X20CP1483 and X20CP1483-1

1 General information

The x86 100 MHz-compatible X20CP1483 is the entry-level X20 CPU. With an optimal price/performance ratio, it has the same basic features as the larger CPUs and offers sufficient performance for most standard applications.

USB and Ethernet are included in every CPU. In addition, every CPU has a POWERLINK connection for real-time communication.
In addition, a multi-purpose slot is provided for an additional interface module.

- Intel x86 100 MHz-compatible with additional I/O processor
- Onboard Ethernet, POWERLINK V1/V2 and USB
- Modular expansion of interfaces
- CompactFlash as removable application memory
- Fanless

2 Order data - X20CP148x

Model number	Short description
	X20 CPUs
X20CP1483	X20 CPU, x86 100 MHz (Intel compatible), 32 MB DRAM, 128 kB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100BASE-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!
X20CP1483-1	X20 CPU, x86 100 MHz (Intel compatible), 64 MB DRAM, 128 kB SRAM, removable application memory: CompactFlash, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100BASE-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: X20CP1483, X20CP1483-1 - Order data

Included in delivery

Order number	Short description
4A0006.00-000	Backup battery (see also "Battery" on page 14)
-	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

3 X20CP148x - Technical data

Model number	X20CP1483	X20CP1483-1
Short description		
Interfaces	1x RS232, 1x Ethernet, 1x POWERLINK (V1/V2), 2x USB, 1x X2X Link	
System module	CPU	
General information		
B&R ID code	0xA239	0xAEC5
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		
ACOPOS support	Yes	
Visual Components support	Yes	
Power consumption without memory card, interface module and USB	6 W	
Power consumption for 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	
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 GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)	
LR	ENV1	
KR	Yes	
ABS	Yes	
EAC	Yes	
KC	Yes	
CPU and X2X Link power supply		
Input voltage	24 VDC -15% / +20%	
Input current	Max. 2.2 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	

Table 3: X20CP1483, X20CP1483-1 - Technical data

Model number	X20CP1483	X20CP1483-1
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	
Controller		
CompactFlash slot	1	
Real-time clock	Nonvolatile, resolution 1 s, -10 to 10 ppm accuracy at 25°C	
FPU	Yes	
Processor		
Type	x86 100 (compatible)	
Clock frequency	100 MHz	
L2 cache	-	
L1 cache for data and program code	16 kB	
Integrated I/O processor	Processes I/O data points in the background	
Modular interface slots	1	
Remanent variables	Max. 32 kB [4]	
Shortest task class cycle time	1 ms	
Typical instruction cycle time	0.09 µs	
Data buffering		
Battery monitoring	Yes	
Lithium battery	At least 3 years	
Standard memory		
RAM	32 MB SDRAM	64 MB SDRAM
User RAM	128 kB 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	
Cable length	Max. 100 m between 2 stations (segment length)	
Transfer rate	10/100 Mbit/s	
Transfer		
Physical layer	10BASE-T/100BASE-TX	
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	
Cable 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	
Variant	Type A	
Max. output current	0.5 A	
Interface IF5		
Type	USB 1.1	
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	

Table 3: X20CP1483, X20CP1483-1 - Technical data

Model number	X20CP1483	X20CP1483-1
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 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	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	300 g	

Table 3: X20CP1483, X20CP1483-1 - Technical data

1) 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.
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 account.
3) In parallel operation, it is only permitted to expect 75% of the nominal power. It is important to make sure that all power supply units operated in parallel are switched on and off at the same time.
4) The memory size for remanent variables is configurable in Automation Studio.
5) Minus the set remanent variables.
6) For additional information, see section "Communication / POWERLINK / General information / Hardware - IF/LS" in Automation Help.

