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 is available for download on the B&R website (www.br-automation.com).**

> **Information:**
>
> **This data sheet must be used with mapp Safety.**
> **B&R safety technology can still be used in Safety Releases ≤1.10, however. The documentation is available for download on the B&R website (www.br-automation.com).**
>
> **For additional information about mapp Safety, additional technical descriptions (e.g. connection examples and error detection) as well as generally valid contents (intended use, etc.), see section Safety technology in Automation Help.**

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 are equipped with an error interlock 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
- Nominal output 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.

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)!**
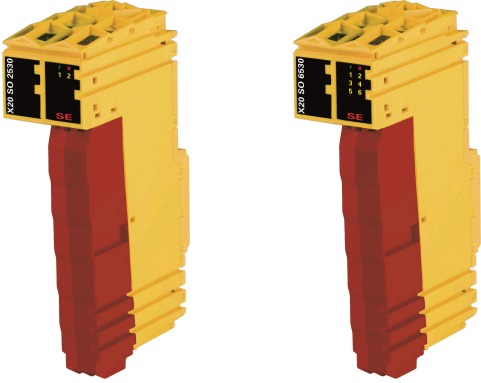
3 Order data

Order 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
X20cSO6530	X20 safe digital output module, coated, 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 connected through
X20BM36	X20 bus module, for X20 SafeIO modules, with node number switch, internal I/O power supply connected through
X20cBM33	X20 bus module, coated, for X20 SafeIO modules, internal I/O power supply connected through
	Terminal blocks
X20TB72	X20 terminal block, 12-pin, safety-keyed, 240 VAC, red

Table 3: X20SO2530, X20cSO2530, X20SO6530, X20cSO6530 - Order data

4 Technical data

Order number	X20SO2530	X20cSO2530	X20SO6530	X20cSO6530
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	0x28DE
System requirements				
Automation Studio	3.0.81.15 or later	4.0.16 or later	4.2.5 or later	4.6.1 or later
Automation Runtime	3.00 or later	V3.08 or later	4.2 or later	4.6 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	-
mapp Technology Package [1]	mapp Safety 5.7.0 or later			mapp Safety 5.16.0 or later
Status indicators	I/O function per channel, operating state, module status			
Diagnostics				
Module run/error	Yes, using LED status indicator and software			
Outputs	Yes, using LED status indicator and software			
Blackout mode				
Scope	Module			
Function	Module functionality			
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	
Additional power dissipation caused by actuators (resistive) [W] [2]	1.44		4.32	
Electrical isolation				
Channel - Bus	Yes			
Channel - Channel	Yes			
Certifications				
CE	Yes			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		-	
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X			In preparation
UL	cULus E115267 Industrial control equipment			In preparation
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5		-	
DNV	In preparation			
EAC	Yes			In preparation
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$_d$				
Per channel	$<1*10^{-10}$			
openSAFETY wired	Negligible			
openSAFETY wireless	$<1*10^{-14}$ * Number of openSAFETY packets per hour			
PFD	$<2*10^{-5}$			
Proof test interval (PT)	20 years			

Table 4: X20SO2530, X20cSO2530, X20SO6530, X20cSO6530 - Technical data

Order number	X20SO2530	X20cSO2530	X20SO6530	X20cSO6530
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 [3]			
PL	PL c if the relay channel is used individually, PL e if 2 relay channels are connected in series [3]			
B10d				
DC1, 24 VDC	6 A / 780,000		6 A / 1,000,000	
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]		4 A / 300,000 [4]	
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 [3]			
I/O power supply				
Nominal voltage	24 VDC			
Voltage range	24 VDC -15% / +20%			
Integrated protection	Reverse polarity protection			
Relay outputs				
Quantity	2		6	
Variant	Relay / Normally open contact, internal high-side and low-side control			
Nominal output current	5 mA to 6 A		5 mA to 6 A (hardware revision <B5: 2 A)	
Diagnostic status	Contact position determined by positively driven contacts			
Max. switching frequency	See section "Inrush current behavior for output channels".			
Switching delay				
0 → 1	<50 ms			
1 → 0	<50 ms		<50 ms Hardware upgrade 2.2.0.0 or later: <20 ms	
Insulation voltage between channel and bus	Safe disconnection of 300 VAC per EN 50178			
Insulation 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/Overload protection	External 6 A gL/gG fuse (melting fuse), LS automat C characteristic 1.6 A			
Switching voltage range	5 to 24 VDC, 5 to 230 VAC			
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	
UL 508	B300 / R300			
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 [5]	0 to 60°C	-25 to 60°C	0 to 60°C	-25 to 60°C
Vertical mounting orientation	0 to 50°C	-25 to 50°C	0 to 50°C	-25 to 50°C
Derating	See section "Derating".			
Storage	-40 to 85°C			
Transport	-40 to 85°C			

