X20BC0143-10

Data sheet
1.20 (August 2025)

1303156296626-1.20

1 General information

1.1 Other applicable documents

For additional and supplementary information, see the following documents.

Other applicable documents

Document name	Title
MAX20	X20 System user's manual

1.2 Order data

Order number	Short description	Figure
	Bus controllers	
X20BC0143-10	X20 bus controller, 1 CANopen interface, 9-pin DSUB, Order 1x connector 7AC911.9 separately! Order bus base, power supply module and terminal block separately!	
	Required accessories	
	System modules for bus controllers	
X20BB80	X20 bus base, for X20 base module (BC, HB, etc.) and X20 power supply module, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20PS9400	X20 power supply module, for bus controller and internal I/O power supply X2X Link power supply	
X20PS9402	X20 power supply module, for bus controller and internal I/O power supply, X2X Link supply, supply not galvanically isolated	
	Terminal blocks	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	
	Optional accessories	
	Infrastructure components	
0AC912.9	Bus adapter, CAN, 1 CAN interface	
0AC913.92	Bus adapter, CAN, 2 CAN interfaces, including 30 cm attachment cable (DSUB)	
7AC911.9	Bus connector, CAN	

Table 1: X20BC0143-10 - Order data

1.3 Module description

The bus controller makes it possible to connect up to 253 X2X Link I/O modules to CANopen. A transition between IP20 and IP67 protection is possible by directly connecting X20, X67 or XV modules to one another at distances of up to 100 m each across control cabinet boundaries as required.

- Auto-configuration of I/O modules
- I/O configuration via the fieldbus
- Constant response times even with large amounts of data (max. 32 Rx and 32 Tx PDOs)
- Configurable transfer rate or automatic transfer rate detection
- Heartbeat consumer and producer
- Emergency producer
- 2x SDO server, NMT slave
- Simple bootup (autostart)
- Terminal access via serial interface on the X20PS9400

Functions:

- CANopen

CANopen

CANopen is a higher-layer protocol based on CAN. The standardized protocol offers very flexible configuration options.

2 Technical description

2.1 Technical data

| Order number	X20BC0143-10
Short description	
Bus controller	CANopen slave
General information	
B&R ID code	0xAD3E
Status indicators	Module status, bus function, data transfer
Diagnostics	
Module status	Yes, using LED status indicator and software
Bus function	Yes, using LED status indicator and software
Data transfer	Yes, using LED status indicator
Power consumption	
Bus	2 W
Additional power dissipation caused by actuators (resistive) [W]	-
Certifications	
CE	Yes
UKCA	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	Temperature: **B** (0 to 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)
CCS	Yes
LR	ENV1
KR	Yes
ABS	Yes
BV	**EC33B** Temperature: 5 - 55°C Vibration: 4 g EMC: Bridge and open deck
Interfaces	
Fieldbus	CANopen slave
Variant	9-pin male DSUB connector
Max. distance	1000 m
Transfer rate	Max. 1 Mbit/s
Default transfer rate	Automatic transfer rate detection or fixed setting
Min. cycle time [1]	
Fieldbus	No limitation
X2X Link	500 µs
Synchronization between bus systems possible	No
Electrical properties	
Electrical isolation	CANopen isolated from I/O CANopen not isolated from bus
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

Table 2: X20BC0143-10 - Technical data

Order number	X20BC0143-10
Ambient conditions	
Temperature	
Operation	
Horizontal mounting orientation	-25 to 60°C
Vertical mounting orientation	-25 to 50°C
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 1x terminal block X20TB12 separately. Order 1x power supply module X20PS9400 or X20PS9402 separately. Order 1x bus base X20BB80 separately.
Pitch [2]	37.5$^{+0.2}$ mm

Table 2: X20BC0143-10 - Technical data

1) The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring.
2) Pitch is based on the width of bus base X20BB80. In addition, power supply module X20PS9400 or X20PS9402 is always required for the bus controller.