4 X20 CPUs - Status LEDs

Figure	LED	Color	Status	Description
	R/E	Green	On	Application running
			Blinking	Boot mode system start: CPU initializing the application, all bus systems and I/O modules[1]
			Double flash	Mode BOOT (during firmware update)[1]
		Red	On	SERVICE mode
			Blinking	The "R/E" LED blinks red and the "RDY/F" LED blinks yellow when there is a license violation.
	RDY/F	Yellow	On	SERVICE or BOOT mode
			Blinking	The "RDY/F" LED blinks yellow and the "R/E" LED blinks red when there is a license violation.
	S/E	Green/Red		Status/Error LED. The statuses of this LED are described in section "LED "S/E" (LED "Status/Error")" on page 5.
	PLK	Green	On	A link to the POWERLINK peer station has been established.
			Blinking	A link to the POWERLINK peer station has been established. The LED blinks when 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	CompactFlash read/write access
	DC	Yellow	On	CPU power supply OK
		Red	On	Backup battery empty

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

4.1 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.

4.1.1 Ethernet mode

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

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

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

4.1.2 POWERLINK V1 mode

LED "S/E"		
Green	**Red**	**Current state 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 7).
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 4: LED "S/E": POWERLINK V1 mode

4.1.3 POWERLINK V2

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

<div align="center">Table: LED "S/E" - Error message (interface in POWERLINK mode)</div>

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.

<div align="center">Table: LED "S/E" - Interface state (interface in POWERLINK mode)</div>

LED "S/E"		
Green	**Red**	**Description**
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)
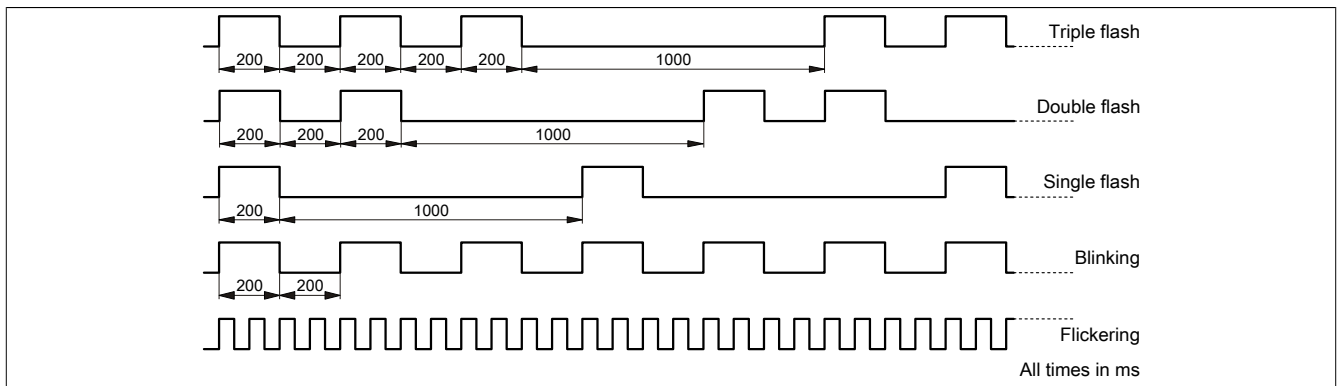
4.2 System stop error codes

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.
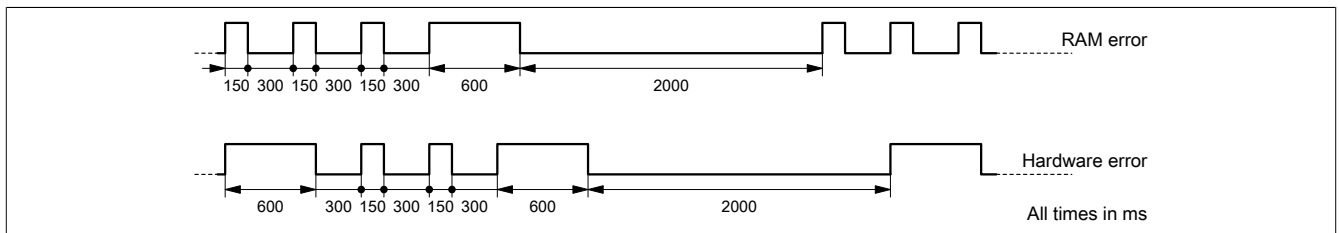

Error	Error description
RAM error	The device is defective and must be replaced.
Hardware error	The device or a system component is defective and must be replaced.

