

X20(c)SO6300

Information:

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

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

Information:

This data sheet must be used with mapp Safety.

B&R safety technology can still be used in Safety Releases ≤ 1.10 , however. Documentation for this 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 6 safe digital outputs. The nominal output current is 0.2 A.

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

The outputs are designed using semiconductor technology so that the safety-related characteristics do not depend on the number of switching cycles. The "high-side high-side" variant (output type B) is required for actuators with reference potential (e.g. enable inputs on frequency inverters). It is important to observe the special notices for the cabling in this case. 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.

- 6 safe digital outputs with 0.2 A
- Source circuit
- Output type B
- Integrated output protection

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	Figure
	Digital output modules	
X20SO6300	X20 safe digital output module, 6 safe type B1 digital outputs, 24 VDC, 0.2 A, OSSD <10 µs	
X20cSO6300	X20 safe digital output module, coated, 6 safe type B1 digital outputs, 24 VDC, 0.2 A, OSSD <10 µs	
	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	
X20TB52	X20 terminal block, 12-pin, safety-keyed	

Table 3: X20SO6300, X20cSO6300 - Order data

4 Technical data

Order number	X20SO6300	X20cSO6300
Short description		
I/O module	6 safe type B1 digital outputs, 24 VDC, 0.2 A, OSSD <10 µs	
General information		
B&R ID code	0xB815	0xDD88
System requirements		
Automation Studio	3.0.81.15 or later	4.0.16 or later
Automation Runtime	3.00 or later	V3.08 or later
SafeDESIGNER	2.70 or later	3.1.0 or later
Safety Release	1.2 or later	1.7 or later
mapp Technology Package ¹⁾	mapp Safety 5.7.0 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 function	
Standalone mode	No	
Max. I/O cycle time	1 ms	
Power consumption		
Bus	0.32 W	
Internal I/O	1.4 W	
Additional power dissipation caused by actuators (resistive) [W] ²⁾	1.128	
Electrical isolation		
Channel - Bus	Yes	
Channel - Channel	No	
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 GL	In preparation	
EAC	Yes	
KC	Yes	-
Safety characteristics		
EN ISO 13849-1:2015		
Category	Cat. 3 if parameter "Disable OSSD = Yes - Warning", Cat. 4 if parameter "Disable OSSD = No" ³⁾	
PL	PL d if parameter "Disable OSSD = Yes - Warning", PL e if parameter "Disable OSSD = No" ³⁾	
DC	>60% if parameter "Disable OSSD = Yes - Warning", >94% if parameter "Disable OSSD = No" ³⁾	
MTTFD	2500 years	
Mission time	Max. 20 years	
IEC 61508:2010, IEC 61511:2004, EN 62061:2013		
SIL CL	SIL 2 if parameter "Disable OSSD = Yes - Warning", SIL 3 if parameter "Disable OSSD = No" ³⁾	
SFF	>60% if parameter "Disable OSSD = Yes - Warning", >90% if parameter "Disable OSSD = No" ³⁾	
PFH / PFH _d		
Module	<1*10 ⁻¹⁰	
openSAFETY wired	Negligible	
openSAFETY wireless	<1*10 ⁻¹⁴ * Number of openSAFETY packets per hour	
PFD	<2*10 ⁻⁵	
Proof test interval (PT)	20 years	

Table 4: X20SO6300, X20cSO6300 - Technical data

Order number	X20SO6300		X20cSO6300
I/O power supply			
Nominal voltage	24 VDC		
Voltage range	24 VDC -15% / +20%		
Integrated protection	Reverse polarity protection		
Safe digital outputs			
Quantity	6		
Variant	FET, 2x positive switching, type B1, output level readable		
Nominal voltage	24 VDC		
Nominal output current	0.2 A		
Total nominal current	1.2 A		
Output protection	See section "Inrush current behavior for output channels".		
Braking voltage when switching off inductive loads	Max. 45 VDC		
Error detection time	1 s		
Insulation voltage between channel and bus	500 V _{eff}		
Peak short-circuit current	See section "Inrush current behavior for output channels".		
Leakage current when the output is switched off	<100 µA		
R _{DS(on)}	4.7 Ω		
Switching voltage	I/O power supply minus voltage drop due to R _{DS(on)}		
Max. switching frequency	See section "Inrush current behavior for output channels".		
Test pulse length	Max. 10 µs		
Max. capacitive load	100 nF		
Current on loss of ground			
I _{OUT}	<100 µA		
I _{GND}	<70 mA		
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	
Vertical mounting orientation	0 to 50°C	-25 to 50°C	
Derating	See section "Derating".		
Storage	-40 to 85°C		
Transport	-40 to 85°C		
Relative humidity			
Operation	5 to 95%, non-condensing	Up to 100%, condensing	
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: X20SO6300, X20cSO6300 - Technical data

- 1) The system requirements of the mapp Technology Package must be observed (see Automation Help).
- 2) Number of outputs x R_{DS(on)} 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.

