

# X20CP0201, X20CP0291, X20CP0292

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## 1 General information

Compact CPUs are ideal for situations where cycle times in the millisecond range are sufficient and a cost-benefit analysis plays a decisive role. A range of models with CAN and Ethernet can adapt optimally to all demands. The result: extremely sleek automation solutions.

- Embedded  $\mu$ P 16 /  $\mu$ P 25 with additional I/O processor
- 100/750 kB User SRAM
- 1 MB / 3 MB User FlashPROM
- X20CP0291 and X20CP0292: Onboard Ethernet
- Only 37.5 mm wide
- No battery

## 2 Order data



| Model number                           | Short description  |
|--|--|
| <b>Compact CPUs</b>                    |  |
| X20CP0201                              | X20 CPU, compact CPU $\mu$ P 16, 100 kB SRAM, 1 MB FlashPROM, support of RS232 and CAN according to compact CPU base, order bus base, power supply module and terminal block separately                                  |
| X20CP0291                              | X20 CPU, compact CPU $\mu$ P 16, 100 kB SRAM, 1 MB FlashPROM, support of RS232 and CAN according to compact CPU base, 1 Ethernet interface 100 Base-T, order bus base, power supply module and terminal block separately |
| X20CP0292                              | X20 CPU, compact CPU $\mu$ P 25, 100 kB SRAM, 1 MB FlashPROM, support of RS232 and CAN according to compact CPU base, 3 Ethernet interface 750 Base-T, order bus base, power supply module and terminal block separately |
| <b>Required accessories</b>            |  |
| <b>System modules for compact CPUs</b> |  |
| X20BB22                                | X20 compact CPU base, for compact CPU and compact CPU supply module, base for integrated RS232 interface, X20 connection, X20 locking plates X20AC0SL1/X20AC0SR1 (left and right) included                               |
| X20BB27                                | X20 compact CPU base, for compact CPU and compact CPU supply module, base for integrated RS232 and CAN interface, X20 connection, X20 locking plates X20AC0SL1/X20AC0SR1 (left and right) included                       |
| X20PS9500                              | X20 power supply module for compact and fieldbus CPUs and internal I/O supply, X2X Link supply   |
| X20PS9502                              | X20 power supply module for compact and fieldbus and internal I/O supply, X2X Link supply, supply not electrically isolated  |
| <b>Terminal blocks</b>                 |  |
| X20TB12                                | X20 terminal block, 12-pin, 24 V keyed   |

Table 1: X20CP0201, X20CP0291, X20CP0292 - Order data

| Model number | Included in delivery     |
|--------------|--------------------------|
| X20AC0SL1    | X20 locking plate, left  |
| X20AC0SR1    | X20 locking plate, right |

