X20(c)CP168x(X) and X20(c)CP368x(X)

1 General information

1.1 Other applicable documents

For additional and supplementary information, see the following documents.

Other applicable documents

Document name	Title
MAX20	X20 System user's manual
MAEMV	Installation / EMC guide

Additional documentation

Document name	Title
MAREDSYS	Redundancy for control systems

1.2 Coated modules

Coated modules are X20 modules with a protective coating for the electronics component. This coating protects X20c modules from condensation and corrosive gases.
The modules' electronics are fully compatible with the corresponding X20 modules.

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



1.3 X20CP168x(X) - Order data



Order number	Short description
	X20 PLCs
X20CP1684	X20 PLC, Atom 0.4 GHz (compatible), 512 MB DDR4 RAM, 1 MB SRAM, 1 GB onboard flash drive, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface module, including supply module. 1x terminal block X20TB12, slot cover and X20 end cover plate X20AC0SR1 (right) included. Order CompactFlash separately!
X20cCP1684	X20c PLC, coated, Atom 0.4 GHz (compatible), 512 MB DDR4 RAM, 1 MB SRAM, 1 GB onboard flash drive, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface, including power supply module. 1x terminal block X20TB12, slot cover and X20 end cover plate (right) X20AC0SR1 included. Order CompactFlash separately!
X20CP1685	X20 PLC, Atom 0.8 GHz, 512 MB DDR4 RAM, 1 MB SRAM, 1 GB onboard flash drive, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface module, including supply module. 1x terminal block X20TB12, slot cover and X20 end cover plate X20AC0SR1 (right) included. Order CompactFlash separately!
X20CP1686X	X20 PLC, Atom 1.3 GHz, 1 GB DDR4 RAM, 1 MB SRAM, 2 GB onboard flash drive, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface, including power supply module. 1x terminal block X20TB12, slot cover and X20 end cover plate X20AC0SR1 (right) included. Order CompactFlash separately!
	Included in delivery
	Batteries
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell
	Locking plate
X20AC0SR1	X20 end cover plate, right
	Terminal blocks
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed
	Optional accessories
	Batteries
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell
	CompactFlash cards
0CFCRD.016GE.02	CompactFlash 16 GB extended temp.
0CFCRD.0512E.02	CompactFlash 512 MB extended temp.
0CFCRD.1024E.02	CompactFlash 1024 MB extended temp.
0CFCRD.2048E.02	CompactFlash 2048 MB extended temp.
0CFCRD.4096E.02	CompactFlash 4096 MB extended temp.
0CFCRD.8192E.02	CompactFlash 8 GB extended temp.
	Technology Guard
0TGF016.01	Technology Guard (MSD) with integrated flash drive, 16 GB (MLC)

Table 1: X20CP168x(X) - Order data

Included in delivery

Order number	Short description
4A0006.00-000	Backup battery (see also "Battery" on page 19)
-	Interface module slot covers
X20AC0SR1	X20 end cover plate (right)
X20TB12	X20 terminal block, 12-pin, 24 V coding

1.4 X20CP368x(X) - Order data



Order number	Short description
	X20 PLCs
X20CP3684	X20 PLC, Atom 0.4 GHz (compatible), 512 MB DDR4 RAM, 1 MB SRAM, 1 GB onboard flash drive, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface, including power supply module. 1x terminal block X20TB12, slot covers and X20 end cover plate X20AC0SR1 (right) included. Order CompactFlash separately!
X20CP3685	X20 PLC, Atom 0.8 GHz, 512 MB DDR4 RAM, 1 MB SRAM, 1 GB onboard flash drive, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface module, including supply module. 1x terminal block X20TB12, slot covers and X20 end cover plate X20AC0SR1 (right) included. Order CompactFlash separately!
X20CP3686X	X20 PLC, Atom 1.3 GHz, 1 GB DDR4 RAM, 1 MB SRAM, 2 GB onboard flash drive, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface, including power supply module. 1x terminal block X20TB12, slot covers and X20 end cover plate X20AC0SR1 (right) included. Order CompactFlash separately!
X20CP3687X	X20 PLC, Atom 1.6 GHz, 2 GB DDR4 RAM, 1 MB SRAM, 2 GB onboard flash drive, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface, including power supply module. 1x terminal block X20TB12, slot covers and X20 end cover plate X20AC0SR1 (right) included. Order CompactFlash separately!
X20cCP3687X	X20c PLC, coated, Atom 1.6 GHz, 2 GB DDR4 RAM, 1 MB SRAM, 2 GB onboard flash drive, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface (TSN) 10/100/1000BASE-T, 1 POWERLINK interface, including power supply module. 1x terminal block X20TB12, slot covers and X20 end cover plate (right) X20AC0SR1 included. Order CompactFlash separately!
	Included in delivery
	Batteries
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell
	Locking plate
X20AC0SR1	X20 end cover plate, right
	Terminal blocks
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed
	Optional accessories
	Batteries
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell
	CompactFlash cards
0CFCRD.016GE.02	CompactFlash 16 GB extended temp.
0CFCRD.0512E.02	CompactFlash 512 MB extended temp.
0CFCRD.1024E.02	CompactFlash 1024 MB extended temp.
0CFCRD.2048E.02	CompactFlash 2048 MB extended temp.
0CFCRD.4096E.02	CompactFlash 4096 MB extended temp.
0CFCRD.8192E.02	CompactFlash 8 GB extended temp.
	Technology Guard
0TGF016.01	Technology Guard (MSD) with integrated flash drive, 16 GB (MLC)

Table 2: X20CP368x(X) - Order data

Included in delivery

Order number	Short description
4A0006.00-000	Backup battery (see also "Battery" on page 19)
-	Interface module slot covers
X20AC0SR1	X20 end cover plate (right)
X20TB12	X20 terminal block, 12-pin, 24 V coding

1.5 Module description

This controller is based on Intel Atom processor technology and used for applications with the highest performance requirements. It rounds off the top end of the X20 controller product family.

The basic configuration includes USB, Ethernet, POWERLINK V2, flash drive and removable CompactFlash. The standard Ethernet interface supports gigabit communication. For even more real-time network performance, the onboard POWERLINK interface supports poll-response chaining mode (PRC).
Up to 3 more slots are available for additional interface modules to increase flexibility.

- Intel Atom processor with 400 MHz (compatible) to 1.6 GHz with integrated I/O processor
- Ethernet, POWERLINK V2 with poll-response chaining and onboard USB
- 1 or 3 slots for modular interface expansion
- CompactFlash as removable application memory
- 512 MB to 2 GB LPDDR4 SDRAM
- 1 to 2 GB onboard flash drive
- Controller redundancy possible
- Fanless

1.6 X2X+ support

For applications that require a short response time or high data throughput, X2X+ can be used instead of X2X Link for the X20CPx686X and X20CP3687X variants. To do so, the corresponding X2X+ bus modules must be used and lined up with each other. The X20 I/O modules can simply be connected to the X2X+ bus modules.

Information:

X2X+ is only available directly on the controller.
It is not possible to directly combine X2X+ and X2X Link in the same segment. A separate X2X Link interface module must be used for this purpose.

The following limitations currently apply to X2X+:

- **Displacement via cable is not possible.**
- **Using double-width modules is not possible.**
- **Using safety modules is not possible.**
- **Using 230 VAC modules (red) is not possible.**

Information:

For simplification purposes, only images and module IDs of X2X Link modules are used in this data sheet. The name "X2X Link" is used in the text.

