

X67SI8103

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

This module is equipped with 8 safe digital inputs. They are designed for a nominal voltage of 24 VDC.

The module can be used to read in digital signals in safety-related applications up to PL e or SIL 3.

The module is equipped with filters that are individually configurable for switch-on and switch-off behavior. The module also provides pulse signals for diagnosing the sensor line.

- 8 safe digital inputs, sink circuit
- 2 pulse outputs - available on all 4 female connectors
- 2 standard inputs, sink circuit
- 2 standard outputs, source circuit
- Device supply
- Software input filter configurable for each channel
- Standardized 8-pin M12 device interface

2 Order data


Order number	Short description	Figure
	Digital input modules	
X67SI8103	X67 safe digital input module, 2x M12 interface each with 2 safe type A digital inputs, configurable input filter and 2 pulse outputs, 24 VDC, 2x standardized 8-pin M12 device interface each with 1 digital input without safety function and 2 safe type A digital inputs, configurable input filter and 2 pulse outputs, 24 VDC and 1 digital output without safety function, 24 VDC, 0.6 A and 1 device power supply, 24 VDC, 2 A	

Table 3: X67SI8103 - Order data

Required accessories:

For an overview of wiring X67 modules and associated order numbers for cables, see the module's download section on the B&R website (www.br-automation.com).

3 Technical data

Order number	X67SI8103
Short description	
I/O module	2x M12 interface each with 2 safe type A digital inputs and 2 pulse outputs, 24 VDC, 2x standardized 8-pin M12 device interface each with 1 digital input without safety function and 2 safe type A digital inputs and 2 pulse outputs, 24 VDC and 1 digital output without safety function, 24 VDC, 0.6 A and 1 device power supply, 24 VDC, 2 A
General information	
B&R ID code	0xBB7C
System requirements	
Automation Studio	3.0.81.15 or later
Automation Runtime	3.00 or later
SafeDESIGNER	2.70 or later
Safety Release	1.2 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
I/O function	Yes, using LED status indicator and software
Blackout mode	
Scope	Module
Function	Module functionality
Standalone mode	No
Max. I/O cycle time	1 ms
Connection type	
X2X Link	M12, B-coded
Inputs/Outputs	M12 8-pin or M12 5-pin, A-coded
I/O power supply	M8, 4-pin
Power consumption	
Bus	0.9 W
Internal I/O	2.1 W
Additional power dissipation caused by actuators (resistive) [W] ²⁾	
Digital outputs	0.216
Pulse outputs	0.192
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 IIA T5 Gc IP67, Ta = 0 - Max. 60°C TÜV 05 ATEX 7201X
UL	cULus E115267 Industrial control equipment
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5
EAC	Yes
KC	Yes
Safety characteristics	
EN ISO 13849-1:2015	
Category	Cat. 3 when using individual input channels, Cat. 4 when using input channel pairs (e.g. SI1 and SI2) or more than 2 input channels ³⁾
PL	PL e
DC	>94%
MTTFD	2500 years
Mission time	Max. 20 years

Table 4: X67SI8103 - Technical data

Order number	X67SI8103
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
24 VDC output	
Output voltage	24 VDC -15% / +20%
Output current	2 A
I/O power supply	
Nominal voltage	24 VDC
Voltage range	18 to 30 VDC
Integrated protection	Reverse polarity protection
Digital inputs	
Quantity	2
Nominal voltage	24 VDC
Input characteristics per EN 61131-2	Type 1
Input voltage	24 VDC -15% / +20%
Input current at 24 VDC ⁴⁾	Min. 2 mA to max. 7.24 mA
Input circuit	Sink
Input filter	
Hardware	≤150 µs
Input resistance	Min. 3.3 kΩ
Switching threshold	
Low	<5 VDC
High	>15 VDC
Insulation voltage between channel and bus	500 V _{eff}
Safe digital inputs	
Quantity	8
Variant	Type A
Nominal voltage	24 VDC
Input characteristics per EN 61131-2	Type 1
Input filter	
Hardware	≤150 µs
Software	Configurable between 0 and 500 ms
Input circuit	Sink
Input voltage	24 VDC -15% / +20%
Input current at 24 VDC ⁴⁾	Min. 2 mA to max. 8.28 mA
Input resistance	Min. 2.9 kΩ
Error detection time	200 ms
Insulation voltage between channel and bus	500 V _{eff}
Switching threshold	
Low	<5 VDC
High	>15 VDC
Line length between signal source (pulse output or external signal) and input	Max. 60 m with unshielded line Max. 400 m with shielded line
Digital outputs	
Quantity	2
Variant	FET, positive switching, output level readable
Nominal voltage	24 VDC
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".
Nominal output current	0.6 A
Total nominal current	1.2 A
Output protection	See section "Inrush current behavior for output channels".
Leakage current when the output is switched off	<500 µA
R _{DS(on)}	300 mΩ
Peak short-circuit current	See section "Inrush current behavior for output channels".
Braking voltage when switching off inductive loads	50 VDC
Insulation voltage between channel and bus	500 V _{eff}
Max. capacitive load	100 nF
Peak output current	1 A
Pulse outputs	
Quantity	8
Variant	Push-Pull
Nominal output current	40 mA
Output protection	Shutdown of individual channels in the event of overload or short circuit ⁵⁾
Peak short-circuit current	25 A for 15 µs

