

# X20(c)SL81xx

## 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](http://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  $\leq 1.10$ , however. The documentation is available for download on the B&R website ([www.br-automation.com](http://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
<b>Danger!</b>	Failure to observe these safety guidelines and notices will result in death, severe injury or substantial damage to property.
<b>Warning!</b>	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
<b>Caution!</b>	Failure to observe these safety guidelines and notices can result in minor injury or damage to property.
<b>Notice!</b>	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
<b>Information:</b>	Useful information, application tips and instructions for avoiding malfunctions.

Table 2: Organization of general notices

## 1 General information

The modules are equipped with SafeLOGIC functionality that allows them to safely execute applications designed in SafeDESIGNER. The modules can be used in safety applications up to PL e or SIL 3.

The SafeLOGIC controller coordinates the safety-related communication of all modules involved in the application. In this context, the SafeLOGIC controller also monitors the configuration of these modules and autonomously carries out parameter downloads to the modules if necessary. This guarantees a consistent and correct module configuration in the network from a safety point of view in all scenarios involving module replacement and service. For X20 SafeLOGIC products, these services are executed by the X20 SafeLOGIC controller. For X20 SafeLOGIC-X and X90 SafeLOGIC products, these services are executed on the standard CPU in interaction with Automation Runtime. The safety-related characteristics for applications up to PL e or SIL 3 are provided in both variants, however.

X20 SafeLOGIC-X and X90 SafeLOGIC products also have the I/O properties described in section "SafeIO" in Automation Help.

- openSAFETY manager for up to 10 / 20 / 100 / 280 SafeNODES
- Flexibly programmable using Automation Studio / SafeDESIGNER
- Innovative management of safe machine options (SafeOPTION)
- Parameter and configuration management

### Information:

**This module is not suitable for POWERLINK ring redundancy applications.**

## 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


	
X20SL8100	X20SL8101
X20SL8110	
Order number	Short description
<b>CPUs</b>	
X20SL8100	X20 SafeLOGIC, safety controller, openSAFETY gateway, removable application memory: SafeKEY, 1 POWERLINK interface, controlled node, integrated 2-port hub, including power supply module, 1x terminal block X20TB52 and X20 end cover plate X20AC0SR1 (right) included, order SafeKEY and SafeLOGIC range of functions using the X20MK configurator!
X20cSL8100	X20 SafeLOGIC, coated, safety controller, openSAFETY gateway, removable application memory: SafeKEY, 1 POWERLINK interface, controlled node, integrated 2-port hub, including power supply module, 1x terminal block X20TB52 and X20 end cover plate X20AC0SR1 (right) included, order SafeKEY and SafeLOGIC range of functions using the X20MK configurator!
X20SL8101	X20 SafeLOGIC with X20 bus controller, safety controller, openSAFETY gateway, removable application memory: SafeKEY, 1 POWERLINK interface, controlled node, integrated 2-port hub, including power supply module for internal I/O power supply and X2X Link power supply, 1x terminal block X20TB52 and X20 end cover plate X20AC0SR1 (right) included, order SafeKEY and SafeLOGIC range of functions using the X20MK configurator!
X20cSL8101	X20 SafeLOGIC with X20 bus controller, coated, safety controller, openSAFETY gateway, removable application memory: SafeKEY, 1 POWERLINK interface, controlled node, integrated 2-port hub, including power supply module for internal I/O power supply and X2X Link power supply, 1x terminal block X20TB52 and X20 end cover plate X20AC0SR1 (right) included, order SafeKEY and SafeLOGIC range of functions using the X20MK configurator!
X20SL8110	X20 SafeLOGIC, safety controller, openSAFETY gateway, removable application memory: SafeKEY, 1 POWERLINK interface, 1 slot for X20 interface module, controlled node, integrated 2-port hub, including power supply module, 1x terminal block X20TB52 and X20 end cover plate X20AC0SR1 (right) included, order SafeKEY and SafeLOGIC range of functions using the X20MK configurator!
<b>Required accessories</b>	
<b>Accessories</b>	
X20MK0223	X20 SafeKEY, 8 MB, for the X20SL81xx series, exclusively for mapp Safety, range of license functions determined via a package-based licensing model or via Technology Guarding in Automation Runtime
X20MKXXXX.XXX.XXX	X20 SafeKEY, for X20SL81xx series, for legacy safety and mapp Safety. The available range of functions is defined by "Safety Technology Guarding". Licenses are stored on a SafeKEY dongle. The range of functions required for the application must be compiled by selecting the available technology functions in the X20MK configurator. Each solution is delivered exclusively as a set consisting of the SafeKEY and the activated licenses for the selected technology functions.
X20cMK0223	X20 SafeKEY, coated, 8 MB, for the X20SL81xx series, exclusively for mapp Safety, range of license functions determined via a package-based licensing model or via Technology Guarding in Automation Runtime

Table 3: X20SL8100, X20cSL8100, X20SL8101, X20cSL8101, X20SL8110 - Order data

## 4 Technical data

Order number	X20SL8100	X20cSL8100	X20SL8101	X20cSL8101	X20SL8110
Short description					
Interfaces	POWERLINK				
System module	CPU				
General information					
B&R ID code	0xDD61	0xE287	0xE649	0xE926	0xE64A
System requirements					
Automation Studio	4.0.16 or later		4.1.6 or later		V4.2.5 or later
Automation Runtime	V3.08 or later (for AsSafe-ty library F4.06 or later)		F4.09 or later, F4.10 or later, A4.23 or later		B4.25 or later
SafeDESIGNER	3.1.0 or later		4.1.0 or later		V4.2 or later
Safety Release	1.7 or later				1.10 or later
mapp Technology Package <sup>1)</sup>	mapp Safety 5.7.0 or later				
Cooling	Fanless				
Status indicators	CPU function, POWERLINK, SafeKEY				
Diagnostics					
CPU function	Yes, using LED status indicator				
POWERLINK	Yes, using LED status indicator				
SafeKEY	Yes, using LED status indicator				
Blackout mode					
Scope	-	Network segment			-
Function	-	Programmable			-
Standalone mode	-	Yes			-
Power consumption	4.3 W		5.3 W		3.9 W <sup>2)</sup>
Power consumption for X2X Link power supply	-		1.42 W <sup>3)</sup>		-
Power consumption					
Internal I/O	-		0.6 W <sup>3)</sup>		-
Additional power dissipation caused by actuators (resistive) [W]	-				
Electrical isolation					
Fieldbus - X2X Link	-	Yes			-
Fieldbus - I/O	-	Yes			-
Certifications					
CE	Yes				
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) FTZÜ 09 ATEX 0083X				
UL	cULus E115267 Industrial control equipment				
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5				-
DNV	Temperature: <b>A</b> (0 - 45°C) Humidity: <b>B</b> (up to 100%) Vibration: <b>A</b> (0.7 g) EMC: <b>B</b> (bridge and open deck)				In preparation
LR	ENV1				-
KR	Yes				-
ABS	Yes				-
EAC	Yes				
Safety characteristics					
EN ISO 13849-1:2015					
Category	Cat. 4				
PL	PL e				
DC	>94%				
MTTFD	2500 years				
Mission time	Max. 20 years				

Table 4: X20SL8100, X20cSL8100, X20SL8101, X20cSL8101, X20SL8110 - Technical data

Order number	X20SL8100	X20cSL8100	X20SL8101	X20cSL8101	X20SL8110
IEC 61508:2010, IEC 61511:2004, EN 62061:2013					
SIL CL	SIL 3				
SFF	>90%				
PFH / PFH <sub>d</sub>					
Module	<1*10 <sup>-10</sup>				
openSAFETY wired	Negligible				
openSAFETY wireless	<1*10 <sup>-14</sup> * Number of openSAFETY packets per hour				
PFD	<2*10 <sup>-5</sup>				
Proof test interval (PT)	20 years				
Functionality					
Communication with each other	Yes				
Support for Safe Commissioning Options					
BOOL	512				
INT	64				
UINT	64				
DINT	64				
UDINT	64				
SafeMOTION support	Yes, depends on the number of available operating licenses on the SafeKEY				
Max. number of SafeMOTION axes	70, depends on the data width of the modules used				
Timing precision	Time * 0.05 + Cycle time of the safety application				
Shortest task class cycle time	1 ms				
Max. number of SafeNODEs	100, depends on the number of available operating licenses on the SafeKEY		280, depends on the number of available operating licenses on the SafeKEY and available resources		
Max. number of POWERLINK controlled nodes	50		100		
Data exchange between CPU and SafeLOGIC controller <sup>4)</sup>					
Max. total data width for each direction <sup>5)</sup>	512 bytes				
Max. number of data points for each direction					
BOOL	1024				
INT	128				
UINT	128				
DINT	64				
UDINT	64				
Data exchange between SafeDOMAIN and SafeDOMAIN <sup>6)</sup>					
Use as Managing SafeDOMAIN	Yes, starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0				
Use as Connected SafeDOMAIN	Yes, starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0				
Max. total data width for each direction <sup>5)</sup>	64 bytes				
Max. total number of data points for each direction <sup>7)</sup>	16				
Max. number of data points for each direction					
BOOL	128				
INT	16				
UINT	16				
DINT	16				
UDINT	16				
Max. number of linked Managing SafeDOMAINs	Starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0: 10		Starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0: 20		
Limit values for SafeDESIGNER application					
Max. resources available for SafeDESIGNER info window entries <sup>8)</sup>					
FB instances	4096				
Marker memory	262,144 bytes				
Stack memory	32,768 bytes				
Memory for safe input data	6144 bytes				
Memory for safe output data	2048 bytes				
Memory for standard input data	1024 bytes				
Memory for standard output data	1024 bytes				
Marker count	16,382				
Additional SafeDESIGNER limit values					
Max. number of function block types	512				
Max. number of force variables	64				
Max. number of variable with variable status	1023				
Input SL / BC / X2X Link power supply					
Input voltage	24 VDC -15% / +20%				
Input current	Max. 0.25 A		Max. 0.9 A		Max. 0.25 A

Table 4: X20SL8100, X20cSL8100, X20SL8101, X20cSL8101, X20SL8110 - Technical data

Order number	X20SL8100	X20cSL8100	X20SL8101	X20cSL8101	X20SL8110
Fuse		-	Integrated, cannot be replaced		-
Reverse polarity protection			Yes		
Output SL / BC / X2X Link power supply					
Nominal output power		-	7 W		-
Parallel connection		-	Yes <sup>9)</sup>		-
Redundant operation		-	Yes		-
Overload characteristics		-	Short-circuit proof, temporary overload		-
Input I/O power supply					
Input voltage		-	24 VDC -15% / +20%		-
Fuse		-	Required line fuse: Max. 10 A, slow-blow		-
Reverse polarity protection		-	Yes		-
Output I/O power supply					
Nominal output voltage		-	24 VDC		-
Behavior on short circuit		-	Required line fuse		-
Permissible contact load		-	10 A		-
Interfaces					
Fieldbus		POWERLINK controlled node			
Type		Type 3 <sup>10)</sup>			
Variant		2x shielded RJ45 port (hub)			
Line length		Max. 100 m between 2 nodes (segment length)			
Transfer rate		100 Mbit/s			
Transfer					
Physical layer		100BASE-TX			
Half-duplex		Yes			
Full-duplex		No			
Autonegotiation		Yes			
Auto-MDI/MDIX		Yes			
Min. cycle time <sup>11)</sup>					
Fieldbus		200 µs			
X2X Link		-	200 µs		-
Synchronization between bus systems possible		-	Yes		-
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	0 to 60°C	-25 to 60°C	0 to 60°C	-25 to 60°C	0 to 60°C
Vertical mounting orientation	0 to 45°C	-25 to 45°C	0 to 45°C	-25 to 45°C	0 to 45°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	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 SafeKEY and SafeLOGIC range of functions using the X20MK configurator. X20 end cover plate (right) included in delivery 12-pin X20 terminal block, safety-keyed, included in delivery SafeKEY cover included in delivery				
Dimensions					
Width	62.5 <sup>+0.2</sup> mm				87.5 <sup>+0.2</sup> mm
Height	99 mm				
Depth	75 mm				
Weight	190 g				

Table 4: X20SL8100, X20cSL8100, X20SL8101, X20cSL8101, X20SL8110 - Technical data

- 1) The system requirements of the mapp Technology Package must be observed (see Automation Help).
- 2) Power consumption without interface module
- 3) The specified values are maximum values. For examples of the exact calculation, see section "Mechanical and electrical configuration" in the X20 system user's manual.
- 4) If hardware upgrades <2.2.0.0 or Automation Runtime versions <AR 4.72 are used, legacy bandwidths apply.
- 5) Each 8 BOOL are combined to 1 byte. Possible stuffing bytes due to alignment must be taken into account. For additional information, see section "Real-time operating system → Target systems → Target systems - SG4 → Runtime behavior - SG4 → Alignment" in Automation Help.
- 6) For additional information about SafeDOMAIN-to-SafeDOMAIN communication, see section "SafeDOMAIN-to-SafeDOMAIN communication" in Automation Help.
- 7) It is important to note that 8 BOOL count as 1 data point.
- 8) For a parameter description, see section "Message window" in the SafeDESIGNER documentation.
- 9) In parallel operation, it is only permitted to expect 75% of the nominal power. It is important to make sure that all power supply units operated in parallel are switched on and off at the same time.

