
<tr><th>Parameter value</th><th>Description</th></tr>
<tr><td>No</td><td>This module is absolutely necessary for the application.

The module must be in OPERATIONAL mode after startup, and safe communication to the SafeLOGIC controller must be established without errors (SafeModuleOK = SAFETRUE). Processing of the safety application on the SafeLOGIC controller is delayed after startup until this state is achieved for all modules with "Optional = No".

After startup, module problems are indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is also made in the logbook.</td></tr>
<tr><td>Yes</td><td>This module is not necessary for the application.

The module is not taken into account during startup, which means the safety application is started regardless of whether the modules with "Optional = Yes" are in OPERATIONAL mode or if safe communication is properly established between these modules and the SafeLOGIC controller.

After startup, module problems are NOT indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is NOT made in the logbook.</td></tr>
<tr><td>Startup</td><td>This module is optional. The system determines how the module will proceed during startup.

If it is determined that the module is physically present during startup (regardless of whether it is in OPERATIONAL mode or not), then the module behaves as if "Optional = No" is set.

If it is determined that the module is not physically present during startup, then the module behaves as if "Optional = Yes" is set.</td></tr>
<tr><td>NotPresent</td><td>This module is not necessary for the application.

The module is ignored during startup, which means the safety application is started regardless of whether the modules with "Optional = NotPresent" are physically present.

Unlike when "Optional = Yes" is configured, the module is not started with "Optional = NotPresent", which optimizes system startup behavior.

After startup, module problems are NOT indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is NOT made in the logbook.</td></tr>
</table>
</td></tr>
<tr><td>External UDID</td><td>This parameter enables the option on the module for the expected UDID to be specified externally by the CPU.</td><td>No</td><td>-</td></tr>
<tr><td></td><td colspan="3">
<table>
<tr><th>Parameter value</th><th>Description</th></tr>
<tr><td>Yes-ATTENTION</td><td>The UDID is determined by the CPU. The SafeLOGIC controller must be restarted if the UDID is changed.</td></tr>
<tr><td>No</td><td>The UDID is specified by a teach-in procedure during startup.</td></tr>
</table>
</td></tr>
</table>

Table 24: SafeDESIGNER parameters: Basic

Danger!

If function "External UDID = Yes-ATTENTION" is used, incorrect specifications from the CPU can lead to safety-critical situations.
Perform an FMEA (Failure Mode and Effects Analysis) in order to detect these situations and implement additional safety measures to handle them.

Group: Safety Response Time

<table>
<tr><th>Parameter</th><th>Description</th><th>Default value</th><th>Unit</th></tr>
<tr><td>Manual Configuration</td><td>This parameter makes it possible to manually and individually configure the safety response time for the module.

The parameters for the safety response time are generally set in the same way for all stations involved in the application. For this reason, these parameters are configured for the SafeLOGIC controller in SafeDESIGNER. For application situations in which individual safety functions require optimal response time behavior, the parameters for the safety response time can be configured individually on the respective module.

<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Yes</td><td>Data from the module's "Safety Response Time" group is used to calculate the safety response time for the module's signals.</td></tr><tr><td>No</td><td>The parameters for the safety response time are taken from the "Safety Response Time" group on the SafeLOGIC controller.</td></tr></table></td><td>No</td><td>-</td></tr>
<tr><td>Safe Data Duration</td><td>This parameter specifies the maximum permissible data transmission time between the SafeLOGIC controller and SafeIO module.
For more information about the actual data transmission time, see section Diagnostics and service → Diagnostics tools → Network analyzer → Editor → Calculation of safety runtime of Automation Help. The cycle time of the safety application must also be added.
• Permissible values: 2000 to 10,000,000 µs (corresponds to 2 ms to 10 s)</td><td>20000</td><td>µs</td></tr>
<tr><td>Additional Tolerated Packet Loss</td><td>This parameter specifies the number of additional tolerated lost packets during data transfer.
• Permissible values: 0 to 10</td><td>0</td><td>Packets</td></tr>
<tr><td>Packets per Node Guarding</td><td>This parameter specifies the maximum number of packets used for node guarding.
• Permissible values: 1 to 255
Note
• The larger the configured value, the greater the amount of asynchronous data traffic.
• This setting is not critical to safety functionality. The time for safely cutting off actuators is determined independently of this.</td><td>5</td><td>Packets</td></tr>
</table>

