

X20(c)SD1207

Information:

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

The certified, currently valid data sheet is available for download on the B&R website (www.br-automation.com).

Information:

This data sheet must be used with mapp Safety.

B&R safety technology can still be used in Safety Releases ≤ 1.10 , however. The documentation is available for download on the B&R website (www.br-automation.com).

For additional information about mapp Safety, additional technical descriptions (e.g. connection examples and error detection) as well as generally valid contents (intended use, etc.), see section Safety technology in Automation Help.

Organization of notices

Safety notices

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

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

Table 1: Organization of safety notices

General notices

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

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

Table 2: Organization of general notices

1 General information

The modules are equipped with 1 safe digital input for measuring the velocity. Velocity information can be acquired from AB signals up to a maximum frequency of 7 kHz.

The safe counter modules are suitable for safely acquiring velocities for safety applications up to PL e or SIL 3.

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

- 1 safe digital counter input with up to 7 kHz counter frequency
- For encoder inputs A-A, A-B, A-A/-B-B/
- Sink circuit
- Input filter configurable

2 Coated modules

Coated modules are X20 modules with a protective coating for the electronics component. This coating protects X20c modules from condensation.

The modules' electronics are fully compatible with the corresponding X20 modules.

Information:

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

The coating has been certified according to the following standards:

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

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



2.1 Starting temperature

The starting temperature describes the minimum permissible ambient temperature in a voltage-free state at the time the coated module is switched on. This is permitted to be as low as -40°C. During operation, the conditions as specified in the technical data continue to apply.

Information:

It is important to absolutely ensure that there is no forced cooling by air currents in the closed control cabinet, e.g. due to the use of a fan or ventilation slots.

3 Order data


Order number	Short description	Figure
	Counter and positioning modules	
X20SD1207	X20 safe digital counter module, 1 safe type A digital counter channel, 7 kHz, 24 VDC	
X20cSD1207	X20 safe digital counter module, coated, 1 safe type A digital counter channel, 7 kHz, 24 VDC	
	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: X20SD1207, X20cSD1207 - Order data

4 Technical data

Order number	X20SD1207	X20cSD1207
Short description		
I/O module	1 safe type A digital counter channel, 7 kHz, 24 VDC	
General information		
B&R ID code	0xCAC1	0xE1CB
System requirements		
Automation Studio	3.0.90 or later	4.0.16 or later
Automation Runtime	3.00 or later	V3.08 or later
SafeDESIGNER	2.91 or later	3.1.0 or later
Safety Release	1.5 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	
Inputs	Yes, using LED status indicator and software	
Blackout mode		
Scope	Module	
Function	Module functionality	
Standalone mode	No	
Max. I/O cycle time	2 ms	
Power consumption		
Bus	0.25 W	
Internal I/O	0.75 W	
Additional power dissipation caused by actuators (resistive) [W] ²⁾	0.064	
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	Temperature: A (0 - 45°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (bridge and open deck)	
LR	ENV1	
KR	Yes	
ABS	Yes	
EAC	Yes	
Safety characteristics		
EN ISO 13849-1:2015		
Category	Cat. 4 The special instructions in chapter "Connection examples" must be taken into account. ³⁾	
PL	PL e	
DC	>94%	
MTTFD	2500 years	
Mission time	Max. 20 years	

