

# X20CP158x and X20CP358x

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## 1 General information

Based on state-of-the-art Intel® ATOM™ processor technology, the X20 CPUs cover a wide spectrum of demands. They can be implemented in solutions ranging from standard applications to those requiring the highest 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 removable CompactFlash. The standard Ethernet interface is capable of handling communication in the gigabit range. For improved real-time network performance, the onboard POWERLINK interface supports poll response chaining mode (PRC).

In addition, there are up to three multi-purpose slots for additional interface modules.

- 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
- Ethernet, POWERLINK V1/V2 with poll response chaining and onboard 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
- Extremely compact

## 2 Order data - X20CP158x



Model number	Short description
<b>X20 CPUs</b>	
X20CP1583	X20 CPU, ATOM 333 MHz compatible, 128 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
X20CP1584	X20 CPU, ATOM 0.6 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable data storage: CompactFlash, 1 insert slot for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
X20CP1585	X20 CPU, ATOM 1.0 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable data storage: CompactFlash, 1 insert slot for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
X20CP1586	X20 CPU, ATOM 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable data storage: CompactFlash, 1 insert slot for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
<b>Required accessories</b>	
<b>CompactFlash</b>	
0CFCRD.0128E.01	CompactFlash 128 MB WD extended temp.
0CFCRD.0512E.01	CompactFlash 512 MB WD extended temp.
5CFCRD.0064-03	CompactFlash 64 MB Western Digital (SLC)
5CFCRD.0128-03	CompactFlash 128 MB Western Digital (SLC)
5CFCRD.016G-06	CompactFlash 16 GB B&R (SLC)
5CFCRD.0256-03	CompactFlash 256 MB Western Digital (SLC)
5CFCRD.0512-03	CompactFlash 512 MB Western Digital (SLC)
5CFCRD.1024-03	CompactFlash 1 GB Western Digital (SLC)
5CFCRD.1024-06	CompactFlash 1 GB B&R (SLC)
5CFCRD.2048-03	CompactFlash 2 GB Western Digital (SLC)
5CFCRD.2048-06	CompactFlash 2 GB B&R (SLC)
5CFCRD.4096-03	CompactFlash 4 GB Western Digital (SLC)
5CFCRD.4096-06	CompactFlash 4 GB B&R (SLC)
5CFCRD.8192-03	CompactFlash 8 GB Western Digital (SLC)
5CFCRD.8192-06	CompactFlash 8 GB B&R (SLC)
<b>Optional accessories</b>	
<b>Batteries</b>	
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect the cells against short circuit. For emergency information, call RENATA SA at + 41 61 319 28 27
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell

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

### Included in delivery

Model number	Short description
4A0006.00-000	Backup battery (see also section 20 "Exchanging the lithium battery")
-	Interface module slot covers
X20AC0SR1	X20 locking plate, right
X20TB12	X20 terminal block, 12-pin, 24 V keyed

Table 2: X20 CPUs - Contents of delivery

### 3 Technical data - X20CP158x

Product ID	X20CP1583	X20CP1584	X20CP1585	X20CP1586
<b>Short description</b>				
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V1/V2), 2x USB, 1x X2X Link			
System module	CPU			
<b>General information</b>				
Cooling	Fanless			
B&R ID code	0xD45B	0xC370	0xC3AE	0xC3B0
Status indicators	CPU function, overtemperature, Ethernet, POWERLINK, CompactFlash, battery			
Diagnostics	Yes, using status LED and software			
Battery	Yes, using status LED			
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			
CPU redundancy possible	No			
ACOPOS capability	Yes			
Visual Components support	Yes			
Power consumption without interface module and USB	8.2 W	8.6 W	8.8 W	9.7 W
Internal power consumption of the X2X Link and I/O supply <sup>1)</sup>				
Bus	1.42 W			
Internal I/O	0.6 W			
Additional power dissipation caused by the actuators (resistive) [W]	-			
Electrical isolation				
IF1 - IF2	Yes			
IF1 -> IF3	Yes			
IF1 -> IF4	No			
IF1 -> IF5	No			
IF1 -> IF6	Yes			
IF2 -> IF4	Yes			
IF2 -> IF5	Yes			
IF3 -> IF4	Yes			
IF3 -> IF5	Yes			
IF4 -> IF5	No			
IF4 -> IF6	Yes			
IF5 -> IF6	Yes			
PLC - IF1	No			
PLC - IF2	Yes			
PLC - IF3	Yes			
PLC - IF4	No			
PLC - IF5	No			
PLC - IF6	Yes			
Certification				
CE	Yes			
UL 508 (cULus)	LISTED 14F2 BR			
ATEX Zone 2 (EX)	II 3G nA nC T5 0-60°C IP20 BR			
KC (KC)	BR KCC-REI-BRK-X20CP			
GOST-R	Yes			
<b>CPU and X2X Link supply</b>				
Input voltage	24 VDC -15% / +20%			
Input current	Max. 1.5 A			
Fuse	Integrated, cannot be replaced			
Reverse polarity protection	Yes			
<b>X2X Link supply output</b>				
Nominal output power	7.0 W <sup>2)</sup>			
Parallel operation	Yes <sup>3)</sup>			
Redundant operation	Yes			
<b>Input I/O supply</b>				
Input voltage	24 VDC -15% / +20%			
Fuse	Required line fuse: Max. 10 A, slow-blow			
<b>Output I/O supply</b>				
Rated output voltage	24 VDC			
Permitted contact load	10.0 A			
<b>Supply - General information</b>				
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			