Table 25: SafeDESIGNER parameters: Safety Response Time

15.3 Channel list

<table>
<tr><th>Channel name</th><th>Access via Automation Studio</th><th>Access via SafeDESIGNER</th><th>Data type</th><th>Description</th></tr>
<tr><td>ModuleOk</td><td>Read</td><td>-</td><td>BOOL</td><td>Indicates if the module is OK</td></tr>
<tr><td>SerialNumber</td><td>Read</td><td>-</td><td>UDINT</td><td>Module serial number</td></tr>
<tr><td>ModuleID</td><td>Read</td><td>-</td><td>UINT</td><td>Module ID</td></tr>
<tr><td>HardwareVariant</td><td>Read</td><td>-</td><td>UINT</td><td>Hardware variant</td></tr>
<tr><td>FirmwareVersion</td><td>Read</td><td>-</td><td>UINT</td><td>Firmware version of the module</td></tr>
<tr><td>UDID_low</td><td>(Read) 1)</td><td>-</td><td>UDINT</td><td>UDID, lower 4 bytes</td></tr>
<tr><td>UDID_high</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>UDID, upper 2 bytes</td></tr>
<tr><td>MissionTimeEnd</td><td>(Read) 1)</td><td>-</td><td>UDINT</td><td>Expiration of the mission time.
Specified in format YYYYMMDD (e.g. 20250506 = 2025-05-06, 0 = Not stored).</td></tr>
<tr><td>SafetyFWversion1</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>Firmware version - Safety processor 1</td></tr>
<tr><td>SafetyFWversion2</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>Firmware version - Safety processor 2</td></tr>
<tr><td>SafetyFWcrc1</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>CRC of firmware header on safety processor 1</td></tr>
<tr><td>SafetyFWcrc2</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>CRC of firmware header on safety processor 2</td></tr>
<tr><td>Bootstate</td><td>(Read) 1)</td><td>-</td><td>UINT</td><td>Startup state of the module.
Notes:
Some of the boot states do not occur during normal startup or are cycled through so quickly that they are not visible externally.
The boot states usually cycle through in ascending order. There are cases, however, in which a previous value is captured.
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0x0003</td><td>Startup communication processor OK, no communication to the safety processors (check 24 V supply voltage!)</td></tr>
<tr><td>0x0010</td><td>FAILSAFE. At least one of the safety processors is in the safe state.</td></tr>
<tr><td>0x0020</td><td>Internal communication to safety processors started</td></tr>
<tr><td>0x0024</td><td>Firmware update of safety processors</td></tr>
<tr><td>0x0040</td><td>Firmware of safety processors started</td></tr>
<tr><td>0x0440</td><td>Firmware of safety processors running</td></tr>
<tr><td>0x0840</td><td>Waiting for openSAFETY "Operational" (loading SafeDESIGNER application or no valid application exists, waiting on acknowledgments such as module exchange)</td></tr>
<tr><td>0x1040</td><td>Evaluating the configuration according to the SafeDESIGNER application</td></tr>
<tr><td>0x3440</td><td>Stabilizing cyclic openSAFETY data exchange.
Note:
If the boot state remains here, check SafeDESIGNER parameters "(Default) Safe Data Duration", "(Default) Additional Tolerated Packet Loss".</td></tr>
<tr><td>0x4040</td><td>RUN. Final state, startup completed.</td></tr>
</table></td></tr>
<tr><td>Diag1_Temp</td><td>(Read) 1)</td><td>-</td><td>INT</td><td>Module temperature in °C</td></tr>
<tr><td>SafeModuleOK</td><td>-</td><td>Read</td><td>SAFEBOOL</td><td>Indicates if the safe communication channel is OK</td></tr>
<tr><td>DigitalOutputxx</td><td>Write</td><td>-</td><td>BOOL</td><td>Enable signal - Channel SO xx</td></tr>
<tr><td>DigitalOutputxxyy</td><td>Write</td><td>-</td><td>BOOL</td><td>Enable signal for combined channel SO xx/yy</td></tr>
<tr><td>SafeDigitalOutputxx</td><td>-</td><td>Write</td><td>SAFEBOOL</td><td>Safe channel SO xx</td></tr>
<tr><td>SafeDigitalOutputxxyy</td><td>-</td><td>Write</td><td>SAFEBOOL</td><td>Safe combined channel SO xx/yy</td></tr>
<tr><td>SafeOutputOKxx</td><td>Read</td><td>Read</td><td>SAFEBOOL</td><td>Status of channel SO xx</td></tr>
<tr><td>ReleaseOutput</td><td>-</td><td>Write</td><td>BOOL</td><td>Release signal for start interlock on error</td></tr>
<tr><td>PhysicalStateOutputxx</td><td>Read</td><td>Read</td><td>BOOL</td><td>Read-back value of physical channel SO xx</td></tr>
<tr><td>FBOutputState</td><td>Read</td><td>-</td><td>UDINT</td><td>State number of start interlock on error of channel x.
See section ""Start interlock on error" state diagram"
<table>
<tr><th>Bit 23 to 20</th><th>Bit 19 to 16</th><th>Bit 15 to 12</th><th>Bit 11 to 8</th><th>Bit 7 to 4</th><th>Bit 3 to 0</th></tr>
<tr><td>Channel 6</td><td>Channel 5</td><td>Channel 4</td><td>Channel 3</td><td>Channel 2</td><td>Channel 1</td></tr>
</table></td></tr>
</table>

Table 26: Channel list

1) This data is accessed in Automation Studio using the ASIOACC library.

Danger!