Table 4: X67SI8103 - Technical data

Order number	X67SI8103
Short-circuit current	100 mA _{eff}
Leakage current when the output is switched off	0.1 mA
R _{DS(on)}	60 Ω
Switching voltage	I/O power supply minus voltage drop due to R _{DS(on)}
Total nominal current	80 mA
Operating conditions	
Mounting orientation	
Any	Yes
Installation elevation above sea level	0 to 2000 m, no limitation
Degree of protection per EN 60529	IP67
Ambient conditions	
Temperature	
Operation	-40 to 60°C ⁶⁾
Storage	-40 to 85°C
Transport	-40 to 85°C
Mechanical properties	
Dimensions	
Width	53 mm
Height	85 mm
Depth	42 mm
Weight	190 g
Torque for connections	
M8	Max. 0.4 Nm
M12	Max. 0.6 Nm

Table 4: X67SI8103 - 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 sensors 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.
- 5) The protective function is provided for max. 30 minutes for a continuous short circuit.
- 6) Up to hardware revision <G0: -25 to 60°C

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.

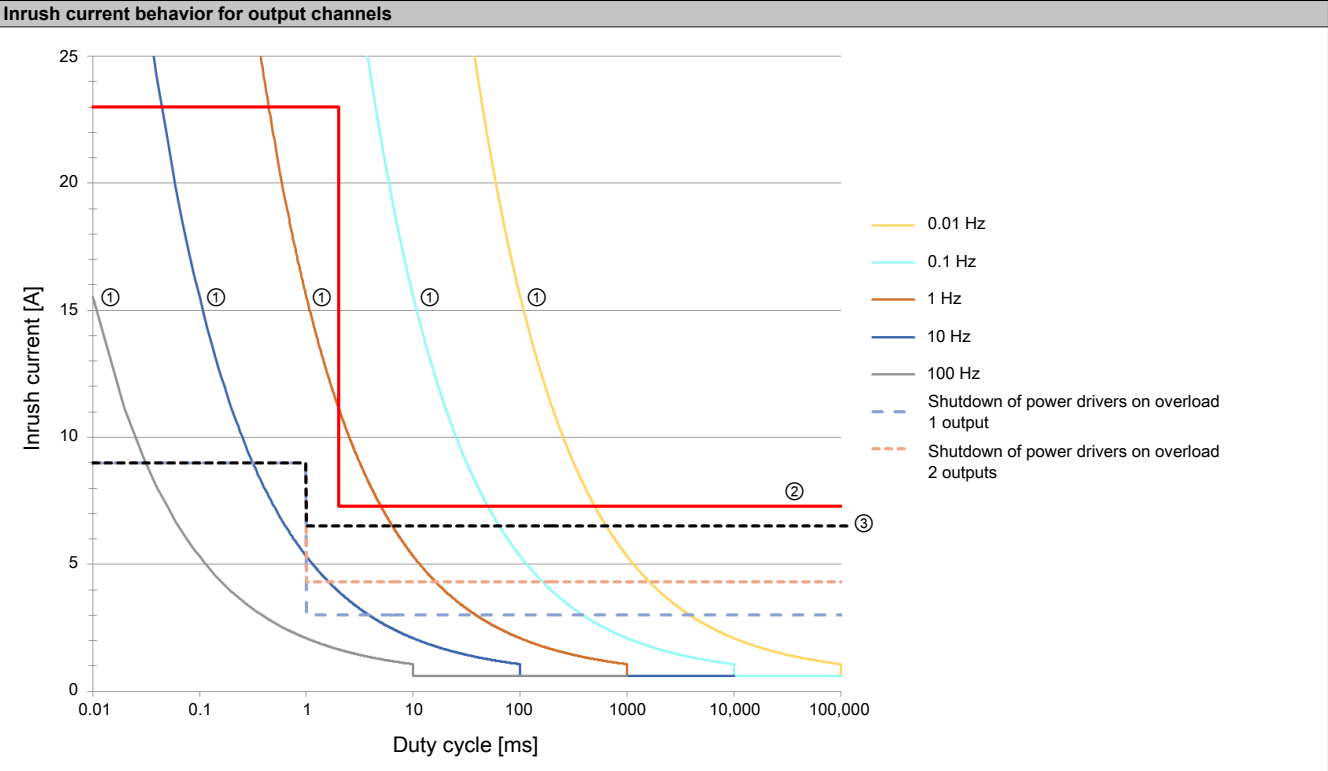


Table 5: Inrush current behavior for output channels

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.
③	Shutdown of power drivers on overload per channel These output channels are equipped with power drivers with integrated shutdown on overload. 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 X67 modules" in Automation Help.

4 LED status indicators


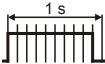
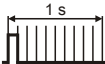



