# X20CP041x and X20CP048x

## 1 General information

The CPUs in the X20 Compact-S family are available in 5 different variants. This way, customers get the product that best meets the requirements of the machine – technically and economically.

The processor performance of the compact CPUs ranges from 166 MHz (compatible) to 667 MHz. The most economical variant comes equipped with 128 MB RAM, 8 kB nonvolatile RAM and 256 MB flash drive. The most powerful version of the Compact-S CPUs achieves cycle times down to 400 µs and has 64 kB nonvolatile RAM as well as 2 GB internal flash drive.

With POWERLINK, Ethernet, USB and RS232, the CPUs offer ample communication options. A CAN interface is also available as an option. If the application requires additional interfaces, the CPU can be modularly expanded by one or two X20 interface slots. This allows the entire product range of X20 fieldbus interfaces to be used.

The fan-free, battery-free design of Compact-S CPUs means they are completely maintenance-free.

- ARM Cortex A9 processor with 166 MHz (compatible) to 667 MHz and integrated I/O processor
- Depending on the variant: POWERLINK with poll-response chaining
- 2x onboard USB
- Up to 2 slots for modular interface expansions
- 128 to 256 MB DDR3 SDRAM
- 256 MB to 2 GB onboard flash drive
- Fanless
- No battery
- Extremely compact

# 2 Order data



X20CP0410, X20CP0411                    X20CP0482, X20CP0483, X20CP0484

| Model number | Short description |
|---|---|
| **Compact-S CPUs** | |
| X20CP0410 | X20 Compact-S CPU, ARM Cortex A9-166 (compatible), 128 MB DDR3 RAM, 8 kB FRAM, 256 MB onboard flash drive, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100BASE-T, order bus base, power supply module and terminal block separately. |
| X20CP0411 | X20 Compact-S CPU, ARM Cortex A9-240, 128 MB DDR3 RAM, 16 kB FRAM, 512 MB onboard flash drive, 2 USB interfaces, 1 RS232 interface, 1 Ethernet interface 10/100BASE-T, order bus base, power supply module and terminal block separately. |
| X20CP0482 | X20 Compact-S CPU, ARM Cortex A9-300, 128 MB DDR3 RAM, 16 kB FRAM, 1 GB onboard flash drive, 2 USB interfaces, 1 RS232 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T, can be expanded with X20 interface slots, order bus base, power supply module and terminal block separately. |
| X20CP0483 | X20 Compact-S CPU, ARM Cortex A9-500, 256 MB DDR3 RAM, 32 kB FRAM, 1 GB onboard flash drive, 2 USB interfaces, 1 RS232 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T, can be expanded with X20 interface slots, order bus base, power supply module and terminal block separately. |
| X20CP0484 | X20 Compact-S CPU, ARM Cortex A9-667, 256 MB DDR3 RAM, 64 kB FRAM, 2 GB onboard flash drive, 2 USB interfaces, 1 RS232 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T, can be expanded with X20 interface slots, order bus base, power supply module and terminal block separately. |
| **Required accessories** | |
| **System modules for Compact-S CPUs** | |
| X20BB52 | X20 Compact-S bus base, for Compact-S CPU and Compact-S CPU power supply module, base for integrated RS232 interface, X20 connection, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included |
| X20BB57 | X20 Compact-S bus base, for Compact-S CPU and Compact-S CPU power supply module, base for integrated RS232 and CAN bus interface, X20 connection, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included |
| X20BB62 | X20 Compact-S bus base, for Compact-S CPU and Compact-S CPU power supply module, base for integrated RS232 interface, slot for X20 interface module, X20 connection, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included |
| X20BB67 | X20 Compact-S bus base, for Compact-S CPU and Compact-S CPU power supply module, base for integrated RS232 and CAN bus interface, slot for X20 interface module, X20 connection, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included |
| X20BB72 | X20 Compact-S bus base, for Compact-S CPU and Compact-S CPU power supply module, base for integrated RS232 interface, 2 slots for X20 interface modules, X20 connection, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included |
| X20BB77 | X20 Compact-S bus base, for Compact-S CPU and Compact-S CPU power supply module, base for integrated RS232 and CAN bus interface, 2 slots for X20 interface modules, X20 connection, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included |
| X20PS9600 | X20 power supply module, for Compact-S CPU and internal I/O power supply, X2X Link power supply |
| X20PS9602 | X20 power supply module, for Compact-S CPU and internal I/O power supply, X2X Link power supply, power supply not electrically isolated |
| **Terminal blocks** | |
| X20TB12 | X20 terminal block, 12-pin, 24 VDC keyed |

Table 1: X20CP041x and X20CP048x - Order data

### Included in delivery

X20 end cover plates are included with the delivery of the Compact-S CPU bus base.