Derating

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

Module	X20SO6300
Derating bonus	
At 24 VDC	+0°C
Dummy module on the left	+2.5°C
Dummy module on the right	+0°C
Dummy module on the left and right	+5°C
With double PFH / PFH _d	+0°C

Table 5: Derating bonus

The maximum total nominal current depends on the operating temperature and the mounting orientation. The resulting total nominal current can be looked up in the following table.

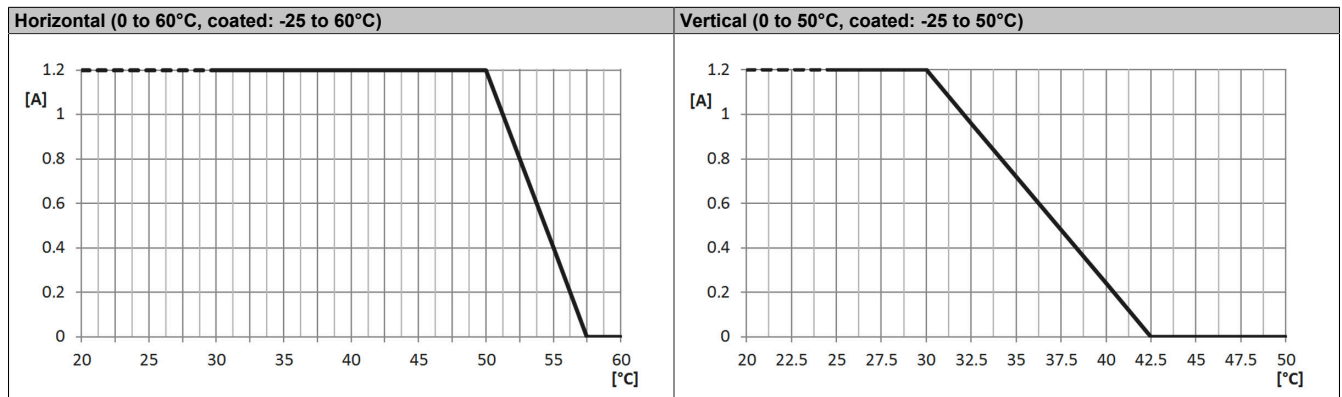


Table 6: Derating in relation to operating temperature and mounting orientation

Information:

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

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.