Figure	LED	Color	Status	Description
<p>Status indicator re: Left: Green (r), Right: Red (e)</p>  <p>Status indicator SE Left: Red (S), Right: Red (E)</p>	r	Green	Off	No power to module
	r	Green	Single flash	Mode "Reset"
			Double flash	Updating firmware
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
	e	Red	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	State of the corresponding device		
	2	Green	Off	Without signal function: No error, all signals from female connector off ("low" state)
	3		On	Dual-channel evaluation: No error, dual-channel evaluation FALSE ("low" state)
	4			Without signal function: All inputs on the female connector set ("high" state)
			Blinking	Dual-channel evaluation: Dual-channel evaluation signal TRUE ("high" state)
		Red	On	Without signal function: Only one input on the female connector set ("high" state)
			Blinking	Dual-channel evaluation: -
		Red	On	Without signal function: Error on all inputs of the female connector
			Blinking	Dual-channel evaluation: Error in dual-channel evaluation
		Red/Green	Blinking	Without signal function: Error on only one input of the female connector, the signal is NOT set on the second input ("low" state)
				Dual-channel evaluation: -
		Red/Green	Blinking	Without signal function: Error on only one input of the female connector, the signal is set on the second input ("high" state)
				Dual-channel evaluation: -
	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 6: 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!