| Model number | Short description |
|---|---|
| X20AC0SL1 | X20 end cover plate, left |
| X20AC0SR1 | X20 end cover plate, right |

# 3 Technical data

| Model number | X20CP0410 | X20CP0411 | X20CP0482 | X20CP0483 | X20CP0484 |
|---|---|---|---|---|---|
| **Short description** | | | | | |
| Interfaces | 1x Ethernet, 2x USB, 1x X2X Link | | 1x Ethernet, 1x POWERLINK (V2), 2x USB, 1x X2X Link | | |
| System module | CPU | | | | |
| **General information** | | | | | |
| Cooling | Fanless | | | | |
| B&R ID code | 0xE94F | 0xE950 | 0xE951 | 0xE952 | 0xE953 |
| Status indicators | CPU function, Ethernet | | CPU function, Ethernet, POWERLINK | | |
| Diagnostics | | | | | |
|   CPU function | Yes, using status LED | | | | |
|   Ethernet | Yes, using status LED | | | | |
|   POWERLINK | - | | Yes, using status LED | | |
|   Overtemperature | Yes, using software | | | | |
| Power consumption | 2.2 W [1] | 2.7 W [1] | | 2.9 W [1] | 2.95 W [1] |
| CPU redundancy possible | No | | | | |
| ACOPOS support | Yes | | | | |
| Visual Components support | Yes | | | | |
| Additional power dissipation caused by the actuators (resistive) [W] | - | | | | |
| Electrical isolation | | | | | |
|   IF2 - IF3 | - | | Yes | | |
|   IF2 - IF4 | Yes | | | | |
|   IF2 - IF5 | Yes | | | | |
|   IF2 - IF6 | Yes | | | | |
|   IF3 - IF4 | - | | Yes | | |
|   IF3 - IF5 | - | | Yes | | |
|   IF3 - IF6 | - | | Yes | | |
|   IF4 - IF5 | No | | | | |
|   IF4 - IF6 | Yes, with X20PS9600 / No, with X20PS9602 | | | | |
|   IF5 - IF6 | Yes, with X20PS9600 / No, with X20PS9602 | | | | |
|   PLC - IF2 (Ethernet) | Yes | | | | |
|   PLC - IF3 (POWERLINK) | - | | Yes | | |
|   PLC - IF4 (USB) | No | | | | |
|   PLC - IF5 (USB) | No | | | | |
|   PLC - IF6 (X2X Link) | Yes, with X20PS9600 / No, with X20PS9602 | | | | |
| Certification | | | | | |
|   CE | Yes | | | | |
|   GOST-R | Yes | | | | |
| **Controller** | | | | | |
| Real-time clock | Buffering for at least 300 hours, typ. 1000 hours at 25°C, 1 s resolution, -18 to 28 ppm accuracy at 25°C | | | | |
| FPU | Yes | | | | |
| Processor | | | | | |
|   Type | ARM Cortex-A9 | | | | |
|   Clock frequency | 166 MHz (comp.) | 240 MHz | 300 MHz | 500 MHz | 667 MHz |
|   L1 cache | | | | | |
|     Data code | 32 kB | | | | |
|     Program code | 32 kB | | | | |
|   L2 cache | 512 kB | | | | |
| Integrated I/O processor | Processes I/O data points in the background | | | | |
| Remanent variables | 8 kB FRAM, buffering >10 years [2] | 16 kB FRAM, buffering >10 years [2] | | 32 kB FRAM, buffering >10 years [2] | 64 kB FRAM, buffering >10 years [2] |
| Shortest task class cycle time | 4 ms | 2 ms | 1 ms | 0.8 ms | 0.4 ms |
| Typical instruction cycle time | 0.0446 µs | 0.0309 µs | 0.0247 µs | 0.0145 µs | 0.0106 µs |
| Standard memory | | | | | |
|   RAM | 128 MB DDR3 SDRAM | | | 256 MB DDR3 SDRAM | |
| Application memory | | | | | |
|   Type | 256 MB eMMC flash memory | 512 MB eMMC flash memory | 1 GB eMMC flash memory | | 2 GB eMMC flash memory |
|   Data retention | 10 years | | | | |
|   Writable data amount | | | | | |
|     Guaranteed | 40 TB | | | | |
|     Results for 5 years | 21.9 GB/day | | | | |
|   Guaranteed clear/write cycles | 20,000 | | | | |
|   Error correction coding (ECC) | Yes | | | | |
| Slots for interface modules | | | | | |
|   X20BB5x | - | | 0 | | |
|   X20BB6x | - | | 1 | | |
|   X20BB7x | - | | 2 | | |