2 Technical description

2.1 X20(c)CP168x(X) - Technical data

Order number	X20CP1684	X20cCP1684	X20CP1685	X20CP1686X
Short description				
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V2), 2x USB, 1x X2X Link			1x RS232, 1x Ethernet, 1x POWERLINK (V2), 2x USB, 1x X2X Link/X2X+
System module	Controller			
General information				
B&R ID code	0xF9EA	0x2F42	0xF9EB	0xF9EC
Cooling	Fanless			
Status indicators	CPU function, Ethernet, POWERLINK, CompactFlash, battery			
Diagnostics				
Battery	Yes, using LED status indicator and software			
CPU function	Yes, using LED status indicator			
CompactFlash	Yes, using LED status indicator			
Ethernet	Yes, using LED status indicator			
POWERLINK	Yes, using LED status indicator			
Temperature	Yes, using software register			
Support				
Controller redundancy	No			
Storage health data support [1]	Yes			
ACOPOS support	Yes			
Visual Components support	Yes			
Power consumption without interface module and USB	6.9 W			7.5 W
Power consumption for X2X Link power supply [2]	1.42 W			
Power consumption [2]				
Internal I/O	0.6 W			
Additional power dissipation caused by actuators (resistive) [W]	-			
Certifications				
CE	Yes			
UKCA	Yes			
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X			
UL	cULus E115267 Industrial control equipment			
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5			
DNV	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)			
CPU and X2X Link power supply				
Input voltage	24 VDC -20% / +25% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 36 W)			
Input current	Max. 1.5 A at 24 VDC			
Fuse	Integrated, cannot be replaced			
Reverse polarity protection	Yes			
X2X Link power supply output				
Nominal output power	7 W [3]			
Parallel connection	Yes [4]			
Redundant operation	Yes			
Input I/O power supply				
Input voltage	24 VDC -15% / +20% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 240 W)			
Fuse	Required line fuse: Max. 10 A slow-blow			
Output I/O power supply				
Nominal output voltage	24 VDC			
Permissible contact load	10 A			
Power supply - General information				
Status indicators	Overload, operating status, module status, RS232 data transfer			
Diagnostics				
RS232 data transfer	Yes, using LED status indicator			
Module run/error	Yes, using LED status indicator and software			
Overload	Yes, using LED status indicator and software			

Table 3: X20CP168x(X) - Technical data

Order number	X20CP1684	X20cCP1684	X20CP1685	X20CP1686X
Electrical isolation				
I/O supply - I/O power supply	No			
CPU/X2X Link supply - CPU/X2X Link power supply	Yes			
Controller				
CompactFlash slot	1			
Real-time clock	Nonvolatile, resolution 1 s, -20 to 20 ppm accuracy at 25°C			
FPU	Yes			
Processor				
Type	Atom E3915			Atom E3930
Clock frequency	400 MHz (compatible).		800 MHz	1.3 GHz
L1 cache				
Data code	24 kB			
Program code	32 kB			
L2 cache	1 MB			
Integrated I/O processor	Processes I/O data points in the background			
Modular interface slots	1			
Remanent variables	Max. 512 kB [5]			Max. 1 MB [5]
Shortest task class cycle time	400 µs		200 µs	100 µs
Typical instruction cycle time	0.0044 µs		0.0028 µs	0.0015 µs
Data buffering				
Battery monitoring	Yes			
Lithium battery	During operation: 4 years PLC switched off: Min. 2 years at 23°C ambient temperature			
Standard memory				
RAM	512 MB LPDDR4 SDRAM			1 GB LPDDR4 SDRAM
User RAM	1 MB SRAM [6]			
Application memory				
Type	1 GB eMMC flash memory			2 GB eMMC flash memory
Data retention	10 years			
Writable data amount				
Guaranteed	40 TB			
Results for 5 years	21.9 GB/day			
Guaranteed erase/write cycles	20,000			
Error-correcting code (ECC)	Yes			
Interfaces				
Interface IF1				
Signal	RS232			
Variant	Connection via 12-pin terminal block X20TB12			
Max. distance	900 m			
Transfer rate	Max. 115.2 kbit/s			
Interface IF2				
Signal	Ethernet			
Variant	1x RJ45 shielded			
Line length	Max. 100 m between 2 stations (segment length)			
Transfer rate	10/100/1000 Mbit/s			
Transfer				
Physical layer	10BASE-T/100BASE-TX/1000BASE-T			
Half-duplex	Yes			
Full-duplex	Yes			
Autonegotiation	Yes			
Auto-MDI/MDIX	Yes			
Interface IF3				
Fieldbus	POWERLINK (V2) managing or controlled node			
Type	Type 4 [7]			
Variant	1x RJ45 shielded			
Line length	Max. 100 m between 2 stations (segment length)			
Transfer rate	100 Mbit/s			
Transfer				
Physical layer	100BASE-TX			
Half-duplex	Yes			
Full-duplex	POWERLINK mode: No / Ethernet mode: Yes			
Autonegotiation	Yes			
Auto-MDI/MDIX	Yes			
Interface IF4				
Type	USB 1.1/2.0			
Variant	Type A			
Max. output current	0.5 A			
Interface IF5				
Type	USB 1.1/2.0			
Variant	Type A			
Max. output current	0.5 A			

Table 3: X20CP168x(X) - Technical data

Order number	X20CP1684	X20cCP1684	X20CP1685	X20CP1686X
Interface IF6				
Fieldbus		X2X Link master		X2X Link / X2X+ master
Electrical properties				
Electrical isolation	Ethernet (IF2), POWERLINK (IF3) and X2X (IF6) isolated from each other, from other interfaces and from PLC			
Operating conditions				
Mounting orientation				
Horizontal		Yes		
Vertical		Yes		
Installation elevation above sea level				
0 to 2000 m		No limitation		
>2000 m		Reduction of ambient temperature by 0.5°C per 100 m		
Degree of protection per EN 60529		IP20		
Ambient conditions				
Temperature				
Operation				
Horizontal mounting orientation		-25 to 60°C		
Vertical mounting orientation		-25 to 50°C		
Derating		See section "Derating".		
Storage		-40 to 70°C		
Transport		-40 to 70°C		
Relative humidity				
Operation	5 to 95%, non-condensing	Up to 100%, condensing	5 to 95%, non-condensing	
Storage		5 to 95%, non-condensing		
Transport		5 to 95%, non-condensing		
Mechanical properties				
Note		Order application memory (CompactFlash) separately Backup battery included in delivery X20 end cover plate (right) included in delivery 12-pin X20 terminal block included in delivery Interface module slot covers included in delivery		
Dimensions				
Width		150 mm		
Height		99 mm		
Depth		85 mm		
Weight		480 g [8)]		

Table 3: X20CP168x(X) - Technical data

1) For details about *storage health data*, see Automation Help.
2) The specified values are maximum values. For examples of the exact calculation, see section "Mechanical and electrical configuration" in the X20 system user's manual.
3) When operated at temperatures above 55°C, a derating of the nominal output power to 5 W for the X2X Link power supply must be taken into account.
4) In parallel operation, it is only permitted to expect 75% of the nominal power. It is important to ensure that all power supply units operated in parallel are switched on and off simultaneously.
5) The memory size for remanent variables is configurable in Automation Studio.
6) 1 MB SRAM minus the configured remanent variables.
7) For additional information, see section "Communication / POWERLINK / General information / Hardware - IF/LS" in Automation Help.
8) The PLC was weighed with the battery and terminal block X20TB12. The CompactFlash card, interface module slot cover and X20 end cover plate (right) were not included in the weighing.