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

X20CP158x and X20CP358x

Product ID	X20CP1583	X20CP1584	X20CP1585	X20CP1586
Electrical isolation I/O feed - I/O supply CPU/X2X Link feed - CPU/X2X Link supply			No Yes	
<b>Controller</b>				
CompactFlash slot			1	
Real-time clock		Nonvolatile memory, resolution 1 second		
FPU		Yes		
Processor				
Type	ATOM™ E620T		ATOM™ E640T	Atom™ E680T
Clock frequency	333 MHz	0.6 GHz	1.0 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 <sup>4)</sup>	Max. 256 kB <sup>4)</sup>		Max. 1 MB <sup>4)</sup>
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		Yes		
Battery monitoring 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 <sup>5)</sup>		
<b>Interfaces</b>				
IF1 interface		RS232		
Signal		Connection made using 12-pin X20TB12 terminal block		
Design		900 m		
Max. distance		Max. 115.2 kbit/s		
Transfer rate				
IF2 interface		Ethernet		
Signal		1x shielded RJ45 port		
Design		Max. 100 m between two stations (segment length)		
Cable length		10/100/1000 Mbit/s		
Transfer rate				
Transmission		10 BASE-T/100 BASE-TX/1000 BASE-T		
Physical interfaces		Yes		
Half-duplex		Yes		
Full-duplex		Yes		
Autonegotiation		Yes		
Auto-MDI / MDIX		Yes		
IF3 interface		POWERLINK (V1/V2) managing or controlled node		
Fieldbus		Type 4 <sup>6)</sup>		
Type		1x shielded RJ45 port		
Design		Max. 100 m between two stations (segment length)		
Cable length		100 Mbit/s		
Transfer rate				
Transmission		100 BASE-TX		
Physical interfaces		Yes		
Half-duplex		No		
Full-duplex		Yes		
Autonegotiation		Yes		
Auto-MDI / MDIX		Yes		
IF4 interface		USB 1.1/2.0		
Type		Type A		
Design				
IF5 interface		USB 1.1/2.0		
Type		Type A		
Design				
IF6 interface		X2X Link master		
Fieldbus				
<b>Operating conditions</b>				
Mounting orientation		Yes		
Horizontal		Yes		
Vertical				
Installation at elevations above sea level		No limitations		
0 to 2000 m		Reduction of ambient temperature by 0.5°C per 100 m		
>2000 m				
EN 60529 protection		IP20		

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

Product ID	X20CP1583	X20CP1584	X20CP1585	X20CP1586
<b>Environmental conditions</b>				
Temperature				
Operation				
Horizontal installation				
Vertical installation				
Derating	When operated at temperatures above 55°C, the rated output current of the X2X Link supply is reduced to 5 W			
Storage				
Transport				
Relative humidity				
Operation	5 to 95%, non-condensing			
Storage	5 to 95%, non-condensing			
Transport	5 to 95%, non-condensing			
<b>Mechanical characteristics</b>				
Note	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking plate (right) included in delivery X20 terminal block (12-pin) included in delivery Interface module slot covers included in delivery			
Dimensions				
Width	150 mm			
Height	99 mm			
Depth	85 mm			
Weight	710 g		750 g	710 g

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

- 1) The specified values are maximum values. The exact calculation is included as a data sheet in the module documentation and can be downloaded from the B&R website.
- 2) When operated at temperatures above 55°C, a derating of the rated output current to 5 W for the X2X Link 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 operating in parallel are switched on and off at the same time.
- 4) Can be configured in Automation Studio.
- 5) 1 MB SRAM minus the configured remanent variables.
- 6) See the POWERLINK online help documentation under "General information, Hardware - IF/LS".

## 4 Order data - X20CP358x



Model number	Short description
	<b>X20 CPUs</b>
X20CP3583	X20 CPU, ATOM 333 MHz compatible, 128 MB DDR2 RAM, 1 MB SRAM, removable application memory: CompactFlash, 3 insert slots for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
X20CP3584	X20 CPU, ATOM 0.6 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable data storage: CompactFlash, 3 insert slots for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
X20CP3585	X20 CPU, ATOM 1.0 GHz, 256 MB DDR2 RAM, 1 MB SRAM, removable data storage: CompactFlash, 3 insert slots for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
X20CP3586	X20 CPU, ATOM 1.6 GHz, 512 MB DDR2 RAM, 1 MB SRAM, removable data storage: CompactFlash, 3 insert slots for X20 interface modules, 2 USB ports, 1 RS232 interface, 1 Ethernet interface 10/100/1000 Base-T, 1 POWERLINK interface, incl. supply module, X20TB12 terminal block and slot covers, X20 locking plate X20AC0SR1 (right) included, order application memory separately.
	<b>Required accessories</b>
	<b>CompactFlash</b>
0CFCRD.0128E.01	CompactFlash 128 MB WD extended temp.
0CFCRD.0512E.01	CompactFlash 512 MB WD extended temp.
5CFCRD.0064-03	CompactFlash 64 MB Western Digital (SLC)
5CFCRD.0128-03	CompactFlash 128 MB Western Digital (SLC)
5CFCRD.016G-06	CompactFlash 16 GB B&R (SLC)
5CFCRD.0256-03	CompactFlash 256 MB Western Digital (SLC)
5CFCRD.0512-03	CompactFlash 512 MB Western Digital (SLC)
5CFCRD.1024-03	CompactFlash 1 GB Western Digital (SLC)
5CFCRD.1024-06	CompactFlash 1 GB B&R (SLC)
5CFCRD.2048-03	CompactFlash 2 GB Western Digital (SLC)
5CFCRD.2048-06	CompactFlash 2 GB B&R (SLC)
5CFCRD.4096-03	CompactFlash 4 GB Western Digital (SLC)
5CFCRD.4096-06	CompactFlash 4 GB B&R (SLC)
5CFCRD.8192-03	CompactFlash 8 GB Western Digital (SLC)
5CFCRD.8192-06	CompactFlash 8 GB B&R (SLC)
	<b>Optional accessories</b>
	<b>Batteries</b>
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect the cells against short circuit. For emergency information, call RENATA SA at + 41 61 319 28 27
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell

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

### Included in delivery

Model number	Short description
4A0006.00-000	Backup battery (see also section 20 "Exchanging the lithium battery")
-	Interface module slot covers
X20AC0SR1	X20 locking plate, right
X20TB12	X20 terminal block, 12-pin, 24 V keyed