Table 2: X20CP041x and X20CP048x - Technical data

| Model number | X20CP0410 | X20CP0411 | X20CP0482 | X20CP0483 | X20CP0484 |
|---|---|---|---|---|---|
| **Interfaces** | | | | | |
| IF2 interface | | | | | |
|   Signal | Ethernet | | | | |
|   Design | 1x RJ45 shielded | | | | |
|   Cable length | Max. 100 m between 2 stations (segment length) | | | | |
|   Transfer rate | 10/100 Mbit/s | | | | |
|   Transmission | | | | | |
|     Physical layer | 10BASE-T/100BASE-TX | | | | |
|     Half-duplex | Yes | | | | |
|     Full-duplex | Yes | | | | |
|     Autonegotiation | Yes | | | | |
|     Auto-MDI / MDIX | Yes | | | | |
| IF3 interface | | | | | |
|   Fieldbus | - | - | POWERLINK (V2) managing or controlled node | | |
|   Type | - | - | Type 4 [3] | | |
|   Design | - | - | 1x RJ45 shielded | | |
|   Cable length | - | - | Max. 100 m between 2 stations (segment length) | | |
|   Transfer rate | - | - | 100 Mbit/s | | |
|   Transmission | | | | | |
|     Physical layer | - | - | 100BASE-TX | | |
|     Half-duplex | - | - | Yes | | |
|     Full-duplex | - | - | POWERLINK mode: No / Ethernet mode: Yes | | |
|     Autonegotiation | - | - | Yes | | |
|     Auto-MDI / MDIX | - | - | Yes | | |
| IF4 interface | | | | | |
|   Type | USB 1.1/2.0 | | | | |
|   Design | Type A | | | | |
|   Max. output current | 0.2 A | | | | |
| IF5 interface | | | | | |
|   Type | USB 1.1/2.0 | | | | |
|   Design | Type A | | | | |
|   Max. output current | 0.2 A | | | | |
| IF6 interface | | | | | |
|   Fieldbus | X2X Link master | | | | |
| On base module | | | | | |
|   X20BB52, X20BB62 and X20BB72 | Compact-S CPU base module with integrated RS232 interface | | | | |
|   X20BB57, X20BB67 and X20BB77 | Compact-S CPU base module with integrated RS232 and CAN bus interface | | | | |
| **Operating conditions** | | | | | |
| Mounting orientation | | | | | |
|   Horizontal | Yes | | | | |
|   Vertical | Yes | | | | |
| Installation at elevations above sea level | | | | | |
|   0 to 2000 m | No limitations | | | | |
|   >2000 m | Reduction of ambient temperature by 0.5°C per 100 m | | | | |
| EN 60529 protection | IP20 | | | | |
| **Environmental conditions** | | | | | |
| Temperature | | | | | |
|   Operation | | | | | |
|     Horizontal installation | -25 to 60°C | | | | |
|     Vertical installation | -25 to 50°C | | | | |
|   Derating | See section "Derating" of X20PS960x data sheet | | | | |
|   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 characteristics** | | | | | |
| Note | Order 1x terminal block X20TB12 separately Order 1x X20PS9600 or X20PS9602 power supply module separately Order 1x X20BB5x Compact-S CPU base separately | | Order 1x terminal block X20TB12 separately Order 1x X20PS9600 or X20PS9602 power supply module separately Order 1x X20BB5x, X20BB6x or X20BB7x Compact-S CPU base separately | | |
| Spacing [4] | | | | | |
|   X20BB5x | 37.5$^{+0.2}$ mm | | | | |
|   X20BB6x | - | - | 62.5$^{+0.2}$ mm [5] | | |
|   X20BB7x | - | - | 87.5$^{+0.2}$ mm [6] | | |

Table 2: X20CP041x and X20CP048x - Technical data

1)     Without USB interface
2)     Configurable in Automation Studio.
3)     See Automation Help under "Communication / POWERLINK / General information / Hardware - IF/LS" for more information.

4)	Spacing is based on the width of the Compact-S CPU base.
5)	X20CP048x CPUs can be used to operate 1 interface module.
6)	X20CP048x CPUs can be used to operate 2 interface modules.