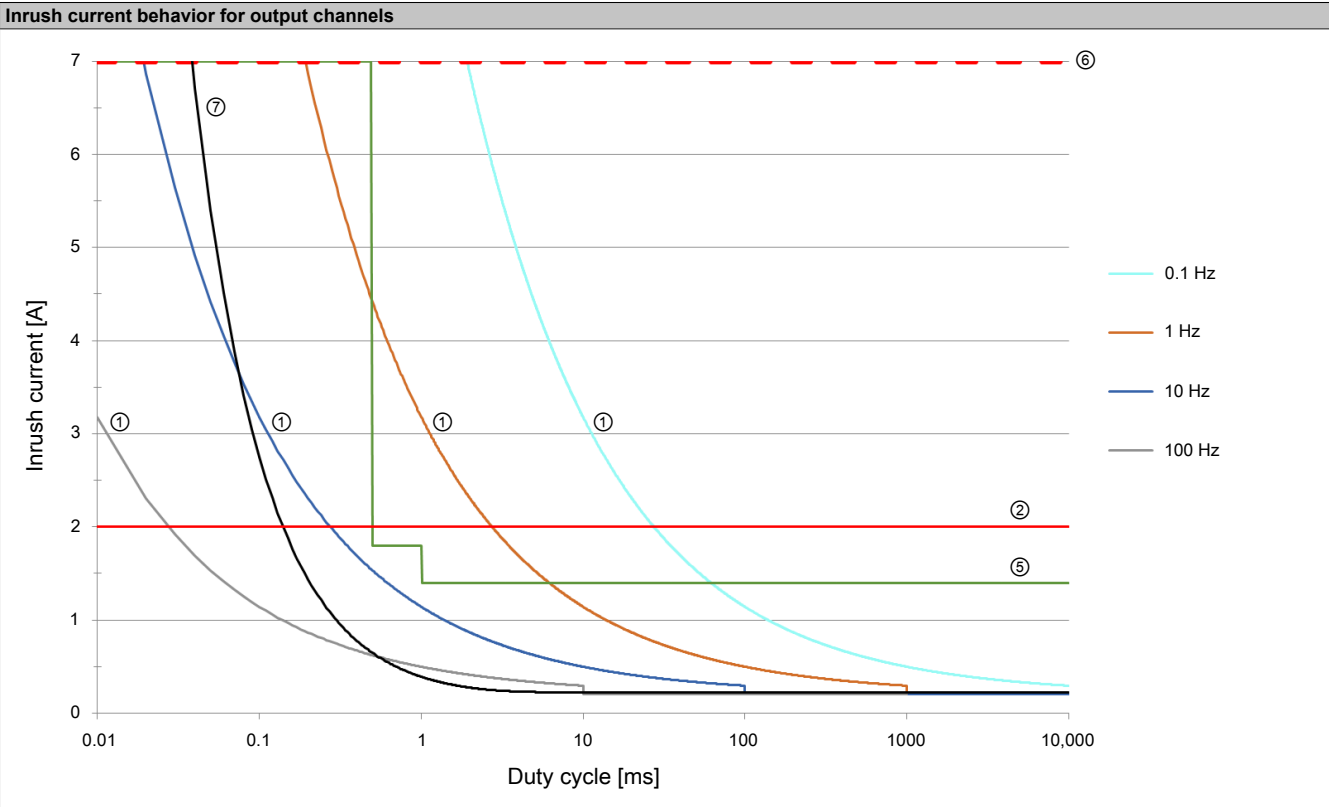


Table 7: Inrush current behavior for output channels

Legend:

①	Limits during cyclic switching operations These curves show the maximum possible total inrush currents of all channels of the module during cyclic switching operations depending on the switching frequency. Overshooting these values results in overheating of the module.
②	Current limiting of the power drivers per channel These output channels are equipped with power drivers with integrated current limiting. The curve shows the maximum possible inrush current per channel. Overshooting is not possible since the power driver limits the current.
⑤	Current monitoring of the firmware - Maximum total inrush current These output channels are equipped with overcurrent detection in the module's firmware. The curve shows the maximum ensured total inrush current of all channels of the module. Overshooting results in the shutdown of all of the module's output channels. In addition, when assessing the maximum possible inrush current, the melting integral of the external fuse of the potential group must of course also be taken into account.
⑥	Component load capacity of the module This limit shows the total inrush current from which individual components of the module are overloaded. Overshooting can result in irreparable damage to the module.
⑦	Overcurrent shutdown of the hardware per channel These output channels are equipped with overcurrent detection in the module's hardware. The curve shows the maximum ensured inrush current per channel. Overshooting can result in the shutdown of the output channel.

Information:

The protective function is provided for max. 30 minutes for a continuous short circuit.

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


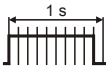
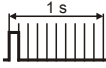



Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	Mode "Reset"
			Double flash	Updating firmware
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			Pulsating	Bootloader mode
			Triple flash	Updating safety-related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

