1.2 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

Unlike X20 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 Overview

Module	X20SI2100	X20SI4100	X20SI8110	X20SI9100
Safe digital inputs				
Number of inputs	2	4	8	20
Nominal voltage	24 VDC			
Input filter Hardware Software	 ≤150 µs Default 0 ms, configurable between 0 and 500 ms			
Input circuit	Sink			
Pulse outputs				
Design	Push-Pull			
Switching voltage	I/O power supply minus residual voltage			

Table 2: Digital input modules

3 Order data


X20SI2100 / X20SI4100


X20SI8110


X20SI9100

Model number	Short description
	Digital input modules
X20SI2100	X20 safe digital input module, 2 safe digital inputs, configurable input filter, 2 pulse outputs, 24 VDC
X20SI4100	X20 safe digital input module, 4 safe digital inputs, configurable input filter, 4 pulse outputs, 24 VDC
X20cSI4100	X20 safe digital input module, coated, 4 safe digital inputs, configurable input filter, 4 pulse outputs, 24 VDC
X20SI8110	X20 safe digital input module, 8 safe digital inputs, configurable input filter, 4 pulse outputs, 24 VDC, single-width
X20SI9100	X20 safe digital input module, 20 safe digital inputs, configurable input filter, 4 pulse outputs, 24 VDC
X20cSI9100	X20 safe digital input module, coated, 20 safe digital inputs, configurable input filter, 4 pulse outputs, 24 VDC
	Required accessories
	Bus modules
X20BM13	X20 bus module, for X20 SafeIO modules, internal I/O power supply continuous, single-width
X20BM33	X20 bus module, for X20 SafeIO modules, internal I/O power supply continuous
X20BM36	X20 bus module, for X20 SafeIO modules, with node number switch, internal I/O power supply continuous
X20cBM33	X20 bus module, coated, for X20 SafeIO modules, internal I/O power supply continuous
	Terminal blocks
X20TB52	X20 terminal block, 12-pin, safety-keyed

Table 3: X20SI2100, X20SI4100, X20cSI4100, X20SI8110, X20SI9100, X20cSI9100 - Order data

4 Technical data

Product ID	X20SI2100	X20SI4100	X20cSI4100	X20SI8110	X20SI9100	X20cSI9100
Short description						
I/O module	2 safe digital inputs, 2 pulse outputs, 24 VDC	4 safe digital inputs, 4 pulse outputs, 24 VDC		8 safe digital inputs, 4 pulse outputs, 24 VDC	20 safe digital inputs, 4 pulse outputs, 24 VDC	
General information						
B&R ID code	0x1F15	0x1DBD	0xDD5A	0xE742	0xAEC8	0xDD5B
System requirements						
Automation Studio	3.0.71 or higher		4.0.16 or higher	4.0 or higher	3.0.81.15 or higher	4.0.16 or higher
Automation Runtime	2.95 or higher		V3.08 or higher	4.0 or higher	3.00 or higher	V3.08 or higher
SafeDESIGNER	2.58 or higher		3.1.0 or higher	3.4.0 or higher	2.71 or higher	3.1.0 or higher
Safety Release	1.1 or higher		1.7 or higher		1.3 or higher	1.7 or higher
Status indicators	I/O function per channel, operating state, module status					
Diagnostics						
Module run/error	Yes, using status LED and software					
Inputs	Yes, using status LED and software					
Max. internal cycle time	800 µs			1 ms	1600 µs	
Power consumption						
Bus	0.25 W	0.32 W			0.4 W	
Internal I/O	1 W	1.25 W		2.5 W	1.6 W	
Electrical isolation						
Channel - Bus	Yes					
Channel - Channel	No					
Certification						
CE	Yes					
cULus	Yes			In preparation	Yes	
cCSAus HazLoc Class 1 Division 2	Yes		-			
ATEX Zone 2 [1]	Yes			In preparation	Yes	
KC	Yes		-		Yes	-
GL	Yes				In preparation	
LR	Yes				-	
EN IEC 61508:2010, EN IEC 62061:2010, EN ISO 13849-1:2008, EN IEC 61511:2004	Yes			In preparation	Yes	
ANSI UL 1998:2008, NFPA 79:2015, NFPA 85:2015, UL category FSPC, FSPC7	Yes			In preparation	Yes	
EN 50156-1:2004	Yes			In preparation	Yes	
GOST-R	Yes					
Safety characteristics						
EN ISO 13849-1:2008 category	CAT 3 when using individual input channels CAT 4 when using input channel pairs (e.g. SI1 & SI2) or more than 2 input channels [2]					
EN ISO 13849-1:2008 PL	PL e					
EN IEC 62061:2010 SIL CL	SIL 3					
EN IEC 61508:2010 SIL CL	SIL 3					
EN IEC 61511:2004 SIL CL	SIL 3					
Proof Test Interval (PT)	20 years					
Mission time	20 years					
PFH						
Module	$<1*10^{-10}$					
openSAFETY wired	Negligible					
openSAFETY wireless	$<1*10^{-14}$ * Number of openSAFETY packets per hour					
PFD						
PT = 10 years	$<1*10^{-5}$					
PT = 20 years	$<2*10^{-5}$					
SFF	>90%					
DC	>94%					
MTTFd	2500 years					
I/O supply						
Nominal voltage	24 VDC					
Voltage range	24 VDC -15% / +20%					
Integrated protection	Reverse polarity protection					
Safe digital inputs						
Nominal voltage	24 VDC					
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	Typ. 3.45 mA, starting with hardware revision J0: Typ. 2.48 mA			Typ. 2.48 mA		
Input resistance	Typ. 7 kΩ, starting with hardware revision J0: Typ. 9.68 kΩ			Typ. 9.68 kΩ		
Error detection time	100 ms				200 ms	