# 4 LED status indicators

## X20CP0410 and X20CP0411

| Figure | LED | Color | Status | Description |
|---|---|---|---|---|
| | R/E | Green | On | Application running |
| | | | Blinking | Boot mode system start:<br>CPU initializing the application, all bus systems and I/O modules[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. |
| | | | Double flash | BOOT mode (during firmware update)[1] |
| | 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. |
| | IF2/ETH | Green | On | A link to the Ethernet remote station has been established. |
| | | | Blinking | A link to the Ethernet remote station has been established. The LED blinks when Ethernet activity is taking place on the bus. |

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

## X20CP0482, X20CP0483 and X20CP0484

| Figure | LED | Color | Status | Description |
|---|---|---|---|---|
| | R/E | Green | On | Application running |
| | | | Blinking | Boot mode system start:<br>CPU initializing the application, all bus systems and I/O modules[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. |
| | | | Double flash | BOOT mode (during firmware update)[1] |
| | 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 4.1 "LED "S/E"". |
| | IF3/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. |
| | IF2/ETH | Green | On | A link to the Ethernet remote station has been established. |
| | | | Blinking | A link to the Ethernet remote station has been established. The LED blinks when Ethernet activity is taking place on the bus. |

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

## 4.1 LED "S/E"

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

### 4.1.1 Ethernet mode

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

| Green - Status | Description |
|---|---|
| On | Interface being operated as an Ethernet interface |

Table 3: Status/Error LED - Ethernet operating mode

## 4.1.2 POWERLINK V2

| Red - Error | Description |
|---|---|
| On | The module is in an error mode (failed Ethernet frames, increased number of collisions on the network, etc.).<br>If an error occurs in the following states, then the green LED blinks over the red LED:<br><br>• PRE_OPERATIONAL_1<br>• PRE_OPERATIONAL_2<br>• READY_TO_OPERATE<br><br><br><br>Note:<br>The LED blinks red several times immediately after the device is switched on. This is not an error, however. |

Table 4: Status/Error LED as Error LED - POWERLINK operating mode

| Green - Status | Description |
|---|---|
| Off | **Mode**<br>The module is in mode NOT_ACTIVE or:<br><br>• Switched off<br>• Starting up<br>• Not configured correctly in Automation Studio<br>• Defective<br><br>**Managing node (MN)**<br>The bus is being monitored for POWERLINK frames. If a corresponding frame is not received within the defined time frame (timeout), then the module switches immediately to mode PRE_OPERATIONAL_1.<br>If POWERLINK communication is detected before the time expires, however, then the MN will not be started.<br><br>**Controlled node (CN)**<br>The bus is being monitored for POWERLINK frames. If a corresponding frame is not received within the defined time frame (timeout), then the module switches immediately to mode BASIC_ETHERNET. If POWERLINK communication is detected before this time expires, however, the module switches immediately to mode PRE_OPERATIONAL_1. |
| Flickering green (approx. 10 Hz) | **Mode**<br>The module is in mode BASIC_ETHERNET. The interface is being operated as an Ethernet TCP/IP interface.<br><br>**Managing node (MN)**<br>This state can only be changed by resetting the module.<br><br>**Controlled node (CN)**<br>If POWERLINK communication is detected while in this state, the module will transition to state PRE_OPERATIONAL_1. |
| Single flash (approx. 1 Hz) | **Mode**<br>The module is in mode PRE_OPERATIONAL_1.<br><br>**Managing node (MN)**<br>The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place.<br><br>**Controlled node (CN)**<br>The module can be configured by the MN in this state. The CN waits until it receives an SoC frame and then switches to mode PRE_OPERATIONAL_2.<br>An LED lit red in this state indicates failure of the MN. |

Table 5: Status/Error LED as Status LED - POWERLINK operating mode

| Green - Status | Description |
|---|---|
| Double flash (approx. 1 Hz) | **Mode** <br> The module is in mode PRE_OPERATIONAL_2. <br><br> **Managing node (MN)** <br> The MN begins cyclic communication (cyclic input data is not yet being evaluated). <br> The CNs are configured in this state. <br><br> **Controlled node (CN)** <br> The module can be configured by the MN in this state. A command then switches the module to mode READY_TO_OPERATE. <br> An LED lit red in this mode indicates failure of the MN. |
| Triple flash (approx. 1 Hz) | **Mode** <br> The module is in state READY_TO_OPERATE. <br><br> **Managing node (MN)** <br> Cyclic and asynchronous communication is taking place. Any received PDO data is ignored. <br><br> **Controlled node (CN)** <br> The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet being evaluated, however. <br> An LED lit red in this mode indicates failure of the MN. |
| On | **Mode** <br> The module is in mode OPERATIONAL. PDO mapping is active and cyclic data is being evaluated. |
| Blinking (approx. 2.5 Hz) | **Mode** <br> The module is in mode STOPPED. <br><br> **Managing node (MN)** <br> This status is not possible for the MN. <br><br> **Controlled node (CN)** <br> No output data is produced or input data supplied. It is only possible to enter or leave this mode after the MN has given the appropriate command. |