2.2 Operating and connection elements
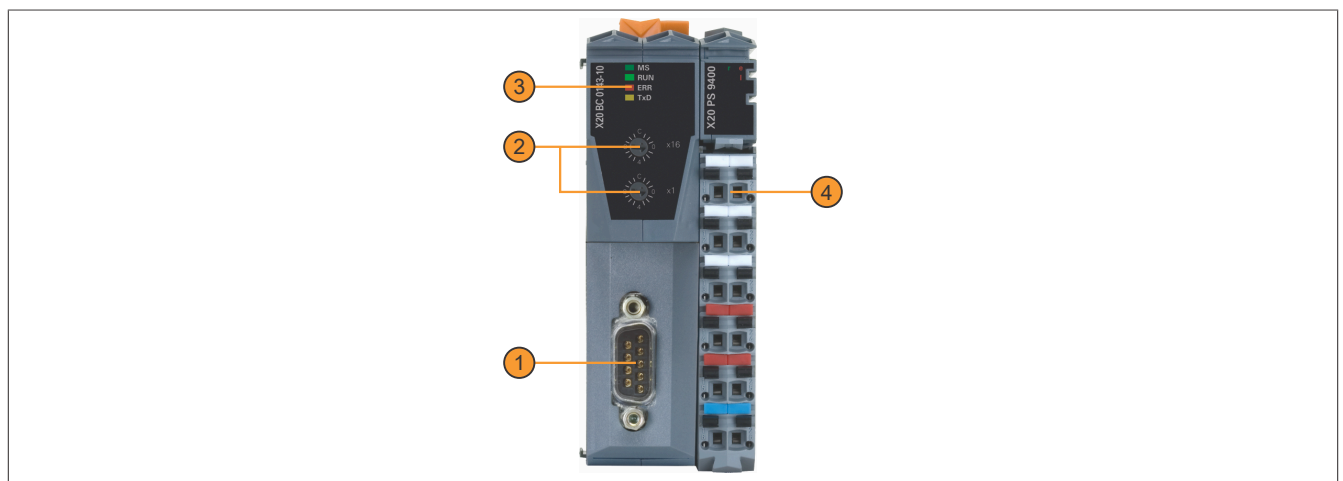
1	CANopen connection	2	Node number switches
3	LED status indicators	4	Terminal block for bus controller and I/O supply

2.2.1 LED status indicators

| Figure	LED	Color	Status	Description
	MS [1]	Green	Off	No power supply
			Flashing	5 s window for deleting all configuration settings
			On	Boot procedure OK, I/O modules OK
		Red	Double flash	Successfully erased flash memory
			Triple flash	Successfully saved transfer rate
			Quad flash	Successfully saved configuration
			On	I/O modules: Error message or incorrect configuration
	RUN	Green	Off	No power supply
			Single flash	STOP mode
			Triple flash	Firmware download in progress
			Blinking	PREOPERATIONAL mode
			On	OPERATIONAL mode
	ERR	Red	Off	No power supply or everything is OK
			Single flash	CAN warning limit reached
			Double flash	Node guarding / heartbeat error
			Blinking	Invalid node number or configuration
			On	Bus errors: Bus off
	RUN/ERR	Green/red	Flickering	Transfer rate detection in progress
	TxD	Yellow	Off	The bus controller is not transmitting any data via the CANopen fieldbus
			On	The bus controller is transmitting data via the CANopen fieldbus
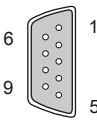
1)   The "MS" LED is a green/red dual LED. The LED blinks red several times immediately after startup. This is a boot message, however, and not an error.