5 LED status indicators for the integrated power supply

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 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.

6 Operating and connection elements
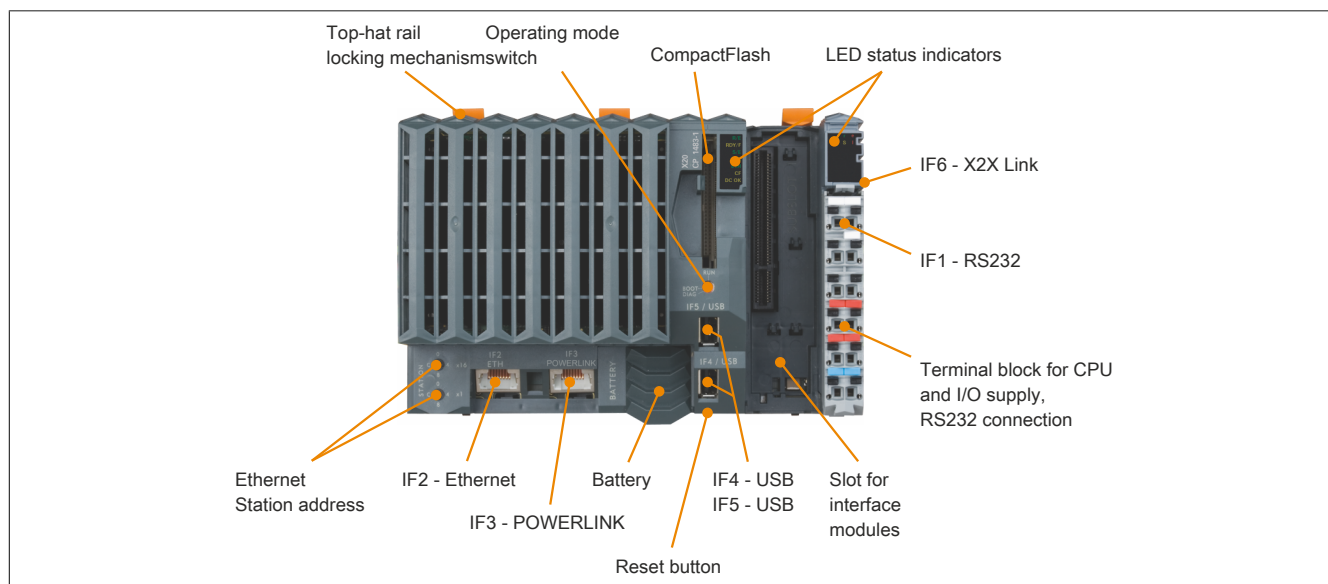
7 Slot for application memory

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 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 5: X20 CPUs - Operating mode

> **Information:**
>
> **A switch position other than those described here is not permitted!**