### 3 Technical data

| Product ID   | X20CP0201  | X20CP0291              | X20CP0292                 |
|--|--|------------------------|---------------------------|
| <b>Short description</b>   |  |                        |                           |
| Interfaces   | -  | 1x Ethernet onboard    | 1x onboard Ethernet       |
| System module  | CPU  |                        |                           |
| <b>General information</b>   |  |                        |                           |
| B&R ID code  | 0x22A2   | 0x22A4                 | 0x22A6                    |
| Status indicators  | CPU function   | CPU function, Ethernet |                           |
| Diagnostics  | Yes, using status LED  |                        |                           |
| CPU function   | -  | Yes, using status LED  |                           |
| Ethernet   | -  | Yes, using status LED  |                           |
| Overtemperature  | -  | Yes, using software    |                           |
| Power consumption  | 2.2 W  | 2.7 W                  | 3.0 W                     |
| Temperature sensor   | No   |                        | Yes                       |
| ACOPOS capability  | Limited (User PROM)  |                        | Yes                       |
| Visual Components support  | Limited (User PROM)  |                        | Yes                       |
| Additional power dissipation caused by the actuators (resistive) [W] | -  |                        |                           |
| Electrical isolation   | -  |                        |                           |
| PLC - IF2  | -  | Yes                    |                           |
| Certification  | -  |                        |                           |
| CE   | Yes  |                        |                           |
| cULus  | Yes  |                        |                           |
| cCSAus HazLoc Class 1 Division 2                                     | Yes  |                        |                           |
| ATEX Zone 2  | Yes  |                        |                           |
| KC   | Yes  |                        |                           |
| GL   | Yes  |                        |                           |
| GOST-R   | Yes  |                        |                           |
| <b>Controller</b>  |  |                        |                           |
| Real-time clock <sup>1)</sup>  | Yes, resolution 1 s  |                        |                           |
| Processor  | -  |                        |                           |
| Type   | Embedded $\mu$ P 16  |                        | Embedded $\mu$ P 25       |
| Integrated I/O processor   | Processes I/O data points in the background                      |                        |                           |
| Backup battery   | No   |                        |                           |
| Shortest task class cycle time                                       | 4 ms   |                        | 2 ms                      |
| Typical instruction cycle time                                       | 0.8 $\mu$ s  |                        | 0.5 $\mu$ s               |
| Permanent variables  | -  |                        |                           |
| Buffer duration  | >10 years  |                        |                           |
| Memory   | 2.75 kB FRAM <sup>2)</sup>                                       |                        |                           |
| Standard memory  | -  |                        |                           |
| User PROM  | 1 MB FlashPROM   |                        | 3 MB FlashPROM            |
| User RAM   | 100 kB SRAM <sup>3)</sup>  |                        | 750 kB SRAM <sup>3)</sup> |
| <b>Interfaces</b>  |  |                        |                           |
| IF2 interface  | -  |                        |                           |
| Signal   | Ethernet   |                        |                           |
| Design   | 1x shielded RJ45 port  |                        |                           |
| Cable length   | Max. 100 m between two stations (segment length)                 |                        |                           |
| Transfer rate  | 100 Mbit/s   |                        |                           |
| Transmission   | -  |                        |                           |
| Physical interfaces  | 100 BASE-TX  |                        |                           |
| Half-duplex  | Yes  |                        |                           |
| Full-duplex  | No   |                        |                           |
| Autonegotiation  | No   |                        |                           |
| Auto-MDI / MDIX  | Yes  |                        |                           |
| On base module   | -  |                        |                           |
| X20BB22 <sup>4)</sup>  | Compact CPU base module with integrated RS232 interface          |                        |                           |
| X20BB27 <sup>5)</sup>  | Compact CPU base module with integrated RS232 and CAN interfaces |                        |                           |
| <b>Operating conditions</b>  |  |                        |                           |
| 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   |                        |                           |
| <b>Environmental conditions</b>                                      |  |                        |                           |
| Temperature  | -  |                        |                           |
| Operation  | -  |                        |                           |
| Horizontal installation  | -25 to 60°C  |                        |                           |
| Vertical installation  | -25 to 50°C  |                        |                           |
| Derating   | -  |                        |                           |
| Storage  | -40 to 85°C  |                        |                           |
| Transport  | -40 to 85°C  |                        |                           |

Table 2: X20CP0201, X20CP0291, X20CP0292 - Technical data

| Product ID                        | X20CP0201   | X20CP0291                | X20CP0292 |
|-----------------------------------|---|--------------------------|-----------|
| 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 1x X20TB12 terminal block separately<br>Order 1x X20PS9500 or X20PS9502 power supply module separately<br>Order 1x X20BB22 or X20BB27 compact CPU base separately |                          |           |
| Spacing <sup>6)</sup>             | 37.5 <sup>+0.2</sup> mm   |                          |           |

Table 2: X20CP0201, X20CP0291, X20CP0292 - Technical data

- 1) The real-time clock is buffered for approx. 1000 hours by a gold foil capacitor. The gold foil capacitor is completely charged after 18 continuous hours of operation.
- 2) This FRAM stores its contents ferroelectrically. A backup battery is therefore not necessary.
- 3) Not buffered.
- 4) For technical data, see the data sheet for the X20PS9500 power supply module.
- 5) For technical data, see the data sheet for the X20PS9502 power supply module.
- 6) Spacing is based on the width of the X20BB22 or X20BB27 compact CPU base. An X20PS9500 or X20PS9502 power supply module is also always required for the CPU.

## 4 LED status indicators


| Figure  | LED | Color  | Status | Description         |
|---|-----|--------|--------|---------------------|
|  <p>The image shows the front panel of the X20 CP 0201 device. It features three status LEDs: a green LED labeled 'R/E', a red LED labeled 'RDY', and a yellow LED labeled 'RDY'. The device is mounted on a blue and grey base.</p> | R/E | Green  | On     | Application running |
|   |     | Red    | On     | SERVICE mode        |
|   |     |        | Off    | <sup>1)</sup>       |
|   | RDY | Yellow | On     | SERVICE mode        |
|   |     |        | Off    | <sup>1)</sup>       |
|   |     |        |        |                     |