5 Connection elements

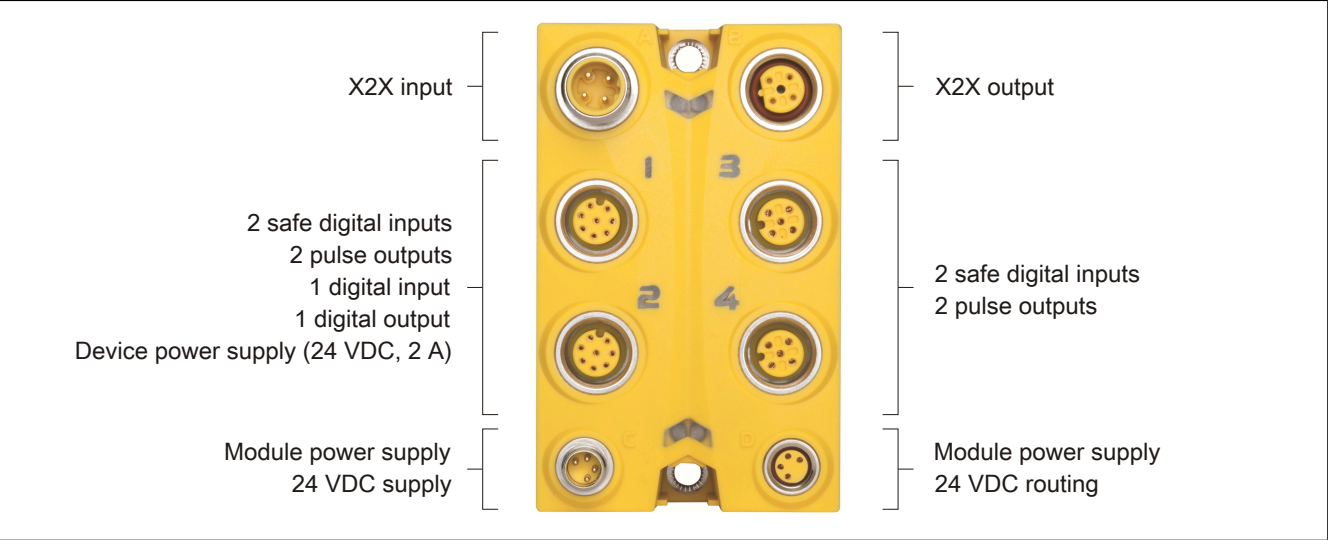


Figure 1: X67SI8103 - Connection elements

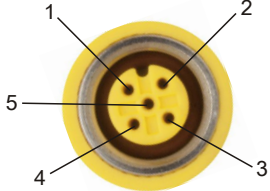
Pinout	Female connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
	3 (IN)	Pulse 1	SI 5	GND	SI 6	Pulse 2
	4 (IN)	Pulse 1	SI 7	GND	SI 8	Pulse 2

Table 7: Pinout

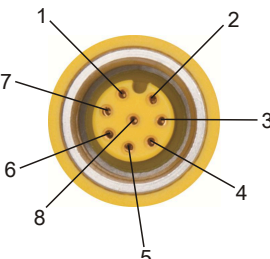
Pinout	Female connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
	1 (IN/OUT)	+24 VDC	Pulse 1	GND	SI 1	DI 1	Pulse 2	SI 2	DO 1
	2 (IN/OUT)	+24 VDC	Pulse 1	GND	SI 3	DI 2	Pulse 2	SI 4	DO 2

Table 8: Pinout

6 X2X Link

This module is connected to X2X Link using pre-assembled cables. The connection is made using a circular connector (2x M12, 4-pin).

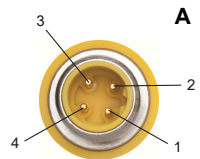
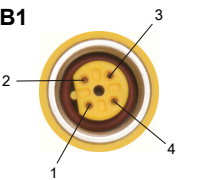
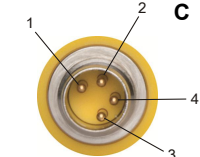
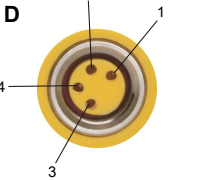
Connection	Pinout	
	Pin	Description
 <p>A</p>	1	X2X+
	2	X2X
	3	X2X _L
	4	X2X _N
	A ... B-coded male connector on the module, input B1 ... B-coded female connector on the module, output SHLD ... Shield via threaded insert in the module	
 <p>B1</p>		

Table 9: X2X Link

7 24 VDC module power supply

The module power supply is connected using pre-assembled cables with circular connectors (2x M8, 4-pin). The power supply is connected via male connector C. Female connector D is used for routing the power supply to other modules.

The maximum permissible current per power supply is 4 A (in summation 8 A)!

Connection	Pinout	
	Pin	Description
 <p>C</p>	1	24 VDC module power supply ¹⁾
	2	24 VDC module power supply ¹⁾
	3	GND
	4	GND
	C ... Male connector on the module, supply D ... Female connector on the module, routing	
 <p>D</p>		

1) Both supply pins must be supplied. Cutting off the outputs is only ensured if **both** pins are disconnected from the power supply.
 If the summation current of the outputs is >4 A, current must also be supplied via female connector D, pin 2.