Table 5: Status/Error LED as Status LED - POWERLINK operating mode

## LED status indicators - Blink times
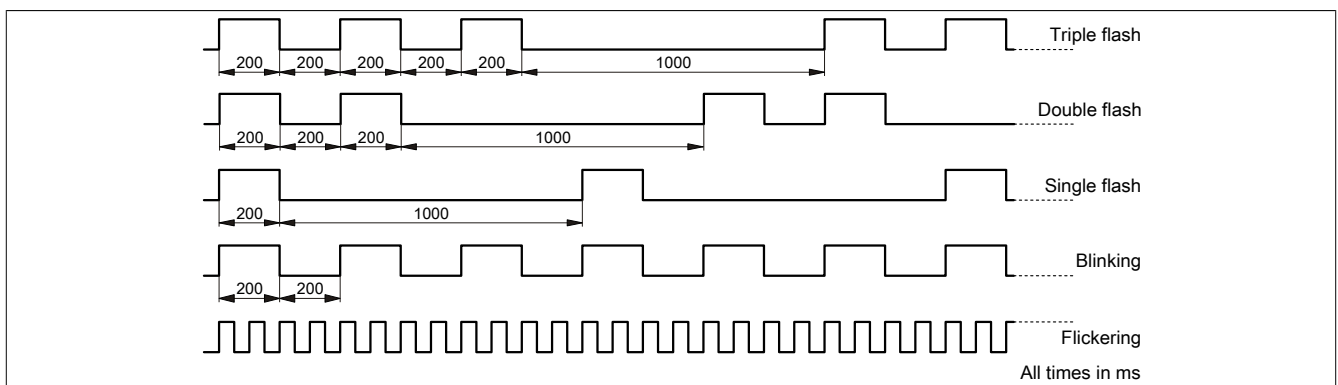


## 4.2 System failure error codes

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

The error code is indicated by the red Error LED using 4 switch-on phases. Each switch-on phase has a duration of either 150 ms or 600 ms. The error code is repeated every 2 seconds.

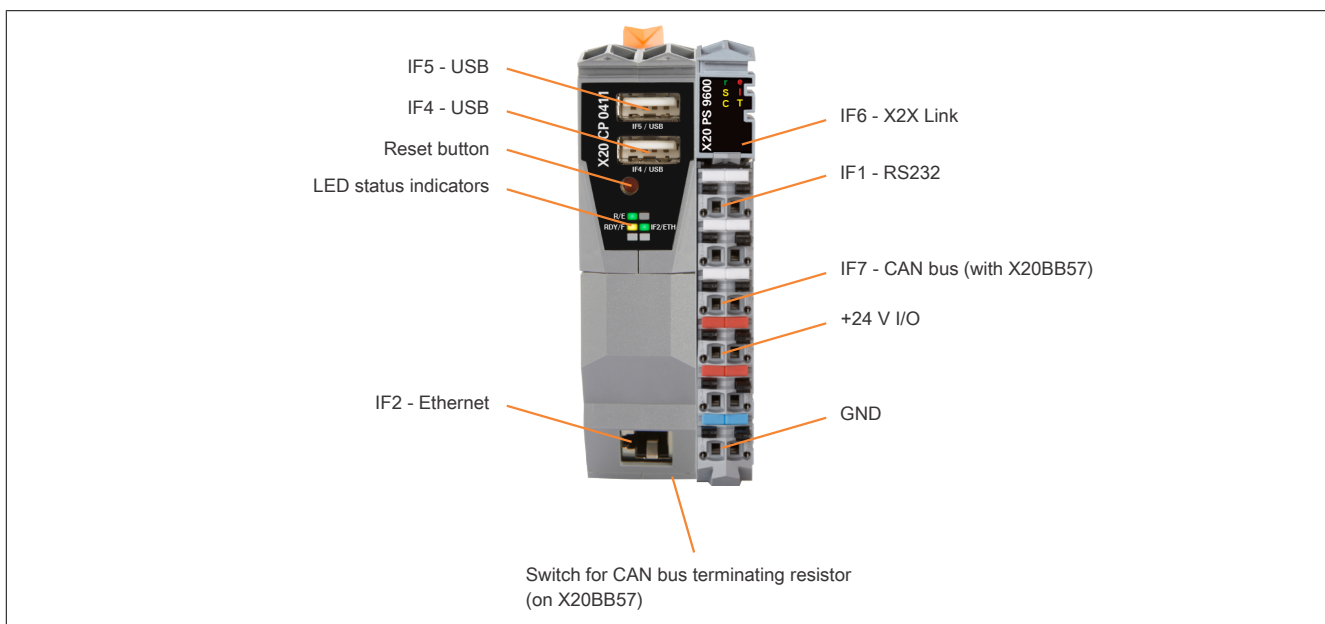| Error description | Error code indicated by red "Status" LED | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RAM error: <br> The module is defective and must be replaced. | ● | ● | ● | - | Pause | ● | ● | ● | - | Pause |
| Hardware error: <br> The module or a system component is defective and must be replaced. | - | ● | ● | - | Pause | - | ● | ● | - | Pause |

