X20(c)CP158x and X20(c)CP358x

1 General information

Based on Intel ATOM processor technology, X20 CPUs cover a wide spectrum of requirements. They can be implemented in solutions ranging from standard applications to those requiring the high levels of performance.

The series starts with Intel ATOM processor 333 MHz compatible models – X20CP1583 and X20CP3583. With an optimum price/performance ratio, it has the same basic features as all of the larger CPUs.

The basic model includes USB, Ethernet, POWERLINK V1/V2 and replaceable CompactFlash card. The standard Ethernet interface is capable of handling communication in the gigabit range. 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 1600/1000/600 Performance with integrated I/O processor
- Entry-level CPU is Intel ATOM 333 MHz-compatible with integrated I/O processor
- Onboard Ethernet, POWERLINK V1/V2 with poll response chaining and USB
- 1 or 3 slots for modular interface expansion
- CompactFlash as removable application memory
- Up to 512 MB DDR2-SRAM according to performance requirements
- CPU redundancy possible
- Fanless

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

3 Order data - X20CP158x

Model number	Short description
	X20 CPUs
X20CP1583	X20 CPU, Atom 333 MHz Intel compatible, 128 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20CP1584	X20 CPU, Atom 0.6 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20cCP1584	X20 CPU, coated, Atom 0.6 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20CP1585	X20 CPU, Atom 1.0 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20CP1586	X20 CPU, Atom 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20cCP1586	X20 CPU, coated, Atom 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
	Required accessories
	CompactFlash cards
0CFCRD.0512E.01	CompactFlash 512 MB extended temp.
0CFCRD.2048E.01	CompactFlash 2048 MB extended temp.
5CFCRD.016G-06	CompactFlash 16 GB B&R (SLC)
5CFCRD.032G-06	CompactFlash 32 GB B&R (SLC)
5CFCRD.0512-06	CompactFlash 512 MB B&R (SLC)
5CFCRD.1024-06	CompactFlash 1 GB B&R (SLC)
5CFCRD.2048-06	CompactFlash 2 GB B&R (SLC)
5CFCRD.4096-06	CompactFlash 4 GB B&R (SLC)
5CFCRD.8192-06	CompactFlash 8 GB B&R (SLC)
	Optional accessories
	Batteries
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell

Table 1: X20CP1583, X20CP1584, X20cCP1584, X20CP1585, X20CP1586, X20cCP1586 - Order data

Included in delivery

Model number	Short description
4A0006.00-000	Backup battery (see also "Battery" on page 17)
-	Interface module slot covers
X20AC0SR1	X20 end cover plate, right
X20TB12	X20 terminal block, 12-pin, 24 V coding

Table 2: X20 CPUs - Content of delivery

4 X20CP158x - Technical data

Model number	X20CP1583	X20CP1584	X20cCP1584	X20CP1585	X20CP1586	X20cCP1586
Short description						
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V1/V2), 2x USB, 1x X2X Link					
System module	CPU					
General information						
Cooling	Fanless					
B&R ID code	0xD45B	0xC370	0xE21B	0xC3AE	0xC3B0	0xE21C
Status indicators	CPU function, overtemperature, Ethernet, POWERLINK, CompactFlash, battery					
Diagnostics						
Battery	Yes, using status LED and software					
CPU function	Yes, using status LED					
CompactFlash	Yes, using status LED					
Ethernet	Yes, using status LED					
POWERLINK	Yes, using status LED					
Overtemperature	Yes, using status LED					
Controller redundancy possible	No					
ACOPOS support	Yes					
Visual Components support	Yes					
Power consumption without interface module and USB	8.2 W	8.6 W		8.8 W	9.7 W	
Power consumption of X2X Link power supply [1]	1.42 W					
Power consumption [1]						
Internal I/O	0.6 W					
Additional power dissipation caused by actuators (resistive) [W]	-					
Certifications						
CE	Yes					
KC	-	Yes	-	Yes		-
EAC	Yes					
UL	cULus E115267 Industrial control equipment					
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5					
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X					
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)					
LR	ENV1					
CPU and X2X Link power supply						
Input voltage	24 VDC -15% / +20%					
Input current	Max. 1.5 A					
Fuse	Integrated, cannot be replaced					
Reverse polarity protection	Yes					
X2X Link power supply output						
Nominal output power	7 W [2]					
Parallel connection	Yes [3]					
Redundant operation	Yes					
Input I/O power supply						
Input voltage	24 VDC -15% / +20%					
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 status LED					
Module run/error	Yes, using status LED and software					
Overload	Yes, using status LED and software					
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, 1 s resolution, -10 to 10 ppm accuracy at 25°C					
FPU	Yes					

Table 3: X20CP1583, X20CP1584, X20cCP1584, X20CP1585, X20CP1586, X20cCP1586 - Technical data