- 10) For additional information, see section "Communication → POWERLINK → General information → Hardware - CN" in Automation Help. It is important to note, however, that the SafeLOGIC controller does not support "early writing of output data". The use of "poll-response chaining" is not recommended for controlled nodes in the same POWERLINK line.
- 11) The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring.

### X20SL8101: Derating for SafeLOGIC / Bus controller / X2X Link power supply

The nominal output power of the X2X Link power supply is 7 W and depends on the operating temperature and mounting orientation.

The derating curve must be shifted to the left with a horizontal mounting orientation depending on the I/O output current.

Module	X20SL8101
<b>Derating penalty</b>	
Load at 24 VDC I/O, max. 10 A	-5°C
Load at 24 VDC I/O, max. 3 A	+0°C

Table 5: Derating penalty

The resulting nominal output power is listed in the following table.

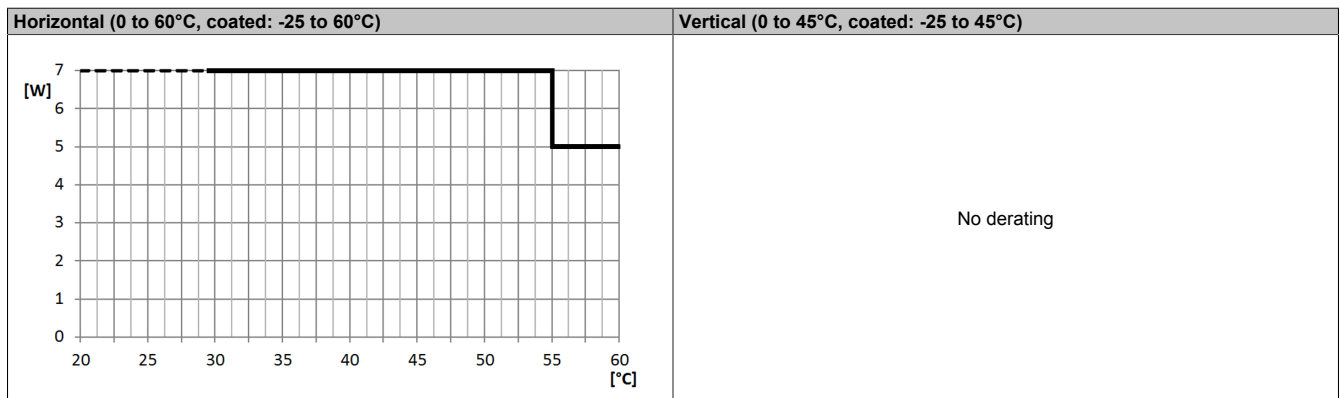


Table 6: Derating for SafeLOGIC / Bus controller / X2X Link power supply

#### Information:

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

#### 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 Operating and connection elements

LEDs and buttons/switches are provided for operating the SafeLOGIC. These elements can be used to perform the following actions:

- Module replacement, including a test of the complete module configuration (section "Module replacement" in Automation Help)
- Firmware replacement (section "Acknowledging a firmware modification" in Automation Help)
- SafeKEY replacement, possibly including transfer of the module configuration from the old SafeKEY (section "Changing the application on the SafeLOGIC controller by replacing the SafeKEY (X20 SafeLOGIC only)" in Automation Help)
- SafeLOGIC controller replacement (section "Module replacement" in Automation Help)

Operation of the SafeLOGIC controller can be displayed via the standard CPU.

A SafeLOGIC controller has the following operating and connection elements:

### X20SL810x

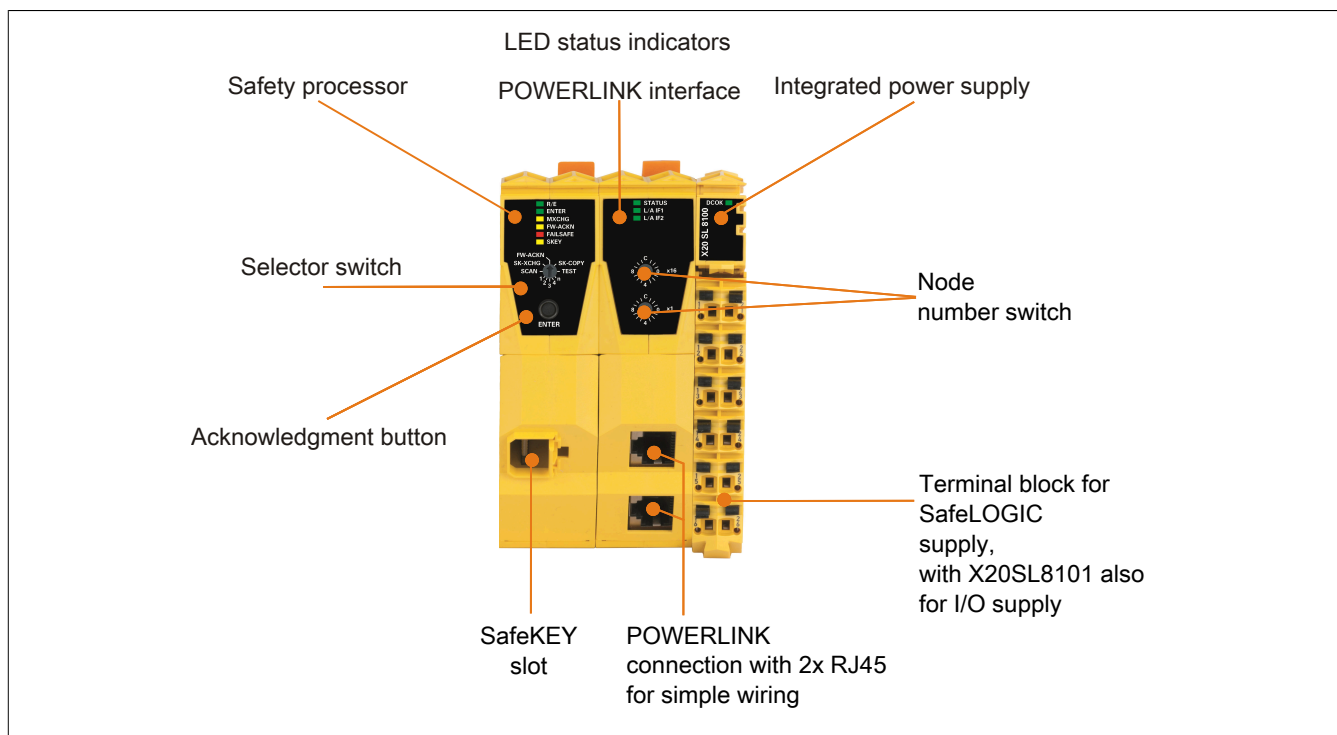


Figure 1: X20SL810x - Operating elements



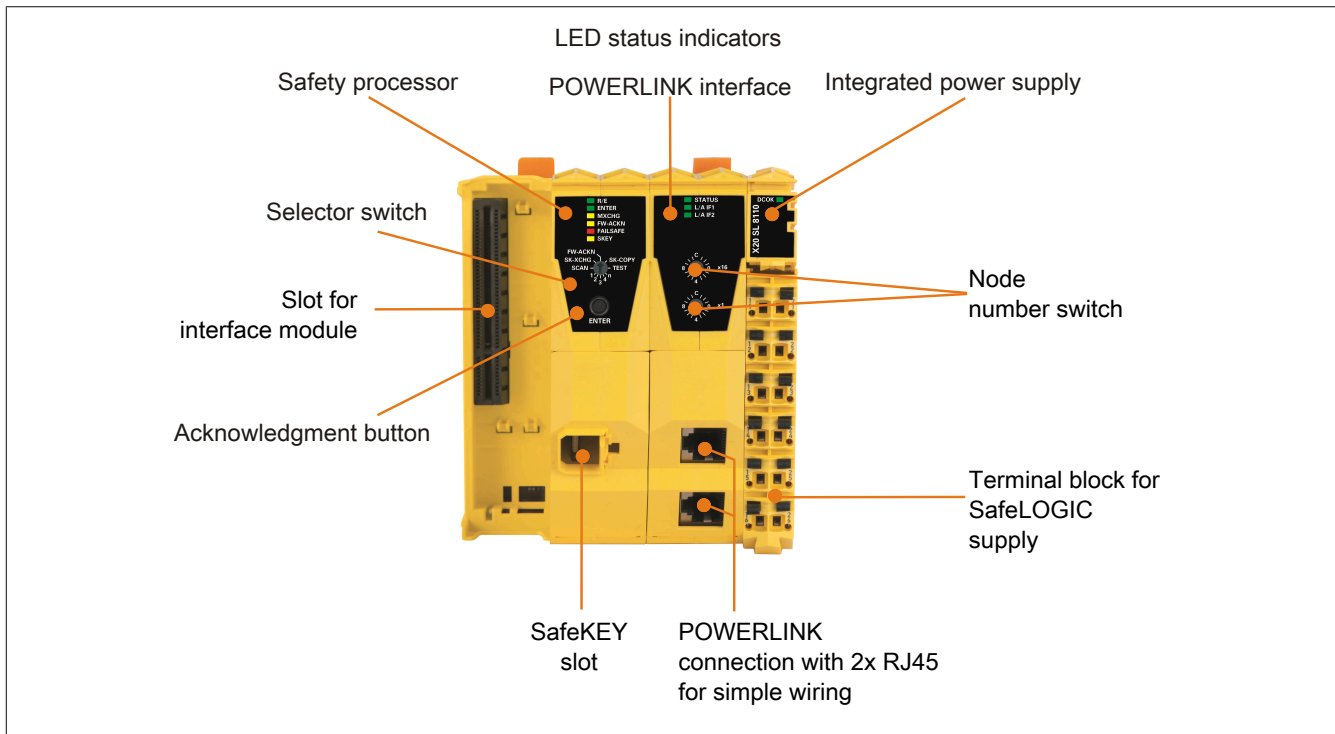
**X20SL8110**

Figure 2: X20SL8110 - Operating elements

**Slot for interface modules**

The X20SL8110 SafeLOGIC controller is equipped with a slot for interface modules.

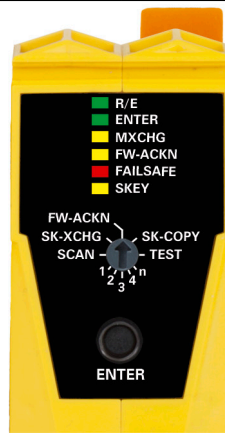
Different bus or network systems can be flexibly integrated into the X20 system by selecting the appropriate interface module.