Table 6: Status/Error ("S/E") LED - System stop error codes

Key: 　　● 　... 150 ms
　　　　- 　... 600 ms
　　Pause ... 2-second pause

# 5 Operating and connection elements

## X20CP0410 and X20CP0411



IF5 - USB
IF4 - USB
Reset button
LED status indicators
IF2 - Ethernet

IF6 - X2X Link
IF1 - RS232
IF7 - CAN bus (with X20BB57)
+24 V I/O
GND

Switch for CAN bus terminating resistor
(on X20BB57)

## X20CP0482, X20CP0483 and X20CP0484



IF5 - USB
IF4 - USB
Reset button
LED status indicators
IF3 - POWERLINK
IF2 - Ethernet

IF6 - X2X Link
IF1 - RS232
IF7 - CAN bus
(with X20BB57/67/77)
+24 V I/O
GND

Switch for CAN bus terminating resistor
(on X20BB57/67/77)
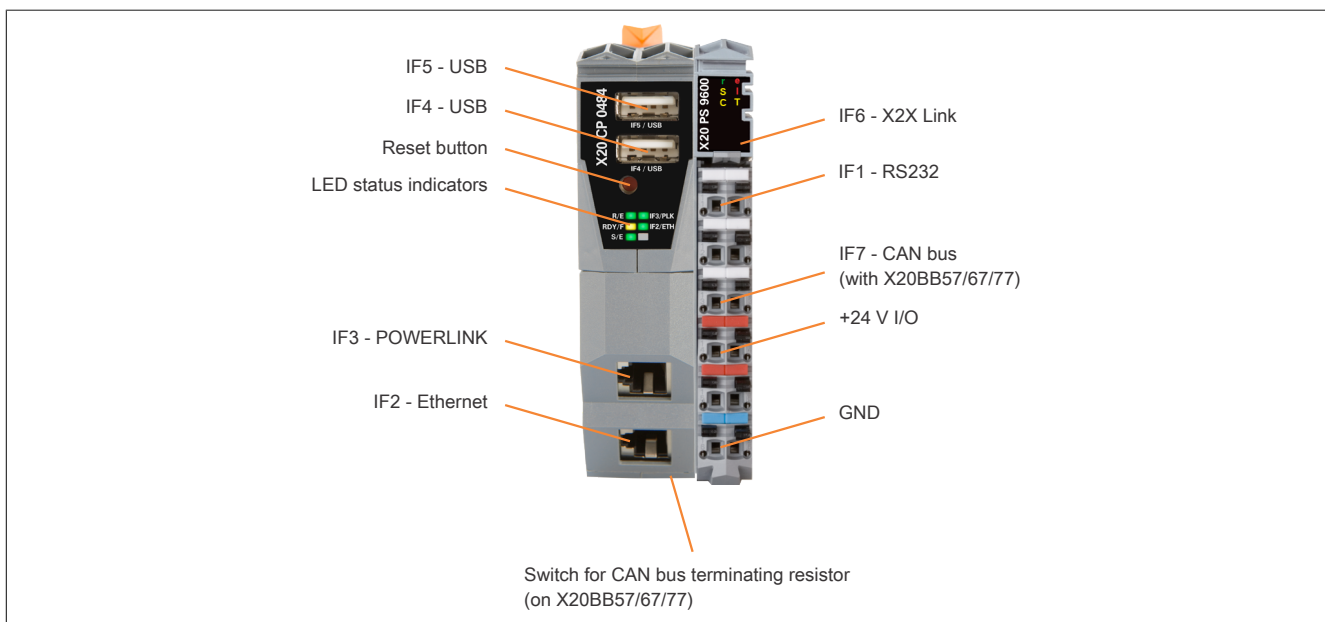
## 5.1 Button for reset and operating mode

### 5.1.1 Reset

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

- 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.

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

### 5.1.2 Operating mode

3 operating modes can be configured using different button sequences:

| Operating mode | Button sequence | Description |
|---|---|---|
| BOOT | Boot mode is enabled by the following button sequence:<br><br>• Press the button for less than 2 seconds.<br>As soon as LED "R/E" lights **RED**, the button can be released.<br>• Then press the button within 2 seconds for longer than 2 seconds.<br>As soon as LED "R/E" is no longer lit, the button can be released. | The default Automation Runtime system is started and the runtime system can be installed via the online interface (Automation Studio). User flash memory is deleted only after the download begins. |
| RUN | Press the button for less than 2 seconds.<br>As soon as LED "R/E" lights **RED**, the button can be released. | RUN mode:<br>The triggering and boot behavior are the same as what happens when a hardware reset is triggered (see "Reset" on page 8). |
| DIAGNOSE | Press the button for more than 2 seconds.<br>LED "R/E" lights **RED** and then goes dark. As soon as LED "R/E" is no longer lit, the button can be released. | Boots the CPU in diagnostic mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostic mode, the CPU always boots with a cold restart. |

## 5.2 Flash drive

This application memory is integrated on a flash drive.