For applications above category 1 per EN ISO 13849-1:2015, the two relay contacts of both relays must be connected in series. In this type of application, the two relays must be controlled using signal "SafeDigitalOutputxxyy".

Controlling the two relay contacts using only the single signals "SafeDigitalOutputxx" is not permitted for applications above category 1 per EN ISO 13849-1:2015 since certain operating states can cause the two relay contacts to melt simultaneously in this case.

Information:

Using signal "SafeDigitalOutputxxyy" and "SafeDigitalOutputxx" at the same time is not permitted and prevented by the system.

Using signal "SafeDigitalOutputxxyy" causes a switch-on sequence to be activated that switches on relay 2 with a 20 ms delay. This behavior is necessary to prevent simultaneous melting of the two relay contacts in certain operating states. Controlling two independent EN ISO 13849-1:2015 Category 1 actuators using signal "SafeDigitalOutputxxyy" must therefore be avoided since this causes delayed activation of the actuator on channel 2.

"Start interlock on error" state diagram

The "start interlock on error" works independently of the "Enabling principle", i.e. the behavior described in section "Restart behavior" is not influenced by the configuration of the enabling principle or by the chronological position of the standard switching signal "DigitalOutputxx".

The following state diagram illustrates the effect of the "start interlock on error" integrated in the module. The hexadecimal value in parentheses corresponds to the state number that is provided via the channel "FBOutputState".

Information:

To set an output channel, at least one time interval from one network cycle is required between the rising edge on signal "SafeDigitalOutputxx" and the rising edge on signal "ReleaseOutput". If this timing is not adhered to, the output channel remains inactive.

Information:

For the maximum switching frequency, see the technical data for the module.

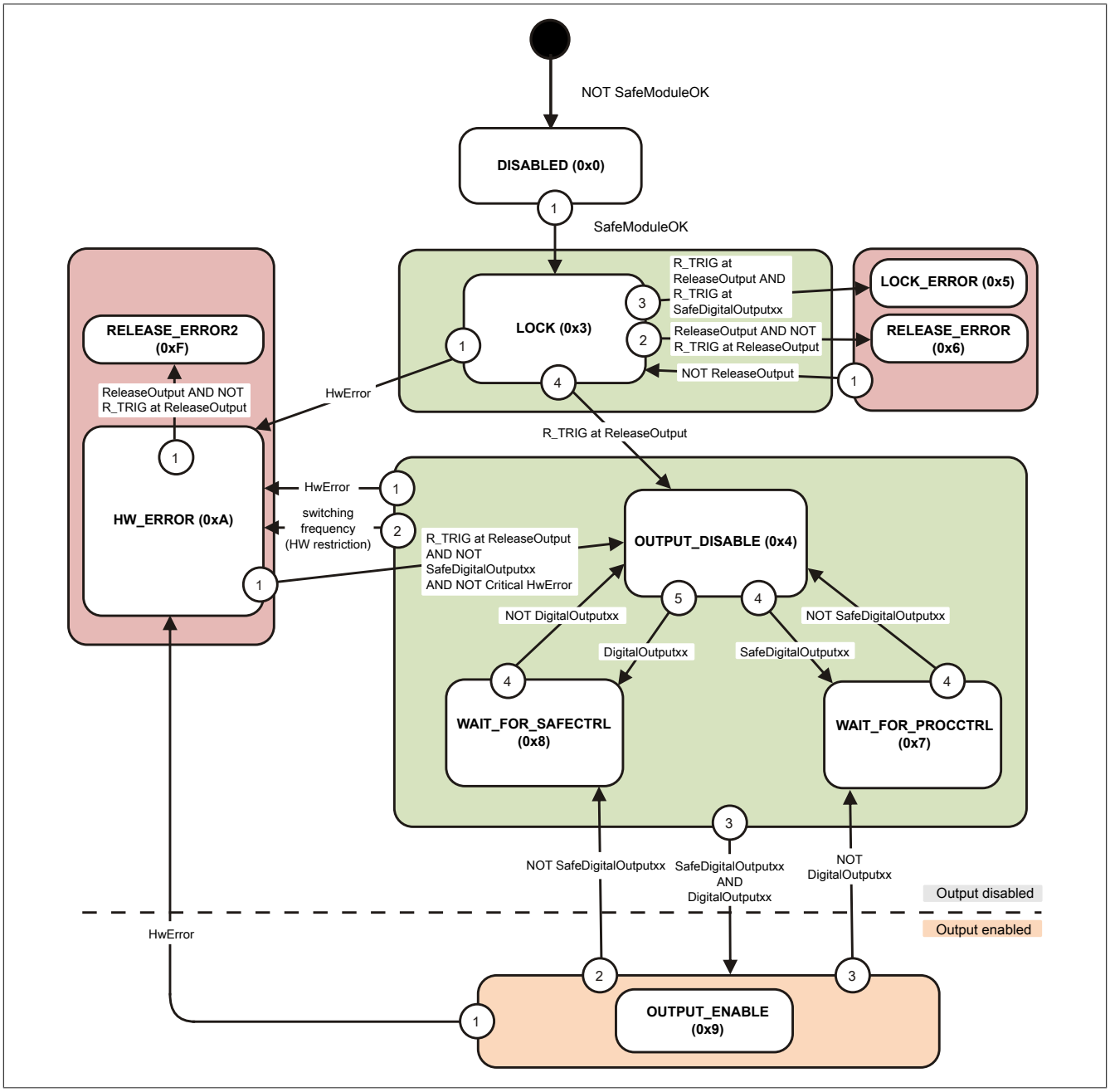


Figure 6: Start interlock on error - State diagram

16 Safety response time

The safety response time is the time between the arrival of the signal on the input channel and the output of the cutoff signal on the output.