Table 5: X20 CPUs - Contents of delivery

## 5 X20CP358x - Technical data

Product ID	X20CP3583	X20CP3584	X20CP3585	X20CP3586
<b>Short description</b>				
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V1/V2), 2x USB, 1x X2X Link			
System module	CPU			
<b>General information</b>				
Cooling	Fanless			
B&R ID code	0xD45C	0xC3AD	0xC3AF	0xBF2B
Status indicators	CPU function, overtemperature, Ethernet, POWERLINK, CompactFlash, battery			
Diagnostics	Yes, using status LED and software			
Battery	Yes, using status LED			
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			
CPU redundancy possible	No	Yes		
ACOPOS capability	Yes			
Visual Components support	Yes			
Power consumption without interface module and USB	8.2 W	8.6 W	8.8 W	9.7 W
Internal power consumption of the X2X Link and I/O supply <sup>1)</sup>				
Bus	1.42 W			
Internal I/O	0.6 W			
Additional power dissipation caused by the actuators (resistive) [W]	-			
Electrical isolation				
IF1 - IF2	Yes			
IF1 -> IF3	Yes			
IF1 -> IF4	No			
IF1 -> IF5	No			
IF1 -> IF6	Yes			
IF2 -> IF4	Yes			
IF2 -> IF5	Yes			
IF3 -> IF4	Yes			
IF3 -> IF5	Yes			
IF4 -> IF5	No			
IF4 -> IF6	Yes			
IF5 -> IF6	Yes			
PLC - IF1	No			
PLC - IF2	Yes			
PLC - IF3	Yes			
PLC - IF4	No			
PLC - IF5	No			
PLC - IF6	Yes			
Certification				
CE	Yes			
UL 508 (cULus)	LISTED 14F2 BR			
ATEX Zone 2 (EX)	II 3G nA nC T5 0-60°C IP20 BR			
KC (KC)	BR KCC-REI-BRK-X20CP			
GOST-R	Yes			
<b>CPU and X2X Link supply</b>				
Input voltage	24 VDC -15% / +20%			
Input current	Max. 1.5 A			
Fuse	Integrated, cannot be replaced			
Reverse polarity protection	Yes			
<b>X2X Link supply output</b>				
Nominal output power	7.0 W <sup>2)</sup>			
Parallel operation	Yes <sup>3)</sup>			
Redundant operation	Yes			
<b>Input I/O supply</b>				
Input voltage	24 VDC -15% / +20%			
Fuse	Required line fuse: Max. 10 A, slow-blow			
<b>Output I/O supply</b>				
Rated output voltage	24 VDC			
Permitted contact load	10.0 A			
<b>Supply - General information</b>				
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			

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

X20CP158x and X20CP358x

Product ID	X20CP3583	X20CP3584	X20CP3585	X20CP3586
Electrical isolation I/O feed - I/O supply CPU/X2X Link feed - CPU/X2X Link supply			No Yes	
<b>Controller</b>				
CompactFlash slot			1	
Real-time clock		Nonvolatile memory, resolution 1 second		
FPU		Yes		
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 <sup>4)</sup>	Max. 256 kB <sup>4)</sup>		Max. 1 MB <sup>4)</sup>
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		Yes		
Battery monitoring		Min. 2 years at 23°C ambient temperature		
Lithium battery				
Standard memory				
RAM	128 MB DDR2 SDRAM	256 MB DDR2 SDRAM		512 MB DDR2 SDRAM
User RAM		1 MB SRAM <sup>5)</sup>		
<b>Interfaces</b>				
IF1 interface		RS232		
Signal		Connection made using 12-pin X20TB12 terminal block		
Design		900 m		
Max. distance		Max. 115.2 kbit/s		
Transfer rate				
IF2 interface		Ethernet		
Signal		1x shielded RJ45 port		
Design		Max. 100 m between two stations (segment length)		
Cable length		10/100/1000 Mbit/s		
Transfer rate				
Transmission		10 BASE-T/100 BASE-TX/1000 BASE-T		
Physical interfaces		Yes		
Half-duplex		Yes		
Full-duplex		Yes		
Autonegotiation		Yes		
Auto-MDI / MDIX		Yes		
IF3 interface		POWERLINK (V1/V2) managing or controlled node		
Fieldbus		Type 4 <sup>6)</sup>		
Type		1x shielded RJ45 port		
Design		Max. 100 m between two stations (segment length)		
Cable length		100 Mbit/s		
Transfer rate				
Transmission		100 BASE-TX		
Physical interfaces		Yes		
Half-duplex		No		
Full-duplex		Yes		
Autonegotiation		Yes		
Auto-MDI / MDIX		Yes		
IF4 interface		USB 1.1/2.0		
Type		Type A		
Design				
IF5 interface		USB 1.1/2.0		
Type		Type A		
Design				
IF6 interface		X2X Link master		
Fieldbus				
<b>Operating conditions</b>				
Mounting orientation		Yes		
Horizontal		Yes		
Vertical				
Installation at elevations above sea level		No limitations		
0 to 2000 m		Reduction of ambient temperature by 0.5°C per 100 m		
>2000 m				
EN 60529 protection		IP20		

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



Product ID	X20CP3583	X20CP3584	X20CP3585	X20CP3586
<b>Environmental conditions</b>				
Temperature				
Operation				
Horizontal installation				
Vertical installation				
Derating	When operated at temperatures above 55°C, the rated output current of the X2X Link supply is reduced to 5 W			
Storage				
Transport				
Relative humidity				
Operation	5 to 95%, non-condensing			
Storage	5 to 95%, non-condensing			
Transport	5 to 95%, non-condensing			
<b>Mechanical characteristics</b>				
Note	Order application memory (CompactFlash) separately Backup battery included in delivery X20 locking 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	777 g			

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

- 1) The specified values are maximum values. The exact calculation is included as a data sheet in the module documentation and can be downloaded from the B&R website.
- 2) When operated at temperatures above 55°C, a derating of the rated output current to 5 W for the X2X Link 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 operating in parallel are switched on and off at the same time.
- 4) Can be configured in Automation Studio.
- 5) 1 MB SRAM minus the configured remanent variables.
- 6) See the POWERLINK online help documentation under "General information, Hardware - IF/LS".

## 6 X20 CPUs - Status LEDs

Figure	LED	Color	Status	Description
	R/E	Green	On	Application running
		Red	On	SERVICE mode
		Double flash	BOOT mode (during firmware update) <sup>1)</sup>	
	RDY/F	Yellow	On	SERVICE or BOOT mode
		Red	On	Overtemperature
	S/E	Green/Red		Status/Error LED. The LED indicators are described in section 6.1 "S/E" LED".
	PLK	Green	On	A link to the POWERLINK remote station has been established.
			Blinking	A link to the POWERLINK remote station has been established. Indicates Ethernet activity is taking place on the bus.
	ETH	Green	On	A link to the peer station has been established.
			Blinking	A link to the peer station has been established. Indicates Ethernet activity is taking place on the bus.
	CF	Green	On	CompactFlash inserted and detected
			Yellow	On
	DC	Yellow	On	CPU power supply OK
Red			On	Backup battery empty

Table 7: X20 CPUs - CPU status indicators

1) Depending on the configuration, a firmware update can take up to several minutes.

### 6.1 "S/E" LED

The status/error LED is a green/red dual LED. The LED status can have different meanings depending on the operating mode.

#### 6.1.1 Ethernet mode

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

Green - Status	Description
On	Interface operated as Ethernet interface.