Model number	X20CP1583	X20CP1584	X20cCP1584	X20CP1585	X20CP1586	X20cCP1586
Processor						
Type		Atom E620T		Atom E640T	Atom E680T	
Clock frequency	333 MHz	0.6 GHz		1 GHz	1.6 GHz	
L1 cache						
Data code		24 kB				
Program code		32 kB				
L2 cache	-	512 kB				
Integrated I/O processor		Processes I/O data points in the background				
Modular interface slots		1				
Remanent variables	Max. 64 kB [4]	Max. 256 kB [4]			Max. 1 MB [4]	
Shortest task class cycle time	800 µs	400 µs		200 µs	100 µs	
Typical instruction cycle time	0.01 µs	0.0075 µs		0.0044 µs	0.0027 µs	
Data buffering						
Battery monitoring		Yes				
Lithium battery		Min. 2 years at 23°C ambient temperature				
Standard memory						
RAM	128 MB DDR2 SDRAM	256 MB DDR2 SDRAM			512 MB DDR2 SDRAM	
User RAM		1 MB SRAM [5]				
Interfaces						
Interface IF1						
Signal		RS232				
Variant		Connection made using 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 (V1/V2) managing or controlled node				
Type		Type 4 [6]				
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				
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 limitations				
>2000 m		Reduction of ambient temperature by 0.5°C per 100 m				
Degree of protection per EN 60529		IP20				

Table 3: X20CP1583, X20CP1584, X20cCP1584, X20CP1585, X20CP1586, X20cCP1586 - Technical data

Model number	X20CP1583	X20CP1584	X20cCP1584	X20CP1585	X20CP1586	X20cCP1586
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 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 properties						
Note	Order application memory (CompactFlash) separately Backup battery included in delivery X20 end cover plate (right) included in delivery X20 12-pin terminal block included in delivery Interface module slot covers included in delivery					
Dimensions						
Width	150 mm					
Height	99 mm					
Depth	85 mm					
Weight	400 g					

Table 3: X20CP1583, X20CP1584, X20cCP1584, X20CP1585, X20CP1586, X20cCP1586 - Technical data

1) The specified values are maximum values. For examples of the exact calculation, see section "Mechanical and electrical configuration" of the X20 system user's manual.
2) 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 consideration.
3) In parallel operation, only 75% of the rated power can be assumed. It is important to make sure that all power supplies operated in parallel are switched on and off at the same time.
4) The size of the memory used for remanent variables is adjustable in Automation Studio.
5) 1 MB SRAM minus the configured remanent variables.
6) See Automation Help under "Communication / POWERLINK / General information / Hardware - IF/LS" for more information.

5 Order data - X20CP358x

Model number	Short description
	X20 CPUs
X20CP3583	X20 CPU, Atom 333 MHz Intel compatible, 128 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20CP3584	X20 CPU, Atom 0.6 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20cCP3584	X20 CPU, coated, ATOM 0.6 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, 1 X20TB12 terminal block, slot covers and X20 end cover plate (right) X20AC0SR1 included, order application memory separately.
X20CP3585	X20 CPU, Atom 1.0 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20CP3586	X20 CPU, Atom 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 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 application memory separately!
X20cCP3586	X20 CPU, coated, ATOM 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, 1 X20TB12 terminal block, slot covers and X20 end cover plate (right) X20AC0SR1 included, order application memory separately.
	Required accessories
	CompactFlash cards
0CFCRD.0512E.01	CompactFlash 512 MB extended temp.
0CFCRD.2048E.01	CompactFlash 2048 MB extended temp.
5CFCRD.016G-06	CompactFlash 16 GB B&R (SLC)
5CFCRD.032G-06	CompactFlash 32 GB B&R (SLC)
5CFCRD.0512-06	CompactFlash 512 MB B&R (SLC)
5CFCRD.1024-06	CompactFlash 1 GB B&R (SLC)
5CFCRD.2048-06	CompactFlash 2 GB B&R (SLC)
5CFCRD.4096-06	CompactFlash 4 GB B&R (SLC)
5CFCRD.8192-06	CompactFlash 8 GB B&R (SLC)
	Optional accessories
	Batteries
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell

Table 4: X20CP3583, X20CP3584, X20cCP3584, X20CP3585, X20CP3586, X20cCP3586 - Order data

Included in delivery

Model number	Short description
4A0006.00-000	Backup battery (see also "Battery" on page 17)
-	Interface module slot covers
X20AC0SR1	X20 end cover plate, right
X20TB12	X20 terminal block, 12-pin, 24 V coding

Table 5: X20 CPUs - Content of delivery

6 X20CP358x - Technical data

Model number	X20CP3583	X20CP3584	X20cCP3584	X20CP3585	X20CP3586	X20cCP3586
Short description						
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V1/V2), 2x USB, 1x X2X Link					
System module	CPU					
General information						
Cooling	Fanless					
B&R ID code	0xD45C	0xC3AD	0xE21D	0xC3AF	0xBF2B	0xE21E
Status indicators	CPU function, overtemperature, Ethernet, POWERLINK, CompactFlash, battery					
Diagnostics						
Battery	Yes, using status LED and software					
CPU function	Yes, using status LED					
CompactFlash	Yes, using status LED					
Ethernet	Yes, using status LED					
POWERLINK	Yes, using status LED					
Overtemperature	Yes, using status LED					
Controller redundancy possible	No	Yes				
ACOPOS support	Yes					
Visual Components support	Yes					
Power consumption without interface module and USB	8.2 W	8.6 W		8.8 W	9.7 W	
Power consumption of X2X Link power supply [1]	1.42 W					
Power consumption [1]						
Internal I/O	0.6 W					
Additional power dissipation caused by actuators (resistive) [W]	-					
Certifications						
CE	Yes					
KC	-	Yes	-	Yes		-
EAC	Yes					
UL	cULus E115267 Industrial control equipment					
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5					
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÚ 09 ATEX 0083X					
DNV GL	Temperature: **B** (0 - 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 -15% / +20%					
Input current	Max. 1.5 A					
Fuse	Integrated, cannot be replaced					
Reverse polarity protection	Yes					
X2X Link power supply output						
Nominal output power	7 W [2]					
Parallel connection	Yes [3]					
Redundant operation	Yes					
Input I/O power supply						
Input voltage	24 VDC -15% / +20%					
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 status LED					
Module run/error	Yes, using status LED and software					
Overload	Yes, using status LED and software					
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, 1 s resolution, -10 to 10 ppm accuracy at 25°C					
FPU	Yes					