Table 8: 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 Pinout

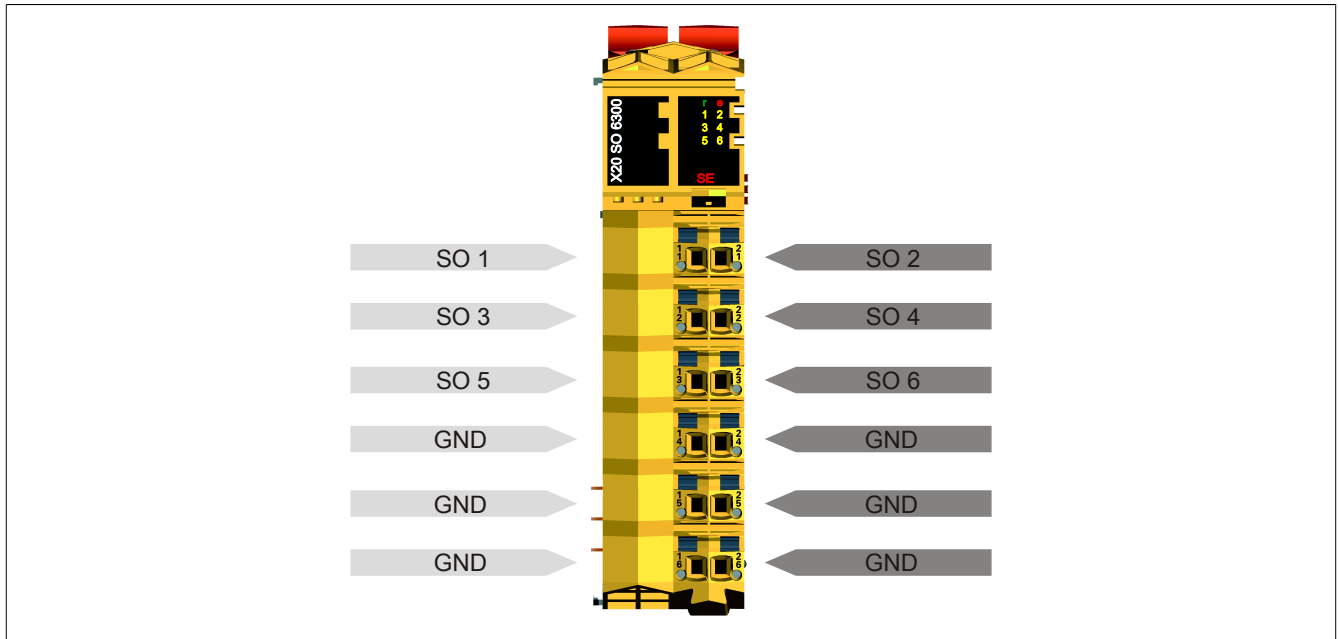


Figure 1: X20SO6300 - Pinout

7 Output circuit diagram

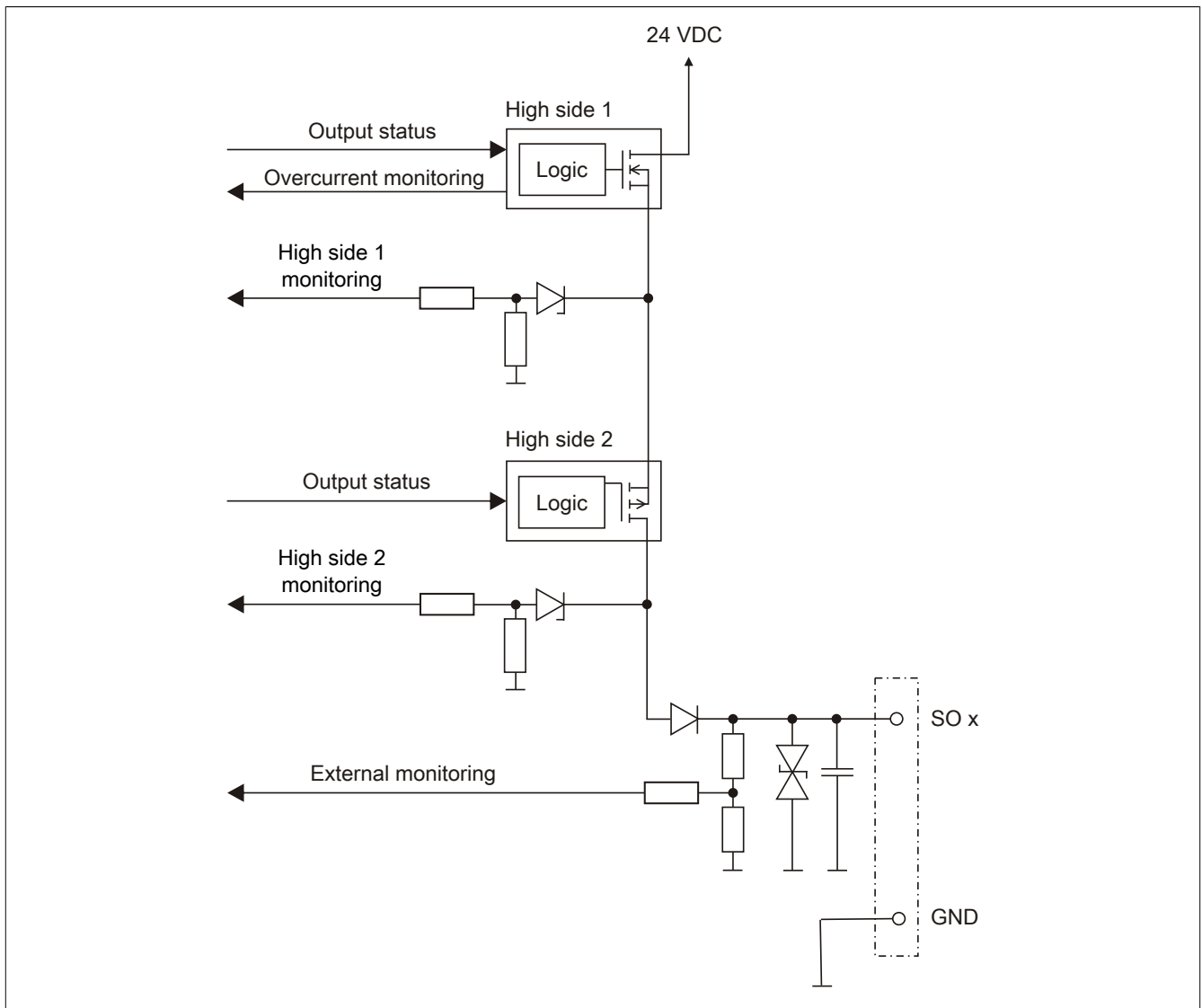


Figure 2: Output circuit diagram

8 Register description

8.1 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 9: 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. <ul style="list-style-type: none">Permissible values: 1 to 1000	Assigned automatically	-	
SafeNODE ID	Unique safety address of the module <ul style="list-style-type: none">Permissible values: 2 to 1023	Assigned automatically	-	

Table 10: I/O configuration parameters: General

Group: Output signal path

Parameter	Description	Default value	Unit					
Digital output xx	This parameter specifies the mode that can be used by the standard application to access the output channel.	Direct	-					
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Direct</td><td>The output channel can be accessed directly by the standard application. Signals "DigitalOutputxx" are available in the I/O mapping accordingly.</td></tr><tr><td>Via SafeLOGIC</td><td>The output channel cannot be accessed directly by the standard application. Signals "DigitalOutputxx" 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.</td></tr></table>	Parameter value	Description	Direct	The output channel can be accessed directly by the standard application. Signals "DigitalOutputxx" are available in the I/O mapping accordingly.	Via SafeLOGIC	The output channel cannot be accessed directly by the standard application. Signals "DigitalOutputxx" 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.	
Parameter value	Description							
Direct	The output channel can be accessed directly by the standard application. Signals "DigitalOutputxx" are available in the I/O mapping accordingly.							
Via SafeLOGIC	The output channel cannot be accessed directly by the standard application. Signals "DigitalOutputxx" 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 11: I/O configuration parameters: Output signal path

8.2 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	-										