The following interface modules can be used in the X20SL8110 SafeLOGIC controller:

Module	Description
X20IF10E3-1	X20 interface module for DTM configuration, 1 PROFINET RT device (slave) interface, electrically isolated

## 5.1 Safety processor

### 5.1.1 LED status indicators of the safety processor









LED	Color	Status	Description
R/E	Green	Off	Boot phase
		On	Application exists and is being executed
		Blinking	Application exists but is not being executed (in the download dialog box for the SafeDESIGNER, "Automatic start" was not selected OR boot phase, i.e. not all necessary safe modules on the network were configured correctly.) In addition, boot states 0x1840 to 0x3440 under index:subindex 0x2410:0x01 must be checked in section " <a href="#">SafeLOGIC - Channel list</a> ".
	Orange	On	SafeDESIGNER in "Debug" mode
		Blinks at 0.5 Hz	SafeDESIGNER in "Debug" mode, application in "Stop"
		Blinks at 1 Hz	No application on SafeKEY
ENTER	Green	On	Authorization missing
		Blinks 1x for 0.8 s	Confirmation of correct entry
		Blinks (1 Hz) for 5 s	Faulty operation
MXCHG	Orange	Off	Module configuration OK
			Replacement of 1 module detected
			Replacement of 2 modules detected
			Replacement of 3 modules detected
			Replacement of 4 modules detected
			Replacement of more than 4 modules detected
			Missing module detected
FW-ACKN	Orange	Off	Firmware configuration OK
		Blinking	Firmware update completed
		On	SafeKEY exchanged
ENTER MXCHG FW-ACKN	Green Orange Orange	Running sequence	Performing module scan or startup phase (Note: Check STATUS LED, see section " <a href="#">LED status indicators for the POWERLINK interface</a> "!)

Table 7: Safety processor status indicators

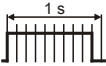
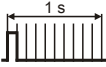
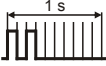
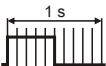
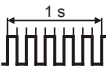
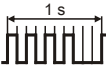
FAILSAFE	Red		LED "FAILSAFE" indicates the startup behavior or the "FailSafe" state related to the entire module after startup.
		Off	Safety firmware OPERATIONAL state
			Boot phase
			Safety firmware PRE_OPERATIONAL state or "SafeOSstate!=RUN"
			Safe communication channel not OK, openSAFETY connection valid problem or "SafeOSstate!=RUN" If the SafeLOGIC controller remains in this state for a longer time, parameter "Default safe data duration" of the "Group: Safety response time default values" must be checked.
			Boot phase, faulty firmware, setup mode active For details about setup mode, see section "Setup mode" in Automation Help.
			Test/Pilot firmware or safety application created with test/pilot version of SafeDESIGNER
			SafeDESIGNER in "Debug" mode
SKEY	Orange	On	Safety state active for the entire module (= state "FailSafe")
		Off	No access to the SafeKEY
		Blinking	Access to the SafeKEY

Table 7: Safety processor status indicators

**Danger!**

**A constantly lit FAILSAFE LED indicates a possible safety-related system error.**

**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!**

**5.1.2 LED test**

The functionality of the LEDs can be tested using the following sequence:

- Move the selector switch to TEST.
- Press the ENTER confirmation button.
- All of the safety processor LEDs will turn on (left module of the SafeLOGIC controller) for the exact duration that the confirmation button is pressed.

### 5.1.3 Selector switch and confirmation button

If configuration confirmations by the user are necessary, they are performed by preselecting the desired function using the selector switch and then pressing the ENTER confirmation button.



Figure 3: Selector switch and confirmation button

Switch position	Functionality	Description
FW-ACKN	Firmware acknowledgment	Acknowledges a firmware change on one or more modules
Unlabeled position between FW-ACKN and SK-COPY (=0xD)	Setup mode	Enables/Disables setup mode For details about setup mode, see section "Setup mode" in Automation Help.
SK-COPY	SafeKEY copy	Copy of the configuration data from the SafeKEY <sup>1)</sup>
TEST	Test	Performs an LED test
Unlabeled position between TEST and n	CLEAR DATA	Deletes the following "user data": <ul style="list-style-type: none"> <li>• Remanent data</li> <li>• Configuration file from the standard application</li> <li>• SafeOPTION</li> </ul>
1,2,3,4,n	Module replacement	Confirms exchange of 1, 2, 3, 4 or more than 4 modules.
SCAN	Scan	Triggers a module scan
SK-XCHG	SafeKEY exchange	Confirmation of SafeKEY exchange
Unlabeled position between FW-ACKN and SK-XCHG	SafeKEY format	Formats the SafeKEY <sup>1)</sup>

Table 8: Confirmation modes

1) Triggers an automatic restart.

#### Confirmation

The confirmation button must be pressed for 0.5 to 5 s to receive confirmation. After 0.5 s, the ENTER LED (see section "[LED status indicators of the safety processor](#)") is illuminated. After releasing the confirmation button, the ENTER LED remains illuminated for an extra 0.8 s. This sequence indicates a correct entry.

- If the confirmation button is released before 0.5 s, it has no effect.
- If the confirmation button is pressed for longer than 5 s, then the ENTER LED blinks for 5 s to display an error.

Another possible reason for an error is an improper placement of the selector switch. If the user wants to confirm a module replacement for one specific module, for example, then the selector switch must be at position "1" (see section "Replacing an individual module" in Automation Help). In this case, if a placement other than "1" is confirmed with the confirmation button, it is considered an error and the ENTER LED blinks for 5 s.

#### Confirmation of "Setup mode", "CLEAR DATA" and "SafeKEY format"

The confirmation button must be pressed for 20 to 30 s to receive confirmation. After 20 s, the ENTER LED is illuminated. After releasing the confirmation button, the ENTER LED remains illuminated for an extra 0.8 s. This sequence indicates a correct entry.

- If the confirmation button is released before 20 s, it has no effect.
- If the confirmation button is pressed for longer than 30 s, then the ENTER LED blinks for 5 s to display an error.

## 5.2 Slot for application memory (SafeKEY)

In order to operate the SafeLOGIC controller, application memory (SafeKEY) is required to save the program, the parameters and the system configuration.

The SafeKEY is equipped with a mechanical locking mechanism to make it more difficult to inadvertently remove during operation.



Figure 4: SafeKEY unlocked

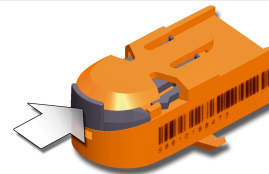


Figure 5: SafeKEY locked

### Information:

Removing a SafeKEY during operation causes the X20 SafeLOGIC controller to be restarted and all safety-related actuators to be cut off.

Removing a SafeKEY during operation can destroy the data on the SafeKEY.

Removing a SafeKEY during operation must therefore always be avoided.

The "Backing up the SafeKEY" sequence is not affected by this general rule.

### Information:

It must be taken into account that modules operated on the local X2X Link network of the X20SL8101 are only correctly configured if a valid SafeDESIGNER project exists on the SafeKEY. Otherwise, channel "ModuleOk" of the modules as well as the SafeLOGIC controllers in Automation Studio remains FALSE.

5.3 POWERLINK interface

5.3.1 LED status indicators for the POWERLINK interface


Figure	LED	Color	Status	Description
	STATUS <sup>1)</sup>	Green/Red		LED "Status/Error". LED states are described in section <a href="#">5.3.2 "LED STATUS"</a> .
	L/A IFx	Green	On	The link to the remote station is established.
			Blinking	The link to the remote station is established. The LED blinks if Ethernet activity is taking place on the bus.

Table 9: POWERLINK interface status indicators

1) LED "Status/Error" is a green/red dual LED.

### 5.3.2 LED STATUS

LED "Status/Error" is a green and red dual LED. The color green (status) is superimposed on the color red (error).

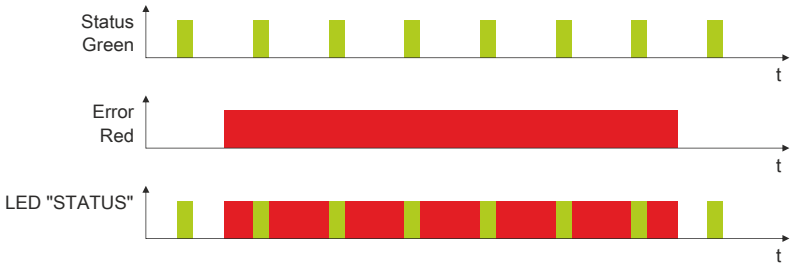
Red - Error	Description
On	<p>The controlled node (CN) is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED:</p> <ul style="list-style-type: none"> <li>PRE_OPERATIONAL_1</li> <li>PRE_OPERATIONAL_2</li> <li>READY_TO_OPERATE</li> </ul>  <p>Note:</p> <ul style="list-style-type: none"> <li>Several red blinking signals are displayed immediately after the device is switched on. This is not an error, however.</li> <li>The LED is lit red for CNs with set physical node number 0 to which no node number has yet been assigned by dynamic node allocation (DNA).</li> </ul>

Table 10: Status/Error LED lit red: LED indicating error

Green - Status	Description
Off	<p>No power supply or mode NOT_ACTIVE.</p> <p>The controlled node (CN) is either not supplied with power, or it is in state NOT_ACTIVE. The CN waits in this state for about 5 seconds after a restart. Communication is not possible with the CN. If no POWERLINK communication is detected during these 5 seconds, the CN enters state BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the CN immediately enters state PRE_OPERATIONAL_1.</p>
Flickering green (approx. 10 Hz)	<p>Mode BASIC_ETHERNET.</p> <p>The CN has not detected any POWERLINK communication. It is possible to communicate directly with the CN in this state (e.g. With UDP, IP, etc.). If POWERLINK communication is detected while in this state, the CN enters state PRE_OPERATIONAL_1.</p>
Single flash (approx. 1 Hz)	<p>Mode PRE_OPERATIONAL_1.</p> <p>The CN waits until it receives an SoC frame and then switches to state PRE_OPERATIONAL_2.</p>
Double flash (approx. 1 Hz)	<p>Mode PRE_OPERATIONAL_2.</p> <p>The CN is normally configured by the manager in this state. A command then switches the CN to the READY_TO_OPERATE state.</p>
Triple flash (approx. 1 Hz)	<p>Mode READY_TO_OPERATE.</p> <p>The manager switches the CN via command to the OPERATIONAL state.</p>
On	<p>Mode OPERATIONAL.</p> <p>The PDO mapping is active and cyclic data is evaluated.</p>
Blinking (approx. 2.5 Hz)	<p>Mode STOPPED.</p> <p>Output data is not being output, and no input data is being provided. It is only possible to switch to or leave this state after the manager has given the appropriate command.</p>

Table 11: Status/Error LED lit green: LED indicating operating state

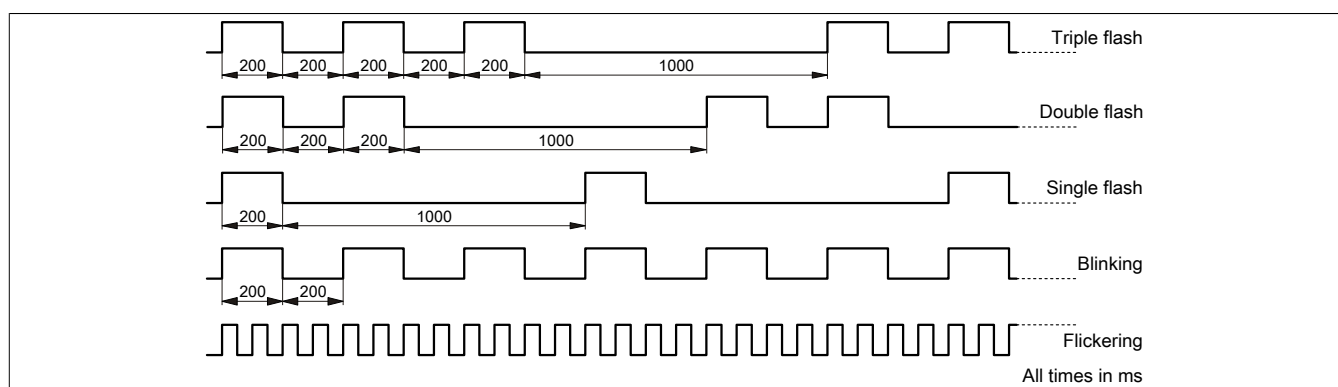


Figure 6: LED status indicators - Blink times

5.3.3 POWERLINK node number

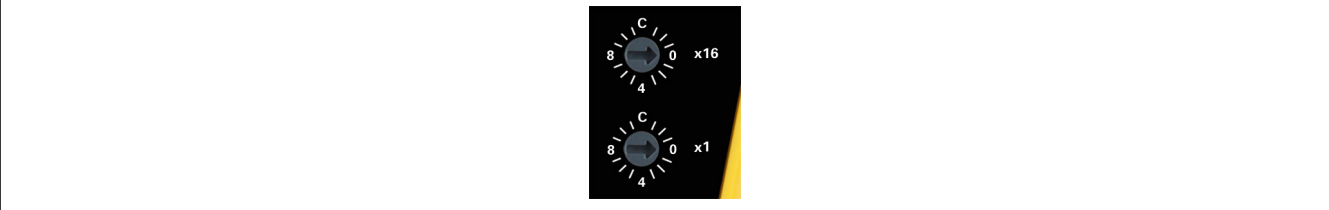


Figure 7: POWERLINK node number switches

The node number of the POWERLINK station is set using the two number switches. Node numbers between 0x01 and 0xEF are permitted.