Table 4: X20SD1207, X20cSD1207 - Technical data

Order number	X20SD1207		X20cSD1207
IEC 61508:2010, IEC 61511:2004, EN 62061:2013			
SIL CL	SIL 3		
SFF	>90%		
PFH / PFH _d			
Per channel	<1*10 ⁻¹⁰		
openSAFETY wired	Negligible		
openSAFETY wireless	<1*10 ⁻¹⁴ * Number of openSAFETY packets per hour		
PFD	<2*10 ⁻⁵		
Proof test interval (PT)	20 years		
Encoder power supply			
Output voltage	I/O power supply minus voltage drop due to R _{DS(on)}		
Nominal output current	80 mA		
R _{DS(on)}	10 Ω		
Protective measures			
Short-circuit proof	Thermal limit determined by PTC		
I/O power supply			
Nominal voltage	24 VDC		
Voltage range	24 VDC -15% / +20%		
Integrated protection	Reverse polarity protection		
Safe digital counter inputs			
Quantity	1		
Variant	Type A		
Nominal voltage	24 VDC		
Input characteristics per EN 61131-2	Type 1		
Input filter			
Hardware	<10 μs		
Software	Configurable between 0 and 100 s		
Input frequency	Max. 7 kHz		
Input circuit	Sink		
Input voltage	24 VDC -15% / +20%		
Input current at 24 VDC ⁴⁾	Min. 2 mA to max. 2.48 mA		
Input resistance	9.68 kΩ		
Insulation voltage between channel and bus	500 V _{eff}		
Switching threshold			
Low	<5 VDC		
High	>15 VDC		
Line length	Max. 30 m shielded		
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".		
Starting temperature	-	Yes, -40°C	
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: X20SD1207, X20cSD1207 - 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. This value also applies to encoders that are supplied via these outputs. For a calculation example, see section "Mechanical and electrical configuration" in the X20 system user's manual.
- 3) In addition, the danger notices in the technical data sheet and section "Safety technology" in Automation Help must be observed.
- 4) The input current specifications refer to the switched-on state of the input.

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	X20SD1207
Derating bonus	
At 24 VDC	+2.5°C
Dummy module on the left	+0°C
Dummy module on the right	+2.5°C
Dummy module on the left and right	+5°C
With double PFH / PFH ₀	+0°C

Table 5: Derating bonus

The number of inputs that should be used at the same time depends on the operating temperature and the mounting orientation. The resulting amount can be looked up in the following table.

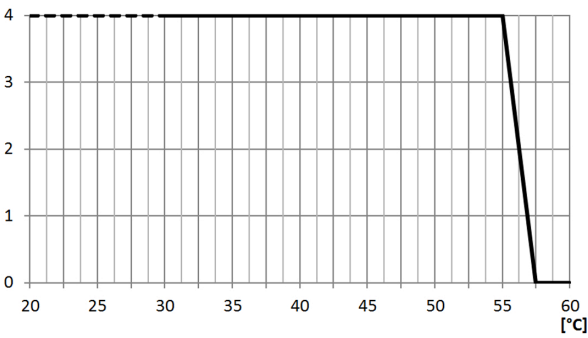
Horizontal (0 to 60°C, coated: -25 to 60°C)	Vertical (0 to 50°C, coated: -25 to 50°C)
	No derating

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.

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


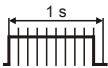
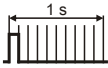
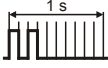


Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	Mode "Reset"
			Double flash	Updating firmware
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			Pulsating	Bootloader mode
			Triple flash	Updating safety-related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