Table 4: X20SO2530, X20cSO2530, X20SO6530, X20cSO6530 - Technical data

Order number	X20SO2530	X20cSO2530	X20SO6530	X20cSO6530
Relative humidity				
Operation	5 to 95%, non-condensing	Up to 100%, condensing	5 to 95%, non-condensing	Up to 100%, 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.			
Pitch	25$^{+0.2}$ mm			

Table 4: X20SO2530, X20cSO2530, X20SO6530, X20cSO6530 - Technical data

1) The system requirements of the mapp Technology Package must be observed (see Automation Help).
2) Number of outputs x Contact resistance x Nominal output current². For a calculation example, see section "Mechanical and electrical configuration" in the X20 system user's manual.
3) In addition, the danger notices in the technical data sheet and section "Safety technology" in Automation Help must be observed.
4) In this case, a protective circuit (parallel diode via load) is necessary.
5) Compared to the value in the X20 system user's manual, where the angle of the horizontal mounting orientation is specified as 70°, this only applies up to an angle of 85° for the X20(c)SO2530. Below this, the derating for face-up installation must be applied.

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 5: Derating bonus / Derating penalty

The max. nominal output current per channel depends on the operating temperature and mounting orientation. The resulting nominal output 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	
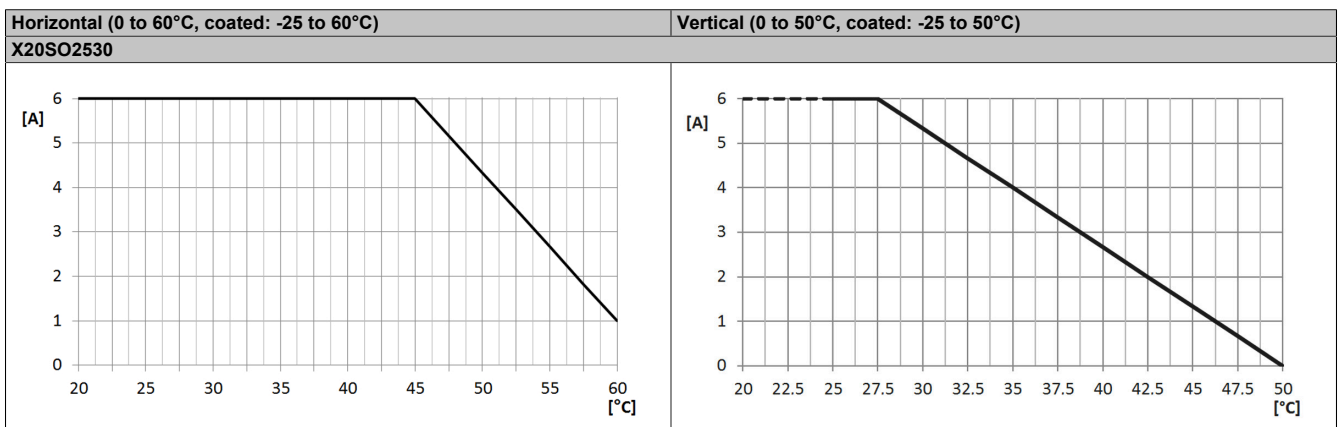
Table 6: Derating in relation to operating temperature and mounting orientation

The max. squared summation current (i.e. sum of the squares of the nominal output currents per channel) 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, coated: -25 to 60°C)	Vertical (0 to 50°C, coated: -25 to 50°C)
X20SO6530	
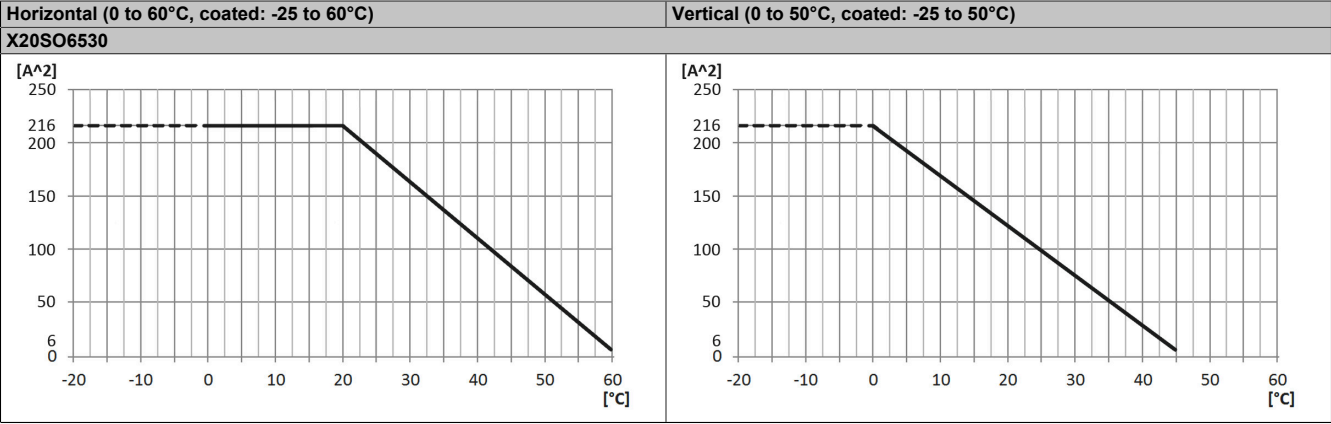
Table 7: Derating in relation to operating temperature and mounting orientation