9 Reset button
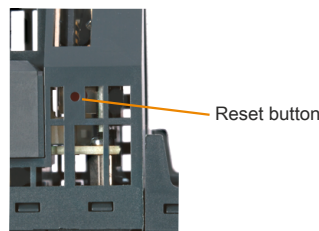
Reset button

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.
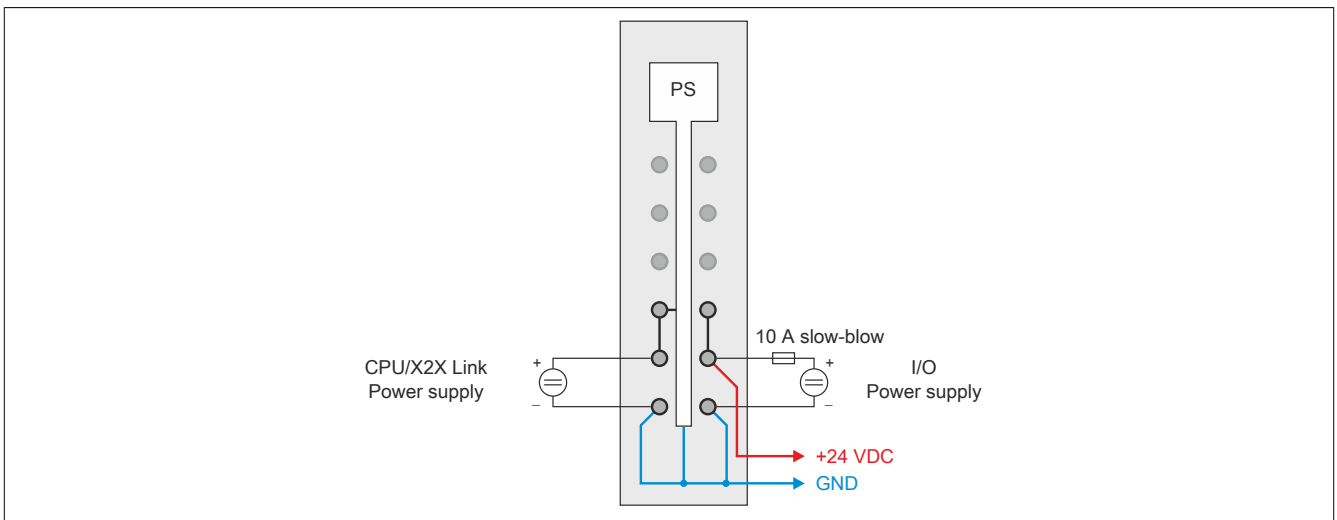
10 CPU power supply

A power supply unit 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.
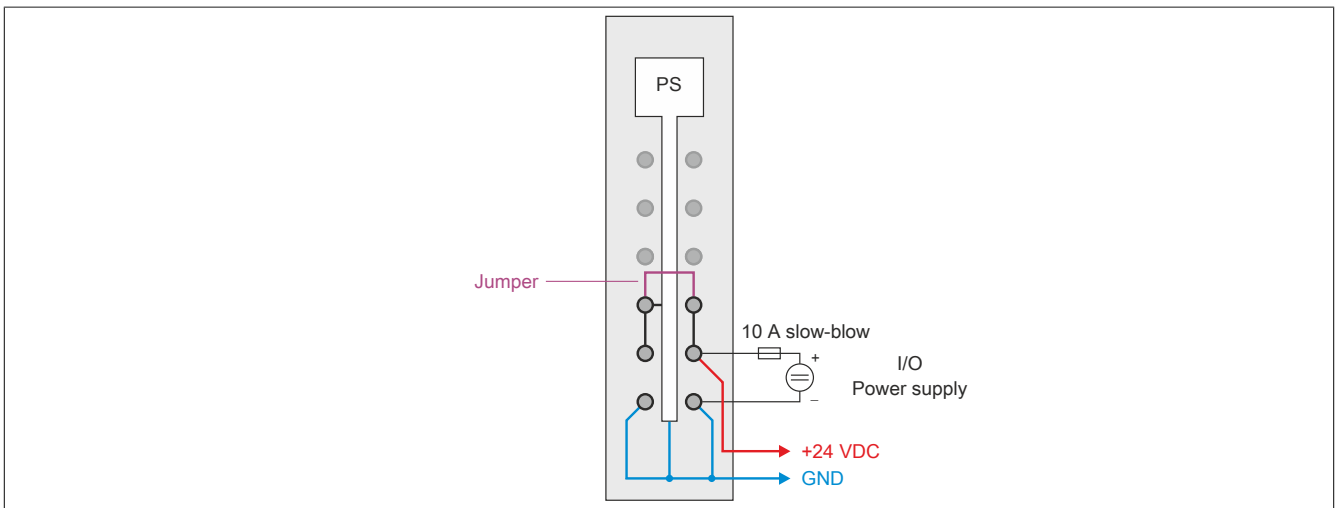
Integrated power supply unit - Pinout