LED status indicators - Blink times
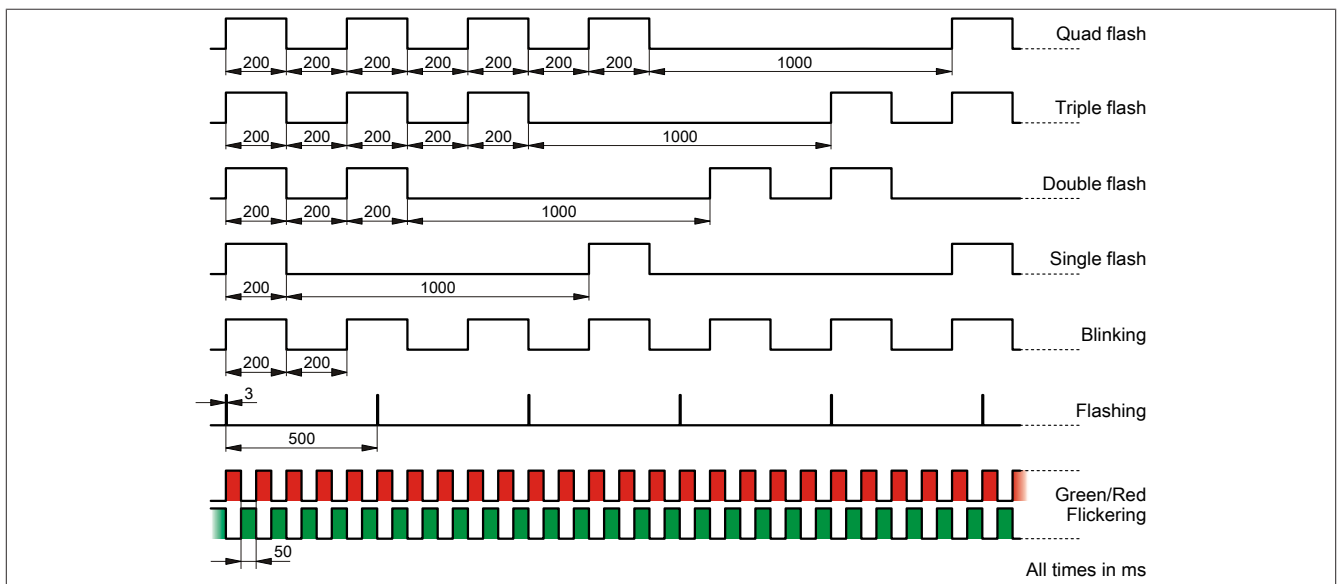
2.2.2 CAN bus interface

The CAN bus interface is a 9-pin DSUB plug.

Interface	Pin	CAN	
	1	Reserved	
	2	CAN_L	CAN low
	3	CAN_GND	CAN ground
	4	Reserved	
	5	Reserved	
	6	Reserved	
	7	CAN_H	CAN high
	8	Reserved	
	9	Reserved	

2.2.3 Node number and transfer rate

Node numbers and transfer rates are configured using the two bus controller number switches.

The transfer rate can be specified in two ways:

- Automatic detection by bus controller (see "Automatic transfer rate detection" on page 9)
- Fixed definition by user (see "Setting the transfer rate" on page 10)

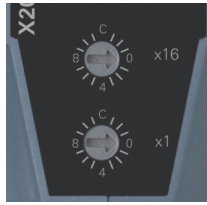| Switch position	Node number	Transfer rate
0x00	Not allowed	-
0x01 - 0x7F	1 - 127	Automatically set by the bus controller (default) or fixed setting by the user
0x80 - 0x88	-	Sets a fixed transfer rate
0x89	-	Sets automatic transfer rate detection
0x8A - 0x8F	Not allowed	-
0x90	Clearing the parameters See "Clearing parameters" on page 10	-
0x91	Not allowed	-
0x92	Save configuration[1] See "Save automatic configuration" on page 11	-
0x93 - 0xFF	Not allowed	-

1) This function is available starting with Hardware version E0 or Firmware version V0001.0107.

3 Function description

3.1 CANopen / CAN

CAN (Controller Area Network) topology is based on a line structure and uses twisted wire pairs for data transfer. CANopen is a higher-layer protocol based on CAN. The standardized protocol offers very flexible configuration options.

CANopen operating modes such as synchronous, event and polling are supported as well as PDO linking, life/node guarding, heartbeat, emergency objects and much more.

For additional information, see the CANopen bus controller user's manual.

4 Commissioning

4.1 Additional documentation and import files (EDS)

Additional documentation about bus controller functions as well as the necessary import files for the master engineering tool are available in the Downloads section of the B&R website (www.br-automation.com).

> **Information:**
>
> **With multifunction modules, the bus controller supports only the default function model in the event of automatic configuration by the bus controller (see the respective module description).**
>
> **Automation Studio V4.3 or later can be used to easily create configuration files (e.g. DCF files). All other function models are also supported by transferring configuration data to the bus controller (e.g. via the master environment with an SDO download).**
>
> **Automation Studio can be downloaded at no cost from the B&R website (www.br-automation.com). The evaluation license is permitted to be used to create complete configurations for fieldbus bus controllers at no cost.**

4.2 Setting the node number and transfer rate

The node number and transfer rate are configured using the two number switches on the bus controller.