Table 7: 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

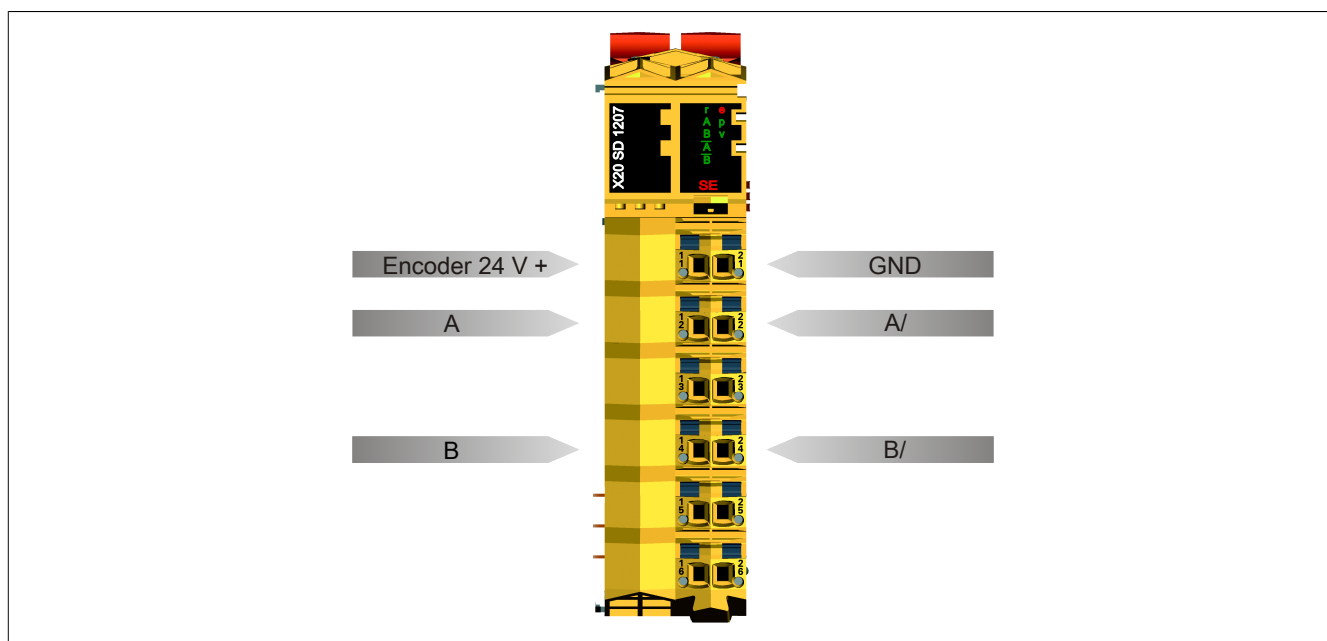


Figure 1: X20SD1207 - Pinout

7 Input circuit diagram

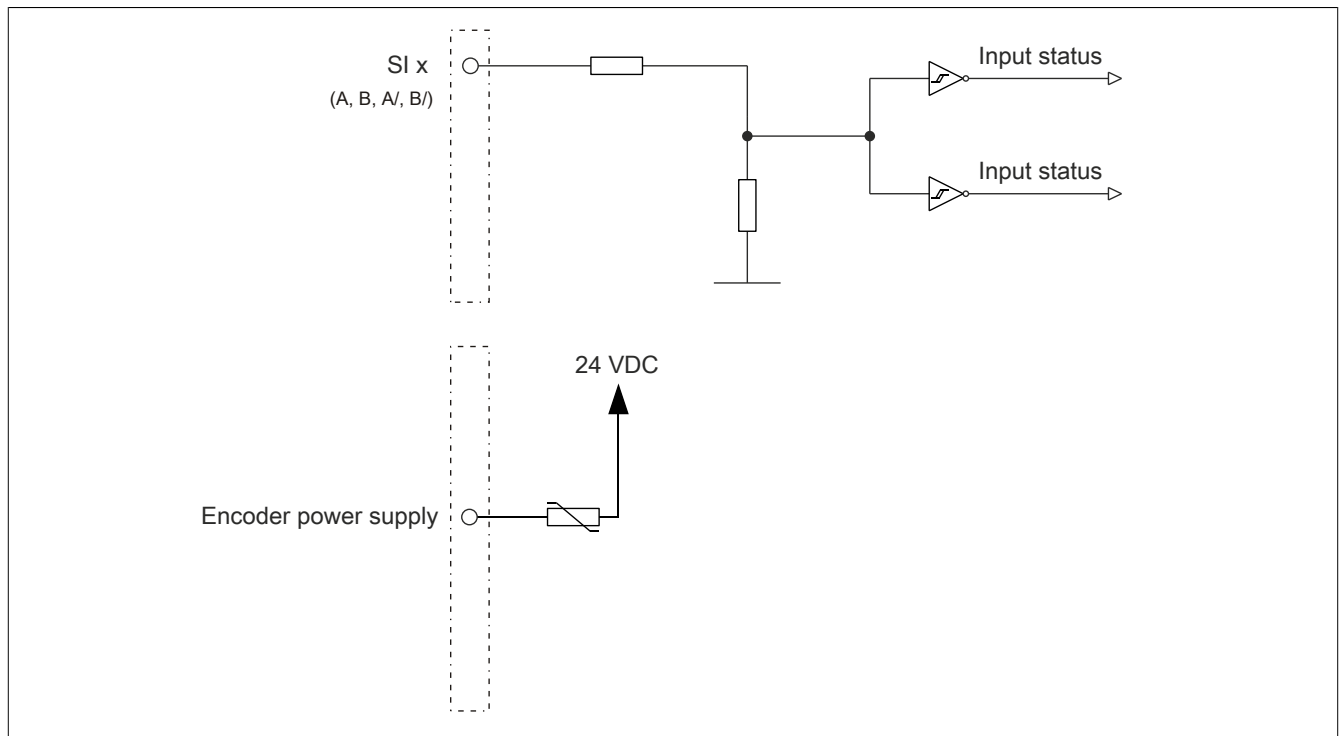


Figure 2: Input circuit diagram

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 8: 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.		
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 9: I/O configuration parameters: General

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 10: SafeDESIGNER parameters: Basic

Group: Safety response time

Parameter	Description	Default value	Unit						
Manual configuration	<p>This parameter makes it possible to manually and individually configure the safety response time for the module.</p> <p>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.</p>	No	-						
	<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: "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 11: SafeDESIGNER parameters: Safety response time

Group: Module configuration

Parameter	Description	Default value	Unit								
Function mode	This parameter can be used to select the mode for input signal evaluation.	Mode A-B	-								
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Mode A-A</td><td>In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The frequency setting can only accept positive values in this mode.</td></tr><tr><td>Mode A-B</td><td>In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The frequency setting can only accept positive values in this mode.</td></tr><tr><td>Mode A-A/-B-B/</td><td>In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The combination of the inputs can be used to differentiate between a positive and negative direction. The frequency setting can accept positive and negative values in this mode.</td></tr></table>	Parameter value	Description	Mode A-A	In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The frequency setting can only accept positive values in this mode.	Mode A-B	In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The frequency setting can only accept positive values in this mode.	Mode A-A/-B-B/	In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The combination of the inputs can be used to differentiate between a positive and negative direction. The frequency setting can accept positive and negative values in this mode.		