Table 8: Status/Error LED - Ethernet operating mode

#### 6.1.2 POWERLINK V1

LED status indicators		Status of the POWERLINK station
Green	Red	
On	Off	The POWERLINK station is running with no errors.
Off	On	A system error has occurred. The error type can be read using the PLC logbook. An irreparable problem has occurred. The system cannot properly carry out its tasks. This status 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 failure. The red blinking LED signals an error code (see section 6.2 "System failure error codes").
Off	Off	Module is: <ul style="list-style-type: none"> <li>Off</li> <li>Starting up</li> <li>Not correctly configured in Automation Studio</li> <li>Defective</li> </ul>

Table 9: Status/Error LED - POWERLINK V1 operating mode

## 6.1.3 POWERLINK V2

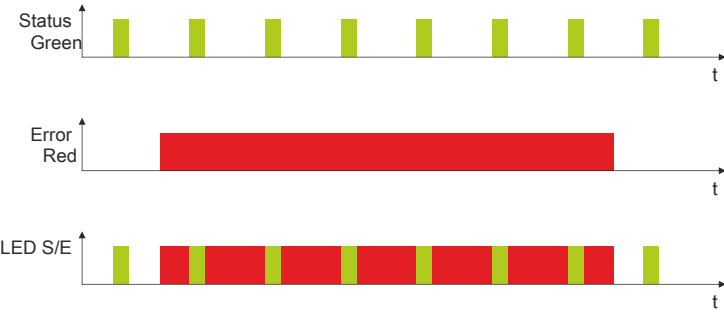
Red - Error	Description
On	<p>The module is in an error mode (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, then the green LED blinks over the red LED:</p> <ul style="list-style-type: none"> <li>• PRE_OPERATIONAL_1</li> <li>• PRE_OPERATIONAL_2</li> <li>• READY_TO_OPERATE</li> </ul>  <p>Note: The LED blinks red several times immediately after startup. This is not an error.</p>

Table 10: Status/Error LED as Error LED - POWERLINK V2 operating mode

Green - Status	Description
Off NOT_ACTIVE	<p><b>Mode</b> Module is in NOT_ACTIVE mode or is:</p> <ul style="list-style-type: none"> <li>• Switched off</li> <li>• Starting up</li> <li>• Not correctly configured in Automation Studio</li> <li>• Defective</li> </ul> <p><b>Managing node (MN)</b> The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the module goes directly into PRE_OPERATIONAL_1 mode (single flash). However, if POWERLINK communication is detected before the time expires, then the MN will not be started.</p> <p><b>Controlled node (CN)</b> The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the defined time frame (timeout), then the module will directly enter BASIC_ETHERNET mode (flickering). If POWERLINK communication is detected before this time passes, however, the module goes directly into PRE_OPERATIONAL_1 mode (single flash).</p>
Green flickering (approx. 10 Hz) BASIC_ETHERNET	<p><b>Mode</b> Module is in BASIC_ETHERNET mode. Interface operated as Ethernet TCP/IP interface.</p> <p><b>Managing node (MN)</b> This status can only be changed by resetting the module.</p> <p><b>Controlled node (CN)</b> If POWERLINK communication is detected while in this status, the status of the module changes to PRE_OPERATIONAL_1 (single flash).</p>
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	<p><b>Mode</b> Module is in PRE_OPERATIONAL_1 mode.</p> <p><b>Managing node (MN)</b> The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place.</p> <p><b>Controlled node (CN)</b> In this status, the module can be configured by the MN. The CN waits until it receives an SoC frame and then goes into the PRE_OPERATIONAL_2 status (double flash). A lit red LED in this state indicates MN failure.</p>
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	<p><b>Mode</b> Module is in PRE_OPERATIONAL_2 mode.</p> <p><b>Managing node (MN)</b> The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this status.</p> <p><b>Controlled node (CN)</b> In this status, the module can be configured by the MN. After this, a command changes the state to READY_TO_OPERATE (triple flash). A lit red LED in this mode indicates MN failure.</p>

Table 11: Status/Error LED as Status LED - POWERLINK V2 operating mode

Green - Status	Description
Triple flash (approx. 1 Hz) READY_TO_OPERATE	<p><b>Mode</b> Module is in READY_TO_OPERATE state.</p> <p><b>Managing node (MN)</b> Cyclic and asynchronous communication. The received PDO data is ignored.</p> <p><b>Controlled node (CN)</b> The module configuration is complete. Normal cyclic and asynchronous communication. The PDO data sent corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A lit red LED in this mode indicates MN failure.</p>
On OPERATIONAL	<p><b>Mode</b> Module is in OPERATIONAL mode. PDO Mapping is active and cyclic data is evaluated.</p>
Blinking (approx. 2.5 Hz) STOPPED	<p><b>Mode</b> Module is in STOPPED mode.</p> <p><b>Managing node (MN)</b> This status is not possible for the MN.</p> <p><b>Controlled node (CN)</b> No output data is produced, and no input data is supplied. Only the appropriate command from the MN can enter or leave this mode.</p>

Table 11: Status/Error LED as Status LED - POWERLINK V2 operating mode

## 6.2 System failure error codes

Incorrect configuration or defective hardware can cause a system failure error.

The error code is indicated by the red error LED using four switch-on phases. The switch-on phases have a duration of either 150 ms or 600 ms. Error code output is repeated cyclically after 2 seconds.

Error description	Error code indicated by red status LED									
RAM error: The module is defective and must be replaced.	•	•	•	-	Pause	•	•	•	-	Pause
Hardware errors: The module or a system component is defective and must be replaced.	-	•	•	-	Pause	-	•	•	-	Pause

Table 12: Status/Error ("S/E") LED - System stop error codes

Key:

- ... 150 ms
- ... 600 ms
- Pause ... 2 sec. delay

## 7 LED status indicators for the integrated power supply

Figure	LED	Color	Status	Description
	r	Green	Off	No power to module
			Single flash	RESET mode
			Blinking	PREOPERATIONAL mode
			On	RUN mode
	e	Red	Off	No power to module or everything OK
			Double flash	LED indicates one of the following states: <ul style="list-style-type: none"> <li>• The X2X Link supply for the power supply is overloaded</li> <li>• I/O supply too low</li> <li>• Input voltage for X2X Link supply too low</li> </ul>
	e + r	Red on / Green single flash	Invalid firmware	
	S	Yellow	Off	No RS232 activity
			On	The LED lights up when data is being sent or received via the RS232 interface.
	l	Red	Off	The X2X Link supply is within the valid limits
On			The X2X Link supply for the power supply is overloaded	