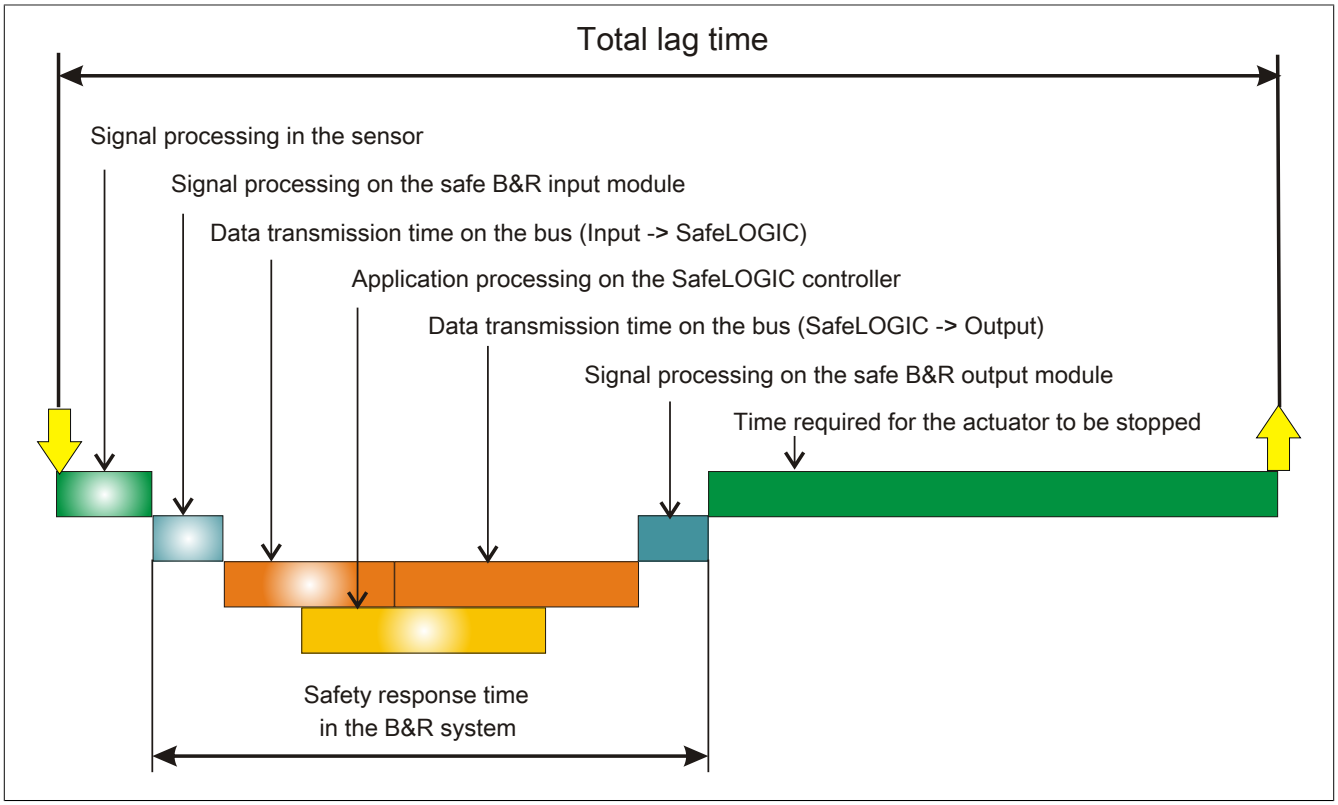


Figure 7: Total lag time

As illustrated in the figure, the safety response time in the B&R system is composed of the following partial response times:

- Signal processing on the safe B&R input module
- Data transmission time on the bus (Input -> SafeLOGIC)
- Data transmission time on the bus (SafeLOGIC -> Output)
- Signal processing on the safe B&R output module

Danger!

The following sections are dedicated exclusively to the safety response time in the B&R system. When assessing the complete safety response time, the user must include signal processing in the sensor as well as the time until the actuator is stopped.

Be sure to validate the total lag time on the system!

Information:

The safety response time in B&R products already contains all delays caused by sampling input data (sampling theorem).

16.1 Signal processing on the safe B&R input module

The maximum I/O update time in the "I/O update time" chapter for the respective module must be taken into account when processing signals in the safe B&R input module.