Table 6: X20CP3583, X20CP3584, X20cCP3584, X20CP3585, X20CP3586, X20cCP3586 - Technical data

Model number	X20CP3583	X20CP3584	X20cCP3584	X20CP3585	X20CP3586	X20cCP3586
Processor						
Type		Atom E620T		Atom E640T	Atom E680T	
Clock frequency	333 MHz	0.6 GHz		1 GHz	1.6 GHz	
L1 cache						
Data code		24 kB				
Program code		32 kB				
L2 cache	-	512 kB				
Integrated I/O processor		Processes I/O data points in the background				
Modular interface slots		3				
Remanent variables	Max. 64 kB [4]	Max. 256 kB [4]			Max. 1 MB [4]	
Shortest task class cycle time	800 µs	400 µs		200 µs	100 µs	
Typical instruction cycle time	0.01 µs	0.0075 µs		0.0044 µs	0.0027 µs	
Data buffering						
Battery monitoring		Yes				
Lithium battery		Min. 2 years at 23°C ambient temperature				
Standard memory						
RAM	128 MB DDR2 SDRAM	256 MB DDR2 SDRAM			512 MB DDR2 SDRAM	
User RAM		1 MB SRAM [5]				
Interfaces						
Interface IF1						
Signal		RS232				
Variant		Connection made using 12-pin X20TB12 terminal block				
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 (V1/V2) managing or controlled node				
Type		Type 4 [6]				
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				
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 limitations				
>2000 m		Reduction of ambient temperature by 0.5°C per 100 m				
Degree of protection per EN 60529		IP20				

Table 6: X20CP3583, X20CP3584, X20cCP3584, X20CP3585, X20CP3586, X20cCP3586 - Technical data

Model number	X20CP3583	X20CP3584	X20cCP3584	X20CP3585	X20CP3586	X20cCP3586
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 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 properties						
Note	Order application memory (CompactFlash) separately Backup battery included in delivery X20 end cover plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery					
Dimensions						
Width	200 mm					
Height	99 mm					
Depth	85 mm					
Weight	470 g					

Table 6: X20CP3583, X20CP3584, X20cCP3584, X20CP3585, X20CP3586, X20cCP3586 - Technical data

1) The specified values are maximum values. For examples of the exact calculation, see section "Mechanical and electrical configuration" of the X20 system user's manual.
2) 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 consideration.
3) In parallel operation, only 75% of the rated power can be assumed. It is important to make sure that all power supplies operated in parallel are switched on and off at the same time.
4) The size of the memory used for remanent variables is adjustable in Automation Studio.
5) 1 MB SRAM minus the configured remanent variables.
6) See Automation Help under "Communication / POWERLINK / General information / Hardware - IF/LS" for more information.

7 LED status indicators

7.1 X20 CPUs - LED status indicators

Figure	LED	Color	Status	Description
	R/E	Green	On	Application running
			Blinking	System startup boot mode: CPU initializing the application, all bus systems and I/O modules[1)]
			Double flash	Mode BOOT (during firmware update)[1)]
		Red	On	Mode SERVICE
			Blinking	If LED "R/E" blinks red and LED "RDY/F" blinks yellow, a license violation has occurred.
	RDY/F	Yellow	On	Mode SERVICE or BOOT
			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" (LED "Status/Error")" on page 10.
	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.
	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	CPU power supply OK
		Red	On	Backup battery empty

1) This process can take several minutes depending on the configuration.

7.1.1 LED "S/E" (LED "Status/Error")

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.

7.1.1.1 Ethernet mode

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

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

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

7.1.1.2 POWERLINK V1 mode

LED "S/E"		
Green	**Red**	**Status of the POWERLINK node**
On	Off	The POWERLINK node is running with no errors.
Off	On	A system error occurred. The type of error can be read using the PLC logbook. An irreparable problem has occurred. The system can no longer properly carry out its tasks. This state can only be changed by resetting the module.
Blinking alternately		The POWERLINK managing node has failed. This error code can only occur when operated as a controlled node. This means that the set node number lies within the range 0x01 - 0xFD.
Off	Blinking	System stop. The red blinking LED indicates an error code (see "System stop error codes" on page 12).
Off	Off	The interface is either not active or one of the following states 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.