2.2 X20CP368x(X) - Technical data

Order number	X20CP3684	X20CP3685	X20CP3686X	X20CP3687X	X20cCP3687X
Short description					
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V2), 2x USB, 1x X2X Link		1x RS232, 1x Ethernet, 1x POWERLINK (V2), 2x USB, 1x X2X Link/X2X+		
System module	Controller				
General information					
B&R ID code	0xF9ED	0xF9EE	0xF9F9	0xF9FA	0x2F43
Cooling	Fanless				
Status indicators	CPU function, Ethernet, POWERLINK, CompactFlash, battery				
Diagnostics					
Battery	Yes, using LED status indicator and software				
CPU function	Yes, using LED status indicator				
CompactFlash	Yes, using LED status indicator				
Ethernet	Yes, using LED status indicator				
POWERLINK	Yes, using LED status indicator				
Temperature	Yes, using software register				
Support					
Controller redundancy	Yes				
Storage health data support [1]	Yes				
ACOPOS support	Yes				
Visual Components support	Yes				
Power consumption without interface module and USB	6.9 W		7.5 W	8 W	
Power consumption for X2X Link power supply [2]	1.42 W				
Power consumption [2]					
Internal I/O	0.6 W				
Additional power dissipation caused by actuators (resistive) [W]	-				
Certifications					
CE	Yes				
UKCA	Yes				
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X				
UL	cULus E115267 Industrial control equipment				
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5				
DNV	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)				
CPU and X2X Link power supply					
Input voltage	24 VDC -20% / +25% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 36 W)				
Input current	Max. 1.5 A at 24 VDC				
Fuse	Integrated, cannot be replaced				
Reverse polarity protection	Yes				
X2X Link power supply output					
Nominal output power	7 W [3]				
Parallel connection	Yes [4]				
Redundant operation	Yes				
Input I/O power supply					
Input voltage	24 VDC -15% / +20% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 240 W)				
Fuse	Required line fuse: Max. 10 A slow-blow				
Output I/O power supply					
Nominal output voltage	24 VDC				
Permissible contact load	10 A				
Power supply - General information					
Status indicators	Overload, operating status, module status, RS232 data transfer				
Diagnostics					
RS232 data transfer	Yes, using LED status indicator				
Module run/error	Yes, using LED status indicator and software				
Overload	Yes, using LED status indicator and software				
Electrical isolation					
I/O supply - I/O power supply	No				
CPU/X2X Link supply - CPU/X2X Link power supply	Yes				

Table 4: X20CP368x(X) - Technical data

Order number	X20CP3684	X20CP3685	X20CP3686X	X20CP3687X	X20cCP3687X
Controller					
CompactFlash slot	1				
Real-time clock	Nonvolatile, resolution 1 s, -20 to 20 ppm accuracy at 25°C				
FPU	Yes				
Processor					
Type	Atom E3915		Atom E3930	Atom E3940	
Clock frequency	400 MHz (compatible).	800 MHz	1.3 GHz	1.6 GHz	
L1 cache					
Data code	24 kB				
Program code	32 kB				
L2 cache	1 MB				
Integrated I/O processor	Processes I/O data points in the background				
Modular interface slots	3				
Remanent variables	Max. 512 kB [5]		Max. 1 MB [5]		
Shortest task class cycle time	400 µs	200 µs	100 µs		
Typical instruction cycle time	0.0044 µs	0.0028 µs	0.0015 µs	0.0010 µs	
Data buffering					
Battery monitoring	Yes				
Lithium battery	During operation: 4 years PLC switched off: Min. 2 years at 23°C ambient temperature				
Standard memory					
RAM	512 MB LPDDR4 SDRAM		1 GB LPDDR4 SDRAM	2 GB LPDDR4 SDRAM	
User RAM	1 MB SRAM [6]				
Application memory					
Type	1 GB eMMC flash memory		2 GB eMMC flash memory		
Data retention	10 years				
Writable data amount					
Guaranteed	40 TB				
Results for 5 years	21.9 GB/day				
Guaranteed erase/write cycles	20,000				
Error-correcting code (ECC)	Yes				
Interfaces					
Interface IF1					
Signal	RS232				
Variant	Connection via 12-pin terminal block X20TB12				
Max. distance	900 m				
Transfer rate	Max. 115.2 kbit/s				
Interface IF2					
Signal	Ethernet				
Variant	1x RJ45 shielded				
Line length	Max. 100 m between 2 stations (segment length)				
Transfer rate	10/100/1000 Mbit/s				
Transfer					
Physical layer	10BASE-T/100BASE-TX/1000BASE-T				
Half-duplex	Yes				
Full-duplex	Yes				
Autonegotiation	Yes				
Auto-MDI/MDIX	Yes				
Interface IF3					
Fieldbus	POWERLINK (V2) managing or controlled node				
Type	Type 4 [7]				
Variant	1x RJ45 shielded				
Line length	Max. 100 m between 2 stations (segment length)				
Transfer rate	100 Mbit/s				
Transfer					
Physical layer	100BASE-TX				
Half-duplex	Yes				
Full-duplex	POWERLINK mode: No / Ethernet mode: Yes				
Autonegotiation	Yes				
Auto-MDI/MDIX	Yes				
Interface IF4					
Type	USB 1.1/2.0				
Variant	Type A				
Max. output current	0.5 A				
Interface IF5					
Type	USB 1.1/2.0				
Variant	Type A				
Max. output current	0.5 A				
Interface IF6					
Fieldbus	X2X Link master		X2X Link / X2X+ master		

Table 4: X20CP368x(X) - Technical data

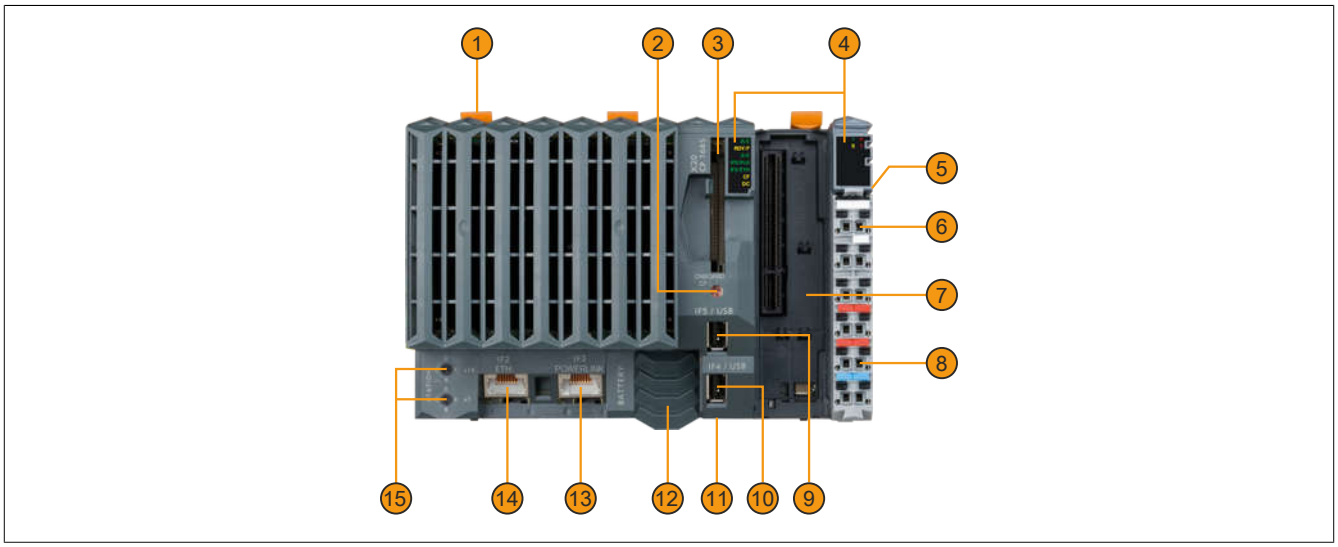
Order number	X20CP3684	X20CP3685	X20CP3686X	X20CP3687X	X20cCP3687X
Electrical properties					
Electrical isolation	Ethernet (IF2), POWERLINK (IF3) and X2X (IF6) isolated from each other, from other interfaces and from PLC				
Operating conditions					
Mounting orientation					
Horizontal	Yes				
Vertical	Yes				
Installation elevation above sea level					
0 to 2000 m	No limitation				
>2000 m	Reduction of ambient temperature by 0.5°C per 100 m				
Degree of protection per EN 60529	IP20				
Ambient conditions					
Temperature					
Operation					
Horizontal mounting orientation	-25 to 60°C				
Vertical mounting orientation	-25 to 50°C				
Derating	See section "Derating".				
Storage	-40 to 70°C				
Transport	-40 to 70°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 application memory (CompactFlash) separately Backup battery included in delivery X20 end cover plate (right) included in delivery 12-pin X20 terminal block included in delivery Interface module slot covers included in delivery				
Dimensions					
Width	200 mm				
Height	99 mm				
Depth	85 mm				
Weight	530 g [8]				