Table 10: 24 VDC module power supply

8 Input circuit diagram

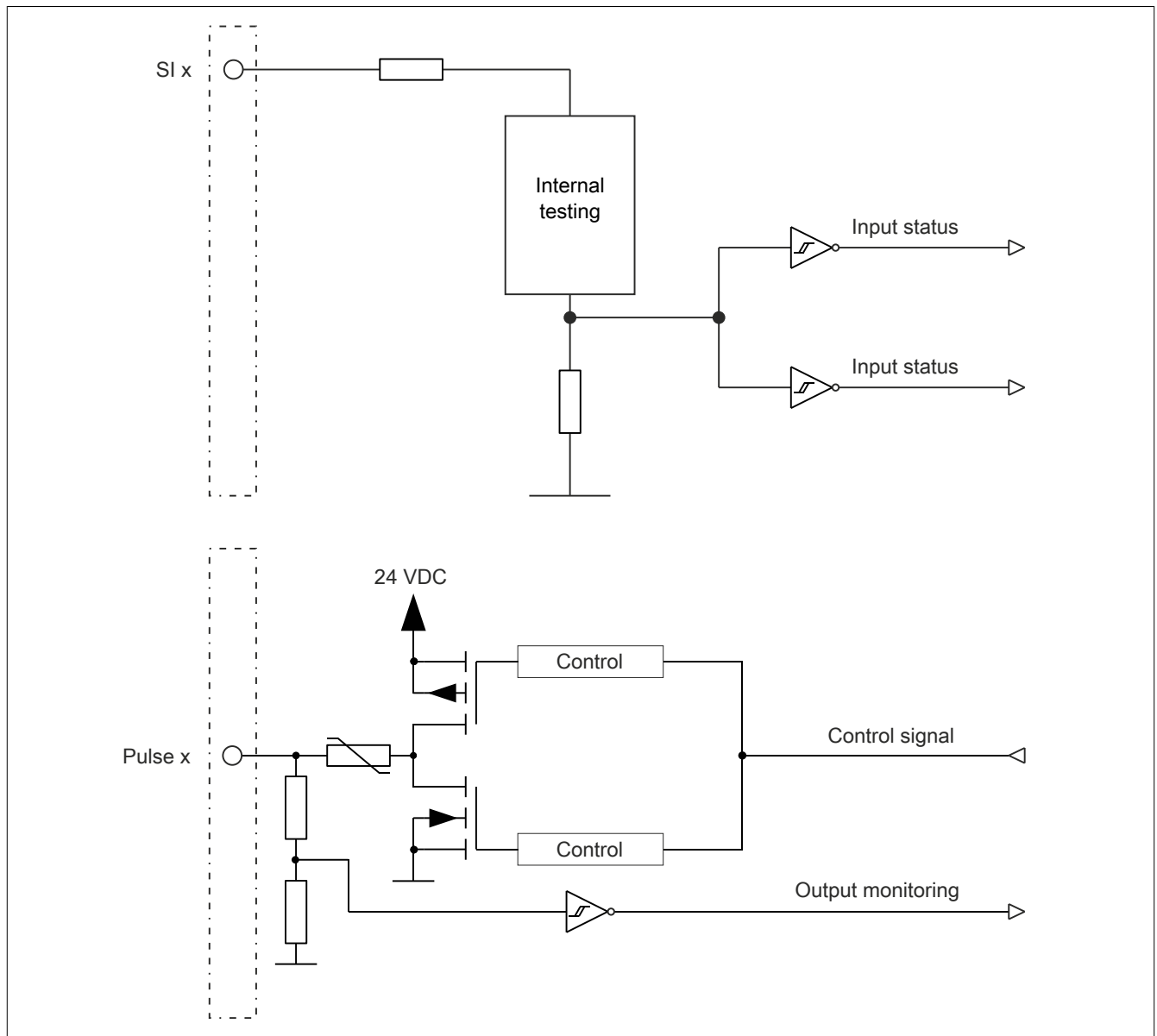


Figure 2: Input circuit diagram

9 Input circuit diagram - Standard input without safety function

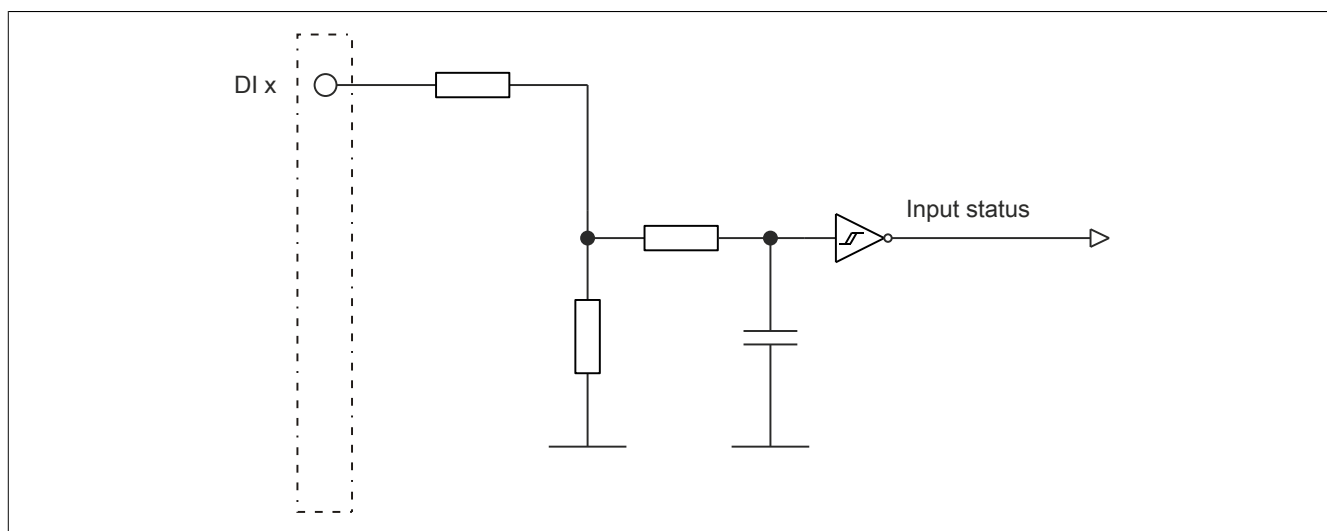


Figure 3: Input circuit diagram - Standard input without safety function

10 Output circuit diagram - Standard output without safety function

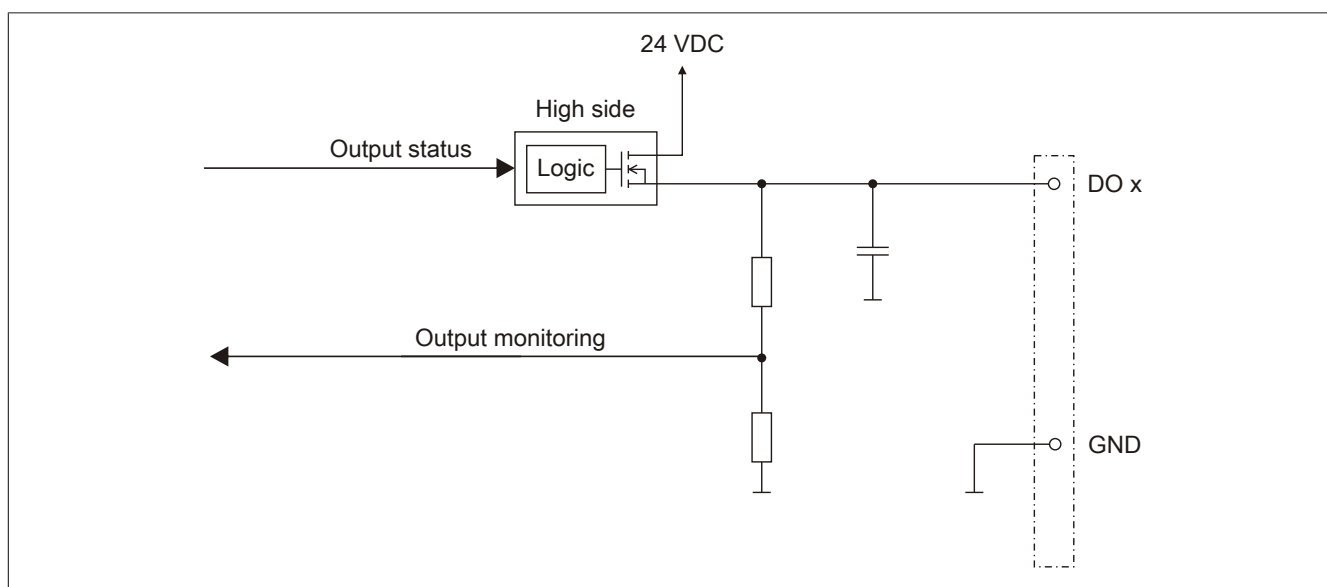


Figure 4: Output circuit diagram - Standard output without safety function

11 Register description

11.1 Parameters in the I/O configuration

Group: Function model

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

Table 11: I/O configuration parameters: Function model

Group: General

Parameter	Description	Default value	Unit
Module supervised	System behavior when a module is missing	On	-
	Parameter value	Description	
	On	A missing module triggers service mode.	
	Off	A missing module is ignored.	
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 dual-channel evaluation	This parameter enables/disables the status information of dual-channel evaluation.	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 12: I/O configuration parameters: General

Group: Output signal path

Parameter	Description	Default value	Unit						
Digital output 0102	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 13: I/O configuration parameters: Output signal path

11.2 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>
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Table 14: 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
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 15: SafeDESIGNER parameters: Safety response time

Group: SafeDigitalInputxx

Parameter	Description	Default value	Unit