Table 7: LED "S/E": POWERLINK V1 mode

7.1.1.3 POWERLINK V2 mode

Error message

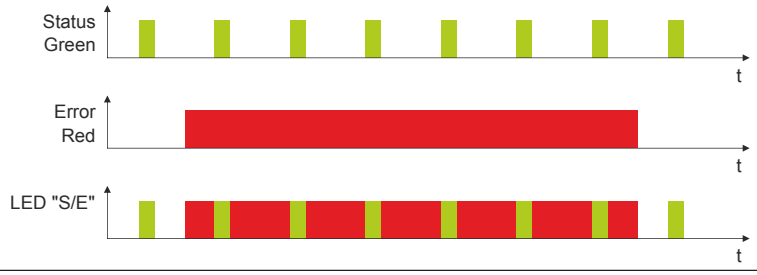
LED "S/E"		
Green	**Red**	**Description**
Off	On	The interface is in the error mode (failed Ethernet frames, increased number of collisions on the network, etc.). Note: Several red blinking signals are displayed immediately after the device is switched on. These are not errors, however.
Blinking	On	If 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 

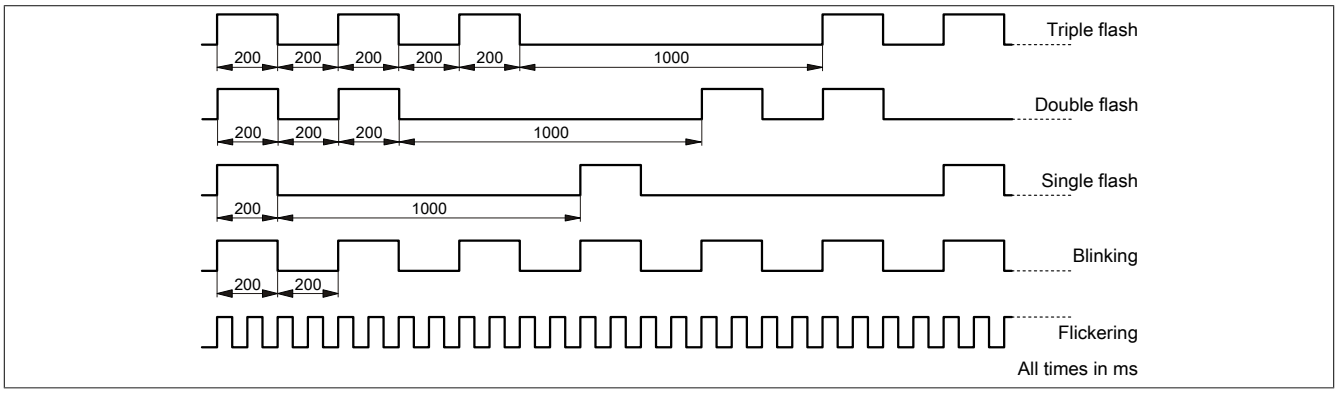
Table: LED "S/E" - Error message (interface in POWERLINK mode)

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" operation. 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)

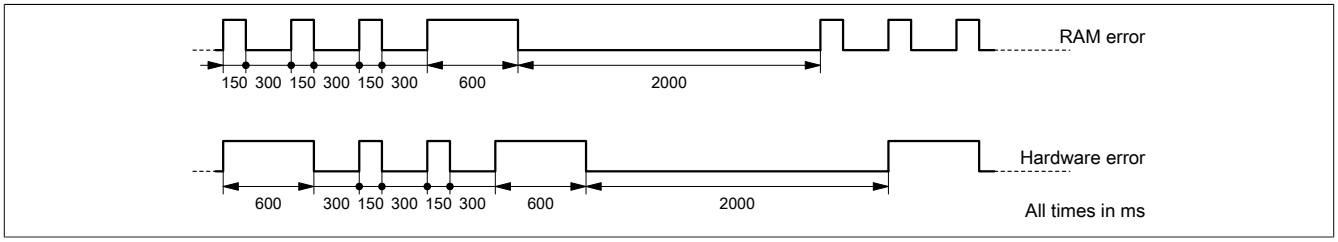
Blink times



7.1.2 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.

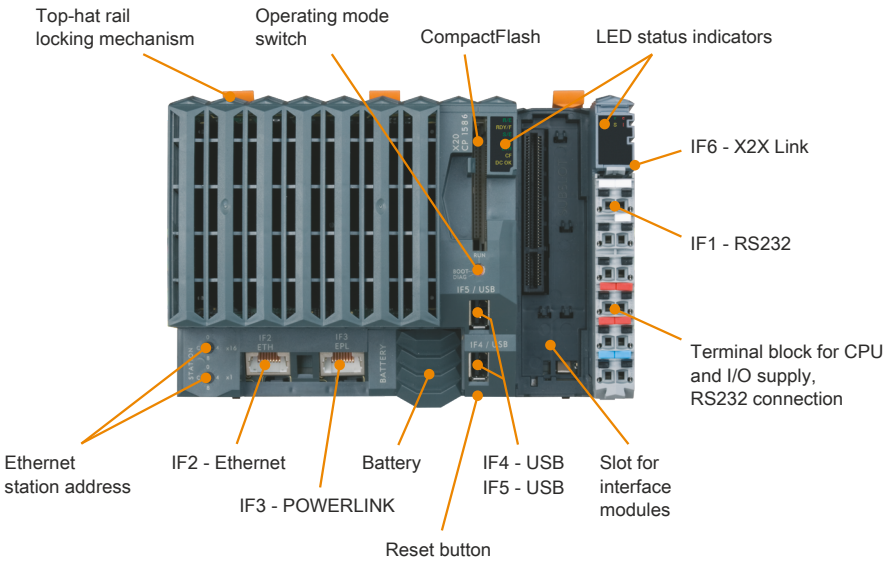
7.2 LED status indicators for the integrated power supply