## 5.3 Programming the system flash memory

### General information

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

### Installation over an online connection

These CPUs come standard with an Automation Runtime system (with limited functionality) already installed. This runtime system is started in boot mode (see "Button for reset and operating mode" on page 8 or invalid flash drive). Some of its tasks include initializing the Ethernet and integrated serial RS232 interfaces so that it is possible to download a runtime system.

1. Switch on the supply voltage for the CPU. The CPU starts with the default Automation Runtime in boot mode (see "Button for reset and operating mode" on page 8 or an invalid flash drive).

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. Search for available B&R target system in the local network by selecting **Online / Settings** from the Automation Studio menu and then clicking the **Browse targets** button. 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 an online connection in Automation Studio. For details about the configuration: See Automation Help under "Automation software - Communication - Online communication".

5. Start the download procedure by selecting **Services** from the **Online** menu. Then select **Transfer Automation Runtime** from the pop-up menu. Now follow the instructions provided by Automation Studio.

## 5.4 Data and real-time clock buffering

The CPUs are not designed for use with batteries. This makes them completely maintenance-free. The following features make operation without a backup battery possible.

| Data and real-time clock buffering | Type of buffering | Note |
|---|---|---|
| Remanent variables | FRAM | This FRAM stores its contents ferroelectrically. Unlike normal SRAM, this does not require a battery. |
| Real-time clock | Gold foil capacitor | The real-time clock is buffered for approx. 1000 hours by a gold foil capacitor. The gold foil capacitor is completely charged after 3 continuous hours of operation. |

# 6 Slot for interface modules

Up to 2 interface module can be connected to the left side of X20CP048x Compact-S CPUs. Various bus and network systems can easily be integrated into the X20 system by selecting the corresponding interface module.

| CPU base | Slots for interface modules |
|---|---|
| X20BB62, X20BB67 | 1 |
| X20BB72, X20BB77 | 2 |

## 6.1 Information regarding operation of interface modules on X20CP048x controllers

X20 interface modules must have a minimum firmware version in order to be operated on X20CP048x controllers. A hardware upgrade may be necessary. This can be installed from Automation Studio by selecting **Tools/Upgrades** from the menu. The following table provides an overview:

| Model number | Minimum upgrade version |
|---|---|
| X20IF1082-2 | 1.5.0.0 |
| X20IF1082 | 1.5.0.0 |
| X20IF1086-2 | 1.5.0.0 |
| X20IF2181-2 | 1.3.0.0 |
| X20cIF1082-2 | 1.5.0.0 |
| X20cIF2181-2 | 1.3.0.0 |
| X20IF1091 | 1.1.0.0 |
| X20IF2792 | 1.1.0.0 |

# 7 RS232 interface (IF1)

The non-electrically isolated RS232 interface is primarily intended to serve as an online interface for communication with the programming device. The terminal connections for the signals are located on the power supply module.
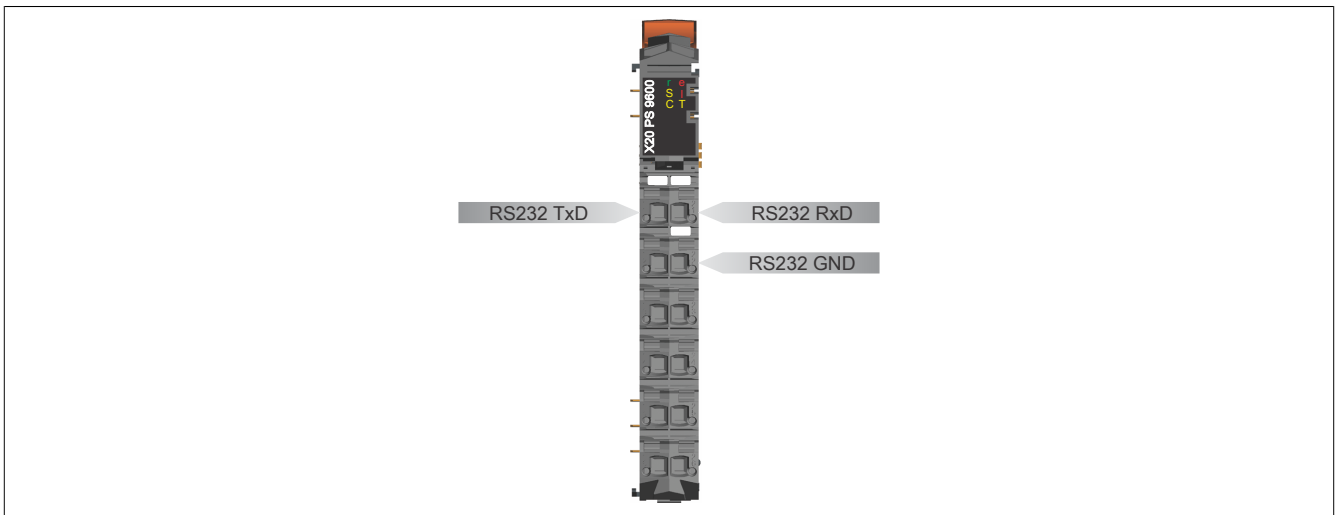
# 8 Ethernet interface (IF2)