Pulse source	This parameter can be used to specify the pulse source for the input channel.	Pulse x	-
	Parameter value	Description	
	Pulse x	The input expects a test pulse from the pulse output (pulse x).	
	No pulse	The input does not expect a test pulse.	
	Other module	The input expects an external test pulse.	
Filter off	Switch-off filter for the channel to remove potentially disruptive signal low phases. <ul style="list-style-type: none">Permissible values: 0 to 500,000 µs (corresponds to 0 to 0.5 s)	0	µs
Filter on	Switch-on filter for the channel that can be used to "debounce" the signals. This function also makes it possible for the module to lengthen a switch-off signal that would otherwise be too short. <ul style="list-style-type: none">Permissible values: 0 to 500,000 µs (corresponds to 0 to 0.5 s)	200000	µs
Discrepancy time	Parameter only available for odd-numbered channels. This parameter specifies for function "dual-channel evaluation" the maximum time in which the selected "Dual-channel processing mode" is permitted to be violated by one of the input channels without an error being output. <ul style="list-style-type: none">Permissible values: 0 to 10,000,000 µs (corresponds to 0 to 10 s)	50000	µs
Dual-channel processing mode	Parameter only available for odd-numbered channels. This parameter specifies the type of dual-channel evaluation. Permissible values: <ul style="list-style-type: none">EquivalentAntivalent	Equivalent	-

Table 16: SafeDESIGNER parameters: SafeDigitalInputxx

Danger!

Configuring a switch-off filter lengthens the safety response time!
The configured filter value must be added to the total response time.

Danger!

Signals with a low phase shorter than the safety response time can potentially be lost. Such signals should be lengthened accordingly using the "switch-on filter" function on the input module.