Table 3: X20CP0201 - Status LEDs

- 1) BOOT mode: R/E and RDY LEDs are off and the power supply LED is blinking


| Figure  | LED | Color  | Status   | Description  |
|---|-----|--------|----------|--|
|  <p>The image shows the front panel of the X20 CP 0291 device. It features four status LEDs: a green LED labeled 'R/E', a red LED labeled 'RDY', a yellow LED labeled 'L/A', and a green LED labeled 'L/A'. The device is mounted on a blue and grey base.</p> | R/E | Green  | On       | Application running  |
|   |     | Red    | On       | SERVICE mode   |
|   |     |        | Off      | <sup>1)</sup>  |
|   | RDY | Yellow | On       | SERVICE mode   |
|   |     |        | Off      | <sup>1)</sup>  |
|   | L/A | 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. |

Table 4: X20CP029x - Status LEDs

- 1) BOOT mode: R/E and RDY LEDs are off and the power supply LED is blinking

## 5 Operating and connection elements

### X20CP0201

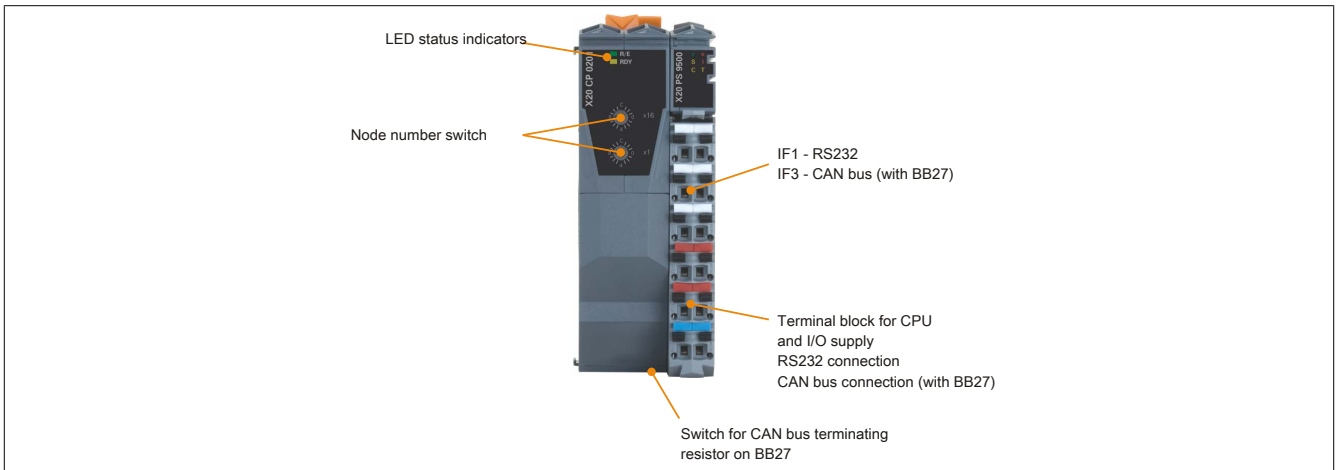


Figure 1: X20 compact CPUs - Operating elements for X20CP0201

### X20CP0291 and X20CP0292

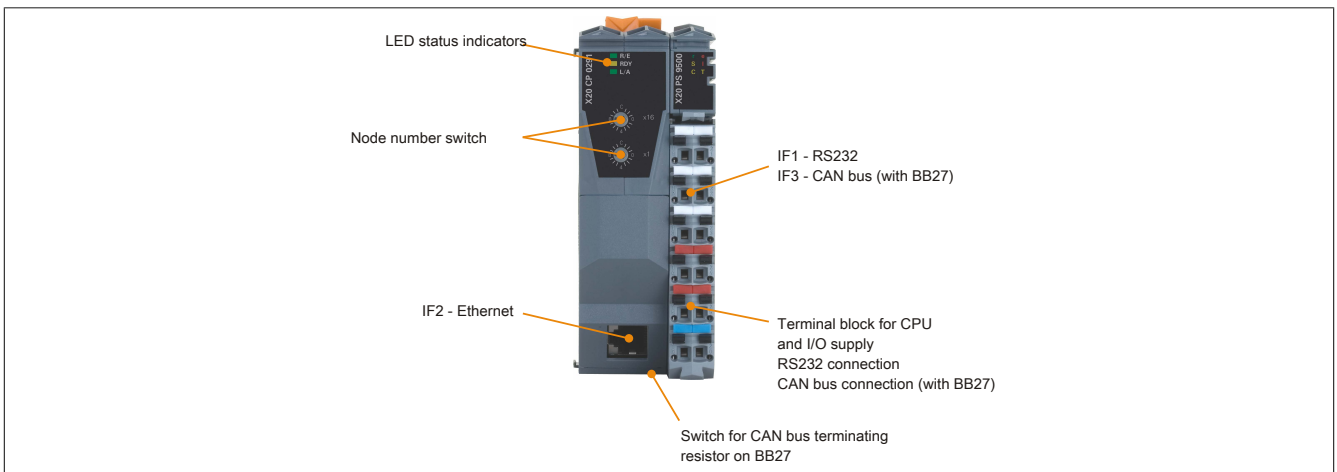


Figure 2: X20 compact CPUs - Operating elements for X20CP0291 and X20CP0292

## 6 Node number switches



Figure 3: Node number switches

The node number is set using the two hex switches. The switch setting can be evaluated by the application program at any time. The operating system only evaluates the switch position when the device is switched on.