<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 12: 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.	No	-						
	The parameters for the safety response time are generally set in the same way for all stations involved in the application. For this reason, these parameters are configured for the SafeLOGIC controller in SafeDESIGNER. For application situations in which individual safety functions require optimal response time behavior, the parameters for the safety response time can be configured individually on the respective module.								
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Yes</td><td>Data from the module's "Safety response time" group is used to calculate the safety response time for the module's signals.</td></tr><tr><td>No</td><td>The parameters for the safety response time are taken from the "Safety response time" group on the SafeLOGIC controller.</td></tr></table>	Parameter value	Description	Yes	Data from the module's "Safety response time" group is used to calculate the safety response time for the module's signals.	No	The parameters for the safety response time are taken from the "Safety response time" group on the SafeLOGIC controller.		
Parameter value	Description								
Yes	Data from the module's "Safety response time" group is used to calculate the safety response time for the module's signals.								
No	The parameters for the safety response time are taken from the "Safety response time" group on the SafeLOGIC controller.								
Safe data duration	<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:</p> <p>"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">Permissible values: 2000 to 10,000,000 µs (corresponds to 2 ms to 10 s)	20000	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">Permissible values: 0 to 10	1	Packets						
Node guarding packets	<p>This parameter specifies the maximum number of packets used for node guarding.</p> <ul style="list-style-type: none">Permissible values: 1 to 255 <p>Note</p> <ul style="list-style-type: none">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 13: SafeDESIGNER parameters: Safety response time