	Parameter value	Description									
	Mode A-A	In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The frequency setting can only accept positive values in this mode.									
	Mode A-B	In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The frequency setting can only accept positive values in this mode.									
Mode A-A/-B-B/	In this mode, the frequency of the pulses on the inputs is determined. The frequencies of the relevant inputs are checked to see if they are the same, and a channel error is triggered if there are any deviations. The combination of the inputs can be used to differentiate between a positive and negative direction. The frequency setting can accept positive and negative values in this mode.										
Unit	This parameter can be used to set the unit that should be used when the module transfers the frequency.	Increments/s	-								
	<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Increments/s</td><td>The frequency that has been determined will be shown in increments per second.</td></tr><tr><td>Increments/min</td><td>The frequency that has been determined will be shown in increments per minute.</td></tr><tr><td>Increments/h</td><td>The frequency that has been determined will be shown in increments per hour.</td></tr></table>	Parameter value	Description	Increments/s	The frequency that has been determined will be shown in increments per second.	Increments/min	The frequency that has been determined will be shown in increments per minute.	Increments/h	The frequency that has been determined will be shown in increments per hour.		
	Parameter value	Description									
	Increments/s	The frequency that has been determined will be shown in increments per second.									
	Increments/min	The frequency that has been determined will be shown in increments per minute.									
Increments/h	The frequency that has been determined will be shown in increments per hour.										
Time base	This parameter specifies the time for calculating the average value of the frequency. <ul style="list-style-type: none">Permissible values: 10 ms, 20 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1,000 ms, 2,000 ms, 5,000 ms, 10,000 ms, 20,000 ms, 50,000 ms, 100,000 ms	10	ms								