| Switch position | Operating mode | Description   |
|-----------------|----------------|---|
| 0x00            | BOOT           | In this switch position, the operating system can be installed via the RS232 interface configured as the online interface. User Flash is deleted only after the update begins.        |
| 0x01 - 0xFE     | RUN            | RUN mode, the application is running.   |
| 0xFF            | 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 <b>cold restart</b> . |

Table 5: X20 CPUs - Operating modes

### X20CP0201

When used with the X20BB27 bus module, the X20CP0201 has access to a CAN bus interface. The INA2000 station number for CAN is set using the node number switches.

### X20CP0291 and X20CP0292

Both of these CPUs are equipped with an onboard Ethernet interface. When used with the X20BB27 bus module, they also have access to a CAN bus interface.

The number set using the two hex switches defines the INA2000 station number of both the CAN and the Ethernet interface.

## 7 Ethernet interface (IF2)



Figure 4: X20 compact CPUs - Ethernet interface for X20CP0291 and X20CP0292

The X20CP0291 and X20CP0292 are equipped with an Ethernet interface. The connection is made using a 100 BASE-T twisted pair RJ45 socket.

### Pinout

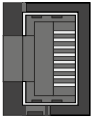
| Interface   | Pin | Ethernet    | Pinout         |
|---|-----|-------------|----------------|
| <br>Shielded RJ45 port | 1   | RXD         | Receive data   |
|   | 2   | RXD\        | Receive data\  |
|   | 3   | TXD         | Transmit data  |
|   | 4   | Termination |                |
|   | 5   | Termination |                |
|   | 6   | TXD\        | Transmit data\ |
|   | 7   | Termination |                |
|   | 8   | Termination |                |

Table 6: RJ45 port - 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)).

### Information:

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

Starting with operating system version 1.07, CPUs have a default IP address.

IP address: 192.168.0.1  
Subnet mask: 255.255.0.0

## 8 Programming the system flash memory

### General information

CPUs are delivered with a runtime system. When delivered, the node number switch is set to switch position 0x00 (bootstrap loader mode).

A suitable switch position must be set (0x01 to 0xFE) in order to boot the PLC in RUN mode. Updating the runtime system is only possible in RUN mode.

### Runtime system update

The runtime system can be updated via the programming environment. When updating the runtime system via an online connection, the following procedure must be carried out:

1. An online runtime system update is only possible if the processor is in RUN mode. For this to be true, the node number must be set to a value in the range 0x01 to 0xFE.
2. Switch on the power.
3. The runtime system update is performed via the existing online connection. The online connection can be established via the onboard serial RS232 interface, for example. If a CPU has an Ethernet interface, then it too can be used to perform the update.
4. Start B&R Automation Studio.
5. Start the update procedure by selecting **Online** from the **Project** menu. Select **Transfer Automation Runtime** from the pop-up menu. Now follow the instructions given by B&R Automation Studio.
6. A window opens up for setting the runtime system version. The runtime system version is already pre-selected by the project settings made by the user. The drop-down menu can be used to select one of the runtime system versions stored in the project. Clicking on the **Browse** button allows a runtime system version to be loaded from the hard drive or CD.

Clicking on **Next** opens a pop-up window that allows the user to select whether modules with target memory SYSTEM ROM should be transferred during the subsequent runtime system update. If not, these modules can also be transferred later during an application download.

Clicking on **Next** opens a dialog box where the user can set the CAN transfer rate, CAN ID and CAN node number (the CAN node number set here is only relevant if an interface module does not have a CAN node number switch). The CAN node number must be between decimal 01 and 99. Assigning a unique node number is especially important with online communication over a CAN network (INA2000 protocol).

7. The update procedure is started by clicking on **Next**. Update progress is shown in a message box.

#### **Information:**

**User flash memory is deleted.**

8. When the update procedure is complete, the online connection is reestablished automatically.
9. The PLC is now ready for use.

Updating the runtime system is possible not only via an online connection, but also via a CAN network, serial network (INA2000 protocol) or Ethernet network, depending on the system configuration.