Table 4: X20SI2100, X20SI4100, X20cSI4100, X20SI8110, X20SI9100, X20cSI9100 - Technical data

Product ID	X20SI2100	X20SI4100	X20cSI4100	X20SI8110	X20SI9100	X20cSI9100
Isolation voltage between channel and bus	500 V_{eff}					
Switching threshold						
Low	<5 VDC					
High	>15 VDC					
Cable length	Max. 50 m					
Pulse outputs						
Design	Push-Pull					
Nominal output current	100 mA, starting with hardware revision J0: 50 mA			50 mA		
Output protection	Thermal cutoff of all channels if overload or short circuit occurs, Starting with hardware revision J0: Cutoff of individual channels if overload or short circuit occurs [3]			Cutoff of individual channels if overload or short circuit occurs [3]		
Diagnostic status	Output monitoring					
Peak short circuit current	300 mA, starting with hardware revision J0: 100 mA			500 mA	Typ. 7 A for 1 ms, starting with hardware revision D0: 100 mA	
Leakage current when switched off	Max. 25 µA			<500 µA	Max. 25 µA	
Residual voltage	Max. 0.6 VDC at 100 mA, starting with hardware revision J0: 2 VDC			≤4 VDC	Typ. 0.2 VDC, starting with hardware revision D0: 2 VDC	
Switching voltage	I/O power supply minus residual voltage					
Total nominal current	200 mA, starting with hardware revision J0: 100 mA	400 mA, starting with hardware revision J0: 200 mA		200 mA		
Cable length	Max. 50 m					
Operating conditions						
Mounting orientation						
Horizontal	Yes					
Vertical	Yes					
Installation at elevations above sea level						
0 to 2000 m	No limitations					
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m					
EN 60529 protection	IP20					
Environmental conditions						
Temperature						
Operation						
Horizontal installation	0 to 60°C, see Derating		-25 to 60°C, see Derating	0 to 60°C, see Derating		-25 to 60°C, see Derating
Derating bonus at 24 VDC	+2.5°C			+0°C	+5°C	
Derating bonus with dummy modules	Dummy module to the left: +0°C Dummy module to the right: +2.5°C Dummy module to the left and right: +5°C			Dummy module to the left: +0°C Dummy module to the right: +0°C Dummy module to the left and right: +0°C	Dummy module to the left: +0°C Dummy module to the right: +2.5°C Dummy module to the left and right: +5°C	
Vertical installation	0 to 50°C		-25 to 50°C	0 to 50°C, see Derating		-25 to 50°C, see Derating
Storage	-40 to 85°C					
Transport	-40 to 85°C					
Relative humidity						
Operation	5 to 95%, non-condensing		Up to 100%, condensing	5 to 95%, non-condensing		Up to 100%, condensing
Storage	5 to 95%, non-condensing					
Transport	5 to 95%, non-condensing					
Mechanical characteristics						
Note	Order 1x safety-keyed terminal block separately Order 1x safety-keyed bus module separately			Order 1x safety-keyed terminal block separately Order 1x safety-keyed bus module (single-width) separately	Order 2x safety-keyed terminal block separately Order 1x safety-keyed bus module separately	
Spacing	25$^{+0.2}$ mm			12.5$^{+0.2}$ mm	25$^{+0.2}$ mm	

Table 4: X20SI2100, X20SI4100, X20cSI4100, X20SI8110, X20SI9100, X20cSI9100 - Technical data

1) Ta min.: 0°C
   Ta max.: See environmental conditions
2) It is also important to take note of the danger warnings in the technical data sheet.
3) Protection is provided for max. 30 minutes for continuous short circuits.

Danger!

Operating outside of technical data specifications is not permitted and can result in dangerous situations.