Reserved	
Reserved	Reserved
+24 V CP/X2X L.	+24 V I/O
+24 V CP/X2X L.	+24 V I/O
GND	GND
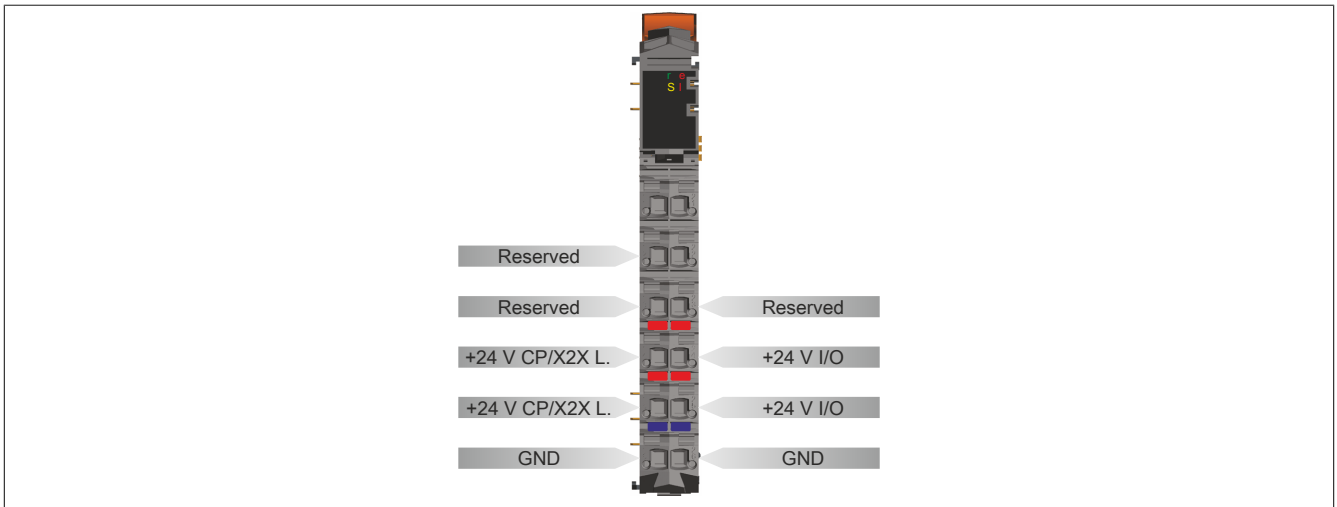
Connection example with 2 separate power supplies