Table 4: X20CP368x(X) - Technical data

1) For details about *storage health data*, see Automation Help.
2) The specified values are maximum values. For examples of the exact calculation, see section "Mechanical and electrical configuration" in the X20 system user's manual.
3) When operated at temperatures above 55°C, a derating of the nominal output power to 5 W for the X2X Link power supply must be taken into account.
4) In parallel operation, it is only permitted to expect 75% of the nominal power. It is important to ensure that all power supply units operated in parallel are switched on and off simultaneously.
5) The memory size for remanent variables is configurable in Automation Studio.
6) 1 MB SRAM minus the configured remanent variables.
7) For additional information, see section "Communication / POWERLINK / General information / Hardware - IF/LS" in Automation Help.
8) The PLC was weighed with the battery and terminal block X20TB12. The CompactFlash card, interface module slot covers and X20 end cover plate (right) were not included in the weighing.

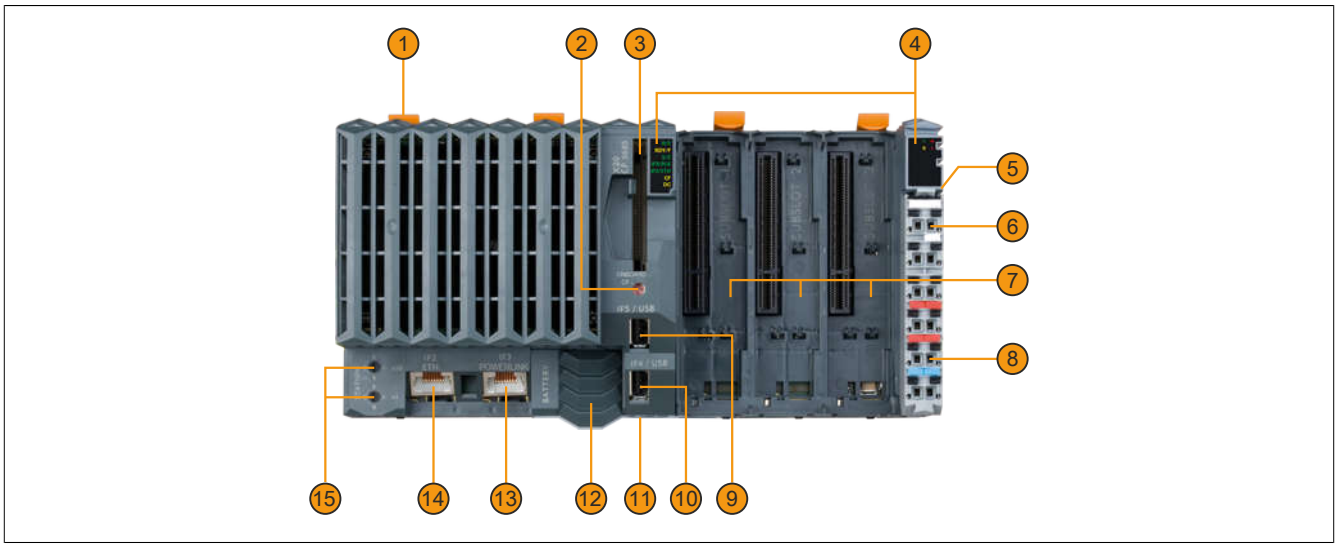
2.3 Operating and connection elements

X20CP168x(X)



1	Top-hat rail latch	2	Selecting application memory
3	Slot for CompactFlash	4	LED status indicators
5	IF6 - X2X Link	6	IF1 - RS232
7	Slot for interface modules	8	Terminal block for controller and I/O supply, RS232 connection
9	IF5 - USB	10	IF4 - USB
11	Reset button	12	Battery compartment
13	IF3 - POWERLINK	14	IF2 - Ethernet
15	Ethernet station address	-	-

X20CP368x(X)



1	Top-hat rail latch	2	Selecting application memory
3	Slot for CompactFlash	4	LED status indicators
5	IF6 - X2X Link	6	IF1 - RS232
7	Slots for interface modules	8	Terminal block for controller and I/O supply, RS232 connection
9	IF5 - USB	10	IF4 - USB
11	Reset button	12	Battery compartment
13	IF3 - POWERLINK	14	IF2 - Ethernet
15	Ethernet station address	-	-

2.3.1 LED status indicators

2.3.1.1 X20 controller - LED status indicators

Figure	LED	Color	Status	Description
	R/E	Green	On	Application running
			Blinking	System startup: The controller is initializing the application, all bus systems and I/O modules.[1)]
			Double flash	System startup during firmware update[1)]
		Red	On	Mode SERVICE[2)] or BOOT[2)]
			Blinking	If LED "R/E" blinks red and LED "RDY/F" blinks yellow, a license violation has occurred.
			Double flash	System startup: Installation error[3)]
	RDY/F	Yellow	On	Mode SERVICE[2)] or BOOT[2)]
			Blinking	If LED "RDY/F" blinks yellow and LED "R/E" blinks red, a license violation has occurred.
	S/E	Green/Red		Status/Error LED. LED states are described in section "LED "S/E" (status/error LED)" on page 12.
	IF3/PLK	Green	On	The link to the POWERLINK remote station is established.
			Blinking	The link to the POWERLINK remote station is established. The LED blinks if Ethernet activity is taking place on the bus.
	IF2/ETH	Green	On	The link to the Ethernet remote station is established.
			Blinking	The link to the Ethernet remote station is established. The LED blinks if Ethernet activity is taking place on the bus.
	CF	Green	On	CompactFlash inserted and detected
		Yellow	On	CompactFlash read/write access
	DC	Yellow	On	Controller power supply unit OK
		Red	On	Backup battery empty

1) This procedure can take several minutes depending on the configuration.
2) The operating states are described in "Real-time operating system - Method of operation - Operating states" in Automation Help.
3) AR 4.93 and later: The project installation (initial installation or update) via USB flash drive was aborted with an error.

2.3.1.1.1 LED "S/E" (status/error LED)

This LED is a green/red dual LED and indicates the state of the POWERLINK interface. The LED states have a different meaning depending on the operating mode of the POWERLINK interface.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

LED "S/E"		
Green	Red	Description
On	Off	The interface is operated as an Ethernet interface.

Table: LED "S/E": Interface in Ethernet mode

POWERLINK V2 mode

Error message

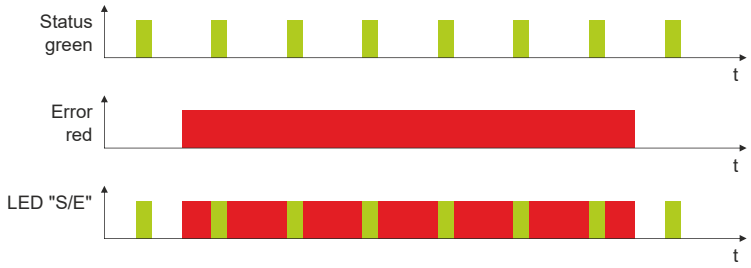
LED "S/E"		
Green	Red	Description
Off	On	The interface is in error mode (failed Ethernet frames, increased number of collisions on the network, etc.). Note: Several red blinking signals are displayed immediately after the device is switched on. These are not errors, however.
Blinking	On	If an error occurs in the following modes, then the green LED blinks over the red LED: • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE 