Example:

Series connection of channel 1 (NO 1 and COM 1) and channel 2 (NO 2 and COM 2) with a load of 6 A, channel 3 to channel 6 not loaded:

6 A * 6 A (channel 1) + 6 A * 6 A (channel 2) = 72 A^2

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
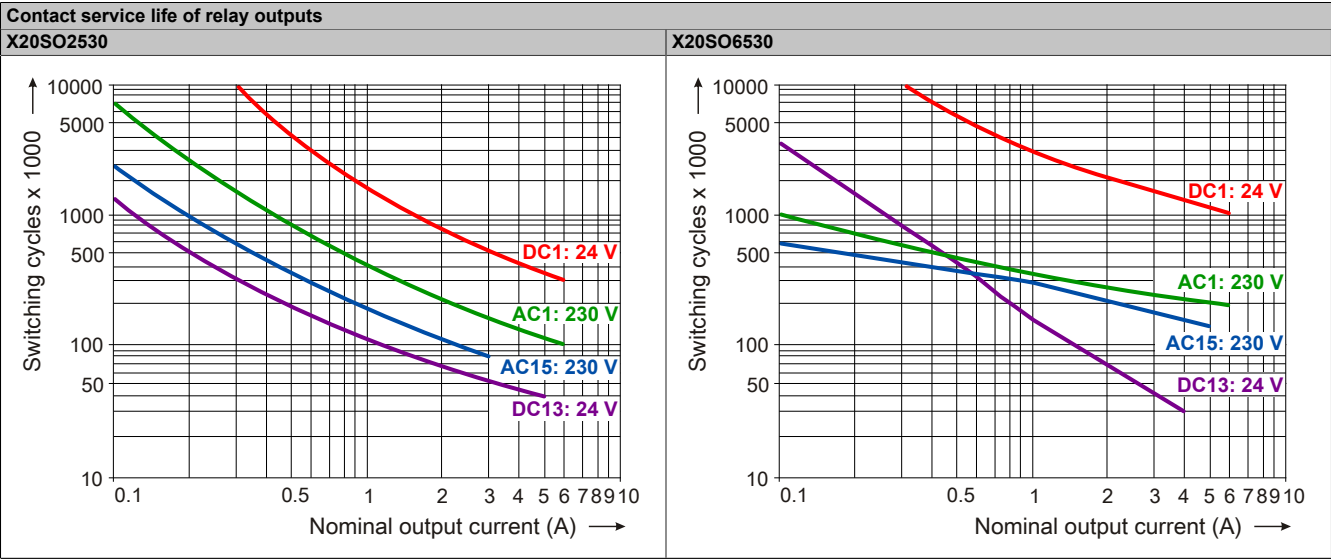
Table 8: Contact service life of relay outputs