The transfer rate can be configured in 2 ways:

- Automatic determination by the bus controller (see)
- Programmed by the user (see)

4.2.1 Automatic transfer rate detection

After startup, the bus controller goes into "Listen only" mode. This means the bus controller behaves passively on the bus and only listens.

The bus controller attempts to receive valid objects. If receive errors occur, the controller switches to the next transfer rate in the lookup table.

If no objects are received, all transfer rates are tested cyclically. This procedure is repeated until valid objects are received.

Lookup table

The bus controller tests the transfer rate according to this table. Beginning with the starting transfer rate (1000 kbit/s), the controller switches to the next lower transfer rate. At the end of the table, the bus controller restarts the search from the beginning.

Transfer rate
1000 kbit/s
800 kbit/s
500 kbit/s
250 kbit/s
125 kbit/s
100 kbit/s
50 kbit/s
20 kbit/s
10 kbit/s

4.2.2 Setting the transfer rate

Automatic transfer rate detection is enabled on the bus controller by default. Switch positions 0x80 to 0x88 can be used to set a fixed transfer rate, or 0x89 can be used to enable automatic transfer rate detection.

Switch position	Transfer rate
0x80	1000 kbit/s
0x81	800 kbit/s
0x82	500 kbit/s
0x83	250 kbit/s
0x84	125 kbit/s
0x85	100 kbit/s
0x86	50 kbit/s
0x87	20 kbit/s
0x88	10 kbit/s
0x89	Automatic transfer rate detection

Programming the transfer rate

1. Switch off the power supply to the bus controller.
2. Define the transfer rate by selecting the switch position (0x80 to 0x89).
3. Switch on the power supply to the bus controller.
4. Wait until LED "MS" blinks with a red triple flash (transfer rate is programmed).
5. Switch off the power supply to the bus controller.
6. Set the desired node number (0x01 - 0x7F).
7. Switch on the power supply to the bus controller.
8. The bus controller now boots with the set node number and the programmed transfer rate.

4.2.3 Clearing parameters

Various parameters can be stored in the bus controller's flash memory:

- Communication parameters
- Vendor-specific parameters
- Application parameters (device profile)
- Programmed transfer rate

Clearing the parameters using switch position 0x90 returns the bus controller to its factory settings.

Clearing the parameters listed above

1. Turn off the power supply to the bus controller.
2. Set the node number to 0x90.
3. Turn on the power supply to the bus controller.
4. Wait until the "MS" LED flashes green. The node number switch must be set to 0x00 and then back to 0x090 within this time window of 5 seconds (rotate the top switch).
5. Wait until the "MS" LED blinks with a red double-flash (parameters have been cleared).
6. Turn off the power supply to the bus controller.
7. Set the desired node number (0x01 - 0x7F).
8. Turn on the power supply to the bus controller.
9. The bus controller boots with the set node number and automatic transfer rate detection.

4.2.4 Save automatic configuration

The node number position 0x92 can be used to save automatically generated configurations. This makes it possible to work with a standardized configuration without having to adapt the application to changes associated with service work or different development stages for example.

1. Turn off the power supply to the bus controller.
2. Set the node number to 0x90.
3. Turn on the power supply to the bus controller.
4. Wait until the "MS" LED flashes green.
5. The node number switch must be set to 0x00 and then back to 0x90 within this time window of 5 seconds (rotate the top switch).
6. Wait until the "MS" LED blinks with a red double-flash (parameters have been cleared).
7. Turn off the power supply to the bus controller.
8. Set the node number to 0x92.
9. Turn on the power supply to the bus controller.
10. Wait until the "MS" LED flashes green.
11. The node number switch must be set to 0x02 and then back to 0x92 within this time window of 5 seconds (rotate the top switch).
12. Wait until the "MS" LED blinks with a red quad-flash (parameters have been saved).
13. Turn off the power supply to the bus controller.
14. Set the desired node number (0x01 - 0x7F).
15. Turn on the power supply to the bus controller.
16. The bus controller boots with the set node number and automatic transfer rate detection.

> **Information:**
>
> **A mapping tool for decoding the saved PDO mapping is available in the Download section of the B&R website (www.br-automation.com).**

> **Information:**
>
> **This function is available starting with Hardware version E0 or Firmware version V0001.0107.**