Switch position	Description
0x00	Reserved, switch position not permitted.
0x01 to 0xEF	Node number of the POWERLINK station, operation as controlled node (CN)
0xF0 to 0xFF	Reserved, switch position not permitted.

Table 12: POWERLINK node number

5.3.4 RJ45 ports

For information about wiring X20 modules with an Ethernet interface, see section "Mechanical and electrical configuration - Wiring guidelines for X20 modules with Ethernet cables" of the X20 user's manual.

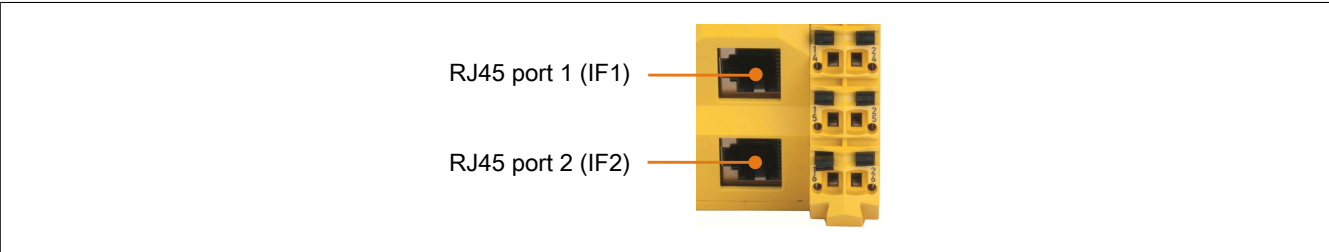


Figure 8: RJ45 ports

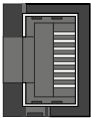
Interface	Pinout		
	Pin	Ethernet	
 Shielded RJ45 port	1	RXD	Receive data
	2	RXD\	Receive data\
	3	TXD	Transmit data
	4	Termination	
	5	Termination	
	6	TXD\	Transmit data\
	7	Termination	
	8	Termination	

Table 13: Pinout for RJ45 port



## 5.4 Integrated power supply

A power supply is integrated in the SafeLOGIC controller.

### 5.4.1 LED status indicators for the integrated power supply

#### X20SL81x0


Figure	LED	Color	Status	Description
	DCOK	Green	On	Voltage applied to module
			Off	Voltage not applied to module

Table 14: X20SL81x0 - LED status indicators for the integrated power supply

#### X20SL8101

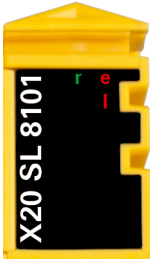
Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	Mode RESET
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			Double flash	The LED indicates one of the following states: <ul style="list-style-type: none"> <li>The SafeLOGIC controller / bus controller / X2X Link power supply for the power supply is overloaded</li> <li>I/O power supply too low</li> <li>Input voltage for the SafeLOGIC controller / bus controller / X2X Link power supply is too low</li> </ul>
	e + r	Solid red / Single green flash		Invalid firmware
	l	Red	Off	The SafeLOGIC controller / bus controller / X2X Link power supply is in the valid range.
			On	The SafeLOGIC controller / bus controller / X2X Link power supply for the power supply is overloaded.

Table 15: X20SL8101 - LED status indicators for the integrated power supply

### 5.4.2 Pinout for the integrated power supply

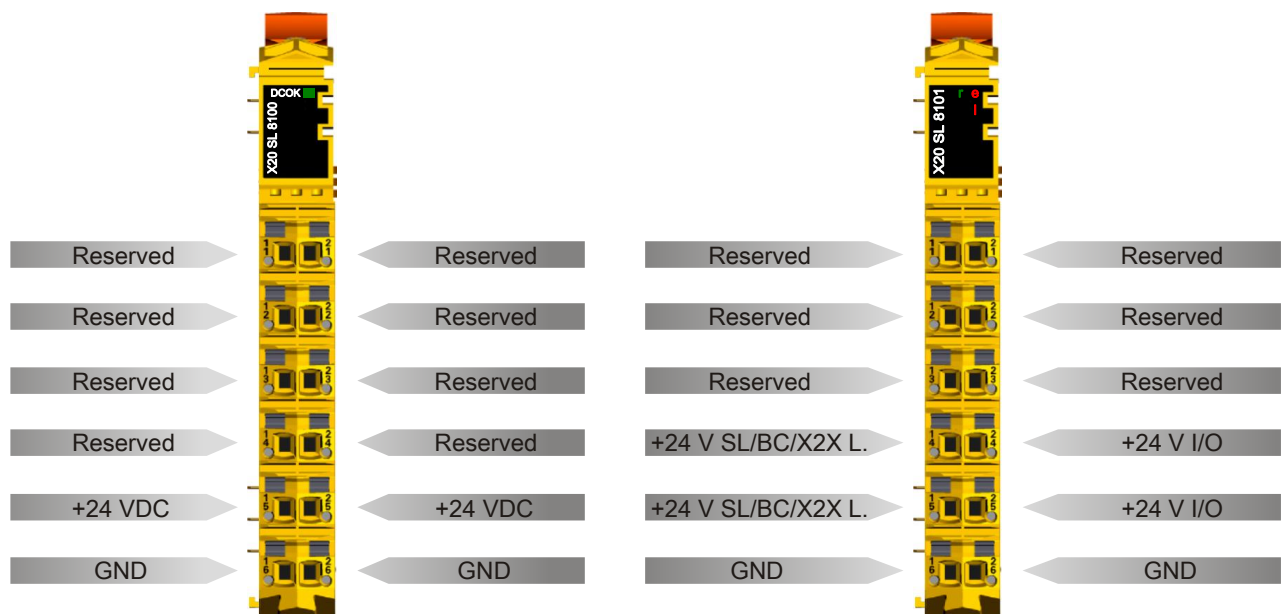


Figure 9: X20SL81x0 - Pinout of the integrated power supply Figure 10: X20SL8101 - Pinout of the integrated power supply