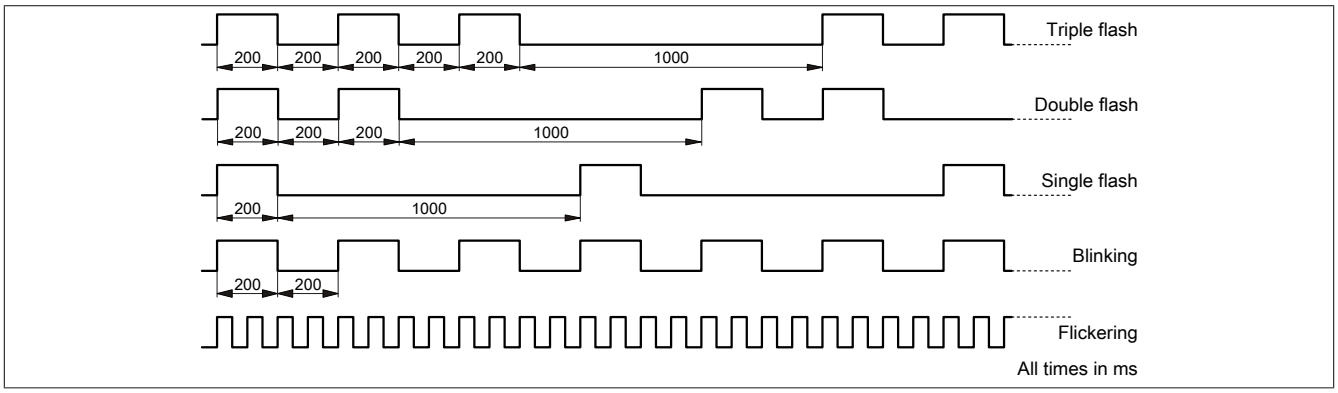
Table: LED "S/E" - Error message (interface in POWERLINK mode)

Interface status

LED "S/E"		
Green	**Red**	**Description**
Off	Off	**Mode:** NOT_ACTIVE The interface is either in mode NOT_ACTIVE or one of the following modes or errors is present: • The device is switched off. • The device is in the startup phase. • The interface or device is not configured correctly in Automation Studio. • The interface or device is defective. **Managing node (MN)** The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1. If POWERLINK communication is detected before the time has elapsed, however, the MN is not started. **Controlled node (CN)** The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode BASIC_ETHERNET. If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1.
Flickering (approx. 10 Hz)	Off	**Mode:** BASIC_ETHERNET The interface is in mode BASIC_ETHERNET. The interface is operated in Ethernet mode. **Managing node (MN)** This mode can only be exited by resetting the controller. **Controlled node (CN)** If POWERLINK communication is detected during this mode, the interface enters mode PRE_OPERATIONAL_1.
Single flash (approx. 1 Hz)	Off	**Mode:** PRE_OPERATIONAL_1 The interface is in mode PRE_OPERATIONAL_1. **Managing node (MN)** The MN is in "reduced cycle" mode. The CNs are configured in this mode. Cyclic communication is not yet taking place. **Controlled node (CN)** The CN can be configured by the MN in this mode. The CN waits until it receives an SoC frame and then switches to mode PRE_OPERATIONAL_2.
	On	**Controlled node (CN)** If the red LED lights up in this mode, this means that the MN has failed.
Double flash (approx. 1 Hz)	Off	**Mode:** PRE_OPERATIONAL_2 The interface is in mode PRE_OPERATIONAL_2. **Managing node (MN)** The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this mode. **Controlled node (CN)** The CN can be configured by the MN in this mode. A command then switches the mode to READY_TO_OPERATE.
	On	**Controlled node (CN)** If the red LED lights up in this mode, this means that the MN has failed.
Triple flash (approx. 1 Hz)	Off	**Mode:** READY_TO_OPERATE The interface is in mode READY_TO_OPERATE. **Managing node (MN)** Cyclic and asynchronous communication. Received PDO data is ignored. **Controlled node (CN)** The configuration of the CN is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated.
	On	**Controlled node (CN)** If the red LED lights up in this mode, this means that the MN has failed.
On	Off	**Mode:** OPERATIONAL The interface is in mode OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz)	Off	**Mode:** STOPPED The interface is in mode STOPPED. **Managing node (MN)** This mode does not occur for the MN. **Controlled node (CN)** Output data is not being output, and no input data is being provided. This mode can only be reached and exited by a corresponding command from the MN.

Table: LED "S/E" - Interface state (interface in POWERLINK mode)

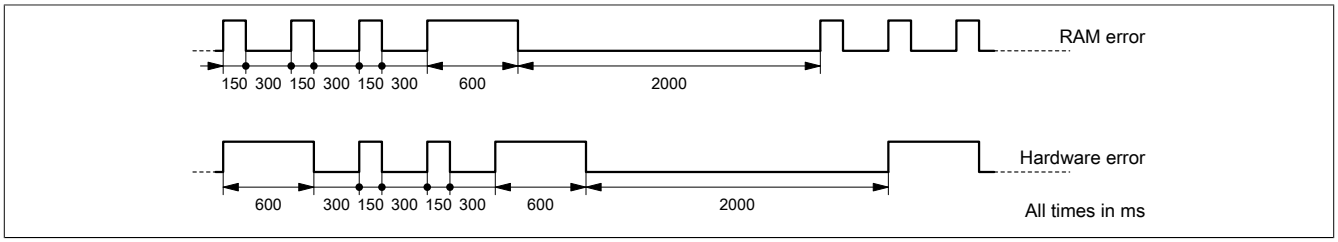
Blink times



2.3.1.1.2 System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by LED "S/E" blinking red. The blinking signal of the error code consists of 4 switch-on phases with short (150 ms) or long (600 ms) duration. The error code is repeated every 2 seconds.



Error	Error description
RAM error	The device is defective and must be replaced.
Hardware error	The device or a system component is defective and must be replaced.

2.3.1.2 LED status indicators for the integrated power supply unit

For a description of the various operating modes, see section "Additional information - Diagnostic LEDs" in the X20 System user's manual.

Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	Mode RESET
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			Double flash	The LED indicates one of the following states: • The X2X Link power supply of the power supply unit is overloaded. • I/O power supply too low • The input voltage for the X2X Link power supply is too low.
	e + r	Solid red / Single green flash		Invalid firmware
	S	Yellow	Off	No RS232 activity
			On	The LED lights up when data is being transmitted or received via the RS232 interface.
	I	Red	Off	The X2X Link power supply is within the valid range.
			On	The X2X Link power supply of the power supply unit is overloaded.

2.3.2 Application memory

In order for the application project to be processed on the controller, Automation Runtime (operating system), the system components and application project must be installed on application memory. Either an integrated flash drive or removable CompactFlash card can be selected as the application memory.

2.3.2.1 Flash drive

This application memory is implemented as an integrated flash drive.

2.3.2.2 Removable CompactFlash card

The CompactFlash card is not included in delivery with the controllers; it must be ordered separately as an accessory!

Information:

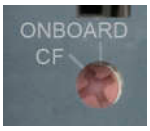
Removing the CompactFlash card during operation is not permitted.

2.3.2.3 Project installation

Project installation is described in "Project management - Project installation" in Automation Help.

2.3.2.4 Selecting application memory

The application memory is selected via a switch on the controller front.

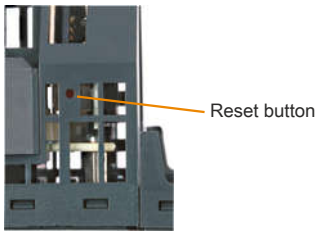


Application memory	Description
ONBOARD	The flash drive integrated in the controller is used as the application memory.
CF	The connected CompactFlash card is used as the application memory.

Information:

A switch position other than those described here is not permitted!

2.3.3 Button for reset and operating mode



The reset button is located below the USB interfaces on the bottom of the housing. It can be pressed with any small pointed object (e.g. paper clip).

2.3.3.1 Reset

The button must be pressed for less than 2 seconds to trigger a reset. This triggers a hardware reset on the controller, which means that:

- All application programs are stopped.
- All outputs are set to zero.