Load limit curve for direct current

Load limit curve for direct current	
X20SO2530	**X20SO6530**
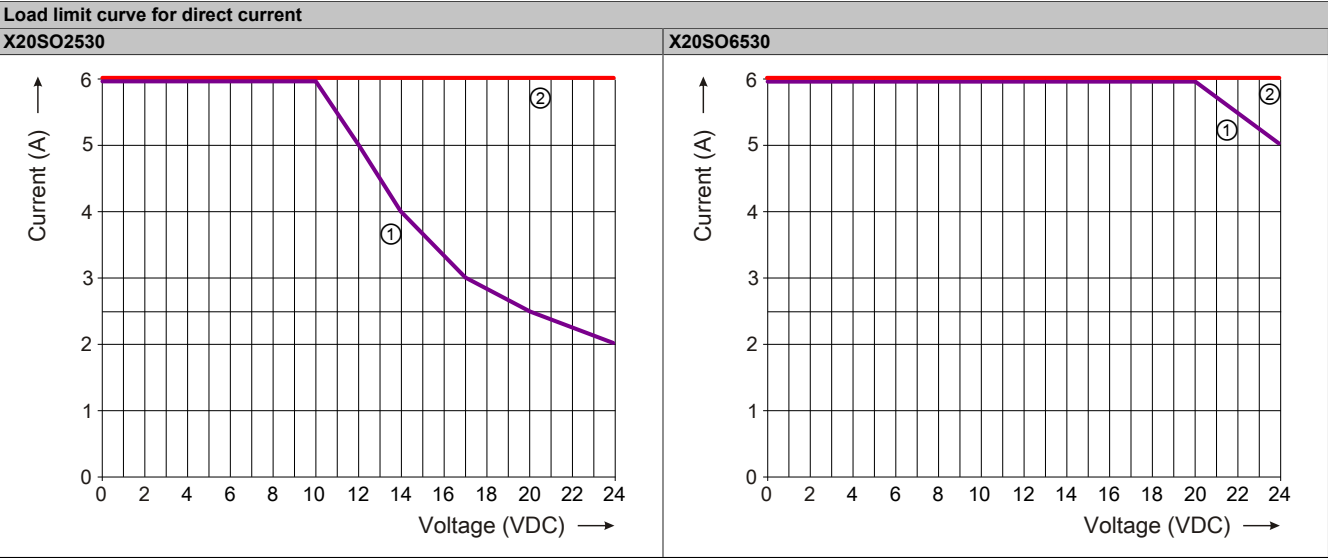
Table 9: Load limit curve for direct current

Legend:

①	Inductive load L/R 40 ms
②	Resistive load

Inrush current behavior for output channels

In addition to the nominal output current specified in the technical data, the output channels indicate the following possibilities for increased inrush current.

Inrush current behavior for output channels
X20SO2530

| **X20SO6530** |
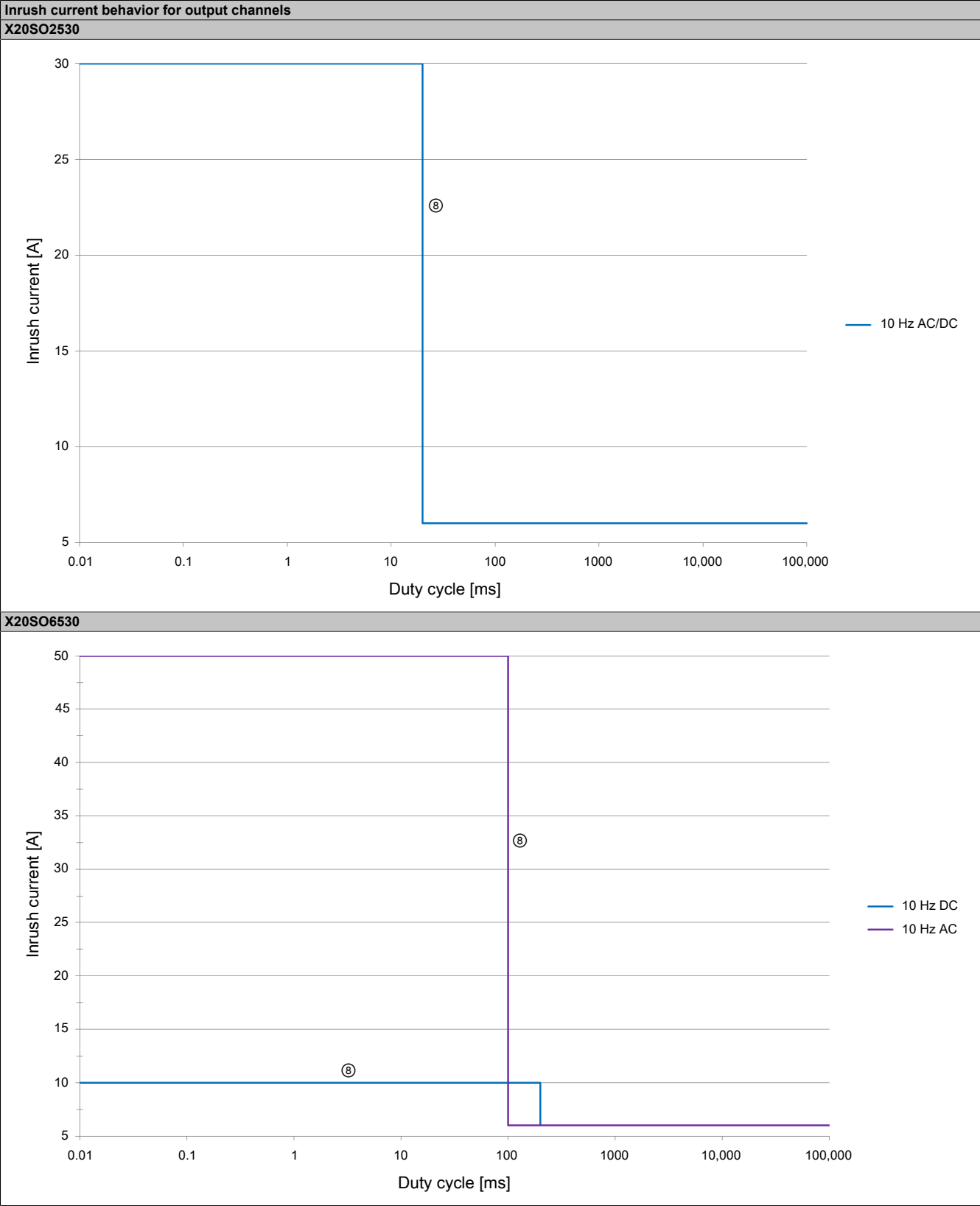
Table 10: Inrush current behavior for output channels