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

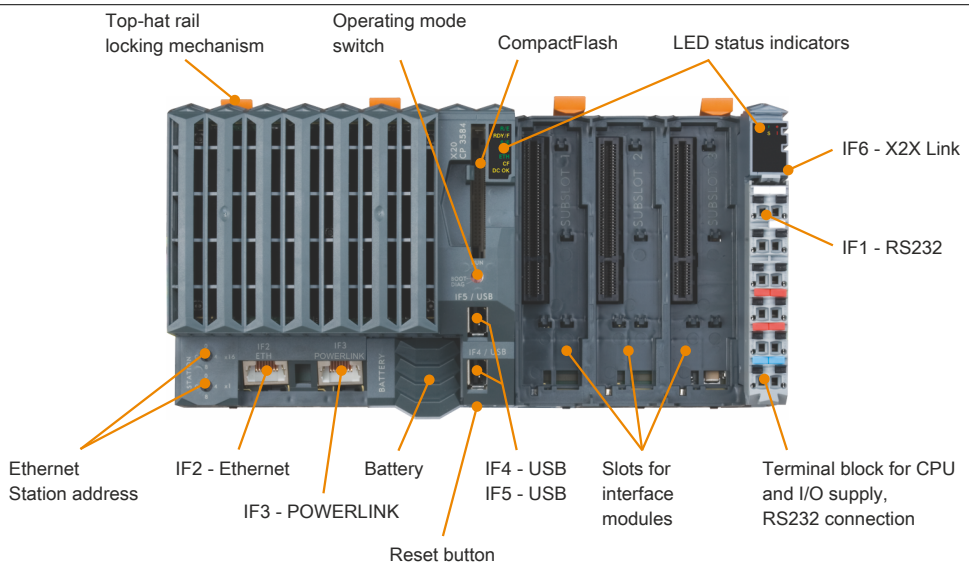
Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	Mode RESET
			Blinking	Mode PREOPERATIONAL
			On	Mode RUN
	e	Red	Off	Module not supplied with power or everything OK
			Double flash	The LED indicates one of the following states: • The X2X Link power supply of the power supply 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 is overloaded.

8 Operating and connection elements

X20CP158x



X20CP358x



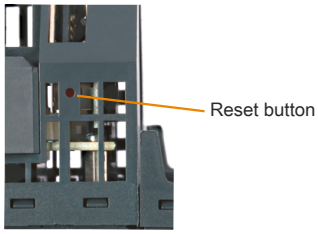
8.1 Operating mode switch

The operating mode switch is used to set the operating mode.

Switch position	Operating mode	Description
BOOT	BOOT	In this switch position, Boot AR is started and the runtime system can be installed via the online interface (B&R Automation Studio). User flash memory is erased only when the download begins.
RUN	RUN	Mode RUN
DIAG	DIAGNOSE	The CPU boots in diagnostic mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostic mode, the CPU always boots with a warm restart.

Table 8: X20 CPUs - Operating mode

8.2 Reset button



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). Pressing the reset button triggers a hardware reset, which means:

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

The PLC then starts up in service mode by default. The startup mode that follows after pressing the reset button can be set in Automation Studio.

8.3 Slot for application memory

Program memory is required to operate the CPUs. The application memory is provided in the form of a Compact-Flash card. It is not included with the CPUs, but must be ordered separately as an accessory.

Information:

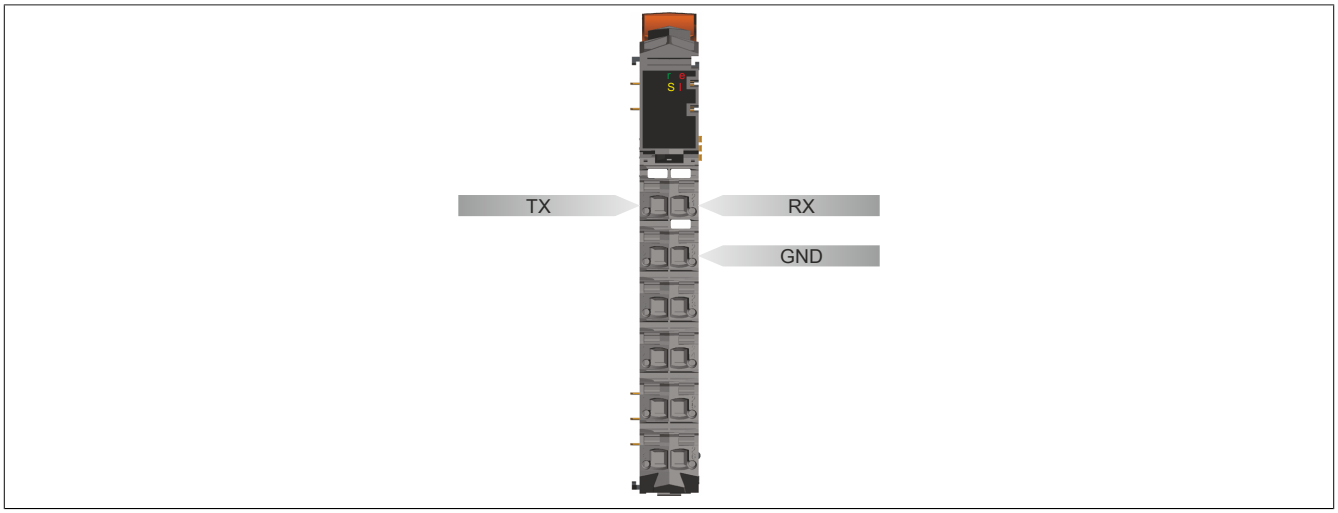
The CompactFlash card must not be removed during operation.