The controller then boots into service mode by default. The startup mode after pressing the reset button can be set in Automation Studio:

- Service mode (default)
- Warm restart
- Cold restart
- Diagnostic mode

2.3.3.2 Operating mode

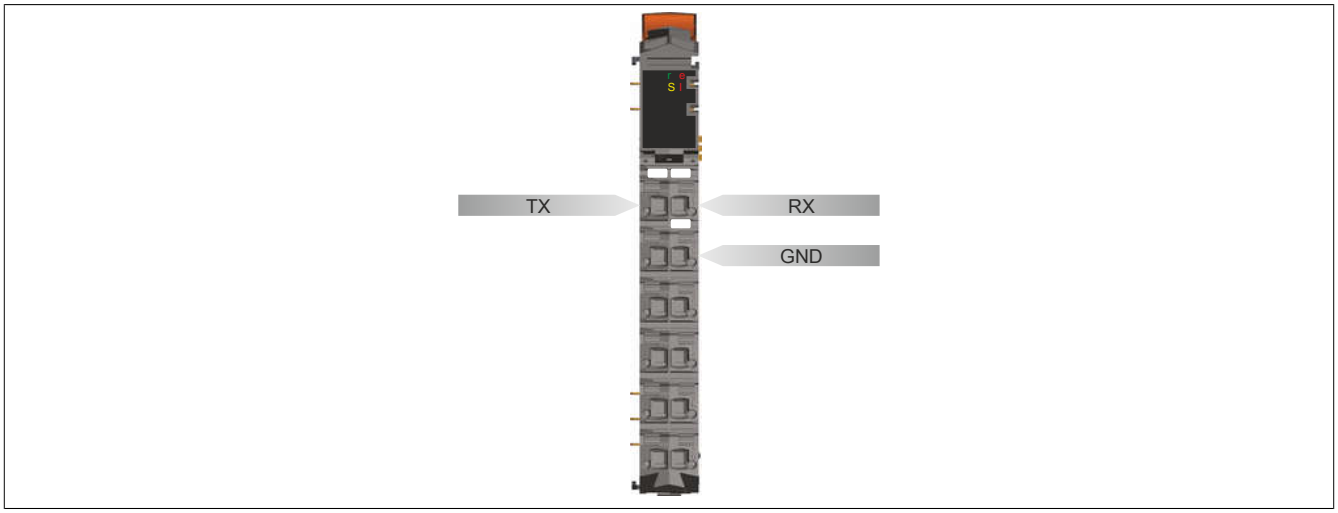
3 operating modes can be set using different button sequences:

Operating mode	Button sequence	Description
BOOT[1)]	Boot mode is enabled by the following button sequence: • Press the button for less than 2 s. • Then press the button within 2 s for longer than 2 s.	Boot AR is started, and the runtime system can be installed via the online interface (Automation Studio). User flash memory is erased only when the download begins.
SERVICE/RUN[1)]	Press the button for less than 2 s.	Mode SERVICE/RUN: Triggering and startup behavior correspond to triggering a hardware reset (see "Reset" on page 16).
DIAGNOSE[1)]	Press the button for more than 2 s.	The controller is starting up in diagnostic mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostic mode, the controller always boots with a warm restart.

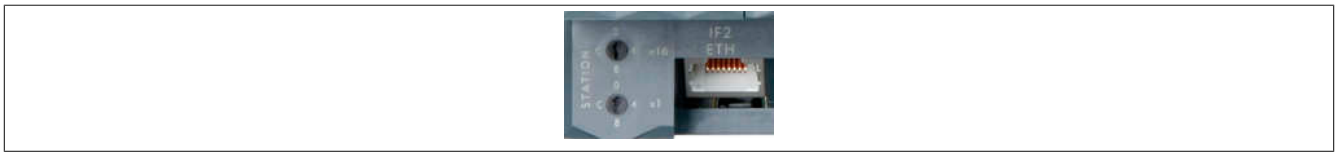
1) The operating states are described in "Real-time operating system - Method of operation - Operating states" in Automation Help.

2.3.4 RS232 interface (IF1)

The non-electrically isolated RS232 interface is designed as an online interface for communication with the programming device.



2.3.5 Ethernet interface (IF2)



IF2 is designed as a 10BASE-T/100BASE-TX/1000BASE-T gigabit-capable Ethernet interface.

The INA2000 station number of the Ethernet interface is set using the two hex switches.

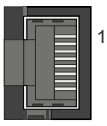
For information about wiring X20 modules with an Ethernet interface, see section "Mechanical and electrical configuration - Wiring guidelines for X20 modules with Ethernet cables" in the X20 user's manual.

Information:

The Ethernet interface is not suitable for POWERLINK.

When using the POWERLINK interface, the Ethernet interface is not permitted to be operated with an IP address from the POWERLINK address range.
POWERLINK address range: 192.168.100.x

Pinout

Interface	Pinout		
	Pin	Ethernet	
 1 Shielded RJ45 port	1	D1+	Data 1+
	2	D1-	Data 1-
	3	D2+	Data 2+
	4	D3+	Data 3+
	5	D3-	Data 3-
	6	D2-	Data 2-
	7	D4+	Data 4+
	8	D4-	Data 4-

2.3.6 POWERLINK interface (IF3)

The controller are equipped with a POWERLINK V2 interface.

POWERLINK

Setting in Automation Studio

By default, the POWERLINK interface is operated as a managing node (MN). In the managing node, the node number is set to a fixed value of 240.

If the POWERLINK node is operated as a controlled node (CN), a node number from 1 to 239 can be set in the POWERLINK configuration in Automation Studio.

Setting with hex switches

The POWERLINK node number can also be set with the two onboard hex switches. These are normally used to set the INA2000 station number of the Ethernet interface. Switching takes place in the POWERLINK configuration in Automation Studio.

Node numbers from 0x01 to 0xF0 are permitted.

Switch position	Description
0x00	Reserved, switch position not permitted.
0x01 - 0xEF	Node number of the POWERLINK node. Operation as a controlled node (CN).
0xF0	Operation as a managing node (MN).
0xF1 - 0xFF	Reserved, switch position not permitted.

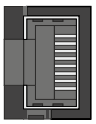
Ethernet mode

In this mode, the interface is operated as an Ethernet interface. The INA2000 station number is set using the Automation Studio software.

Pinout



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

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

2.3.7 USB interfaces (IF4 and IF5)



IF4 and IF5 are non-galvanically isolated USB interfaces. The abbreviation USB stands for "Universal Serial Bus". Both USB interfaces support the USB 1.1 and 2.0 standards.

Information:

USB peripheral devices can be connected to the USB interfaces. Automation Runtime supports a selection of USB peripheral devices. For the supported USB classes, see the AR help documentation.

Information:

The following must be taken into account when using a USB peripheral device and grounded controller power supply (PELV):

- **Only USB peripheral devices with no connection between GND and ground are permitted to be connected. This is the case, e.g. with the USB dongle from B&R.**

2.3.8 Slots for interface modules

The controllers are equipped with 1 or 3 slots for interface modules.

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

2.3.9 Battery

X20 controllers are equipped with a lithium battery. The lithium battery is located in a separate compartment and protected by a cover.

Backup battery data

Order number 4A0006.00-000 0AC201.91	 1 pcs. 4 pcs.
Short description	Lithium battery, 3 V / 950 mAh, button cell
Storage temperature	-40 to 85°C
Storage time	Max. 3 years at 30°C
Relative humidity	0 to 95% (non-condensing)

The following areas are buffered:

- Remanent variables
- User RAM
- System RAM
- Real-time clock

Battery monitoring

The battery voltage is checked cyclically. The cyclic load test of the battery does not considerably shorten its service life; instead, it gives an early warning of weakened buffer capacity.

Status information "Battery OK" is available from system library function "BatteryInfo" and the controller's I/O mapping.

Replacement interval for battery

The battery should be replaced every 4 years. The replacement intervals recommended by B&R reflect the batteries' average service life and operating conditions. They do not correspond to the maximum buffer duration!