Legend:

⑧	**Limits during cyclic switching operations of the relays**
	These curves show the maximum possible inrush currents of each channel during cyclic switching operations depending on the switching frequency. Overshooting these values results in overheating of the module.

Information:

The effective current must be less than or equal to the permissible nominal output current of 6 A.

Danger!

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

Information:

For additional information about installation, see section "Installation notes for X20 modules" in Automation Help.

5 LED status indicators
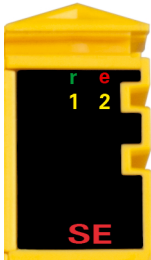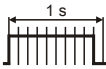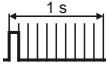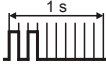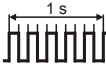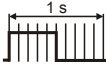
Figure	LED	Color	Status	Description
X20SO2530 / X20SO6530	r	Green	Off	No power to module
			Single flash	Mode "Reset"
			Double flash	Updating firmware
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			Pulsating	Bootloader mode
			Triple flash	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
			[1 s pulse diagram]	Boot phase, missing X2X Link or defective processor
			[1 s pulse diagram]	Safety PREOPERATIONAL state. Modules that are not used in the SafeDESIGNER application remain in state PREOPERATIONAL.
			[1 s pulse diagram]	Safe communication channel not OK
			[1 s pulse diagram]	The firmware for this module is a non-certified pilot customer version.
			[1 s pulse diagram]	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 ("S" LED) and safety processor 2 ("E" LED).		