16.2 Data transmission time on the bus

The following relationship must be taken into consideration for the data transmission time on the bus:

- The time needed to transfer data from the input to the SafeLOGIC controller or to the output depends on the sum of the cycle times and CPU copy times in effect on the transfer line.
- POWERLINK MN (managing node, standard CPU) settings are important for the actual timing on the bus, but they cannot be used from a safety point of view since the values can be changed at any time in the course of modifications made outside of the safety application.
- In the SafeLOGIC controller, data transmission times are monitored on the bus using openSAFETY services. The time needed to process the application on the SafeLOGIC controller is taken into account in this test (system-dependent). Monitoring is defined in SafeDESIGNER using the parameters in parameter group "Safety Response Time".

Information:

The safety components located in this network segment could be cut off by the SafeLOGIC controller if modified parameters on the POWERLINK MN alter the data transmission times on the bus so that they lie outside of the SafeDESIGNER parameters defined in parameter group "Safety Response Time".

Information:

The safety components located in this network segment could be cut off by the SafeLOGIC controller if EMC disturbances cause data failures that fall outside of the SafeDESIGNER parameters defined in parameter group "Safety Response Time".

Calculating the maximum data transmission time - up to Release 1.9:

- The total max. data transmission time on the bus is calculated by adding parameter "Worst_Case_Response_Time_us" for the safe input module and parameter "Worst_Case_Response_Time_us" for the safe output module. When doing this, be sure to check parameter "Manual_Configuration". If parameter "Manual_Configuration" is set to "No", the value specified for parameter "Default_Worst_Case_Response_Time_us" is used.
- **Special case: Local inputs on the X20SLX module:**
  The total max. data transmission time on the bus is calculated by adding parameter "Cycle_Time_max_us" + 2000 µs and parameter "Worst_Case_Response_Time_us" for the safe output module. When doing this, be sure to check parameter "Manual_Configuration". If parameter "Manual_Configuration" is set to "No", the value specified for parameter "Default_Worst_Case_Response_Time_us" is used.

Calculating the maximum data transmission time - Release 1.10 and later:

The following parameters are relevant for calculating the data transmission time between the safe input module and safe output module; parameter "Manual Configuration" deserves special attention.

- Relevant parameters for "Manual Configuration = No":
  - "PacketLoss1": Parameter "Default Additional Tolerated Packet Loss" of group "Safety Response Time Defaults" of the SafeLOGIC controller
  - "DataDuration1": Parameter "Default Safe Data Duration" of group "Safety Response Time Defaults" of the SafeLOGIC controller
  - "NetworkSyncCompensation1": 12 ms
  - "PacketLoss2": Same as "PacketLoss1"
  - "DataDuration2": Same as "DataDuration1"
  - "NetworkSyncCompensation2": Same as "NetworkSyncCompensation1"
- Relevant parameters for "Manual Configuration = Yes":
  - "PacketLoss1": Parameter "Additional Tolerated Packet Loss" of group "Safety Response Time" of the safe input module
  - "DataDuration1": Parameter "Safe Data Duration" of group "Safety Response Time" of the safe input module
  - "NetworkSyncCompensation1": 12 ms
  - "PacketLoss2": Parameter "Additional Tolerated Packet Loss" of group "Safety Response Time" of the safe output module
  - "DataDuration2": Parameter "Safe Data Duration" of group "Safety Response Time" of the safe output module
  - "NetworkSyncCompensation2": Same as "NetworkSyncCompensation1"
- **Special case: Local inputs on the X20SLX module:**
  - "PacketLoss1": 0
  - "DataDuration1": Parameter "Cycle Time max" of group "Module Configuration" of the X20SLX + 2000 µs
  - "NetworkSyncCompensation1": 0 ms
- **Special case: Local outputs on the X20SLX module:**
  - "PacketLoss2": 0
  - "DataDuration2": Parameter "Cycle Time max" of group "Module Configuration" of the X20SLX + 2000 µs
  - "NetworkSyncCompensation2": 0 ms
- **Special case: Linking local inputs with local outputs on the X20SRT module:**
  - "PacketLoss1": 0
  - "PacketLoss2": 0
  - "DataDuration1": Parameter "Cycle time" of group "General"
  - "DataDuration2": Parameter "Cycle time" of group "General"
  - "NetworkSyncCompensation1": 0 ms
  - "NetworkSyncCompensation2": 0 ms

The following equation is used to calculate the maximum data transmission time between the safe input module and safe output module:

Maximum data transmission time = (PacketLoss1+1)* DataDuration1 + NetworkSyncCompensation1 + (Packet-Loss2+1)* DataDuration2 + NetworkSyncCompensation2

Information:

In addition to the data transmission time on the bus, the time for signal processing in the safe B&R input and output module must be taken into account (see section 16 "Safety response time").

Information:

For more information about the actual data transmission time, see Automation Help, section Diagnostics and service → Diagnostics tools → Network analyzer → Editor → Calculation of safety runtime. The cycle time of the safety application must also be added.