Danger!

Configuring a switch-off filter causes signals with a low phase shorter than the switch-off filter to be filtered out. If this results in a problem concerning safety functionality, then the switch-off filter must be set to 0. Lengthening the low phase with a switch-on filter is not possible in these cases.

Group: PulseOutput

Crop: Pulse output

Parameter	Description	Default value	Unit						
Pulse x mode	This parameter can be used to define the pulse pattern of the associated pulse output. Parameter "Pulse source" defines the input channel from which this pulse output is used.	Internal	-						
<table><tr><th>Parameter value</th><th>Description</th></tr><tr><td>Internal</td><td>The channel generates a unique pulse pattern that can only be processed by input channels where this pulse output is defined as the pulse source.</td></tr><tr><td>External</td><td>The channel generates a pulse pattern that can be processed by all input channels where an external test pulse is defined as the pulse source.</td></tr></table>				Parameter value	Description	Internal	The channel generates a unique pulse pattern that can only be processed by input channels where this pulse output is defined as the pulse source.	External	The channel generates a pulse pattern that can be processed by all input channels where an external test pulse is defined as the pulse source.
Parameter value	Description								
Internal	The channel generates a unique pulse pattern that can only be processed by input channels where this pulse output is defined as the pulse source.								
External	The channel generates a pulse pattern that can be processed by all input channels where an external test pulse is defined as the pulse source.								