CPU/X2X Link Power supply

10 A slow-blow

I/O Power supply

+24 VDC
GND

Connection example with power supply and jumper

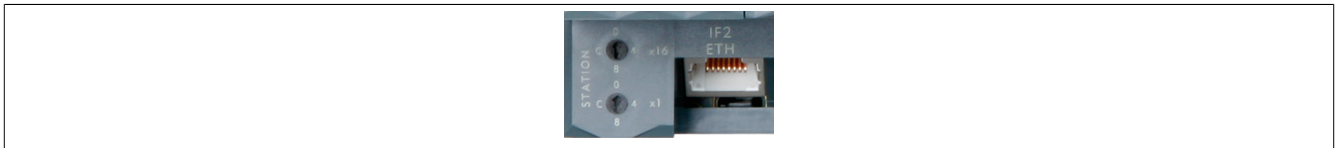Jumper

10 A slow-blow

I/O Power supply

+24 VDC
GND

11 RS232 interface (IF1)

The non-electrically isolated RS232 interface is designed as an online interface for communication with the programming device.
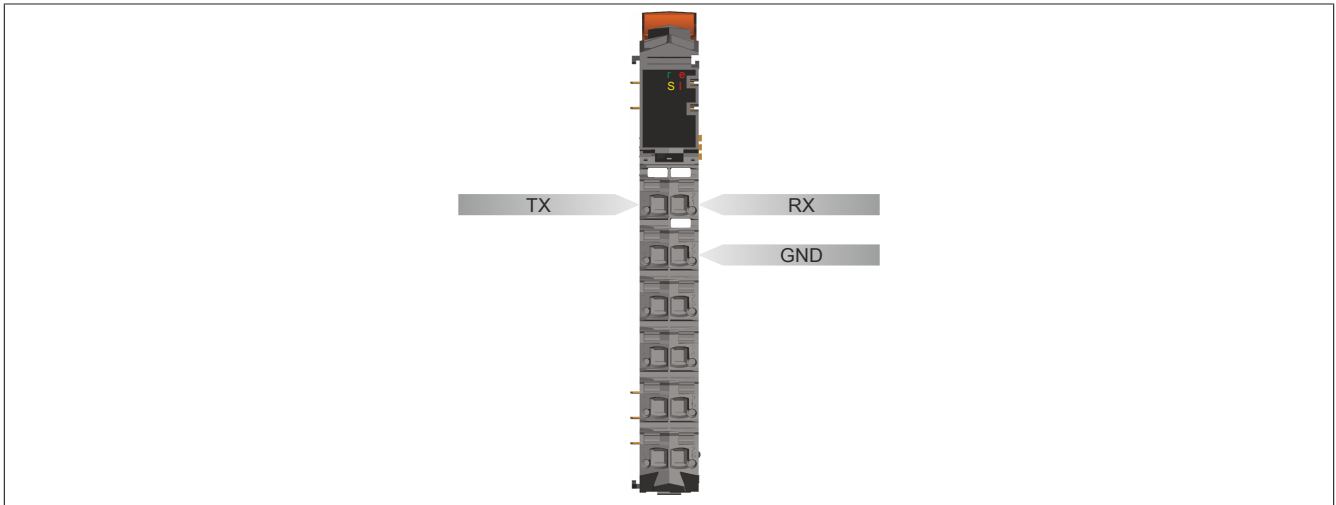
12 Ethernet interface (IF2)

IF2 is designed as a 10BASE-T/100BASE-TX 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.
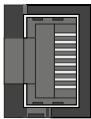
> ## Information:
>
> **The Ethernet interface is not suitable for POWERLINK.**
>
> **When using the POWERLINK interface, the Ethernet interface is not permitted to be operated with an IP address from the POWERLINK address range.**
> **POWERLINK address range: 192.168.100.x**

Pinout

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

13 POWERLINK interface (IF3)

POWERLINK V1

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

POWERLINK V2

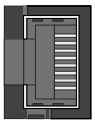| Switch position	Description
0x00	Reserved, switch position not permitted.
0x01 - 0xEF	Node number of the POWERLINK node. Operation as a controlled node (CN).
0xF0	Operation as a managing node (MN).
0xF1 - 0xFF	Reserved, switch position not permitted.

Ethernet mode

Starting with Automation Studio Version V2.5.3 and with Automation Runtime V2.90, the interface can be operated as an Ethernet interface.

The INA2000 station number can be 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" in the X20 user's manual.

Interface	Pinout		
	Pin	Ethernet	
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	

14 USB interfaces (IF4 and IF5)

IF4 and IF5 are non-electrically isolated USB interfaces. The connection is made using a USB 1.1 interface.

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

> **Information:**
> - **USB interfaces cannot be used for online communication with a programming device.**
> - **Only devices isolated from GND can be connected to the USB interfaces.**
> - **Current-carrying capacity is listed in the technical data.**

15 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.

16 Overtemperature cutoff

To prevent damage, a shut-off/reset is triggered on the CPU when the processor reaches 100°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 6: X20 CPUs - Logbook entries after overtemperature cutoff