16.3 Signal processing on the safe B&R output module

The maximum I/O update time in the "I/O update time" chapter for the respective module must be taken into account when processing signals in the safe B&R output module.

16.4 Minimum signal lengths

The parameters in group "Safety Response Time" in SafeDESIGNER influence the maximum number of data packets that are permitted to fail without triggering a safety response. These parameters therefore act like a switch-off filter. If several data packets are lost within the tolerated amount, safety signals may not be detected if their low phase is shorter than the determined data transmission time.

Danger!

Lost signals can result in serious safety errors. Check all signals to determine the smallest possible pulse length and make sure that it is larger than the determined data transmission time.

Suggested solution:

- The switch-on filter can be used to extend the low phase of a signal on the input module.
- Low phases of signals from the SafeLOGIC controller can be lengthened with restart interlock functions or timer function blocks.

17 Intended use

Danger!

Danger from incorrect use of safety-related products/functions

Proper functionality is only ensured if the products/functions are used in accordance with their intended use by qualified personnel and the provided safety information is taken into account. The aforementioned conditions must be observed or covered by supplementary measures on your own responsibility in order to ensure the specified protective functions.

17.1 Qualified personnel

Use of safety-related products is restricted to the following persons:

- Qualified personnel who are familiar with relevant safety concepts for automation technology as well as applicable standards and regulations
- Qualified personnel who plan, develop, install and commission safety equipment in machines and systems

Qualified personnel in the context of this manual's safety guidelines are those who, because of their training, experience and instruction combined with their knowledge of relevant standards, regulations, accident prevention guidelines and operating conditions, are qualified to carry out essential tasks and recognize and avoid potentially dangerous situations.
In this regard, sufficient language skills are also required in order to be able to properly understand this manual.

17.2 Application range

The safety-related B&R control components described in this manual were designed, developed and manufactured for special applications for machine and personnel protection. They are not suitable for any use involving serious risks or hazards that could lead to the injury or death of several people or serious environmental impact without the implementation of exceptionally stringent safety precautions. In particular, this includes the use of these devices to monitor nuclear reactions in nuclear power plants, flight control systems, air traffic control, the control of mass transport vehicles, medical life support systems and the control of weapon systems.

When using safety-oriented control components, the safety precautions applying to industrial control systems (e.g. the provision of safety devices such as emergency stop circuits, etc.) must be observed in accordance with applicable national and international regulations. The same applies for all other devices connected to the system, e.g. drives or light curtains.

The safety guidelines, information about connection conditions (nameplate and documentation) and limit values specified in the technical data must be read carefully before installation and commissioning and must be strictly observed.

17.3 Security concept

B&R products communicate via a network interface and were developed for integration into a secure network. The network and B&R products are affected by the following hazards (not a complete list):

- Unauthorized access
- Digital intrusion
- Data leakage
- Data theft
- A variety of other types of IT security breaches

It is the responsibility of the operator to provide and maintain a secure connection between B&R products and the internal network as well as other networks, such as the Internet, if necessary. The following measures and security solutions are suitable for this purpose:

- Segmentation of the network (e.g. separation of the IT and OT networks)
- Firewalls for the secure connection of network segments
- Implementation of a security-optimized user account and password concept
- Intrusion prevention and authentication systems
- Endpoint security solutions with modules for anti-malware, data leakage prevention, etc.
- Data encryption

It is the responsibility of the operator to take appropriate measures and to implement effective security solutions.

B&R Industrial Automation GmbH and its subsidiaries are not liable for damages and/or losses resulting from, for example, IT security breaches, unauthorized access, digital intrusion, data leakage and/or data theft.

Before B&R releases products or updates, they are subjected to appropriate functional testing. Independently of this, the development of customized test processes is recommended in order to be able to check the effects of changes in advance. Such changes include, for example:

- Installation of product updates
- Notable system modifications such as configuration changes
- Import of updates or patches for third-party software (non-B&R software)
- Hardware replacement

These tests should ensure that implemented security measures remain effective and that systems behave as expected.

17.4 Safety technology disclaimer

The proper use of all B&R products must be guaranteed by the customer through the implementation of suitable training, instruction and documentation measures. The guidelines set forth in system user's manuals must be taken into consideration here as well. B&R has no obligation to provide verification or warnings with regard to the customer's purpose of using the delivered product.

Changes to the devices are not permitted when using safety-related components. Only certified products are permitted to be used. Currently valid product versions in each case are listed in the corresponding certificates. Current certificates are available on the B&R website (www.br-automation.com) in the Downloads section for the respective product. The use of non-certified products or product versions is not permitted.

All relevant information regarding these safety products must be read in the latest version of the related data sheet and the corresponding safety notices observed before the safety products are permitted to be operated. Certified data sheets are available on the B&R website (www.br-automation.com) in the Downloads section for the respective product.