### 5.4.3 Connection examples

#### X20SL81x0

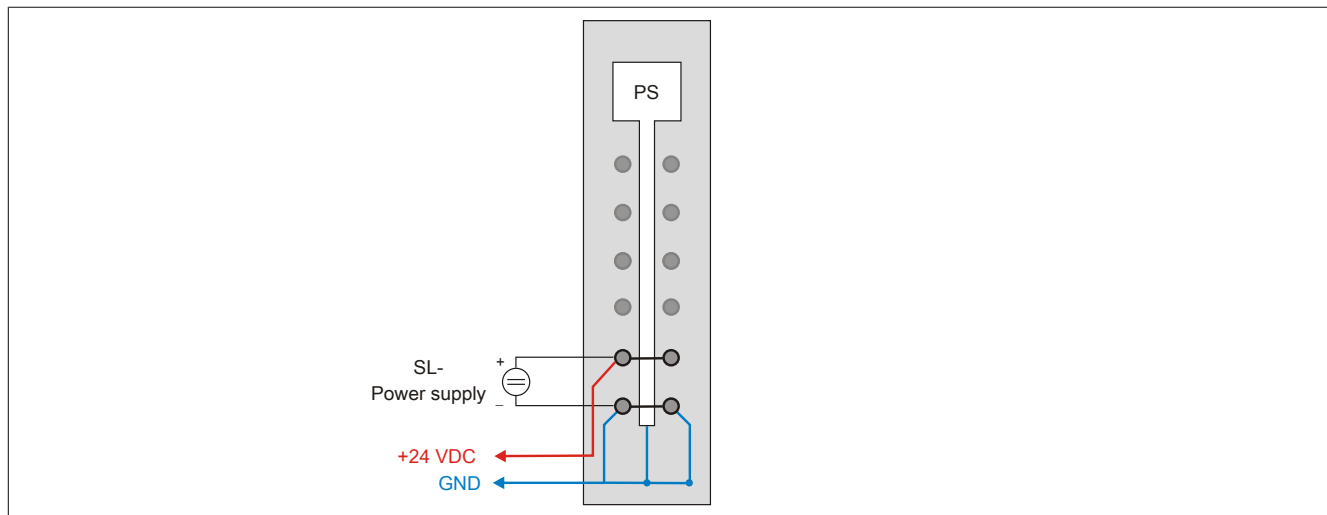


Figure 11: X20SL81x0 - Connection example

#### X20SL8101 - With 2 isolated power supplies

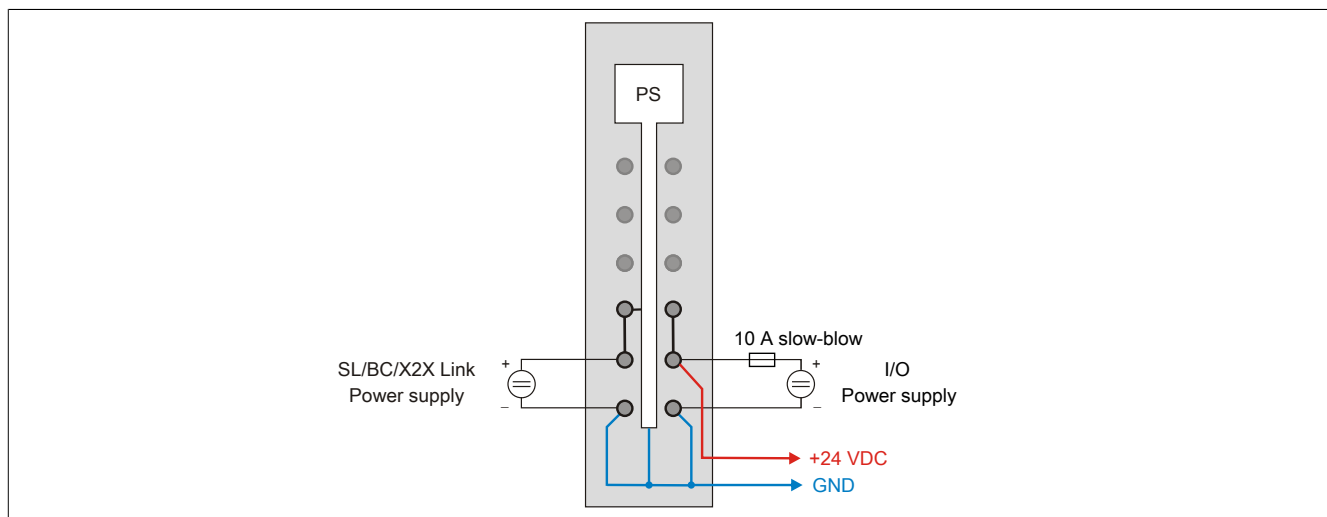


Figure 12: X20SL8101 - Connection example with 2 isolated power supplies

#### X20SL8101 - With one power supply and jumper

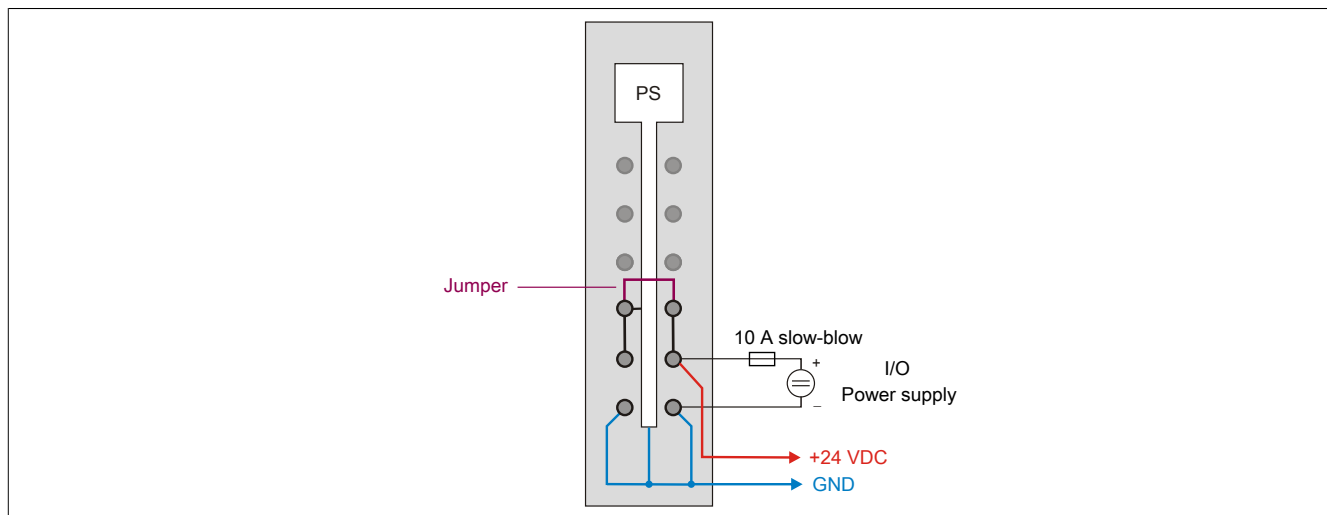


Figure 13: X20SL8101 - Connection example with one power supply and jumper

## 6 Register description

### 6.1 Parameters in the I/O configuration

#### Group: POWERLINK parameters

Parameter	Description	Default value	Unit
Mode	SafeLOGIC can only be operated as a "controlled node" (CN). A "managing node" (MN) is not supported.	Controlled node	-

Table 16: I/O configuration parameters: POWERLINK parameters

#### Information:

There are additional configuration parameters available.

For details, see Automation Help under "Communication → POWERLINK → AR configuration → POWERLINK controlled node configuration (SG4)".

#### Group: Function model

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

Table 17: I/O configuration parameters: Function model

**Group: General**

Parameter	Description	Default value	Unit						
Module supervised	System behavior when a module is missing	On	-						
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>On</td><td>Missing module triggers service mode</td></tr><tr><td>Off</td><td>Missing module is ignored</td></tr></table>	Parameter value	Description	On	Missing module triggers service mode	Off	Missing module is ignored		
	Parameter value	Description							
	On	Missing module triggers service mode							
Off	Missing module is ignored								
Interface slot enable (X20SL8110 only)	This parameter enables data transfer for the interface card.	On	-						
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>On</td><td>Data transfer for the interface card is enabled.</td></tr><tr><td>Off</td><td>Data transfer for the interface card is disabled.</td></tr></table>	Parameter value	Description	On	Data transfer for the interface card is enabled.	Off	Data transfer for the interface card is disabled.		
	Parameter value	Description							
	On	Data transfer for the interface card is enabled.							
Off	Data transfer for the interface card is disabled.								
Node used as IP gateway	This parameter is reserved for future functional expansions.	240	-						
Standalone mode (X20SL8101 only)	This parameter enables standalone mode (see section Blackout mode in Automation Help under: Hardware → X20 system → Additional information → Blackout mode) and allows the SafeLOGIC controller to be started up without an active master.	Off	-						
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>On</td><td>Standalone mode is enabled.</td></tr><tr><td>Off</td><td>Standalone mode is disabled.</td></tr></table>	Parameter value	Description	On	Standalone mode is enabled.	Off	Standalone mode is disabled.		
	Parameter value	Description							
	On	Standalone mode is enabled.							
Off	Standalone mode is disabled.								
SafeDOMAIN ID	In applications with multiple SafeLOGIC controllers, this parameter defines the unique SafeLOGIC address. <ul style="list-style-type: none"><li>Permissible values: 1 to 1000</li></ul>	Assigned automatically	-						
SafeNODE ID	Unique safety address of the module <ul style="list-style-type: none"><li>Permissible values: 1</li></ul>	1	-						
Manual cycle time configuration	Specification for the cycle time mode	Yes	-						
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Yes</td><td>Operation with a fixed cycle time (in accordance with parameter "Cycle time").</td></tr></table>	Parameter value	Description	Yes	Operation with a fixed cycle time (in accordance with parameter "Cycle time").				
	Parameter value	Description							
Yes	Operation with a fixed cycle time (in accordance with parameter "Cycle time").								
Cycle time	This parameter determines the cycle time of the safety application. <ul style="list-style-type: none"><li>Permissible values: 800 to 20,000 µs (corresponds to 0.8 to 20 ms)</li></ul>	4000	µs						
	The set value must be an integer multiple of the POWERLINK cycle time!								

Table 18: I/O configuration parameters: General

**Information:**

Parameter "Cycle time" must be greater than the processing time for the safety application and must correspond to an integer multiple of the POWERLINK cycle time. The processing time can be determined in the online dialog window using function "Info". If the parameter "Cycle time" is less than or too close to the necessary processing time, a cycle time violation can occur.

For additional information, see section "Dialog box 'SafePLC info' in SafeDESIGNER" in Automation Help.

### Group: SafeDESIGNER-to-SafeLOGIC communication

When SPROXY is enabled, the SafeLOGIC controller can be accessed via a TCP/IP port on the standard CPU. This uses SafeDESIGNER setting "SL - Communication through BR-CPU".

Parameter	Description	Default value	Unit
Server communication port	TCP/IP port number used to access the SafeLOGIC controller <ul style="list-style-type: none"> <li>Recommended values: 50,000 to 50,100</li> </ul> <b>Note:</b> If multiple SafeLOGIC controllers are being used in the project, then a different port number must be configured for each one!	Assigned automatically	-

Table 19: I/O configuration parameters: SafeDESIGNER-to-SafeLOGIC communication

### Group: CPU-to-SafeLOGIC communication

Parameter	Description	Default value	Unit
Number of BOOL channels	Number of BOOL channels from the CPU to the SafeLOGIC controller <ul style="list-style-type: none"> <li>Permissible values: 0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 128, 256, 384, 512, 640, 768, 896, 1024.</li> </ul>	8	-
Number of INT channels	Number of INT channels from the CPU to the SafeLOGIC controller <ul style="list-style-type: none"> <li>Permissible values: 0 to 128.</li> </ul>	0	-
Number of UINT channels	Number of UINT channels from the CPU to the SafeLOGIC controller <ul style="list-style-type: none"> <li>Permissible values: 0 to 128.</li> </ul>	0	-
Number of DINT channels	Number of DINT channels from the CPU to the SafeLOGIC controller <ul style="list-style-type: none"> <li>Permissible values: 0 to 64.</li> </ul>	0	-
Number of UDINT channels	Number of UDINT channels from the CPU to the SafeLOGIC controller <ul style="list-style-type: none"> <li>Permissible values: 0 to 64.</li> </ul>	0	-

Table 20: I/O configuration parameters: CPU-to-SafeLOGIC communication

### Group: SafeLOGIC-to-CPU communication

Parameter	Description	Default value	Unit
Number of BOOL channels	Number of BOOL channels from the SafeLOGIC controller to the CPU <ul style="list-style-type: none"> <li>Permissible values: 0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 128, 256, 384, 512, 640, 768, 896, 1024.</li> </ul>	8	-
Number of INT channels	Number of INT channels from the SafeLOGIC controller to the CPU <ul style="list-style-type: none"> <li>Permissible values: 0 to 128.</li> </ul>	0	-
Number of UINT channels	Number of UINT channels from the SafeLOGIC controller to the CPU <ul style="list-style-type: none"> <li>Permissible values: 0 to 128.</li> </ul>	0	-
Number of DINT channels	Number of DINT channels from the SafeLOGIC controller to the CPU <ul style="list-style-type: none"> <li>Permissible values: 0 to 64.</li> </ul>	0	-
Number of UDINT channels	Number of UDINT channels from the SafeLOGIC controller to the CPU <ul style="list-style-type: none"> <li>Permissible values: 0 to 64.</li> </ul>	0	-

Table 21: I/O configuration parameters: SafeLOGIC-to-CPU communication

**Group: SafeDOMAIN-to-SafeDOMAIN communication**

Starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0

For additional information about SafeDOMAIN-to-SafeDOMAIN communication, see section "SafeDOMAIN-to-SafeDOMAIN communication" in Automation Help.

Parameter	Description	Default value	Unit
<b>Group: Managing SafeDOMAIN connection xx</b> Configuration of the SafeDOMAINs to which this SafeDOMAIN establishes a connection.			
SafeDOMAIN ID of connection xx	SafeDOMAIN ID of the Managing SafeDOMAIN to which a connection should be established	0	-
<b>Group: Output channels</b> This data is generated by the connected Managing SafeDOMAIN.			
Number of BOOL channels	Number of BOOL channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120, 128.	8	-
Number of INT channels	Number of INT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-
Number of UINT channels	Number of UINT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-
Number of DINT channels	Number of DINT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-
Number of UDINT channels	Number of UDINT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-
<b>Group: Input channels</b> This data is received by the connected Managing SafeDOMAIN.			
Number of BOOL channels	Number of BOOL channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0, 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120, 128.	8	-
Number of INT channels	Number of INT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-
Number of UINT channels	Number of UINT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-
Number of DINT channels	Number of DINT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-
Number of UDINT channels	Number of UDINT channels from the SafeDOMAIN to the SafeDOMAIN • Permissible values: 0 to 16.	0	-

Table 22: I/O configuration parameters: SafeDOMAIN-to-SafeDOMAIN communication

**Group: Power supply parameters (X20SL8101 only)**

Parameter	Description	Default value	Unit
Module status information	This parameter enables/disables additional status information in the I/O mapping.	On	-
Current/voltage information	This parameter enables/disables additional current and voltage information in the I/O mapping.	Off	-