Group: Module configuration

Parameter	Description	Default value	Unit						
Disable OSSD	This parameter can be used to switch off automatic testing of the output driver for all of the module's channels.	No	-						
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Yes - Warning</td><td>Automatic testing of the output driver is switched off.</td></tr><tr><td>No</td><td>Automatic testing of the output driver is enabled.</td></tr></table>	Parameter value	Description	Yes - Warning	Automatic testing of the output driver is switched off.	No	Automatic testing of the output driver is enabled.		
	Parameter value	Description							
	Yes - Warning	Automatic testing of the output driver is switched off.							
No	Automatic testing of the output driver is enabled.								

Table 14: SafeDESIGNER parameters: Module configuration

Danger!**Danger from an accumulation of errors due to missing module diagnostics**

Configuring "Disable OSSD = Yes - Warning" greatly reduces the internal error detection of the module. The associated information provided in section "Detecting module-internal faults" in Automation Help must be observed.

8.3 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	<div>Startup state of the module.</div> <div>Notes:</div> <div><ul style="list-style-type: none">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.</div> <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>	Value	Description	0x0003	Startup communication processor OK, no communication with the safety processors (check 24 V supply voltage!)	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	0x0040	Firmware of safety processors started	0x0440	Firmware of safety processors running	0x0840	Waiting for openSAFETY "Operational" (loading the SafeDESIGNER application or no valid application available; waiting for acknowledgments such as module replacement)	0x1040	Evaluating the configuration according to the SafeDESIGNER application	0x3440	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.	0x4040	RUN. Final state, startup completed.
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Diag1_Temp	(Read) ¹⁾	-	INT	Module temperature in °C																						
oS_PropDelayStat (hardware upgrade 2.3.0.0 or later)	(Read) ¹⁾	-	UDINT	<div>Propagation delay statistics (average value of the data transmission time).</div> <div>The unit depends on parameter "Process data transfer rate" of the SafeLOGIC controller.</div> <div><ul style="list-style-type: none">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.</div> <div>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.</div>																						
SafeModuleOK	Read	Read	SAFEBOOL	Indicates whether the safe communication channel is OK																						
DigitalOutputxx	Write	-	BOOL	Enable signal - Channel SO xx																						
SafeDigitalOutputxx	-	Write	SAFEBOOL	Safe channel SO xx																						
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	<div>State number of the error interlock for channel x. See section "Error interlock - State diagram" in Automation Help.</div> <table><tr><th>Bit 7 to 4</th><th>Bit 3 to 0</th></tr><tr><td>Channel yy</td><td>Channel xx</td></tr></table>	Bit 7 to 4	Bit 3 to 0	Channel yy	Channel xx																		
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Table 15: Channel list

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

9 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

10 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
500 µs
Maximum I/O update time
1800 µs

11 Version history

Version	Date	Comment
2.10	May 2021	Chapter 4 "Technical data": <ul style="list-style-type: none"> Updated display of system requirements. Safety characteristics: Updated footnote.
2.08	November 2020	Chapter 4 "Technical data": Safe digital outputs: Added number of channels.
2.07	August 2020	<ul style="list-style-type: none"> Chapter 4 "Technical data": <ul style="list-style-type: none"> General information: Added additional power dissipation caused by actuators (resistive) [W]. Safe digital outputs: Added $R_{DS(on)}$, removed residual voltage, updated switching voltage. Editorial changes.
2.06	May 2020	<ul style="list-style-type: none"> Chapter 4 "Technical data": Added footnote for system requirements. Chapter 8.2 "Parameters in SafeDESIGNER": Group "Module configuration": Updated danger notice. Chapter 8.3 "Channel list": Added channel "oS_PropDelayStat". Editorial changes.
2.05	February 2020	<ul style="list-style-type: none"> Chapter 4 "Technical data": Added section "Inrush current behavior for output channels" and updated technical data accordingly. Chapter 8.2 "Parameters in SafeDESIGNER": Group "Module configuration": Updated danger notice. Editorial changes.
2.04	November 2019	Editorial changes.
2.02	May 2019	First edition for mapp Safety

Table 16: Version history

12 EC declaration of conformity

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

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

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

Commercial register number: FN 111651 v.

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

VATIN: ATU62367156

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