Table 13: X20 CPUs - LED status indicators for the integrated power supply

## 8 Operating and connection elements

### X20CP158x

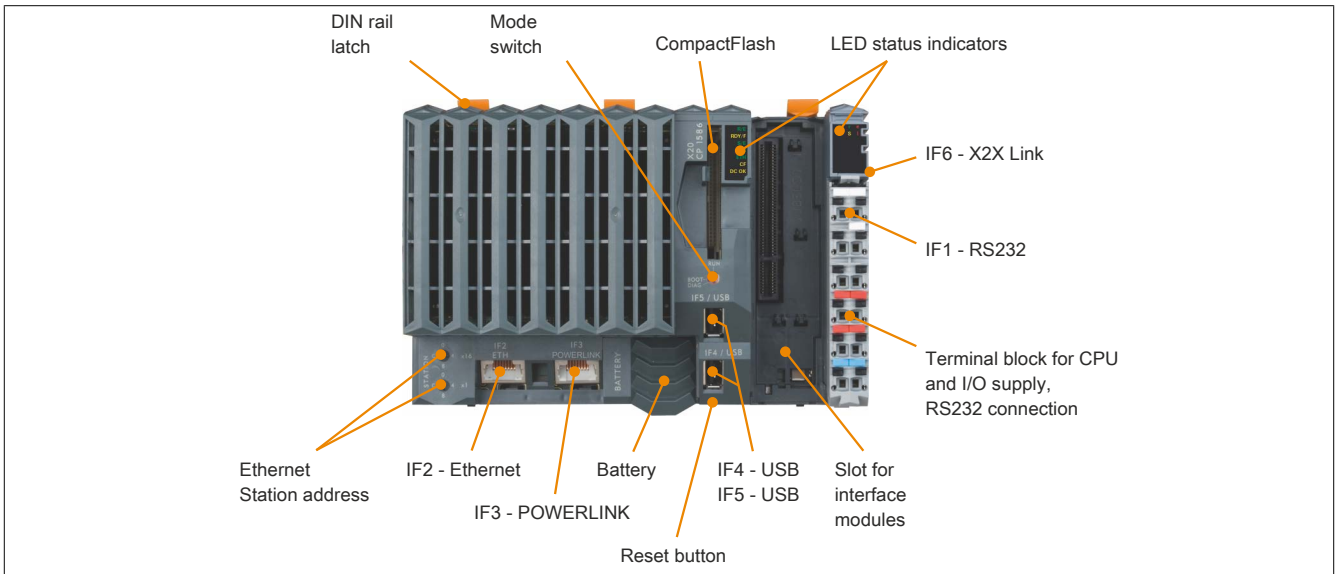


Figure 1: X20 CPUs - Operating elements for X20CP158x

### X20CP358x

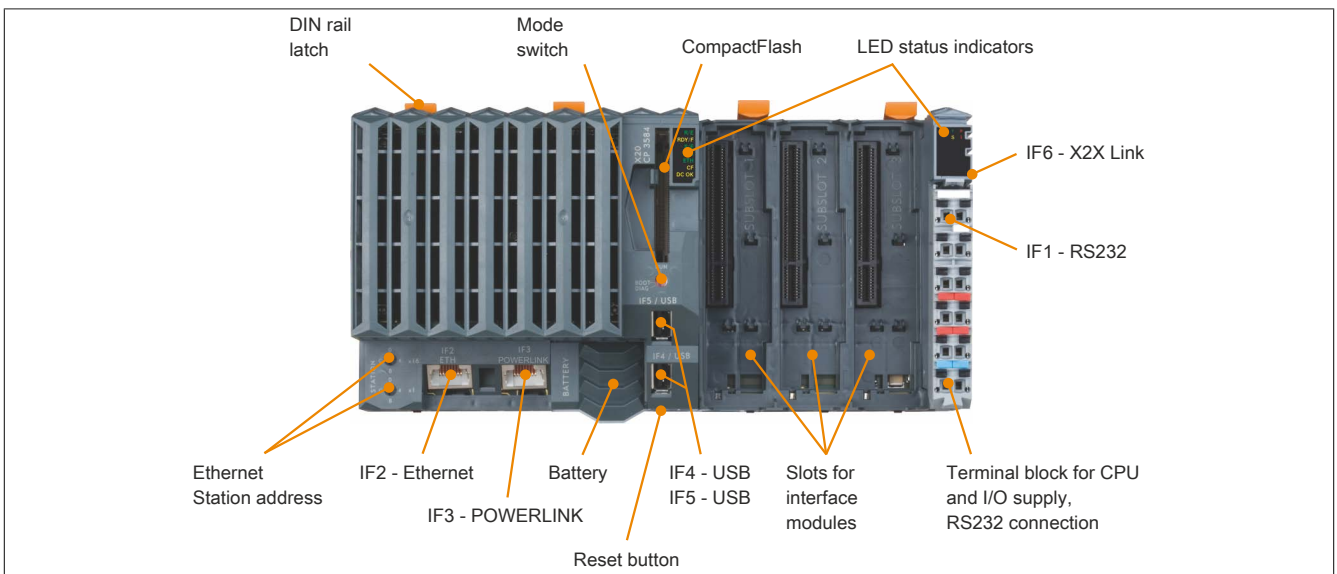


Figure 2: X20 CPUs - Operating elements for X20CP358x

## 9 Slot for application memory

The CPUs require application memory in order to operate. The application memory is provided in the form of a CompactFlash 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.

## 10 Mode switch

The mode switch is used to set the operating mode.



Figure 3: X20 CPUs - Operating mode switch

Switch position	Operating mode	Description
BOOT	BOOT	When the switch is in this position, the default B&R Automation Runtime (AR) system is started and the runtime system can be installed via the online interface (B&R Automation Studio). The User Flash is cleared only after the download begins.
RUN	RUN	RUN mode
DIAG	Diagnostics	Boots the CPU in Diagnostics mode. Program sections in User RAM and User FlashPROM are not initialized. Following diagnostics mode, the CPU always boots with a warm restart.

Table 14: X20 CPUs - Operating modes

## 11 Reset button

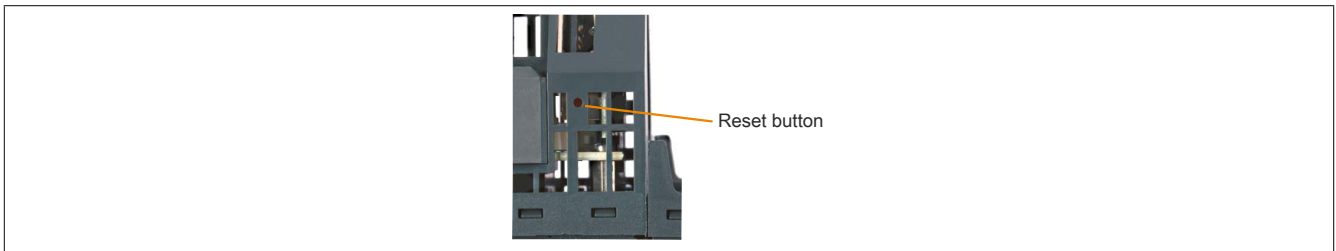


Figure 4: X20CPUs - Reset button

The reset button is located below the USB ports 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 boots into Service mode by default. The boot mode that follows after pressing the reset button can be defined in Automation Studio.