B&R and its employees are not liable for any damages or loss resulting from the incorrect use of these products. The same applies to misuse that may result from specifications or statements made by B&R in connection with sales, support or application activities. It is the sole responsibility of the user to check all specifications and statements made by B&R for proper application as it pertains to safety-related applications. In addition, the user assumes sole responsibility for the proper design of the safety function as it pertains to safety-related applications.

17.5 X20 system characteristics

Because all X20 safety products are seamlessly integrated into the B&R base system, the same system characteristics and user notices from the X20 system user's manual also apply to X20 safety products.

Warning!

Possible failure of safety function

Malfunction of module due to unspecified operating conditions
The notes for installation and operation of the modules provided in the applicable documents must be observed.

In this regard, this means the content and user notices in the following applicable documentation must be observed for X20 safety products:

- X20 system user's manual
- Installation / EMC guide

17.6 Installation notes for X20 modules

Products must be protected against impermissible dirt and contaminants. Products are protected from dirt and contaminants up to pollution degree II as specified in the IEC 60664 standard.

Pollution degree II can usually be achieved in an enclosure with IP54 protection, but uncoated modules are NOT permitted to be operated in condensing relative humidity and temperatures under 0°C.

The operation of coated modules is allowed in condensing relative humidity.

Danger!

Pollution levels higher than specified by pollution degree II in standard IEC 60664 can result in dangerous failures. It is extremely important that you ensure a proper operating environment.

Danger!

In order to guarantee a specific voltage supply, a SELV power supply that conforms to IEC 60204 must be used to supply the bus, SafeIO and SafeLOGIC controller. This also applies to all digital signal sources that are connected to the modules.

If the power supply is grounded (PELV system), then only a GND connection is permitted for grounding. Grounding types that have ground connected to +24 VDC are not permitted.

The power supply of X20 potential groups must generally be protected using a fuse with a maximum of 10 A.
For more information, see chapter "Mechanical and electrical configuration" of the X20 or X67 user's manual.

17.7 Safe state

If an error is detected by the module (internal or wiring error), the modules enable the safe state. The safe state is structurally designed as a low state or cutoff and cannot be modified.

Danger!

Applications in which the safe state must actively switch on an actuator cannot be implemented with this module. In these cases, other measures must be taken to meet this safety-related requirement (e.g. mechanical brakes for hanging load that engage on power failure).

17.8 Mission time

All safety modules are designed to be maintenance-free. Repairs are not permitted to be carried out on safety modules.

All safety modules have a maximum mission time of 20 years.

This means that all safety modules must be taken out of service one week (at the latest) before the expiration of this 20-year time span (starting from B&R's delivery date).

Danger!

Operating safety modules beyond the specified mission time is not permitted! The user must ensure that all safety modules are replaced by new safety modules or removed from operation before their mission time expires.

18 Release information

A manual version always describes the respective range of functions for a given product set release. The following table shows the relationship between manual versions and releases.

<table>
<tr><th>Manual version</th><th>Valid for</th></tr>
<tr><td>V1.141
V1.140
V1.131
V1.130
V1.123
V1.122
V1.121
V1.120
V1.111
V1.110
V1.103
V1.102
V1.101
V1.100
V1.92
V1.91
V1.90
V1.80
V1.71
V1.70
V1.64
V1.63.2
V1.63.1
V1.63
V1.62
V1.61
V1.60
V1.52.1
V1.52
V1.51
V1.50.1
V1.50
V1.42
V1.41
V1.40
V1.20
V1.10</td><td>
<table>
<tr><th>Version</th><th>Starting with</th><th>Up to</th></tr>
<tr><td>Product set</td><td>Release 1.2</td><td>Release 1.10</td></tr>
<tr><td>SafeDESIGNER</td><td>2.70</td><td>4.9</td></tr>
<tr><td>Firmware</td><td>270</td><td>399</td></tr>
<tr><td>Upgrades</td><td>1.2.0.0</td><td>1.10.999.999</td></tr>
</table>
</td></tr>
<tr><td>V1.02
V1.01
V1.00</td><td>
<table>
<tr><th>Version</th><th>Starting with</th><th>Up to</th></tr>
<tr><td>Product set</td><td>Release 1.0</td><td>Release 1.1</td></tr>
<tr><td>SafeDESIGNER</td><td>2.58</td><td>2.69</td></tr>
<tr><td>Firmware</td><td>256</td><td>269</td></tr>
<tr><td>Upgrades</td><td>1.0.0.0</td><td>1.1.999.999</td></tr>
</table>
</td></tr>
</table>

Table 27: Release information

19 Version history

Version	Date	Comment
1.141	April 2019	• Chapter 4 "Technical data": – Corrected B10d values for X20SO6530. – Updated standards. • Updated chapter 17.3 "Security concept". • Updated chapter 17.6 "Installation notes for X20 modules".
1.140	February 2019	• Chapter 16.2 "Data transmission time on the bus": Updated calculation of maximum data transmission time. • Editorial changes.
1.130	October 2018	• Added module X20SO6530. • Chapter 4 "Technical data": Limited installation elevation to 2000 m. • Updated chapter 13 "Restart behavior". • Chapter 14.1 "Parameters in the I/O configuration": Added parameter "Blackout mode". • Chapter 17 "Intended use": Added danger notice. • Added chapter "Security notes". • Chapter 17.5 "X20 system characteristics": Added warning notice. • Updated standards. • Editorial changes