17 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.
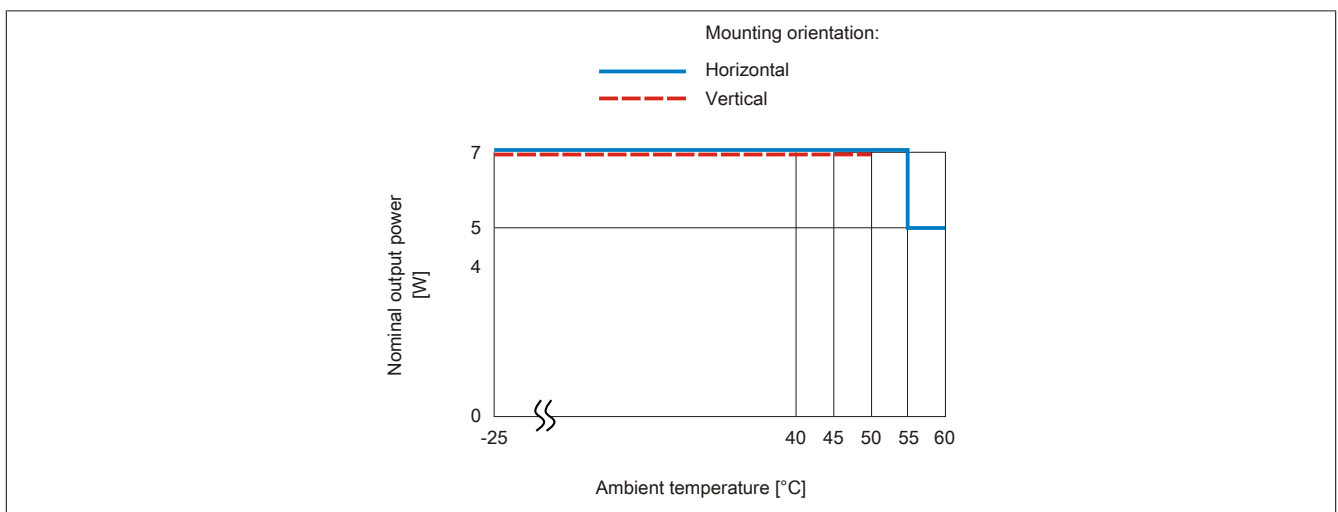
18 Battery

X20 CPUs 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	1 pcs.
0AC201.91	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 when the power to the PLC is switched off as well as when the power to the PLC is switched on. 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 when the power is switched 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. Perform electrostatic discharge at the top-hat rail or at the ground connection (do not reach into the power supply unit!)
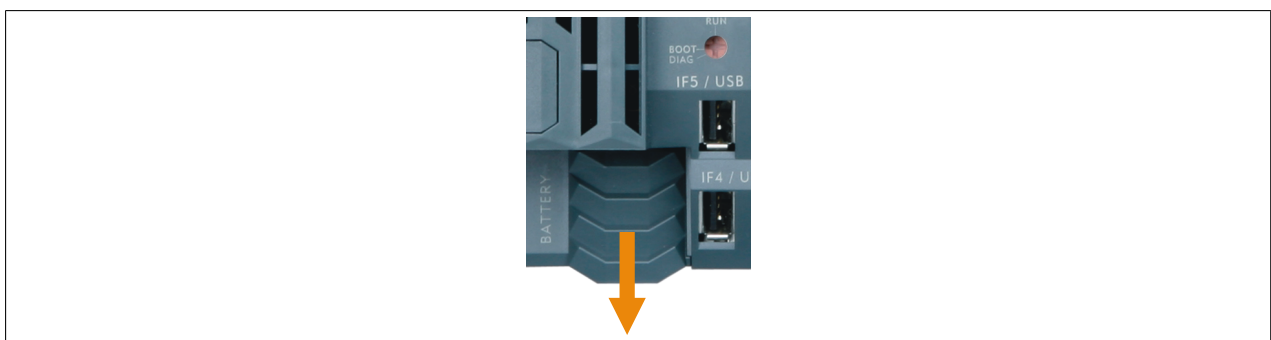2. Remove the cover for the lithium battery. Do this by sliding it down and away from the CPU.

Figure 1: X20 CPUs - Remove lithium battery cover

3. Push the empty battery out of the holder.

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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.

19 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 system (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 the programming device (PC or industrial PC) and the CPU (e.g. over an Ethernet network or the RS232 interface).
3. Before you can establish an online connection via Ethernet, the CPU must be assigned an IP address. In Automation Studio, select **Settings** from the Online menu and then click on the **Browse targets** button to search for B&R target systems on the local network. The CPU should appear in the list. If the CPU has not already received an IP address from a DHCP server, right-click on it and select **Set IP parameters** from the shortcut menu. All necessary network configurations can be made on a temporary basis in this dialog box (should be identical to the settings defined 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. Then select **Transfer Automation Runtime** from the pop-up menu. Now follow the instructions provided by B&R Automation Studio.

20 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" in the X20 system user's manual.