Table 23: I/O configuration parameters: Power supply parameters

## 6.2 Parameters in SafeDESIGNER

### 6.2.1 SafeLOGIC basic settings

#### Group: Basic

Parameter	Description	Default value	Unit										
Min. required firmware revision	This parameter is reserved for future functional expansions.	Basic release	-										
Asynchronous communication load	<p>This parameter can be used to influence the processing mode and thus the load in the SafeLOGIC cycle. This parameter can be used to determine how much asynchronous bandwidth is used for SafeNODE configuration. Increasing the value usually shortens the startup time as long as the network provides sufficient asynchronous bandwidth. Increasing the value also requires more computing time in the SafeLOGIC cycle, however.</p> <table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Low</td><td>Processing of a SSDO/SNMT service is divided across 5 SafeLOGIC cycles, i.e. the load in the cycle is low, but startup takes longer because a SSDO/SNMT service is processed only every 5 SafeLOGIC cycles. Time required per SafeLOGIC cycle: 145 µs</td></tr><tr><td>Medium</td><td>One SSDO/SNMT service is processed in each SafeLOGIC cycle, i.e. the load in the cycle is low, and optimized startup has the same importance. Time required per SafeLOGIC cycle: 260 µs</td></tr><tr><td>High</td><td>5 SSDO/SNMT services are processed in each SafeLOGIC cycle, i.e. the load in the cycle is relatively high to favor optimized startup behavior. Time required per SafeLOGIC cycle: 860 µs</td></tr><tr><td>Auto</td><td>For SafeLOGIC cycles &lt;3 ms, this setting results in the behavior "Asynchronous communication load = Low"; for SafeLOGIC cycles &gt;3 ms, it results in the behavior "Asynchronous communication load = High".</td></tr></table>	Parameter value	Description	Low	Processing of a SSDO/SNMT service is divided across 5 SafeLOGIC cycles, i.e. the load in the cycle is low, but startup takes longer because a SSDO/SNMT service is processed only every 5 SafeLOGIC cycles. Time required per SafeLOGIC cycle: 145 µs	Medium	One SSDO/SNMT service is processed in each SafeLOGIC cycle, i.e. the load in the cycle is low, and optimized startup has the same importance. Time required per SafeLOGIC cycle: 260 µs	High	5 SSDO/SNMT services are processed in each SafeLOGIC cycle, i.e. the load in the cycle is relatively high to favor optimized startup behavior. Time required per SafeLOGIC cycle: 860 µs	Auto	For SafeLOGIC cycles <3 ms, this setting results in the behavior "Asynchronous communication load = Low"; for SafeLOGIC cycles >3 ms, it results in the behavior "Asynchronous communication load = High".	Auto	-
Parameter value	Description												
Low	Processing of a SSDO/SNMT service is divided across 5 SafeLOGIC cycles, i.e. the load in the cycle is low, but startup takes longer because a SSDO/SNMT service is processed only every 5 SafeLOGIC cycles. Time required per SafeLOGIC cycle: 145 µs												
Medium	One SSDO/SNMT service is processed in each SafeLOGIC cycle, i.e. the load in the cycle is low, and optimized startup has the same importance. Time required per SafeLOGIC cycle: 260 µs												
High	5 SSDO/SNMT services are processed in each SafeLOGIC cycle, i.e. the load in the cycle is relatively high to favor optimized startup behavior. Time required per SafeLOGIC cycle: 860 µs												
Auto	For SafeLOGIC cycles <3 ms, this setting results in the behavior "Asynchronous communication load = Low"; for SafeLOGIC cycles >3 ms, it results in the behavior "Asynchronous communication load = High".												
Node guarding timeout	<p>Timeout for changing the safety modules to the PRE_OPERATIONAL state after the SafeLOGIC controller drops out or if there is a communication problem between the safety module and the SafeLOGIC controller. This parameter also defines how long it takes for the SafeLOGIC controller to detect a missing module.</p> <ul style="list-style-type: none"><li>Permissible values: 30 to 300 s</li></ul> <p><b>Notes</b></p> <ul style="list-style-type: none"><li>The shorter the time, the greater the amount of asynchronous data traffic.</li><li>This setting is not critical to safety functionality. The time for safely cutting off actuators is determined independently of this.</li></ul>	60	s										
Auto-acknowledge SafeKEY exchange	<p>This parameter enables automatic acknowledgment of a SafeKEY exchange (acknowledgment request "SafeKEY exchange").</p> <table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Yes - Warning</td><td>Automatic acknowledgment of SafeKEY exchange is enabled.</td></tr><tr><td>No</td><td>Automatic acknowledgment of SafeKEY exchange is not enabled.</td></tr></table>	Parameter value	Description	Yes - Warning	Automatic acknowledgment of SafeKEY exchange is enabled.	No	Automatic acknowledgment of SafeKEY exchange is not enabled.	No	-				
Parameter value	Description												
Yes - Warning	Automatic acknowledgment of SafeKEY exchange is enabled.												
No	Automatic acknowledgment of SafeKEY exchange is not enabled.												
Process data transfer rate	<p>This parameter defines the base transfer rate for process data.</p> <table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>High</td><td>Normal transfer rate.</td></tr><tr><td>Low</td><td>Reduced transfer rate to support networks with low transfer rates (data transmission time &gt;1 s). In rare cases, the connection to SafeNODEs present in the network may be aborted. Connection aborts to Connected SafeDOMAINs are not affected. Connection aborts to SafeNODEs can be avoided by setting up a new SafeDOMAIN in a separate network with a normal transfer rate and connecting this network to the original network with a reduced transfer rate via SafeDOMAIN-to-SafeDOMAIN communication.</td></tr></table>	Parameter value	Description	High	Normal transfer rate.	Low	Reduced transfer rate to support networks with low transfer rates (data transmission time >1 s). In rare cases, the connection to SafeNODEs present in the network may be aborted. Connection aborts to Connected SafeDOMAINs are not affected. Connection aborts to SafeNODEs can be avoided by setting up a new SafeDOMAIN in a separate network with a normal transfer rate and connecting this network to the original network with a reduced transfer rate via SafeDOMAIN-to-SafeDOMAIN communication.	High	-				
Parameter value	Description												
High	Normal transfer rate.												
Low	Reduced transfer rate to support networks with low transfer rates (data transmission time >1 s). In rare cases, the connection to SafeNODEs present in the network may be aborted. Connection aborts to Connected SafeDOMAINs are not affected. Connection aborts to SafeNODEs can be avoided by setting up a new SafeDOMAIN in a separate network with a normal transfer rate and connecting this network to the original network with a reduced transfer rate via SafeDOMAIN-to-SafeDOMAIN communication.												
Availability source	<p>This parameter sets the source for the availability settings of the individual SafeNODEs.</p> <table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>SafeDESIGNER</td><td>The availability of the SafeNODEs is defined in SafeDESIGNER.</td></tr><tr><td>SafeCOMMISSIONING</td><td>The availability of SafeNODEs is defined via "SafeNODE availability" parameters in SafeCOMMISSIONING.</td></tr></table>	Parameter value	Description	SafeDESIGNER	The availability of the SafeNODEs is defined in SafeDESIGNER.	SafeCOMMISSIONING	The availability of SafeNODEs is defined via "SafeNODE availability" parameters in SafeCOMMISSIONING.	SafeDESIGNER	-				
Parameter value	Description												
SafeDESIGNER	The availability of the SafeNODEs is defined in SafeDESIGNER.												
SafeCOMMISSIONING	The availability of SafeNODEs is defined via "SafeNODE availability" parameters in SafeCOMMISSIONING.												
Maximum number of simultaneous module startups (hardware upgrade 2.4.0.0 or later)	<p>This parameter specifies how many modules are addressed simultaneously by the SafeLOGIC controller during startup. Reducing the parameter increases the startup time but reduces the number of transfer errors.</p> <ul style="list-style-type: none"><li>Permissible values: 1 to 280</li></ul>	280	-										

Table 24: SafeDESIGNER parameters: Basic

## Information:

Startup time is also affected by the asynchronous bandwidth on the POWERLINK network. For ways to optimize, see section Communication → POWERLINK → General information → Multiple asynchronous send in Automation Help.

## Information:

The information in section "Automatic acknowledgment" in Automation Help must be observed when using parameter "Auto-acknowledge SafeKEY exchange".

### Group: Safety response time default values

The parameters for the safety response time are generally set in the same way for all stations involved in the application. This is why these parameters are configured for the SafeLOGIC controller in the "Safety response time default values" group in SafeDESIGNER.

If "Manual configuration = No" is set for the individual modules, then these default values are used.

Parameter	Description	Default value	Unit
Default 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. <ul style="list-style-type: none"> <li>Permissible values: 2000 to 10,000,000 µs (corresponds to 2 ms to 10 s)</li> </ul>	20000	µs
Default additional tolerated packet loss	This parameter specifies the number of additional tolerated lost packets during data transfer. <ul style="list-style-type: none"> <li>Permissible values: 0 to 10</li> </ul>	1	Packets
Default node guarding packets	This parameter specifies the maximum number of packets used for node guarding. <ul style="list-style-type: none"> <li>Permissible values: 1 to 255</li> </ul> <b>Note</b> <ul style="list-style-type: none"> <li>The larger the configured value, the greater the amount of asynchronous data traffic.</li> <li>This setting is not critical to safety functionality. The time for safely cutting off actuators is determined independently of this.</li> </ul>	5	Packets

Table 25: SafeDESIGNER parameters: Safety response time default values

### Group: Module configuration

Parameter	Description	Default value	Unit						
Keep remanent	Automatically resets the remanent data (see Automation Help for SafeDESIGNER function block "SF_RemanentData_SAFEDINT" or "SF_RemanentData_SAFEDWORD")	No	-						
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Yes - Warning</td><td>Remanent data is not automatically reset.</td></tr><tr><td>No</td><td>Remanent data is automatically reset if a modified SafeDESIGNER project (modified CRC and/or timestamp) is loaded to the SafeLOGIC controller.</td></tr></table>	Parameter value	Description	Yes - Warning	Remanent data is not automatically reset.	No	Remanent data is automatically reset if a modified SafeDESIGNER project (modified CRC and/or timestamp) is loaded to the SafeLOGIC controller.		
	Parameter value	Description							
	Yes - Warning	Remanent data is not automatically reset.							
No	Remanent data is automatically reset if a modified SafeDESIGNER project (modified CRC and/or timestamp) is loaded to the SafeLOGIC controller.								
Max. cycle time	<p>Parameter for checking whether a maximum time between 2 SafeLOGIC cycles is exceeded.</p> <ul style="list-style-type: none"><li>Permissible values: 2000 to 21,000 µs (corresponds to 2 to 21 ms)</li></ul> <p><b>Important:</b> This value should not be the same as the actual cycle time; jitter must also be taken into account.</p>	20000	µs						

Table 26: SafeDESIGNER parameters: Module configuration

## Danger!

If parameter "Keep remanent" is set to Yes - Warning, it is important when saving data after a project download to note that the data still has the same meaning in the application program.



## 6.2.2 Settings for the SafeDOMAIN-to-SafeDOMAIN connection

Starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0

A connection between 2 SafeDOMAINs must be set up in order to exchange data.

Setting up the connection and defining the safe data to be transferred takes place in the Connected SafeDOMAIN.

For additional information about SafeDOMAIN-to-SafeDOMAIN communication, see section "SafeDOMAIN-to-SafeDOMAIN communication" in Automation Help.

### Information:

Since SafeDOMAIN-to-SafeDOMAIN communication is represented as an additional safety module on the Managing SafeDOMAIN, the parameters for the connection are only available and set in the Managing SafeDOMAIN project.