Table 17: SafeDESIGNER parameters: PulseOutput

11.3 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>																						
FBInputStatexxy	Read	-	USINT	State number of dual-channel evaluation (PLCopen function block "Equivalent" or "Antivalent")																						
InputErrorStates	(Read) ¹⁾	-	UDINT	<div>Channel status, additional information for channel error</div> <table><tr><th>Type of error</th></tr><tr><th>Inputs</th></tr><tr><th>Input stuck at high</th></tr><tr><td>Bit no. 0 to 7 = Channel 1 to 8</td></tr></table> <div>If a bit is set, the corresponding error has been detected on the respective channel.</div>	Type of error	Inputs	Input stuck at high	Bit no. 0 to 7 = Channel 1 to 8																		
Type of error																										
Inputs																										
Input stuck at high																										
Bit no. 0 to 7 = Channel 1 to 8																										

Table 18: Channel list

Channel name	Access via Automation Studio	Access via SafeDESIGNER	Data type	Description	
PulseOutputErrors	(Read) ¹⁾	-	UDINT	Channel status, additional information for channel error	
				Type of error	
				Pulse outputs	
				Feedback stuck at high (shorted to 24 VDC)	Feedback stuck at low (ground fault)
				Bit no. 8 to 9 = Pulse 1 to 2	Bit no. 0 to 1 = Pulse 1 to 2
				If a bit is set, the corresponding error has been detected on the respective channel.	
SafeModuleOK	Read	Read	SAFEBOOL	Indicates whether the safe communication channel is OK	
SafeDigitalInputxx	Read	Read	SAFEBOOL	Physical channel SI xx	
SafeTwoChannelInputxxyy	Read	Read	SAFEBOOL	Dual-channel evaluation of channel SI xx/yy	
SafeInputOKxx	Read	Read	SAFEBOOL	Status of physical channel SI xx	
SafeTwoChannelOKxxyy	Read	Read	SAFEBOOL	Status of dual-channel evaluation of channel SI xx/yy	
DigitalInputxx	Read	Read	BOOL	Physical channel DI xx	
DigitalOutputxx	Write	-	BOOL	Physical channel DO xx	
DigitalOutputOKxx	Read	Read	BOOL	Status of channel DO xx	
PhysicalStateOutputxx	Read	Read	BOOL	Read-back value of physical channel DO xx	

Table 18: Channel list

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

12 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

13 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
2150 µs + Filter time (see section "Filter" in Automation Help)

14 Version history

Version	Date	Comment
2.14	May 2022	<ul style="list-style-type: none"> Chapter 3 "Technical data": Safety characteristics: Editorial change for PFH / PFH_d Updated chapter 15 "Declaration of conformity".
2.11	August 2021	Chapter 3 "Technical data": <ul style="list-style-type: none"> Digital inputs: Input current at 24 VDC: Added footnote and min. value. Safe digital inputs: Input current at 24 VDC: Added footnote and min. value.
2.10	May 2021	Chapter 3 "Technical data": <ul style="list-style-type: none"> Updated display of system requirements. Safety characteristics: Updated footnote.
2.08	November 2020	Chapter 3 "Technical data": <ul style="list-style-type: none"> Digital inputs: Added number of channels. Safe digital inputs: Added number of channels and renamed "Cable length between pulse output and input" to "Cable length between signal source (pulse output or external signal) and input". Digital outputs: Added number of channels. Pulse outputs: Added number of channels.
2.07	August 2020	<ul style="list-style-type: none"> Chapter 3 "Technical data": <ul style="list-style-type: none"> General information: Added additional power dissipation caused by actuators (resistive) [W]. Digital outputs: Added R_{DS(on)}, removed residual voltage, updated switching voltage. Pulse outputs: Added R_{DS(on)}, removed residual voltage, updated switching voltage. Chapter 11.2 "Parameters in SafeDESIGNER": Group "PulseOutput": Updated description. Editorial changes.
2.06	May 2020	<ul style="list-style-type: none"> Chapter 3 "Technical data": Added footnote for system requirements. Chapter 11.3 "Channel list": Added channel "oS_PropDelayStat".
2.05	February 2020	<ul style="list-style-type: none"> Chapter 3 "Technical data": <ul style="list-style-type: none"> Digital outputs: Added max. switching frequency. Added section "Inrush current behavior for output channels" and updated technical data accordingly. Editorial changes.
2.04	November 2019	Editorial changes.
2.02	May 2019	First edition for mapp Safety

Table 19: Version history

15 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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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).