Table 11: 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

NO 1

COM 1

NO 2

COM 2
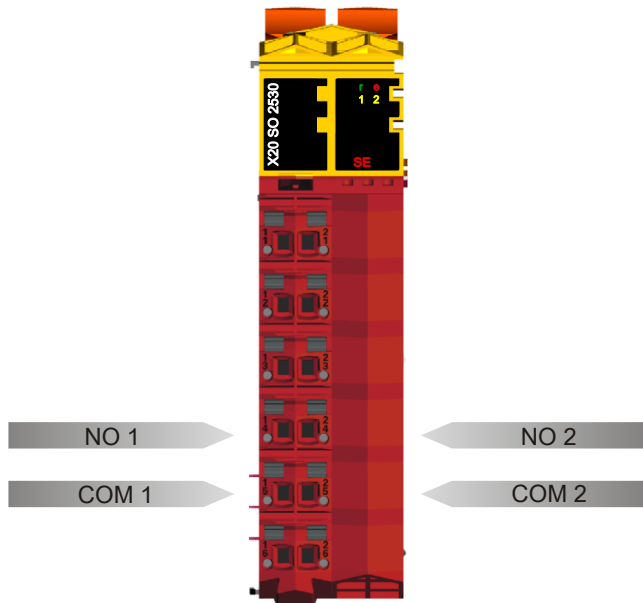
Figure 1: X20SO2530 - Pinout

NO 1

COM 1

NO 3

COM 3

NO 5

COM 5

NO 2

COM 2

NO 4

COM 4

NO 6

COM 6
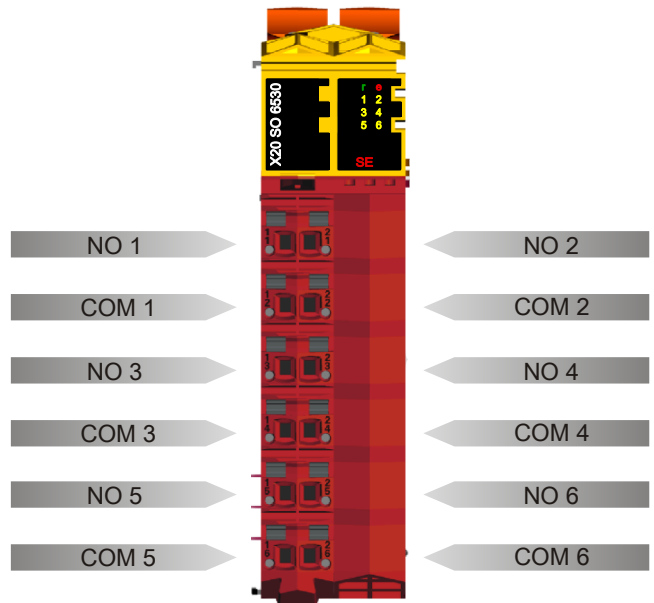
Figure 2: X20SO6530 - Pinout

Data sheet V 2.14 X20(c)SOx530 Translation of the original documentation

7 Output circuit diagram
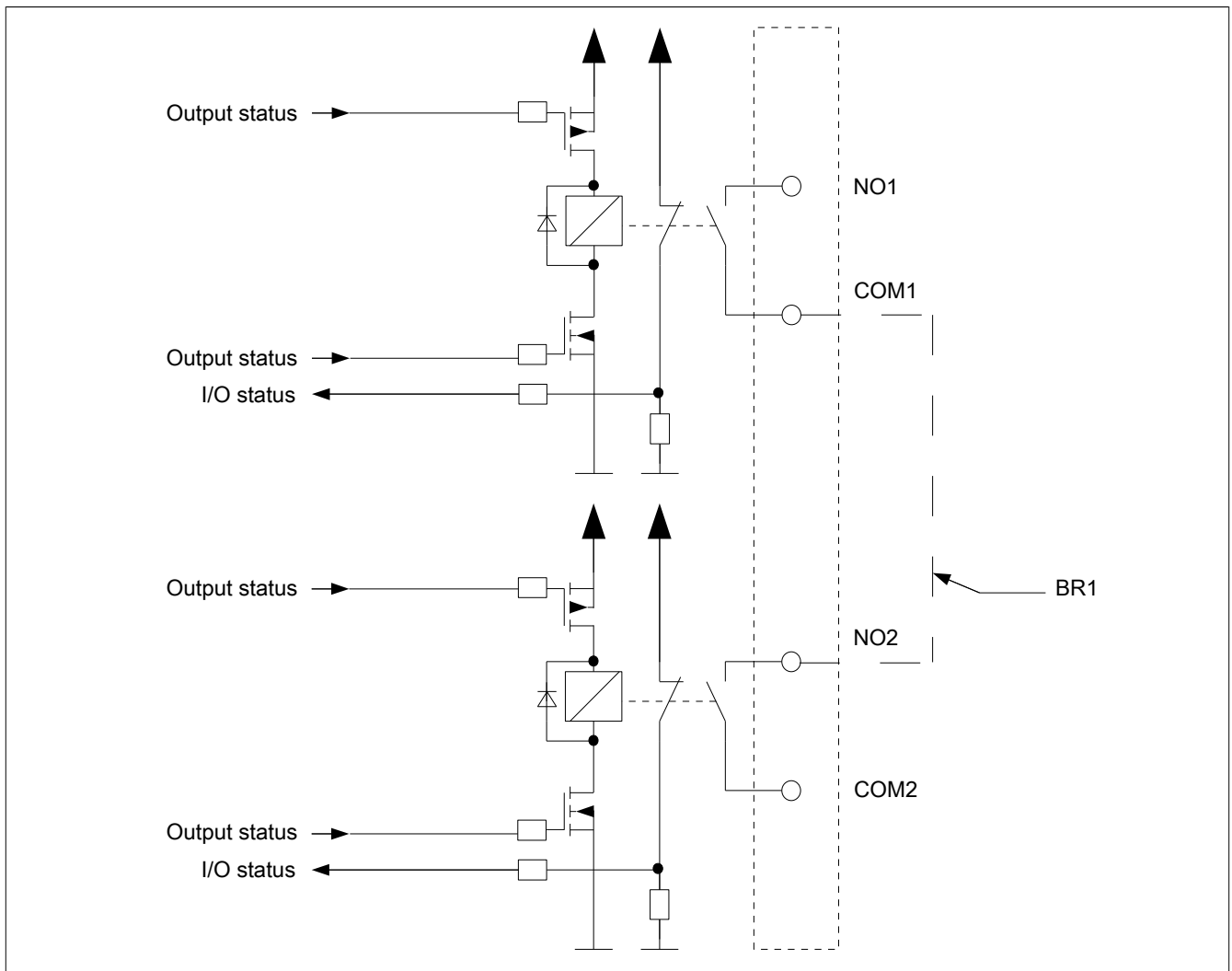
Figure 3: Output circuit diagram

8 UL certificate information

To install the module(s) according to the UL standard, the following rules must be observed.