### 6.2.2.1 Connected SafeDOMAIN parameters

Starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0

#### 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	-										
<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Permanent</td><td><p>This module is mandatory for the application.</p><p>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".</p><p>After startup, module problems are indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is also made in the logbook.</p></td></tr><tr><td>Optional</td><td><p>The module is not required for the application.</p><p>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.</p><p>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.</p></td></tr><tr><td>Startup</td><td><p>This module is optional. The system determines how the module will proceed during startup.</p><p>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.</p><p>If it is determined that the module is not physically present during startup, then the module behaves as if "Availability = Optional" is set.</p></td></tr><tr><td>Never</td><td><p>The module is not required for the application.</p><p>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.</p><p>Unlike when "Availability = Optional" is configured, the module is not started with "Availability = Never", which optimizes system startup behavior.</p><p>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.</p></td></tr></table>				Parameter value	Description	Permanent	<p>This module is mandatory for the application.</p> <p>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".</p> <p>After startup, module problems are indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is also made in the logbook.</p>	Optional	<p>The module is not required for the application.</p> <p>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.</p> <p>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.</p>	Startup	<p>This module is optional. The system determines how the module will proceed during startup.</p> <p>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.</p> <p>If it is determined that the module is not physically present during startup, then the module behaves as if "Availability = Optional" is set.</p>	Never	<p>The module is not required for the application.</p> <p>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.</p> <p>Unlike when "Availability = Optional" is configured, the module is not started with "Availability = Never", which optimizes system startup behavior.</p> <p>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.</p>
Parameter value	Description												
Permanent	<p>This module is mandatory for the application.</p> <p>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".</p> <p>After startup, module problems are indicated by a quickly blinking "MXCHG" LED on the SafeLOGIC controller. An entry is also made in the logbook.</p>												
Optional	<p>The module is not required for the application.</p> <p>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.</p> <p>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.</p>												
Startup	<p>This module is optional. The system determines how the module will proceed during startup.</p> <p>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.</p> <p>If it is determined that the module is not physically present during startup, then the module behaves as if "Availability = Optional" is set.</p>												
Never	<p>The module is not required for the application.</p> <p>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.</p> <p>Unlike when "Availability = Optional" is configured, the module is not started with "Availability = Never", which optimizes system startup behavior.</p> <p>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.</p>												

Table 27: SafeDESIGNER parameters: Basic

**Group: Safety response time**

Parameter	Description	Default value	Unit						
Safe data duration	<p>This parameter specifies the maximum permissible data transmission time between the SafeLOGIC controller and SafeIO module.</p> <p>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.</p> <p>The following formula can be used as the lower limit: "Value of the Network Analyzer" * 2 + SafeLOGIC cycle time * 2</p> <p>The stability of the system cannot be ensured for smaller values.</p> <ul style="list-style-type: none"><li>Permissible values: 2000 to 10,000,000 µs (corresponds to 2 ms to 10 s)</li></ul>	50000	µs						
Additional tolerated packet loss	<p>This parameter specifies the number of additional tolerated lost packets during data transfer.</p> <ul style="list-style-type: none"><li>Permissible values: 0 to 10</li></ul>	1	Packets						
Slow connection	<p>This parameter specifies whether this connection is a slow connection.</p> <table><thead><tr><th>Parameter value</th><th>Description</th></tr></thead><tbody><tr><td>Yes</td><td><p>This is a connection with a large ratio between the SafeLOGIC cycle time and the telegram runtime (affects the parameter calculation internally).</p><p>Rule of thumb: "Yes" from ratio 50:1 (telegram runtime: SafeLOGIC cycle time)</p></td></tr><tr><td>No</td><td><p>Default connection, parameter calculation unchanged</p></td></tr></tbody></table>	Parameter value	Description	Yes	<p>This is a connection with a large ratio between the SafeLOGIC cycle time and the telegram runtime (affects the parameter calculation internally).</p> <p>Rule of thumb: "Yes" from ratio 50:1 (telegram runtime: SafeLOGIC cycle time)</p>	No	<p>Default connection, parameter calculation unchanged</p>	No	-
Parameter value	Description								
Yes	<p>This is a connection with a large ratio between the SafeLOGIC cycle time and the telegram runtime (affects the parameter calculation internally).</p> <p>Rule of thumb: "Yes" from ratio 50:1 (telegram runtime: SafeLOGIC cycle time)</p>								
No	<p>Default connection, parameter calculation unchanged</p>								
Node guarding packets	<p>This parameter specifies the maximum number of packets used for node guarding.</p> <ul style="list-style-type: none"><li>Permissible values: 1 to 255</li></ul> <p><b>Note</b></p> <ul style="list-style-type: none"><li>The larger the configured value, the greater the amount of asynchronous data traffic.</li><li>This setting is not critical to safety functionality. The time for safely cutting off actuators is determined independently of this.</li></ul>	5	Packets						

Table 28: SafeDESIGNER parameters: Safety response time

**Information:**

Parameter "Slow connection" can also be used to specify that the connection between the Connected SafeDOMAIN and Managing SafeDOMAIN is slow. If a value of a few seconds is needed for the connection timeout, then this parameter must be enabled ("Slow connection = Yes").

### 6.3 SafeLOGIC - Channel list

Channel name	Access via Automation Studio	Access via SafeDESIGNER	Data type	Description
ModuleOk	Read	-	BOOL	Indicates whether the module is physically present and configured and whether a SafeDESIGNER project is present
SerialNumber	Read	-	UDINT	Module serial number
ModuleID	Read	-	UDINT	Module ID
HardwareVariant	Read	-	UDINT	Hardware variant
FirmwareVersion	Read	-	UDINT	Firmware version of the module
SafeFirmwareVersion	Read	-	UINT	Channel for reading the version of the safe firmware
UDID_low	Read	-	UDINT	UDID, lower 4 bytes
UDID_high	Read	-	UINT	UDID, upper 2 bytes
BOOL1xxx	Write	Read	BOOL	CPU to SafeLOGIC communication channel
INT1xxx	Write	Read	INT	CPU to SafeLOGIC communication channel
UINT1xxx	Write	Read	UINT	CPU to SafeLOGIC communication channel
DINT1xxx	Write	Read	DINT	CPU to SafeLOGIC communication channel
UDINT1xxx	Write	Read	UDINT	CPU to SafeLOGIC communication channel
BOOL0xxx	Read	Write	BOOL	SafeLOGIC to CPU communication channel
INT0xxx	Read	Write	INT	SafeLOGIC to CPU communication channel
UINT0xxx	Read	Write	UINT	SafeLOGIC to CPU communication channel
DINT0xxx	Read	Write	DINT	SafeLOGIC to CPU communication channel
UDINT0xxx	Read	Write	UDINT	SafeLOGIC to CPU communication channel
SafeModuleOK <sup>1)</sup>	-	Read	SAFEBOOL	Indicates whether the safe communication channel between SafeDOMAIN and SafeDOMAIN is OK
SafeBOOLxxx <sup>1)</sup>	Read	Read/Write	SAFEBOOL	SafeDOMAIN-to-SafeDOMAIN communication channel
SafeINTxx <sup>1)</sup>	Read	Read/Write	SAFEINT	SafeDOMAIN-to-SafeDOMAIN communication channel
SafeUINTxx <sup>1)</sup>	Read	Read/Write	SAFEWORD	SafeDOMAIN-to-SafeDOMAIN communication channel
SafeDINTxx <sup>1)</sup>	Read	Read/Write	SAFEDINT	SafeDOMAIN-to-SafeDOMAIN communication channel
SafeUDINTxx <sup>1)</sup>	Read	Read/Write	SAFEDWORD	SafeDOMAIN-to-SafeDOMAIN communication channel
SafeCommissioningOptionBITxx	-	Read	SAFEBOOL	Internal channels for Safe Commissioning Options
SafeCommissioningOptionINTxx	-	Read	SAFEINT	Internal channels for Safe Commissioning Options
SafeCommissioningOptionUINTxx	-	Read	SAFEWORD	Internal channels for Safe Commissioning Options
SafeCommissioningOptionDINTxx	-	Read	SAFEDINT	Internal channels for Safe Commissioning Options
SafeCommissioningOptionUDINTxx	-	Read	SAFEDWORD	Internal channels for Safe Commissioning Options

Table 29: SafeLOGIC - Channel list

- <sup>1)</sup> Starting with mapp Safety 5.10.0 and hardware upgrade 2.2.1.0. For additional information about SafeDOMAIN-to-SafeDOMAIN communication, see section "SafeDOMAIN-to-SafeDOMAIN communication" in Automation Help.

#### Information:

**Additional diagnostic data points are available on the X20SL8101 and the X20SL8110.**

**For details, see section Communication → POWERLINK → Diagnostics → Diagnostic data points → Bus controller in Automation Help.**

In addition, the following data can be read via POWERLINK registers:

Index:Subindex	Object name	Data type	Access	Values	Description
0x2000:0x04	SafetyFWversion1	UDINT	Read	-	Higher-order 2 bytes: Hardware variant of the module Lower-order 2 bytes: Firmware version - Safety processor 1
0x2000:0x05	SafetyFWversion2	UDINT	Read	-	Higher-order 2 bytes: Hardware variant of the module Lower-order 2 bytes: Firmware version - Safety processor 2
0x2000:0x08	Project_CRC	UDINT	Read	-	CRC of the SafeDESIGNER project
0x2000:0x09	Project_Time	DATE_AND_TIME	Read	-	Timestamp of the SafeDESIGNER project
0x2000:0x0C	Project_Name	STRING (without zero termination)	Read	-	Project name of the SafeDESIGNER project
0x2000:0x0D	Project_Author	STRING (without zero termination)	Read	-	Name of the author of the SafeDESIGNER project
0x2000:0x0E	SafeOS_RUN_STATE	BOOL	Read	0	SafeOS is not in RUN (identical to SafeOSstate!=0x66)
				1	SafeOS is in RUN (identical to SafeOSstate==0x66)
0x2000:0x0F	BOOT_STATE	UDINT	Read	General firmware startup status; Using the updated "Bootstate" object (0x2410:0x01) is recommended.	
				0x00	Startup not yet begun
				0x01	Initialization started
				0x10	Cyclic hardware tests running
				0x11	openSAFETY stack running
				0x12	SafeOS running
0x2000:0x10	openSAFETYstate	UDINT	Read	0	PREOPERATIONAL state (all cyclic safe data zeroed out)
				1	OPERATIONAL state
0x2000:0x11	SafeOsState	UDINT	Read	Status of the safety application (corresponds to LED "R/E" on the SafeLOGIC controller). For details, see section "State of the safety controller" in Automation Help.	
				0x00	Invalid (e.g. SafeKEY blank) or startup still active (BOOT_STATE!=0x12)
				0x0F	ON (startup / internal initialization) or error (check logbook)
				0x33	Loading (startup / internal initialization)
				0x55	Stop [Safe]
				0x66	Run [Safe]
				0x99	Halt [Debug]
				0xAA	Stop [Debug]
				0xCC	Run [Debug]
				0xF0	No execution
0x2000:0x12	Temperature	INT	Read	-	Measured temperature in 0.1°C
0x2000:0x14	SafeKEY_TotalMemory	UDINT	Read	-	Total memory on the SafeKEY. Specified in sectors (1 sector = 0x10000 bytes)
0x2000:0x15	SafeKEY_AvailableMemory	UDINT	Read	-	Available memory on the SafeKEY. Specified in sectors (1 sector = 0x10000 bytes)

The following objects are also available:

Index:Subindex	Data type	Access	Values	Description
0x2410:0x01	UDINT	Read	Bootstate; Startup state of the SafeLOGIC controller. Notes: <ul style="list-style-type: none"> <li>Some of the boot states do not occur during normal startup or are cycled through so quickly that they are not visible externally.</li> <li>The boot states usually cycle through in ascending order. There are cases, however, in which a previous value is captured.</li> </ul>	
			0x0003	Startup communication processor OK, no communication with the safety processors
			0x0008	SafeKEY check (valid SafeKEY not connected)
			0x0010	FAILSAFE. At least one of the safety processors is in the safe state.
			0x0020	Internal communication with safety processors started
			0x0024	Firmware update of safety processors
			0x0030	Startup of safety processors
			0x0040	Firmware of safety processors started
			0x0440	Firmware of safety processors running
			0x0840	Loads the SafeDESIGNER application or valid SafeDESIGNER application not found
			0x1840	Waiting for acknowledgments (e.g. module replacement)
			0x2040 ... 0x2A40	SCAN: The safety modules being used are being looked for in the network and configured. Multiple SCAN cycles are carried out until all modules are found: 0x2040: First cycle 0x2140: Second cycle 0x2240: Third cycle ...
			0x3040	Missing modules. Startup cannot be resumed since modules are missing that are configured with "Availability = Permanent".
			0x3440	Configuration of existing safety modules completed. Stabilizing cyclic openSAFETY data exchange. <b>Note:</b> If the boot state remains here, check SafeDESIGNER parameters "(Default) Safe data duration" and "(Default) Additional tolerated packet loss".
			0x4040	RUN. Final state, startup completed.
0x2410:0x02	UDINT	Read	-	SCAN progress (how many modules have already been processed in the current scan)
0x2410:0x03	UDINT	Read	-	Supply voltage (in mV)
0x2410:0x04	UDINT	Read	-	CRC of the firmware header on safety processor 1
0x2410:0x05	UDINT	Read	-	CRC of the firmware header on safety processor 2
0x2410:0x06	UDINT	Read	-	Maximum cycle time (time from cycle start to cycle end)
0x2410:0x07	UDINT	Read	-	Cycle start interval (time from one cycle start to next cycle start)
0x2410:0x08	UDINT	Read	-	SafeLOGIC status word
0x2410:0x09	UDINT	Read	-	Number of missing modules
0x2410:0x0A	UDINT	Read	-	Number of UDID mismatches
0x2410:0x0B	UDINT	Read	-	Number of firmware mismatches
0x2410:0x0C	UDINT	Read	-	Number of configured modules
0x2410:0x0D	UDINT	Read	-	Flag for missing subsequently loadable files: Bit 0: Safe Commissioning Options missing in AUTOCNF.BIN Bit 1: SafeNODE Availability missing in AUTOCNF.BIN Bit 2: EMODATA1.BIN missing Bit 3: TABDATA1.BIN
0x2410:0x0E	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_LENGTH
0x2410:0x0F	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_TOO_LONG
0x2410:0x10	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_FRM_ID
0x2410:0x11	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_SADR_INV
0x2410:0x12	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_SDN_INV
0x2410:0x13	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_TADR_INV
0x2410:0x14	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_CRC1
0x2410:0x15	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_CRC2
0x2410:0x16	UDINT	Read	-	openSAFETY common event counter SERR_k_SFS_DATA
0x2410:0x17	UDINT	Read	-	openSAFETY common event counter SERR_k_CYC_REJECT
0x2410:0x18	UDINT	Read	-	openSAFETY common event counter SERR_k_CYC_ERROR
0x2410:0x19	UDINT	Read	-	openSAFETY common event counter SERR_k_ACYC_REJECT
0x2410:0x1A	UDINT	Read	-	openSAFETY common event counter SERR_k_ACYC_RETRY
0x2410:0x1B to 0x2410:0x1F	UDINT	Read	-	Reserved for future openSAFETY common event counters
0x2410:0x20	UDINT	Read	-	Number of SCFM errors
0x2410:0x21	UDINT	Read	-	Number of SCM errors
0x2410:0x22	UDINT	Read	-	Number of SDN errors
0x2410:0x23	UDINT	Read	-	Number of SFS errors
0x2410:0x24	UDINT	Read	-	Number of SHNF errors
0x2410:0x25	UDINT	Read	-	Number of SNMTM errors
0x2410:0x26	UDINT	Read	-	Number of SNMTS errors
0x2410:0x27	UDINT	Read	-	Number of SOD errors
0x2410:0x28	UDINT	Read	-	Number of SPDO errors

Index:Subindex	Data type	Access	Values	Description
0x2410:0x29	UDINT	Read	-	Number of SSC errors
0x2410:0x2A	UDINT	Read	-	Number of SSDOC errors
0x2410:0x2B	UDINT	Read	-	Number of SSDOS errors
0x2410:0x2C	UDINT	Read	-	Total memory for parameter files
0x2410:0x2D	UDINT	Read	-	Available memory for parameter files
0x2410:0x2E	UDINT	Read	-	Total memory for project files
0x2410:0x2F	UDINT	Read	-	Available memory for project files
0x2410:0x30	UDINT	Read	-	Total memory for subsequently loadable C libraries and tables
0x2410:0x31	UDINT	Read	-	Available memory for subsequently loadable C libraries and tables
0x2410:0x32	UDINT	Read	-	Total memory for dynamic memory management in subsequently loadable C libraries
0x2410:0x33	UDINT	Read	-	Available memory for dynamic memory management in subsequently loadable C libraries
0x2410:0x34 to 0x2410:0xFE	UDINT	Read	-	Reserved for future expansions
0x2424:0x01	UDINT	Read	-	AutoCnf.bin - Timestamp
0x2424:0x02	UDINT	Read	-	AutoCnf.bin - Number of CRCs
0x2424:0x03	UDINT	Read	-	AutoCnf.bin - Size of file in bytes
0x2424:0x04 to 0x2424:0x0A	UDINT	Read	-	AutoCnf.bin - Reserved for future expansions
0x2424:0x0B to 0x2424:0xn	UDINT	Read	-	AutoCnf.bin - CRC 1 to N
0x2424:0xn+1 to 0x2424:0xFE	UDINT	Read	-	AutoCnf.bin - Reserved for future expansions
0x2425:0x01	UDINT	Read	-	EmoData1.bin - Timestamp
0x2425:0x02	UDINT	Read	-	EmoData1.bin - Number of CRCs
0x2425:0x03	UDINT	Read	-	EmoData1.bin - Size of file in bytes
0x2425:0x04 to 0x2425:0x0A	UDINT	Read	-	EmoData1.bin - Reserved for future expansions
0x2425:0x0B to 0x2425:0xn	UDINT	Read	-	EmoData1.bin - CRC 1 to N
0x2425:0xn+1 to 0x2425:0xFE	UDINT	Read	-	EmoData1.bin - Reserved for future expansions
0x2426:0x01	UDINT	Read	-	TabData1.bin - Timestamp
0x2426:0x02	UDINT	Read	-	TabData1.bin - Number of CRCs
0x2426:0x03	UDINT	Read	-	TabData1.bin - Size of file in bytes
0x2426:0x04 to 0x2426:0x0A	UDINT	Read	-	TabData1.bin - Reserved for future expansions
0x2426:0x0B to 0x2426:0xn	UDINT	Read	-	TabData1.bin - CRC 1 to N
0x2426:0xn+1 to 0x2426:0xFE	UDINT	Read	-	TabData1.bin - Reserved for future expansions
0x2427:0x01	UDINT	Read	-	ParData1.bin - Timestamp
0x2427:0x02	UDINT	Read	-	ParData1.bin - Number of CRCs
0x2427:0x03	UDINT	Read	-	ParData1.bin - Size of file in bytes
0x2427:0x04 to 0x2427:0x0A	UDINT	Read	-	ParData1.bin - Reserved for future expansions
0x2427:0x0B to 0x2427:0xn	UDINT	Read	-	ParData1.bin - CRC 1 to N
0x2427:0xn+1 to 0x2427:0xFE	UDINT	Read	-	ParData1.bin - Reserved for future expansions

The following information about each openSAFETY node can be retrieved in object range 0x2416 to 0x2423 (data type: UDINT, Access: Read):

Parameter ID	Value
0	SafeModule ID
1	Status word Bit 0: Missing module Bit 1: Firmware mismatch on module Bit 2: UDID mismatch on module Bit 3: Reserved Bit 4: Reserved Bit 5: "Connection valid" bit of module Bit 6 to 31: Reserved
2	Connection valid statistics (number of negative edges of the connection valid bit)
3	Propagation delay statistics (average value of the data transmission time). The unit depends on parameter "Process data transfer rate". <ul style="list-style-type: none"> <li>If the value of the parameter is "High", the unit is 100 µs.</li> <li>If the value of the parameter is "Low", the unit is 1 ms.</li> </ul> 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.

The following formulas must be used to calculate the index/subindex:

$$Index = \frac{Module\ number}{23} + 0x2416$$

$$Subindex = Parameter\ ID + \{ [ (Module\ number - 1) \% 23 ] \times 11 \} \% 254 + 1$$

Module number: Sequential number of the desired module

Parameter ID: See previous table

## 6.4 Power supply module (X20SL8101 only) - Channel list

A power supply module is already integrated on station 1 on the X2X Link.

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
ModuleID	Read	-	UINT	Module ID
HardwareVariant	Read	-	UINT	Hardware variant
FirmwareVersion	Read	-	UINT	Firmware version of the module
StatusInput01	Read	-	BOOL	Warning if overcurrent (>2.3 A) or undervoltage (<4.7 V)
StatusInput02	Read	-	BOOL	I/O power supply below the warning limit of 20.4 V
SupplyCurrent	Read	-	USINT	Bus supply current with a resolution of 0.1 A
SupplyVoltage	Read	-	USINT	Bus supply voltage with a resolution of 0.1 V

Table 30: Power supply module - Channel list

## 7 Version history

Version	Date	Comment
2.15	August 2022	Chapter 6.2.1 "SafeLOGIC basic settings": Group "Basic": Parameter "Process data transfer rate": Updated description of value "Low".
2.14	May 2022	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": Updated DNV certification.</li> <li>Updated chapter 8 "Declaration of conformity".</li> </ul>
2.12	November 2021	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": Updated derating.</li> <li>Chapter 5.2 "Slot for application memory (SafeKEY)": Updated information.</li> </ul>
2.11	August 2021	Chapter 4 "Technical data": <ul style="list-style-type: none"> <li>Updated marker memory.</li> <li>Updated marker count.</li> </ul>
2.10	May 2021	<ul style="list-style-type: none"> <li>Chapter 1 "General information": Added information.</li> <li>Chapter 4 "Technical data": <ul style="list-style-type: none"> <li>Updated display of system requirements.</li> <li>Added max. number of SafeMOTION axes</li> <li>Updated memory for safe input data.</li> </ul> </li> <li>Editorial changes.</li> </ul>
2.09	February 2021	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": <ul style="list-style-type: none"> <li>Data exchange between CPU and SafeLOGIC controller: Added footnote for max. total data width for each direction.</li> <li>Data exchange between SafeDOMAIN and SafeDOMAIN: Added footnote for max. total data width for each direction.</li> <li>X20SL8110: Corrected width.</li> </ul> </li> <li>Chapter 6.2.1 "SafeLOGIC basic settings": Group "Basic": Added parameter "Maximum number of simultaneous module startups".</li> </ul>
2.08	November 2020	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": <ul style="list-style-type: none"> <li>Added use as Connected SafeDOMAIN.</li> <li>Updated max. number of linked Managing SafeDOMAINs.</li> </ul> </li> <li>Editorial changes.</li> </ul>
2.07	August 2020	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": <ul style="list-style-type: none"> <li>General information: Added additional power dissipation caused by actuators (resistive) [W].</li> <li>Updated certifications.</li> </ul> </li> <li>Editorial changes.</li> </ul>
2.06	May 2020	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": <ul style="list-style-type: none"> <li>Added footnote for system requirements.</li> <li>Updated certifications.</li> <li>Functionality: Data exchange between SafeDOMAIN and SafeDOMAIN: Added max. number of linked Managing SafeDOMAINs.</li> <li>Added footnote for data exchange between CPU and SafeLOGIC controller.</li> <li>Coated modules: Updated operating temperature.</li> </ul> </li> <li>Editorial changes.</li> </ul>
2.05	February 2020	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": Added data exchange between SafeDOMAIN and SafeDOMAIN.</li> <li>Chapter 6.1 "Parameters in the I/O configuration": Added group "SafeDOMAIN-to-SafeDOMAIN communication".</li> <li>Added chapter 6.2.2 "Settings for the SafeDOMAIN-to-SafeDOMAIN connection".</li> <li>Chapter 6.3 "SafeLOGIC - Channel list": Added new channels.</li> <li>Editorial changes.</li> </ul>
2.04	November 2019	<ul style="list-style-type: none"> <li>Chapter 4 "Technical data": Updated certifications.</li> <li>Updated chapter 5.1.3 "Selector switch and confirmation button".</li> <li>Chapter 6.2 "Parameters in SafeDESIGNER": Updated description of parameter "Asynchronous communication load".</li> <li>Editorial changes.</li> </ul>
2.03	August 2019	Chapter 3 "Order data": Added X20(c)MK0223 accessories.
2.02	May 2019	First edition for mapp Safety

Table 31: Version history



## 8 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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Commercial register number: FN 111651 v

Commercial registry: Regional court Ried im Innkreis

UID number: ATU62367156

Legal structure: Limited liability company

Corporate headquarters: Municipality of Eggelsberg (Upper Austria)

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