8.4 Project installation

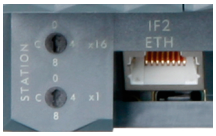
Project installation is described in Automation Help under "Project management / Project installation".

8.5 RS232 interface (IF1)

The non-electrically isolated RS232 interface is primarily intended to serve as an online interface for communication with the programming device.



8.6 Ethernet interface (IF2)



The IF2 is executed as the10 BASE-T / 100 BASE-TX / 1000 BASE-T gigabit Ethernet interface.

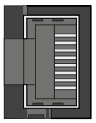
The INA2000 station number of the Ethernet interface is set using the two hex switches.

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

Information:

The Ethernet interface (IF2) is not suitable for POWERLINK (see "POWERLINK interface (IF3)" on page 16).

Pinout

Interface	Pinout		
	Pin	Ethernet	
 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-

8.7 POWERLINK interface (IF3)

The CPUs are equipped with a POWERLINK V1/V2 interface.

POWERLINK V1

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 0.

If the POWERLINK node is operated as a controlled node (CN), a node number from 1 to 253 can be set in the POWERLINK configuration in Automation Studio.

POWERLINK V2

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. Normally, these are 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.

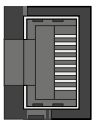
Switch position	Description
0x00	Reserved, switch position not permitted.
0x01 - 0xEF	Node number of the POWERLINK node. Operation as a controlled node (CN).
0xF0	Operation as a managing node (MN).
0xF1 - 0xFF	Reserved, switch position not permitted.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface. The INA2000 node number is set using the B&R 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" of 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	

8.8 USB interfaces (IF4 and IF5)

IF4 and IF5 are non-galvanically isolated USB interfaces. The connection is made via a USB interface (1.1/2.0).

The USB interfaces can only be used for devices approved by B&R (e.g. floppy disk drive, DiskOnKey or dongle).

Information:

- **The USB interfaces cannot be used as online communication interfaces.**
- **Only devices isolated from GND are permitted to be connected to the USB interfaces.**
- **Current-carrying capacity is listed in the technical data.**

8.9 Slots for interface modules

The CPUs have one or three slots for interface modules.

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

8.10 Battery

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

Backup battery data

Model 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 CPU'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 with the PLC switched either on or off. In some countries, safety regulations do not allow batteries to be changed while the module is switched on. To prevent data loss, the battery must be changed within 1 min. with the power off.

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. Touch the mounting rail or ground connection (not the power supply!) in order to discharge any electrostatic charge from your body.
2. Remove the cover for the lithium battery. Do this by sliding it down and away from the CPU.

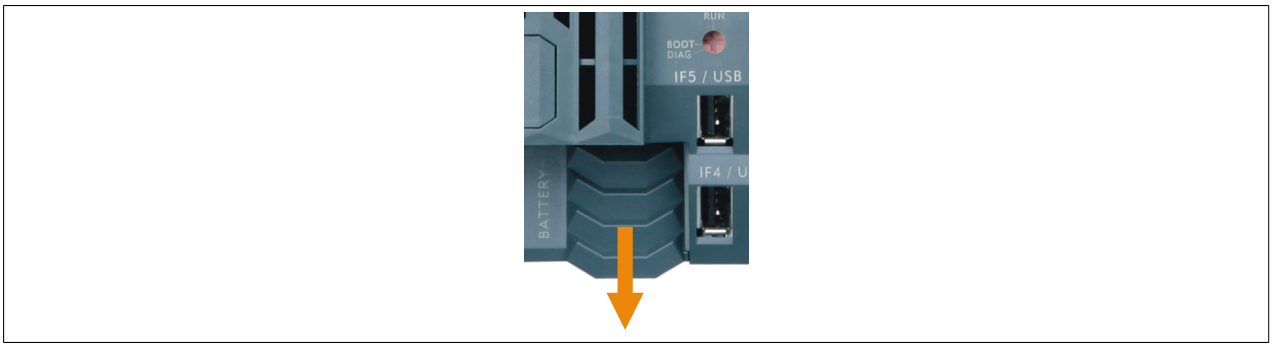


Figure 1: X20 CPUs - Remove lithium battery cover

3. Push the empty battery out of the holder.
4. When handling the new battery, make sure that your fingers are not moist or greasy. 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.