Table 28: Version history

Version	Date	Comment
1.120	November 2017	• Chapter 4 "Technical data": – Updated standards and safety characteristics. – Added max. switching frequency. – Updated switching delay. – Added information. – Updated derating. • Chapter 7 "Connection examples": Added information. • Chapter 13 "Restart behavior": Updated description. • Chapter 14.3 "Parameters in SafeDESIGNER - Release 1.10 and later": Group "Safety Response Time": Removed parameter "Synchronous Network Only" and updated parameter "Safe Data Duration". • Chapter 14.4 "Channel list": Added new channels and information. • Chapter 16.2 "Data transmission time on the bus": Updated description and added information. • Chapter 17.6 "Installation notes for X20 modules": Updated danger warning. • Chapter 17.7 "Safe state": Updated danger warning. • Updated standards. • Editorial changes
1.101	March 2016	• Chapter 16 "Safety response time": Added information.
1.100	January 2016	Merged coated/uncoated modules. • Chapter 1 "General information": Added. • Chapter 4 "Technical data": – Updated standards. – Updated SIL level for 1-channel application. – Limited output protection to max. 30 minutes. – Updated temperature range. – Updated technical data. • Chapter 8.2.1 "Connecting safety-oriented actuators for relay outputs": Updated danger warning. • Revised chapter 11 "I/O update time". • Chapter 14.3 "Parameters in SafeDESIGNER - Release 1.10 and later": Added. • Chapter 14.4 "Channel list": Updated figure "Restart interlock state diagram". • Chapter 16.1 "Signal processing on the safe B&R input module": Updated description. • Chapter 16.2 "Data transmission time on the bus": Updated description with "Release 1.10 and later". • Chapter 16.3 "Signal processing on the safe B&R output module": Updated description. • Chapter 16.4 "Minimum signal lengths": Updated description. • Revised chapter 17.4 "Safety technology disclaimer". • Chapter 18 "Release information": Updated.
1.90	October 2014	• Chapter 4 "Technical data": "Temperature": "Operation": "Horizontal mounting orientation": Extended temperature range to 60°C. • Updated chapter 18 "Release information". • Editorial changes
1.80	July 2014	• Chapter 4 "Technical data": – "Short description": "I/O module": Adapted text to order data. – German word for "normally open contact" changed – "System requirements" added – Added "Safety-related characteristic values" and deleted chapter "Safety-related characteristic values". – "Temperature": "Operation": Added "Derating bonus with dummy modules". – Section "Derating": Updated description and curves. • Chapter 13 "Restart behavior": Updated description. • Chapter 14.2 "Parameters in SafeDESIGNER - up to Release 1.9": Group "Basic": Added parameter value "Not_Present" for "Optional". • Chapter 14.2 "Parameters in SafeDESIGNER - up to Release 1.9": Group "Safety_Response_Time": Added parameter "Node_Guarding_Lifetime". • Chapter 16.2 "Data transmission time on the bus": Updated description. • Chapter 17.6 "Installation notes for X20 modules": Removed figure "Protecting various potential groups", updated description accordingly. • Updated chapter 18 "Release information".

Table 28: Version history

Version	Date	Comment
1.63	November 2013	• Updated standards. • Chapter 4 "Technical data": Added danger warning. • Chapter 8.1 "Internal module errors": Updated description. • Chapter 13 "Restart behavior": Updated the behavior of input channels. • Updated chapter 18 "Release information". • Editorial changes
1.60	January 2013	• Corrected safety characteristics (CAT, PL, PFH, etc.) for applications with only one relay contact. • Added chapter 16 "Safety response time". • Updated standards.
1.51	September 2012	• Chapter 4 "Technical data": Overvoltage category per EN 60664-1 added • Chapter 7.1 "Connecting safety-oriented actuators for relay outputs": Updated figure "Connecting safety-oriented actuators for relay outputs".
1.50	April 2012	First edition as a product-specific manual

Table 28: Version history

20 EC declaration of conformity

This document was originally written in the German language. The German edition therefore represents the original documentation in accordance with the 2006/42/EC Machinery Directive. Documents in other languages are to be interpreted as translations of the original documentation.

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The place of jurisdiction, in accordance with article 17 of the European Convention on Courts of Jurisdiction and Enforcement, is A-4910

Ried im Innkreis, Austria, commercial register court: Ried im Innkreis, Austria

Commercial register number: FN 111651 v.

The place of fulfillment in accordance with article 5 of the European Convention on Courts of Jurisdiction and Enforcement is A-5142 Eggelsberg, Austria

VATIN: ATU62367156

The EC declarations of conformity for B&R products can be downloaded from the B&R website www.br-automation.com.