## 12 CPU supply

A power supply is integrated in the X20 CPUs. It has a feed for the CPU, the X2X Link and the internal I/O supply. Supply for the CPU and X2X Link is electrically isolated.

Multiple supply modules can be operated in parallel to provide redundant X2X Link supply.

### Pinout

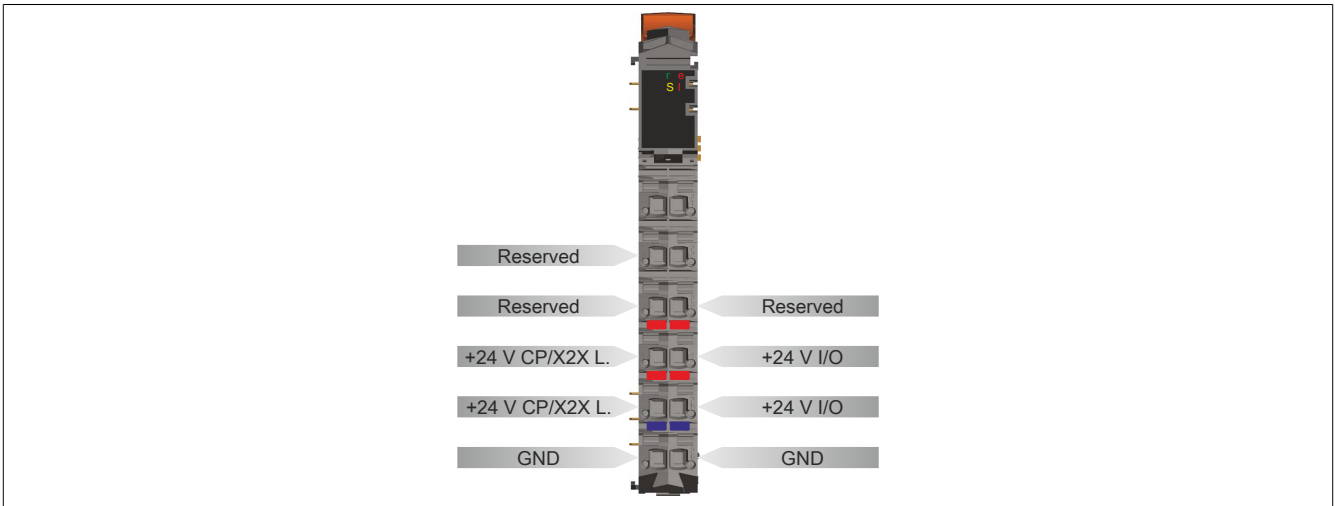


Figure 5: X20 CPUs - Pinout of the integrated power supply

Connection examples

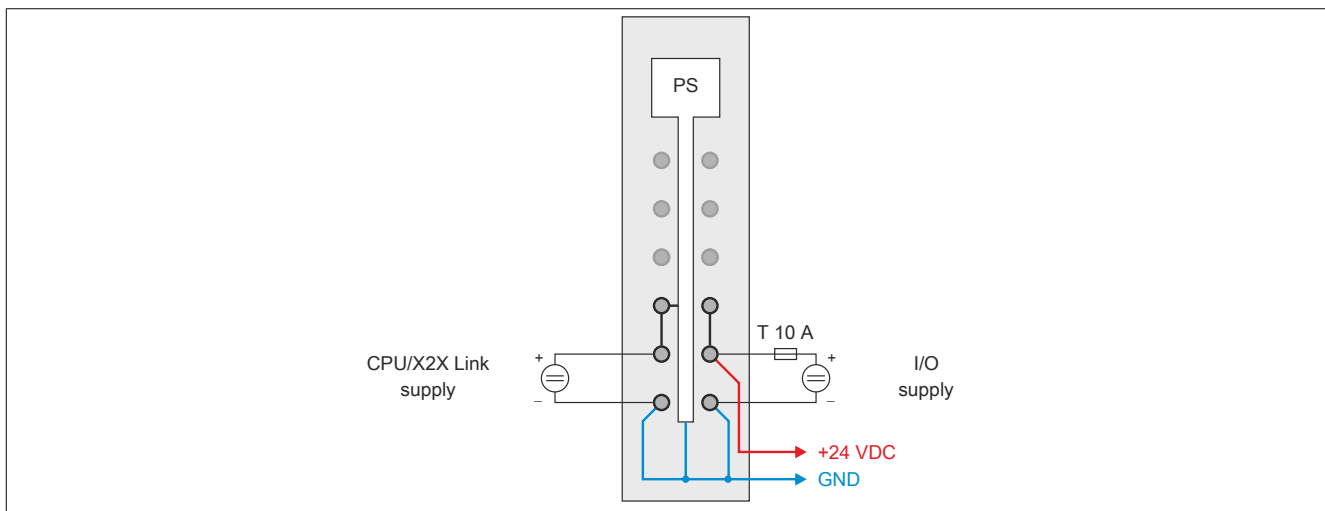


Figure 6: Connection example with two separate supplies

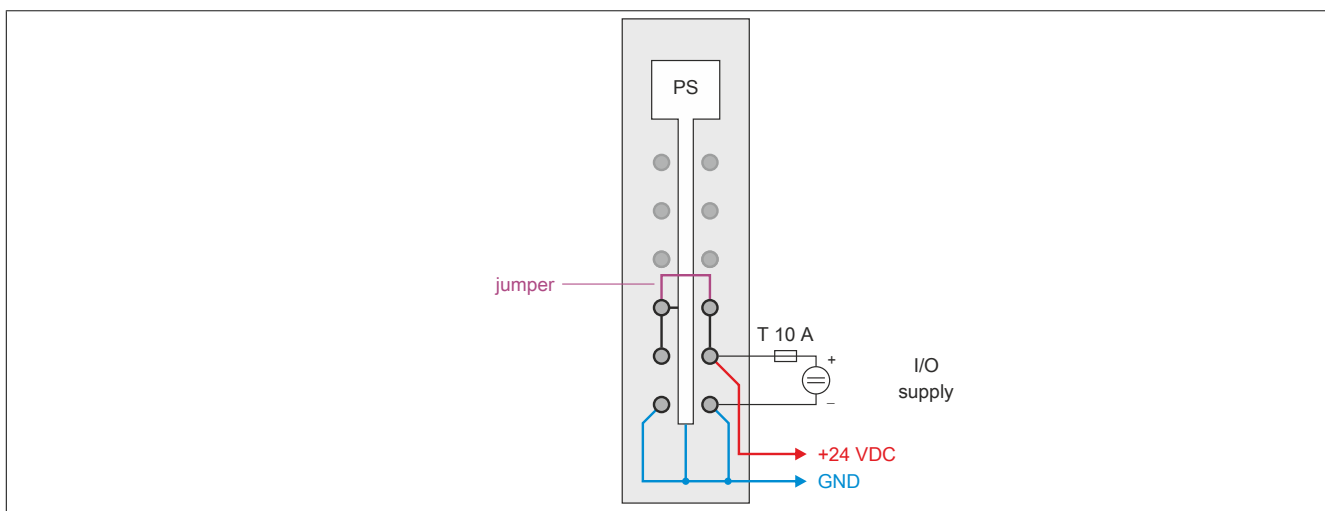


Figure 7: Connection example with a supply and jumper



## 13 RS232 interface (IF1)

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

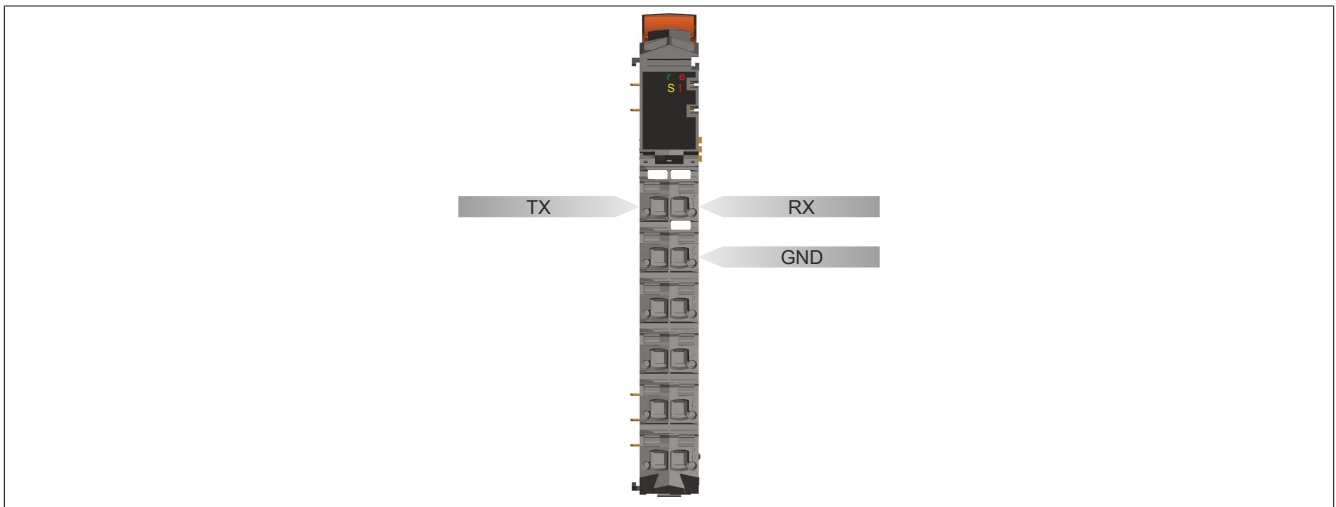


Figure 8: X20 CPUs - Pinout of the RS232 interface (IF1)

## 14 Ethernet interface (IF2)



Figure 9: X20 CPUs - Ethernet interface (IF2)

IF2 is a gigabit-capable ETHERNET interface. The connection is made using a 10/100/1000 BASE-T twisted pair RJ45 socket.

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

Information about cabling X20 modules with an Ethernet interface can be found in the module's download section on the B&R website ([www.br-automation.com](http://www.br-automation.com)).

### Information:

The Ethernet interface (IF2) is not suited for POWERLINK (see 15 "POWERLINK interface (IF3)").

### Pinout

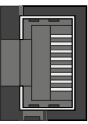
Interface	Pinout		
	Pin	Ethernet	
 Shielded RJ45 port	1	D1+	Data 1+
	2	D1-	Data 1-
	3	D2+	Data 2+
	4	D3+	Data 3+
	5	D3-	Data 3-
	6	D2-	Data 2-
	7	D4+	Data 4+
	8	D4-	Data 4-

Table 15: Pinout for RJ45 port

## 15 POWERLINK interface (IF3)

### POWERLINK V1

Station numbers are permitted between 0x00 and 0xFD. The station number can be set via software.

Switch position	Description
0x00	Operation as managing node.
0x01 - 0xFD	Station number of the POWERLINK station. Operation as controlled node.
0xFE -> 0xFF	Reserved, switch position not permitted

Table 16: X20 CPUs - POWERLINK V1 station number

### POWERLINK V2

Station numbers are permitted between 0x01 and 0xF0. The station number can be set via software.