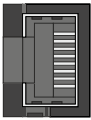IF2 is a 10BASE-T/100BASE-TX Ethernet interface.

The INA2000 station number is set using the B&R Automation Studio software.

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).

## Information:

**The Ethernet interface (IF2) is not suited for POWERLINK.**

**Pinout**

| 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 | |

# 9 POWERLINK interface (IF3)

X20CP048x Compact-S CPUs are equipped with a POWERLINK V2 interface.

**POWERLINK**

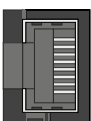Node numbers between 0x01 and 0xF0 are permitted. The node number can be configured using software.

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

**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 at (www.br-automation.com).

| 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 | |

## 10 USB interfaces (IF4 and IF5)

IF4 and IF5 are non-electrically isolated USB interfaces. The connection is made via a USB 1.1/2.0 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.**

## 11 CAN bus interface (IF7)

When used with bus base X20BB57, X20BB67 or X20BB77, the CPUs have access to a CAN bus interface. The terminal connections for the signals are located on the power supply module.
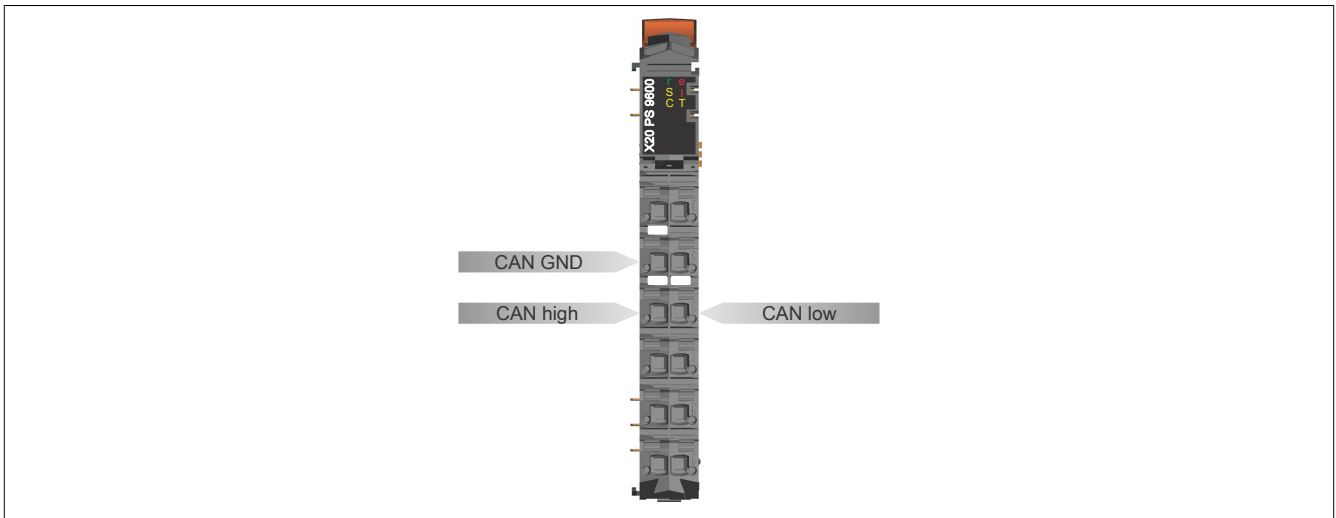


## 12 Overtemperature cutoff

To prevent damage, a shutdown/reset is triggered on the CPU when the processor 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 7: Logbook entries after overtemperature cutoff

## 13 System requirements

The following minimum versions are recommended to generally be able to use all functions:

- Automation Studio 4.3.3
- Automation Runtime 4.34
- To ensure error-free support in Automation Studio, **all** Compact-S hardware upgrades must be installed separately via Automation Studio menu **Tools / Upgrades**:
    - ° X20CP04xx
    - ° X20BB5x/6x/7x
    - ° X20PS960x
- Starting with Automation Studio 4.4, all Compact-S components are included in the installation package.

# 14 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.

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