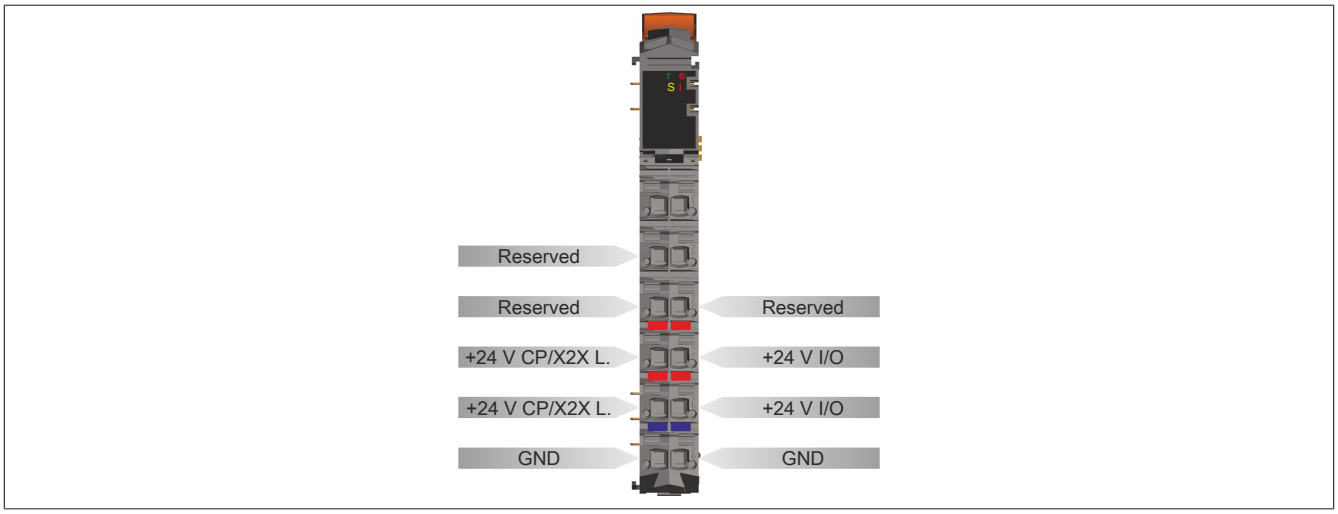
Information:

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

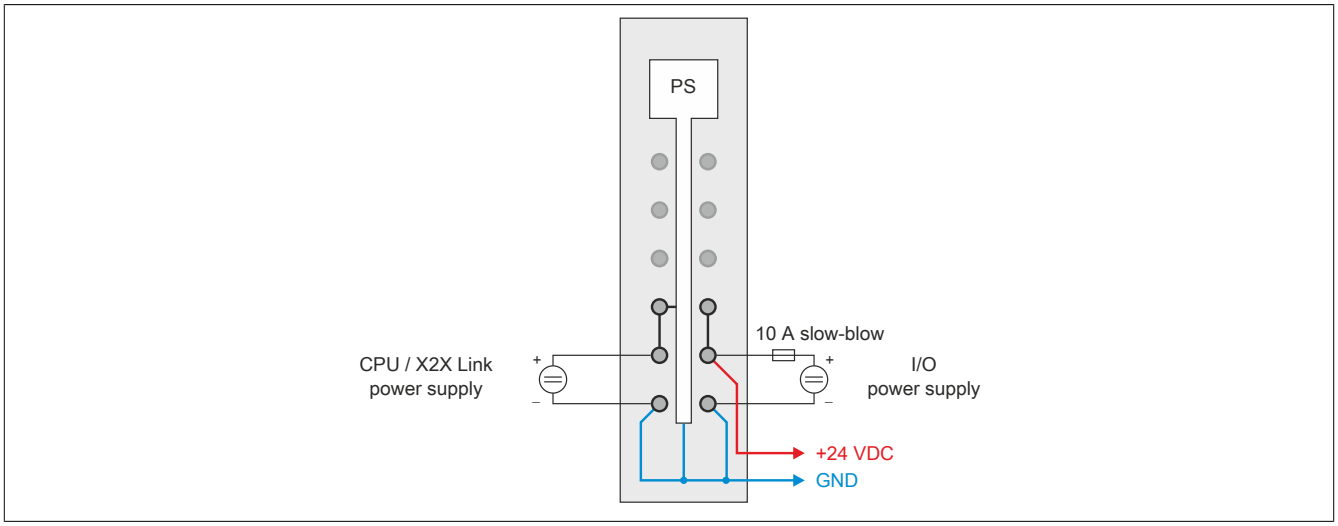
9 CPU power supply

A power supply is integrated in the X20 CPUs. It is equipped with a supply for the CPU, 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.