Switch position	Description
0x00	Reserved, switch position not permitted
0x01 - 0xEF	Station number of the POWERLINK station. Operation as controlled node.
0xF0	Operation as managing node.
0xF1 - 0xFF	Reserved, switch position not permitted

Table 17: X20 CPUs - POWERLINK V2 station number

### Ethernet mode

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

### Pinout



Information about cabling X20 modules with an Ethernet interface can be found in the module's download section on the B&R website ([www.br-automation.com](http://www.br-automation.com)).

Pin	Assignment	
1	RxD	Receive data
2	RxD\	Receive data\
3	TxD	Transmit data
4	Termination	
5	Termination	
6	TxD\	Transmit data\
7	Termination	
8	Termination	

Table 18: X20 CPUs - Pinout for POWERLINK interface (IF3)

## 16 USB ports (IF4 and IF5)



Figure 10: X20 CPUs - USB ports (IF4 and IF5)

IF4 and IF5 are USB ports. The connection is made using a USB 1.1 interface.

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

### Information:

The USB ports cannot be used for online communication with a programming device.

## 17 Slots for interface modules

The CPUs have one or three slots for interface modules.

Various bus and network systems can easily be integrated into the X20 system by selecting the corresponding interface module.

## 18 Overtemperature cutoff

To prevent damage, a shut-off/reset is triggered on the CPU when the processor reaches 110°C or the circuit board reaches 95°C.

The following errors are entered in the logbook:

Error number	Error description
9204	WARNING: System halted because of temperature check
9210	WARNING: Boot by watchdog or manual reset

Table 19: X20 CPUs - Logbook entries after overtemperature cutoff

## 19 Data / real-time buffering

The CPUs are buffered by a backup battery. 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 the battery life, instead it gives an early warning of weakened buffer capacity.

The status information "Battery OK" is available from the 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. It does not represent the maximum buffer duration.