Information:

- **Only use copper cables. Minimum temperature resistance of the cable connected to the field wiring terminals: 80°C, 28 to 14 AWG.**
- **All models are intended to be used in a final safety enclosure that must conform with requirements for protection against the spread of fire and have adequate rigidity per UL 61010-1 and UL 61010-2-201.**
- **All safety modules are designed to be maintenance-free. Repairs are not permitted to be carried out on safety modules.**

Information:

Addition of the following for connections to overcurrent protective devices:

- **A single-pole circuit breaker used as an overcurrent protective device shall be connected in the ungrounded supply conductor. An "ungrounded" supply conductor is one that is not connected to protective earth at any point in the building installation. A "grounded" supply conductor is one that is connected to protective earth at some point in the building installation. It is sometimes called the "neutral conductor".**
- **A multiple-pole circuit breaker used as an overcurrent protective device or devices shall be so constructed as to interrupt all of the neutral (grounded) and ungrounded conductors of the MAINS supply simultaneously.**
- **A single fuse used as an overcurrent protective device shall be connected in the ungrounded supply conductor.**
- **Where fuses are used as overcurrent protective devices in both the neutral (grounded) and ungrounded supply conductors, the fuseholders shall be mounted adjacent to each other and the fuses shall be of the same RATING and characteristics.**
- **The screw shell of a plug fuseholder and the ACCESSIBLE contact of an extractor fuseholder connected to the ungrounded supply conductor shall be connected towards the load. The ACCESSIBLE contact or screw shell of fuseholders connected in the neutral (grounded) conductor shall be located towards the grounded supply line.**

Information:

It is necessary to use a circuit breaker. The circuit breaker or switch must meet the following requirements:

- **An equipment circuit breaker employed as a disconnecting device shall meet the relevant requirements of IEC 60947-2 and be suitable for the application.**
- **An equipment switch employed as a disconnecting device shall meet the relevant requirements of IEC 60947-3, and be suitable for the application.**
- **If a switch or a circuit breaker is used as a disconnecting device, it shall be marked to indicate this function. If there is only one device - one switch or one circuit breaker - symbols 9 and 10 of Table 1 are sufficient if the symbols are marked on or adjacent to the switch or circuit breaker.**

Danger!

The external circuits intended to be connected to SELV/PELV part of the device shall be galvanically separated from mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV circuit.

Danger!

The voltage classes on the terminal block must not be mixed! Only operation at mains voltage (e.g. 230 VAC) OR safety extra-low voltage (e.g. 24 VDC SELV) is permitted.

9 Register description

9.1 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 12: 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 error interlock.	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 1000	Assigned automatically	-
SafeNODE ID	Unique safety address of the module • Permissible values: 2 to 1023	Assigned automatically	-

Table 13: 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 14: I/O configuration parameters: Output signal path

9.2 Parameters in SafeDESIGNER

Group: Basic

Parameter	Description	Default value	Unit
Min. required firmware revision	This parameter is reserved for future functional expansions.	Basic release	-
Availability	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.	Permanent	-

Parameter value	Description
Permanent	This module is mandatory for the application. The module must be in OPERATIONAL mode after startup, and safe communication with 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 "Availability = Permanent". After startup, module problems are indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is also made in the logbook.
Optional	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 "Availability = Optional" 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 "Availability = Permanent" is set. If it is determined that the module is not physically present during startup, then the module behaves as if "Availability = Optional" is set.
Never	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 "Availability = Never" are physically present. Unlike when "Availability = Optional" is configured, the module is not started with "Availability = Never", 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.

Table 15: SafeDESIGNER parameters: Basic

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. <table><tr><td>Parameter value</td><td>Description</td></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>	No	-
Safe data duration	This parameter specifies the maximum permissible data transmission time between the SafeLOGIC controller and SafeIO module. For additional information about the actual data transmission time, see section Diagnostics and service → Diagnostics tools → Network analyzer → Editor → Calculation of safety runtime in Automation Help. The following formula can be used as the lower limit: "Value of the Network Analyzer" * 2 + SafeLOGIC cycle time * 2 The stability of the system cannot be ensured for smaller values. • 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	1	Packets
Node guarding packets	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 16: SafeDESIGNER parameters: Safety response time