Table 12: SafeDESIGNER parameters: Module configuration

Danger!**Configuring parameter "Time base" lengthens the safety response time!**

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.
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.																									
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																						
SafeFrequency	Read	Read	SAFEINT	Current frequency																						
SafeFrequencyOK	Read	Read	SAFEBOOL	Indicates if the frequency being output is OK																						
Reset	-	Write	BOOL	<div>Release signal.</div> <div>To acknowledge an error, the cause of error (e.g. open circuit) must be corrected and the input frequency must be 0 for hardware upgrades <2.5.0.0 of the module. The error can then be acknowledged with a rising edge on channel "Reset".</div>																						

Table 13: Channel list

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

Danger!

The validity of analog signals is represented by the associated status signals. These binary status signals (data type SAFEBOOL) must also be evaluated each time the analog signals are used. A binary status signal with the status FALSE indicates an invalid value in the analog signal. In these situations, the analog signal is no longer permitted to be used for safety-related assessments.

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. This depends on the "Time base" configured in SafeDESIGNER.

Time base	I/O update time	Maximum I/O update time - Function mode A-A and A-B	Maximum I/O update time - Function mode A-A/-B-B/
10 ms	2 ms	12 ms	22 ms
20 ms	2 ms	22 ms	42 ms
50 ms	2 ms	52 ms	102 ms
100 ms	2 ms	102 ms	202 ms
200 ms	2 ms	202 ms	402 ms
500 ms	5 ms	505 ms	1005 ms
1000 ms	10 ms	1010 ms	2010 ms
2000 ms	20 ms	2020 ms	4020 ms
5000 ms	50 ms	5050 ms	10.05 s
10 s	0.1 s	10.1 s	20.1 s
20 s	0.2 s	20.2 s	40.2 s
50 s	0.5 s	50.5 s	100.5 s
100 s	1 s	101 s	201 s

Danger!

Configuring parameter "Time base" lengthens the safety response time!

11 Version history

Version	Date	Comment
2.16	November 2022	Chapter 10 "I/O update time": Updated Maximum I/O update time.
2.15.1	August 2022	Chapter 10 "I/O update time": Updated Maximum I/O update time.
2.15	August 2022	Chapter 10 "I/O update time": Updated Maximum I/O update time.
2.14	May 2022	<ul style="list-style-type: none"> Chapter 4 "Technical data": <ul style="list-style-type: none"> Safety characteristics: Editorial change for PFH / PFH_d Updated DNV certification. Updated chapter 12 "Declaration of conformity".
2.12	November 2021	Chapter 8.3 "Channel list": Updated description for channel "Reset".
2.11	August 2021	Chapter 4 "Technical data": Safe digital counter inputs: Input current at 24 VDC: Added footnote and min. value.
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 counter inputs: 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]. Updated certifications. Encoder power supply: Added R_{DS(on)}, removed residual voltage, updated output voltage. Editorial changes.
2.06	May 2020	<ul style="list-style-type: none"> Chapter 2 "Coated modules": Added description of starting temperature. Chapter 4 "Technical data": <ul style="list-style-type: none"> Added footnote for system requirements. Updated certifications. Coated module: Updated operating temperature. Coated module: Added starting temperature. Chapter 8.3 "Channel list": Added channel "oS_PropDelayStat". Editorial changes.
2.05	February 2020	Editorial changes.
2.04	November 2019	<ul style="list-style-type: none"> Chapter 4 "Technical data": Updated certifications. Chapter 8.3 "Channel list": Updated description of channel "Reset" with more details. Editorial changes.
2.02	May 2019	First edition for mapp Safety

Table 14: Version history

12 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.

Product manufacturer:

B&R Industrial Automation GmbH

B&R Strasse 1

5142 Eggelsberg

Austria

Telephone: +43 7748 6586-0

Fax: +43 7748 6586-26

office@br-automation.com

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).