## 20 Exchanging the lithium battery

The CPUs have a lithium battery. The lithium battery is found in a separate compartment on the bottom of the module and protected by a cover.

### Backup battery data

Model number	
4A0006.00-000	1 pcs.
0AC201.91	4 pcs.
Short description	Lithium battery, 3 V / 950 mAh, button cell
Storage temperature	-20 to 60°C
Storage time	Max. 3 years at 30°C
Relative humidity	0 to 95%, non-condensing

Table 20: X20 CPUs - Backup battery data

### 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 must be replaced by a Type CR2477N Renata battery only. The use of another battery may present a risk of fire or explosion.**

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

### Procedure for exchanging 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.

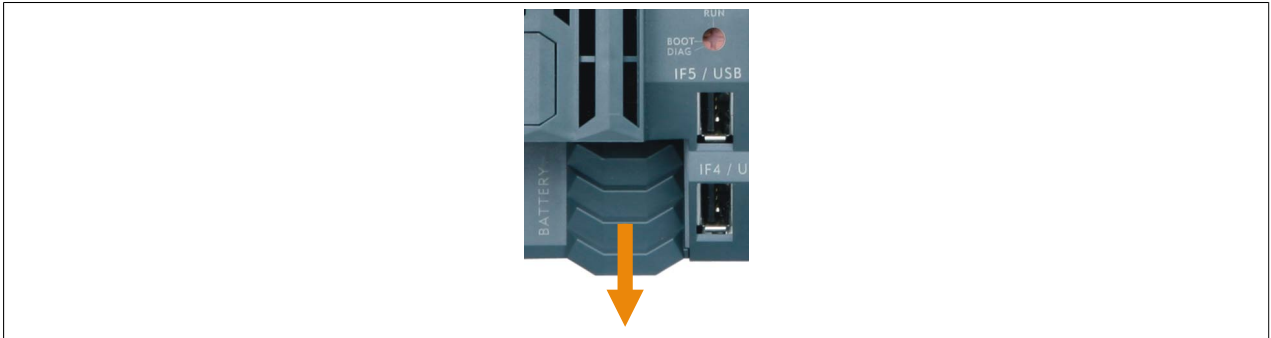


Figure 11: X20 CPUs - Remove lithium battery cover

3. Remove the battery from the holder (do not use pliers or uninsulated tweezers -> risk of short circuiting). The battery should not be held by its edges. **Insulated** tweezers may also be used to remove the battery.

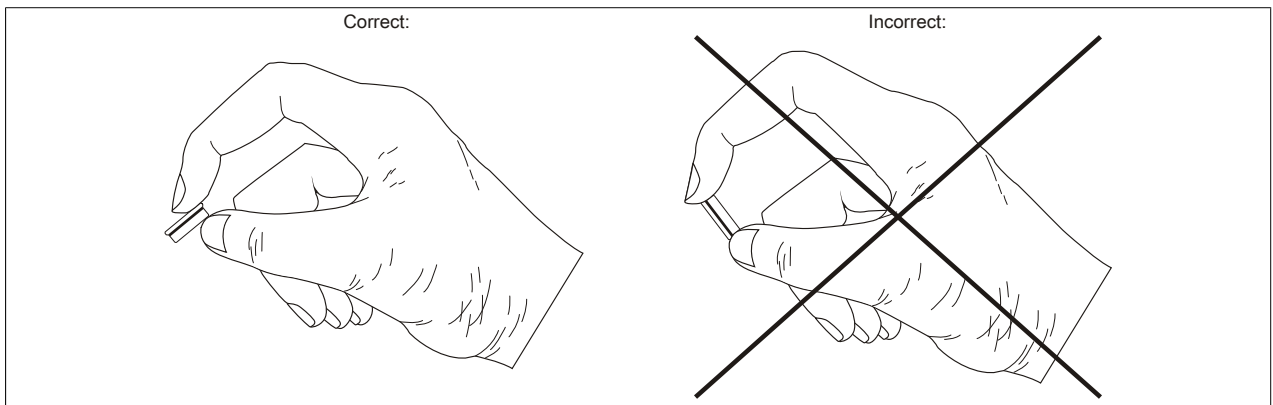


Figure 12: X20 CPUs - Correct grip for the battery

4. Insert the new battery with the correct polarity. To do this, lay the battery with the "+" side up on the right part of the battery holder under the USB port IF4. Then secure the battery in the holder by pressing above the left part of the battery holder.
5. Replace the cover.

### Information:

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

## 21 Programming the system flash memory

### General information

In order for the application project to be executed on the CPU, the Automation Runtime operating system, the system components and the application project must be installed on the CompactFlash card.

### Creating a CompactFlash using a USB card reader

The easiest way to perform an initial installation is by creating a fully programmed CompactFlash card using a USB card reader.

1. Creating and configuring a project in Automation Studio
2. In Automation Studio, select **Tools / Create CompactFlash**
3. In the dialog box that opens, select a CompactFlash card and then generate it
4. Insert the finished CompactFlash into the CPU and turn on the CPU's supply voltage
5. CPU booting

For details about commissioning: See help system under "Automation Software / Getting Started"

### Installation over an online connection

The CPUs are delivered with a default B&R Automation Runtime (with limited functions) already installed. This runtime system is started in Boot mode (operating mode switch in the BOOT position or no CompactFlash / invalid CompactFlash inserted). It initializes the Ethernet interface and onboard serial RS232 interface, making it possible to download a new runtime system.

1. Insert the CompactFlash card and switch on the power to the CPU. When the switch is in the BOOT position, a new or invalid CompactFlash card starts the CPU with the default B&R Automation Runtime system.
2. Establish a physical online connection between programming device (PC or industrial PC) and CPU (e.g. over an Ethernet network or via the RS232 interface).
3. Before you can establish an online connection via Ethernet, the CPU must be assigned an IP address. In Automation Studio, go to **Online / Settings** and click on the **Browse Targets** button to search for B&R targets on the local network. The CPU should appear on the list. If the CPU hasn't already received an IP address from a DHCP server, right-click on it and select **Set IP Parameters** from the shortcut menu. In the dialog box that opens you can make all the necessary network configurations temporarily (should be identical to the settings in the project).
4. Configure online connection in B&R Automation Studio. For details about the configuration: See help system under "Automation Software / Communication / Online communication"
5. Start the download procedure by selecting the **Services** command from the **Project** menu. Select **Transfer Automation Runtime** from the pop-up menu. Now follow the instructions given by B&R Automation Studio.

## 22 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	I0
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 21: X20 CPUs - Minimum upgrade version and minimum hardware revision for X20 IFxxxx interface modules

- The X20CPx58x CPUs are supported by B&R Automation Studio V 3.0.90.20 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".