9.3 Channel list

Channel name	Access via Automation Studio	Access via SafeDESIGNER	Data type	Description
ModuleOk	Read	-	BOOL	Indicates whether the module is physically present in the slot and configured
SerialNumber	Read	-	UDINT	Module serial number
ModuleID	Read	-	UINT	Module ID
HardwareVariant	Read	-	UINT	Hardware variant
FirmwareVersion	Read	-	UINT	Firmware version of the module
UDID_low	(Read) [1]	-	UDINT	UDID, lower 4 bytes
UDID_high	(Read) [1]	-	UINT	UDID, upper 2 bytes
SafetyFWversion1	(Read) [1]	-	UINT	Firmware version - Safety processor 1
SafetyFWversion2	(Read) [1]	-	UINT	Firmware version - Safety processor 2
SafetyFWcrc1	(Read) [1]	-	UINT	CRC of the firmware header on safety processor 1
SafetyFWcrc2	(Read) [1]	-	UINT	CRC of the firmware header on safety processor 2
Bootstate	(Read) [1]	-	UINT	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 with 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 with 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 the SafeDESIGNER application or no valid application available; waiting for acknowledgments such as module replacement)</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, SafeDESIGNER parameters "(Default) Safe data duration" and "(Default) Additional tolerated packet loss" must be checked.</td></tr><tr><td>0x4040</td><td>RUN. Final state, startup completed.</td></tr></table>
Diag1_Temp	(Read) [1]	-	INT	Module temperature in °C
oS_PropDelayStat (hardware upgrade 2.3.0.0 or later)	(Read) [1]	-	UDINT	Propagation delay statistics (average value of the data transmission time). The unit depends on parameter "Process data transfer rate" of the SafeLOGIC controller. - If the value of the parameter is "High", the unit is 100 µs. - If the value of the parameter is "Low", the unit is 1 ms. This value corresponds to the measurement of the forward and return channels and thus twice the theoretical runtime that is determined by the Network Analyzer.
SafeModuleOK	Read	Read	SAFEBOOL	Indicates whether the safe communication channel is OK
DigitalOutputxx	Write	-	BOOL	Enable signal - Channel SO xx
DigitalOutputxxyy	Write	-	BOOL	Enable signal for combined channel SO xx/yy
SafeDigitalOutputxx	-	Write	SAFEBOOL	Safe channel SO xx
SafeDigitalOutputxxyy	-	Write	SAFEBOOL	Safe combined channel SO xx/yy

Table 17: Channel list

Channel name	Access via Automation Studio	Access via SafeDESIGNER	Data type	Description
SafeOutputOKxx	Read	Read	SAFEBOOL	Status of channel SO xx
ReleaseOutput	-	Write	BOOL	Release signal for error interlock
PhysicalStateOutputxx	Read	Read	BOOL	Read-back value of physical channel SO xx
FBOutputStatexxyy	Read	-	USINT	State number of the error interlock for channel x. See section "Error interlock - State diagram" in Automation Help.

Bit 7 to 4	Bit 3 to 0
Channel yy	Channel xx

Table 17: Channel list

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

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.
Release signal "ReleaseOutput" must then indicate state "High" for the duration of the switch-on delay so that a rising edge is also detected on the second channel.
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.

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	1000 µs + 20 ms

12 Version history

Version	Date	Comment

2.14	May 2022	• Chapter 4 "Technical data":
		
		  – Safety characteristics: Editorial change for PFH / PFH$_d$
		  – Updated DNV certification.
		  – X20cSO6530: Updated certifications.
		
		• Updated chapter 13 "Declaration of conformity".

2.11	August 2021	Added coated module X20cSO6530.
2.10	May 2021	Chapter 4 "Technical data": • Updated display of system requirements. • Safety characteristics: Updated footnote.
2.08	November 2020	Chapter 4 "Technical data": • Relay outputs: Added number of channels and UL 508. • Updated section "Inrush current behavior for output channels".
2.07	August 2020	• Chapter 4 "Technical data": General information: Added additional power dissipation caused by actuators (resistive) [W]. • Editorial changes.

2.06	May 2020	• Chapter 4 "Technical data":
		
		  – Added footnote for system requirements.
		  – X20SO6530: Added example in derating section.
		
		• Chapter 9.3 "Channel list":
		
		  – Added channel "oS_PropDelayStat".
		  – Updated information.
		
		• Editorial changes.

2.05	February 2020	• Chapter 4 "Technical data": Added section "Inrush current behavior for output channels" and updated technical data accordingly. • Editorial changes.

2.04.1	November 2019	• Chapter 4 "Technical data":
		
		  – Updated certifications.
		  – Added UL 508 for X20SO6530.
		  – Switching delay: X20SO6530: Updated value.
		
		• Updated chapter 11 "I/O update time".
		• Editorial changes.

2.04	November 2019	Added chapter 8 "UL certificate information".
2.03	August 2019	Chapter 4 "Technical data": Added section "Load limit curve for direct current".
2.02	May 2019	First edition for mapp Safety

Table 18: Version history

13 Declaration of conformity

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

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Declarations of conformity for B&R products are available for download on the B&R website (www.br-automation.com).