Important information about the battery exchange

The product design allows the battery to be changed when the controller is in a voltage-free state as well as when the controller is switched on. In some countries, however, changing is not permitted while operating voltage is applied. To prevent data loss, the battery must be changed within 1 min in a voltage-free state.

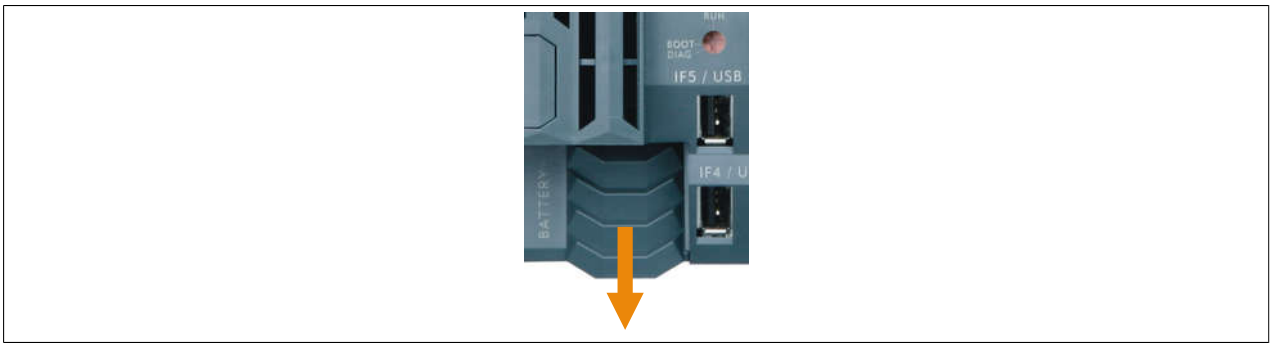
Warning!

The battery is only permitted to be replaced by a Renata CR2477N battery. The use of another battery may present a fire or explosion hazard.

The battery can explode if handled improperly. Do not recharge, disassemble or dispose of the battery in fire.

Procedure for replacing the battery

1. Perform electrostatic discharge at the top-hat rail or at the ground connection (do not reach into the power supply unit!)
2. Remove the cover for the lithium battery. Do this by sliding it down and away from the controller.



3. Push the empty battery out of the holder.
4. It is important to ensure that the new battery is not handled with moist or greasy fingers. Plastic tweezers can also be used. Do not touch the battery with pliers or metal tweezers → short circuit!
5. To insert the battery into the holder, place it with the "+" side up on the right part of the battery holder. Then press the battery into the battery holder.
6. Replace the cover.

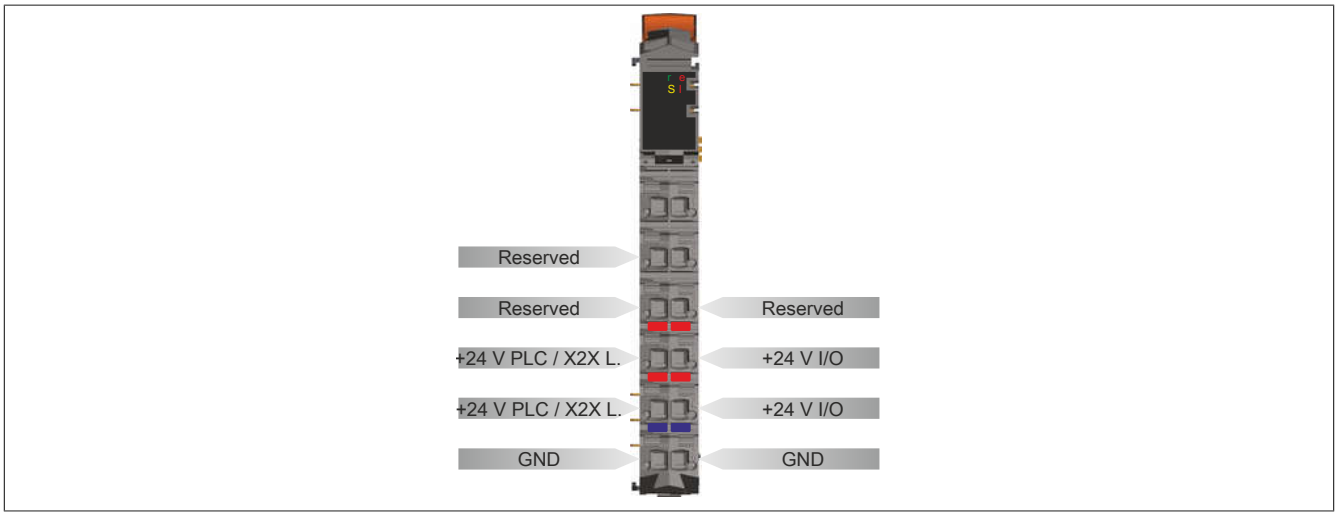
Information:

Lithium batteries are hazardous waste! Used batteries should be disposed of in accordance with applicable local regulations.

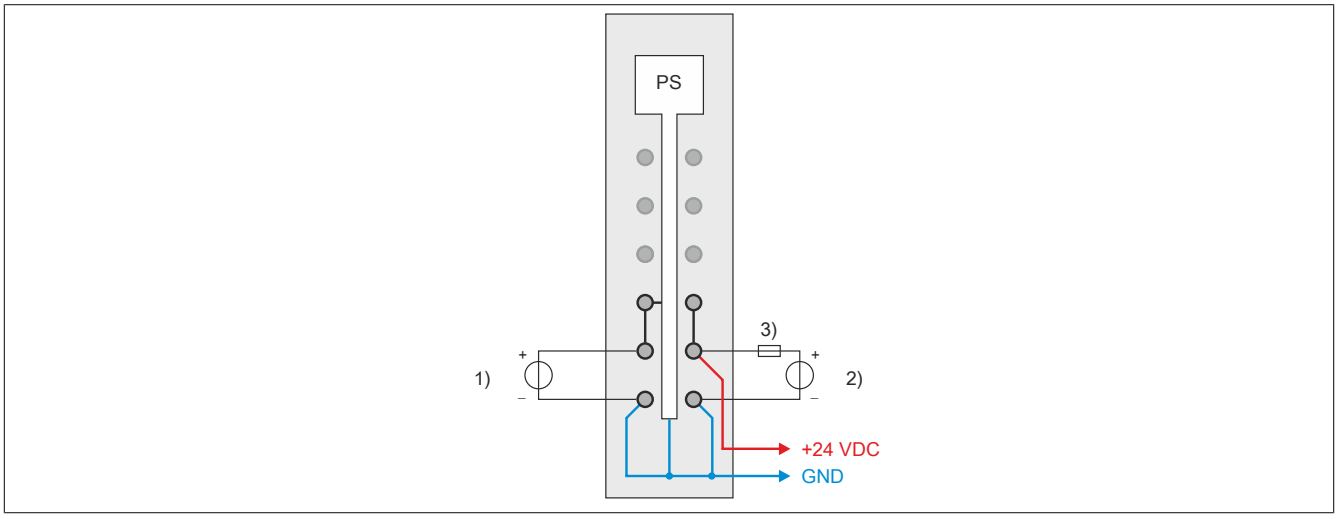
2.4 Controller power supply

A power supply unit is integrated in the X20 controllers. It is equipped with a supply for the controller, X2X Link and the internal I/O power supply. The bus power supply and internal I/O power supply are galvanically isolated from each other.