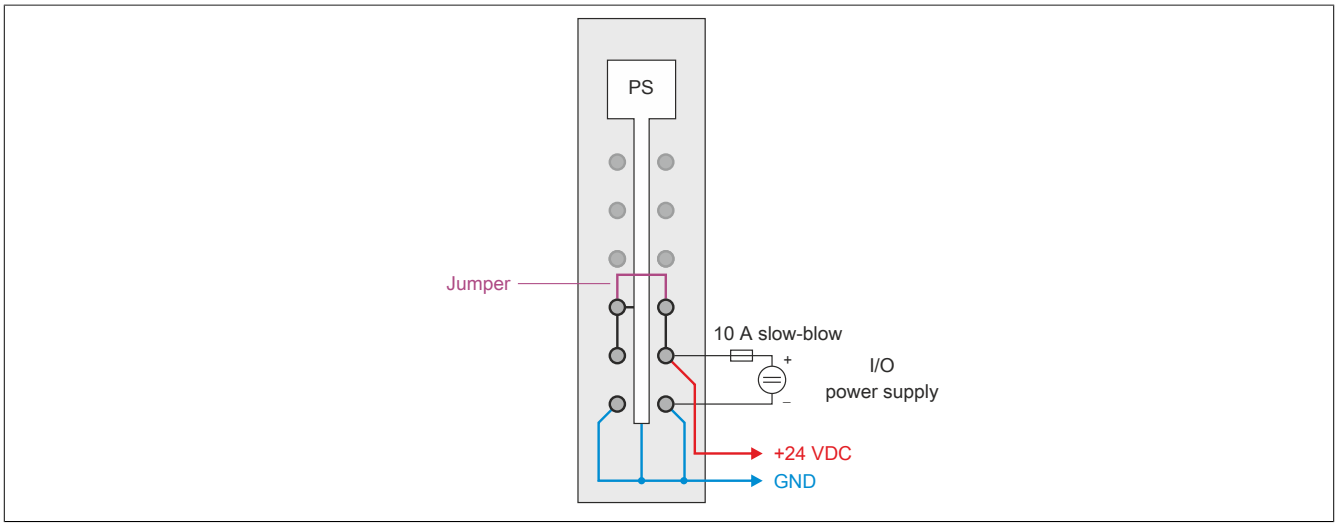
Integrated power supply - Pinout



Connection example with 2 separate supplies

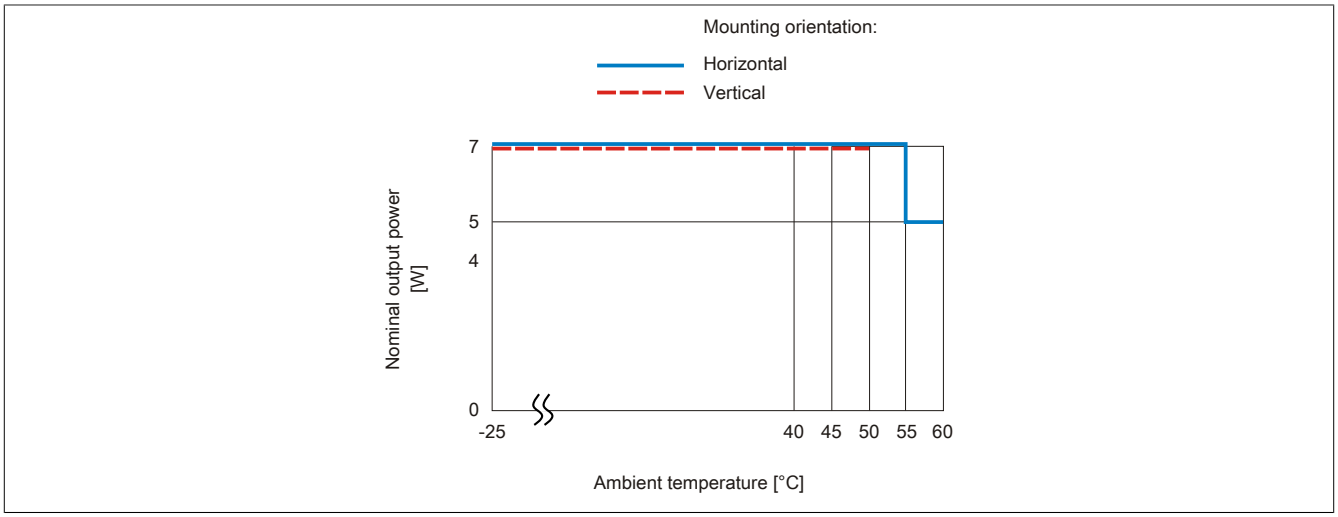


Connection example with power supply and jumper



10 Derating

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.



11 Overtemperature cutoff

To prevent damage, the CPU is switched off - reset state - at 110°C processor temperature or 95°C board temperature.

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

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.

12 Information regarding switching from X20CPx48x to X20CPx58x

- A hardware upgrade is required for some X20 IFxxxx interface modules. This can be installed from Automation Studio by selecting **Tools/Upgrades** from the menu.
  In addition, some modules specify a specific hardware revision. The following table provides an overview:

Model number	Minimum upgrade version	Minimum hardware revision
X20IF1020	1.1.5.1	H0
X20IF1030	1.1.5.1	I0
X20IF1041-1	-	-
X20IF1043-1	-	-
X20IF1051-1	-	-
X20IF1053-1	-	-
X20IF1061	-	E0
X20IF1061-1	-	-
X20IF1063	1.1.5.0	-
X20IF1063-1	-	-
X20IF1065	-	-
X20IF1072	1.0.5.1	-
X20IF1082	1.2.2.0	-
X20IF1082-2	1.2.1.0	-
X20IF1086-2	1.1.1.0	-
X20IF1091	1.0.5.1	-
X20IF10A1-1	-	-
X20IF10D1-1	-	-
X20IF10D3-1	-	-
X20IF10E1-1	-	-
X20IF10E3-1	-	-
X20IF10G3-1	-	-
X20IF10H3-1	-	-
X20IF2772	1.0.6.1	-
X20IF2792	1.0.5.1	-

Table 9: X20 CPUs - Minimum upgrade version and minimum hardware revision for X20 IFxxxx interface modules

- The X20CPx58x CPUs are supported by B&R Automation Studio V3.0.90.20 and higher.
- If an X20CPx48x is to be replaced by an X20CPx58x in an existing Automation Studio configuration, the X20CPx58x may not be listed as one of the available options even though the upgrade for the CPU has already been installed. If this is the case, it is necessary to upgrade the X20CPx48x.
- Starting with Automation Runtime 4.x, USB devices are integrated in Automation Runtime dynamically so that they no longer need to be configured in Automation Studio. In order to use a USB device, its internal device name needs to be obtained at runtime. For an example, see the Automation Studio help system for the library "AsUSB / Examples".

13 General data points

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

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