Integrated power supply unit - Pinout

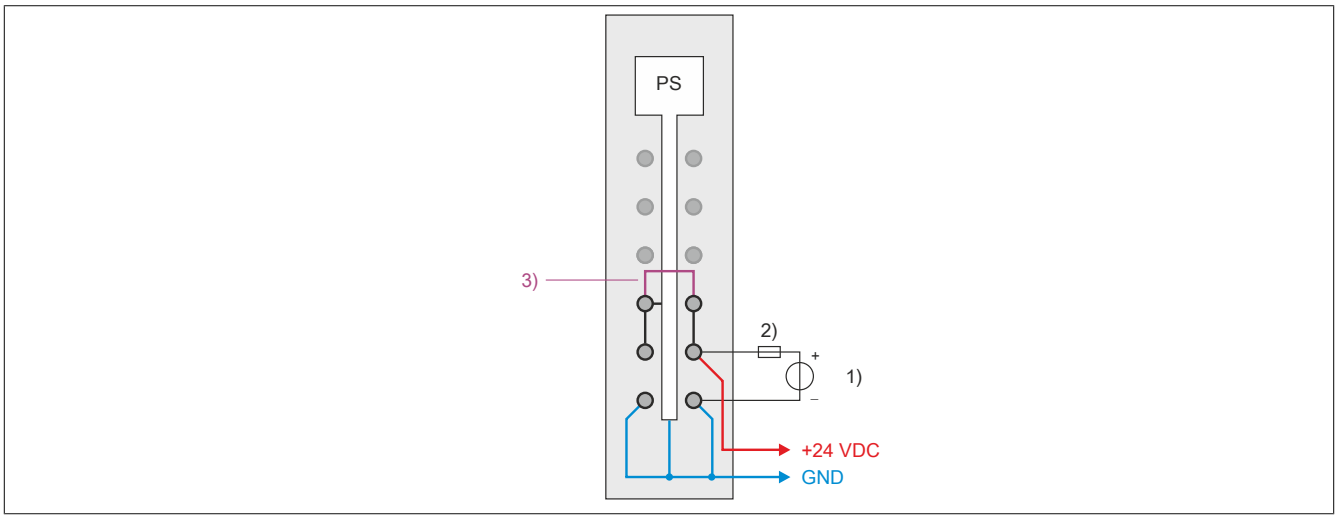


Connection example with 2 separate power supplies



1) Supply for the PLC or X2X Link power supply
2) Supply for the I/O power supply
3) Fuse, 10 A slow-blow

Connection example with power supply and jumper



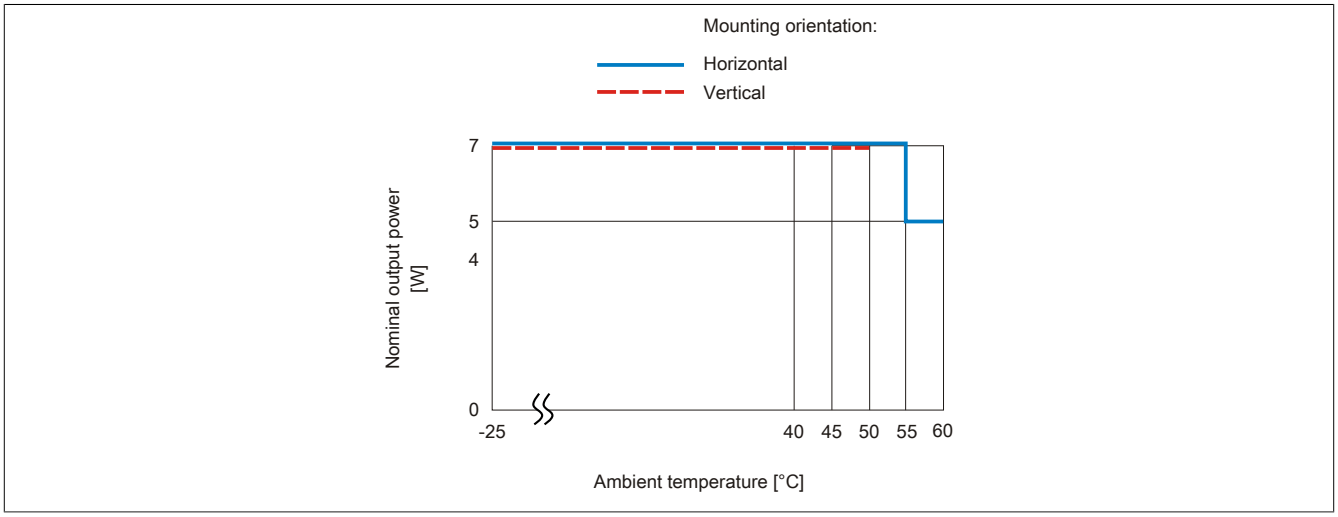
1) Supply for the I/O power supply
2) Fuse, 10 A slow-blow
3) Jumper

2.5 Derating

Information:

Operation in hazardous environment (HazLoc and ATEX) with an ambient temperature of more than 45°C is not allowed for vertical mounting!

There is no derating when operated below 55°C. Above 55°C, the nominal output power for the X2X Link power supply must be reduced to 5 W.



2.6 Overtemperature shutdown

To prevent damage, a shutdown – reset state – of the controller takes place at 110°C processor temperature or 95°C board temperature.

The following errors are entered in the logbook in the event of shutdown:

Error number	Short error text
9204	PLC restart triggered by the PLC CPU's temperature monitoring.
9210	Warning: Halt/Service after watchdog or manual reset.

2.7 System requirements

The following system requirements must be taken into account depending on whether X2X+ is used:

X2X+	System requirements
No	The following minimum versions are recommended to generally be able to use all functions: • Automation Studio 4.7 • Automation Runtime A4.73
Yes	The following minimum versions are required to use X2X+ on the X20CPx686X and X20CP3687X variants: • Automation Studio 4.11 • Automation Runtime 4.92

2.8 Information about migrating from the X20CPx58x to X20CPx68x(X)

The minimum hardware upgrade versions listed in the table are required to operate the following modules with X20CPx68x(X) controllers. The upgrade can be installed from Automation Studio by selecting **Tools / Upgrades** from the menu.

Order number	Minimum hardware upgrade version
X20IF10X0	1.2.2.0
X20SLXyyy	1.10.10.4

3 General data points

This controller is equipped with general data points. These are not controller-specific; instead, they contain general information such as system time and heat sink temperature.

General data points are described in section "Additional information - General controller data points" in the X20 system user's manual.

4 UL Information

English

CAUTION!

- **The external circuits intended to be connected to this device shall be separated from MAINS supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV (Class III) circuit of UL/CSA 61010-1, UL/CSA 61010-2-201.**
- **The module has to be built-in the final safety enclosure, which have adequate rigidity and meets the requirements with respect to spread of fire.**
- **Minimum temperature rating of the cables to be connected to the field wiring terminals: 80°C, AWG (Sol. / Str.) 28-16 / 28-16 (X2X / CPU) and AWG (Sol. / Str.) 26-12 / 26-12 (I/O). Use Copper Conductors Only.**

Information:

- **If the equipment is used in a not specified manner, the protection provided by the equipment may be impaired.**
- **For all Ethernet connections, only connections within a building are permitted, taking into account maximum lengths.**

French

Attention!

- **Les circuits externes destinés à être connectés à cet appareil doivent être séparés de l'alimentation SECTEUR ou des tensions dangereuses par une isolation renforcée ou double et satisfaire les exigences relatives aux circuits TBTS/TBTS (Classe III) spécifiées dans UL/CSA 61010-1, UL/CSA 61010-2-201.**
- **Le module doit être incorporé dans le boîtier de sécurité final. Ce dernier présente une rigidité adéquate et satisfait les exigences en matière de propagation du feu.**
- **Température minimale nominale des câbles à connecter aux bornes de câblage sur place : 80°C, AWG (Sol. / Str.) 28-16 / 28-16 (X2X / CPU) et AWG (Sol. / Str.) 26-12 / 26-12 (I/O). Utiliser des conducteurs en cuivre uniquement.**

Information:

- **Si l'équipement est utilisé d'une manière non spécifiée, la protection fournie par l'équipement peut être compromise.**
- **Pour toutes les connexions Ethernet, seules les connexions à l'intérieur d'un bâtiment sont autorisées, en tenant compte des longueurs maximales.**