

# X20(c)BC0043-10

## 1 General information

Controller Area Network (CAN) is widespread in automation technology. CAN 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.

This 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. All 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.

- Fieldbus: CANopen
- 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 I/O cycle (0.5 to 4 ms)
- Configurable transfer rate or automatic transfer rate detection
- Heartbeat consumer and producer
- Emergency producer
- 2x SDO server, NMT slave
- Simple startup (autostart)
- Terminal access via serial interface on the X20PS9400
- Integrated terminating resistor

### 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](http://www.br-automation.com)). The evaluation license is permitted to be used to create complete configurations for fieldbus bus controllers at no cost.

## 2 Coated modules

Coated modules are X20 modules with a protective coating for the electronics component. This coating protects X20c modules from condensation and corrosive gases.

The modules' electronics are fully compatible with the corresponding X20 modules.

**For simplification purposes, only images and module IDs of uncoated modules are used in this data sheet.**

The coating has been certified according to the following standards:

- Condensation: BMW GS 95011-4, 2x 1 cycle
- Corrosive gas: EN 60068-2-60, method 4, exposure 21 days



### 3 Order data


Order number	Short description	Figure
	<b>Bus controllers</b>	
X20BC0043-10	X20 bus controller, 1 CANopen interface, order 1x terminal block TB2105 separately! Order bus base, power supply module and terminal block separately!	
X20cBC0043-10	X20 bus controller, coated, 1 CANopen interface, order 1x terminal block TB2105 separately! Order bus base, power supply module and terminal block separately!	
	<b>Required accessories</b>	
	<b>System modules for bus controllers</b>	
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 power supply, supply not electrically isolated	
X20cBB80	X20 bus base, coated, for X20 base module (BC, HB, etc.) and X20 power supply module, X20 end plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20cPS9400	X20 power supply module, coated, for bus controller and internal I/O power supply X2X Link power supply	
	<b>Terminal blocks</b>	
0TB2105.9010	Accessory terminal block, 5-pin, screw clamps 2.5 mm²	
0TB2105.9110	Accessory terminal block, 5-pin, push-in terminal block 2.5 mm²	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20BC0043-10, X20cBC0043-10 - Order data

### 4 Technical data

Order number	X20BC0043-10	X20cBC0043-10
Short description		
Bus controller	CANopen slave	
General information		
B&R ID code	0xA8B8	0x2A00
Status indicators	Module status, bus function, data transfer, terminating resistor	
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	
Terminating resistor	Yes, using LED status indicator	
Power consumption		
Bus	1.5 W (rev. <H0: 2 W)	
Certifications		
CE	Yes	
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÜ 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>B</b> (0 - 55°C) Humidity: <b>B</b> (up to 100%) Vibration: <b>B</b> (4 g) EMC: <b>B</b> (bridge and open deck)	
LR	ENV1	
KR	Yes	-
ABS	Yes	
EAC	Yes	-
Interfaces		
Fieldbus	CANopen slave	
Variant	5-pin male multipoint connector	
Max. distance	1000 m	
Transfer rate	Max. 1 Mbit/s	
Default transfer rate	Automatic transfer rate detection or fixed setting	
Min. cycle time <sup>1)</sup>		
Fieldbus	No limitation	
X2X Link	500 µs	


Table 2: X20BC0043-10, X20cBC0043-10 - Technical data

Order number	X20BC0043-10	X20cBC0043-10
Synchronization between bus systems possible	No	
Terminating resistor	Integrated in module	
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	
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	Up to 100%, condensing
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	
Mechanical properties		
Note	Order 1x terminal block TB2105 separately. Order 1x terminal block X20TB12 separately. Order 1x power supply module X20PS9400 or X20PS9402 separately. Order 1x bus base X20BB80 separately.	Order 1x terminal block TB2105 separately. Order 1x terminal block X20TB12 separately. Order 1x power supply module X20cPS9400 separately. Order 1x bus base X20cBB80 separately.
Pitch <sup>2)</sup>	37.5 <sup>+0.2</sup> mm	

Table 2: X20BC0043-10, X20cBC0043-10 - Technical data

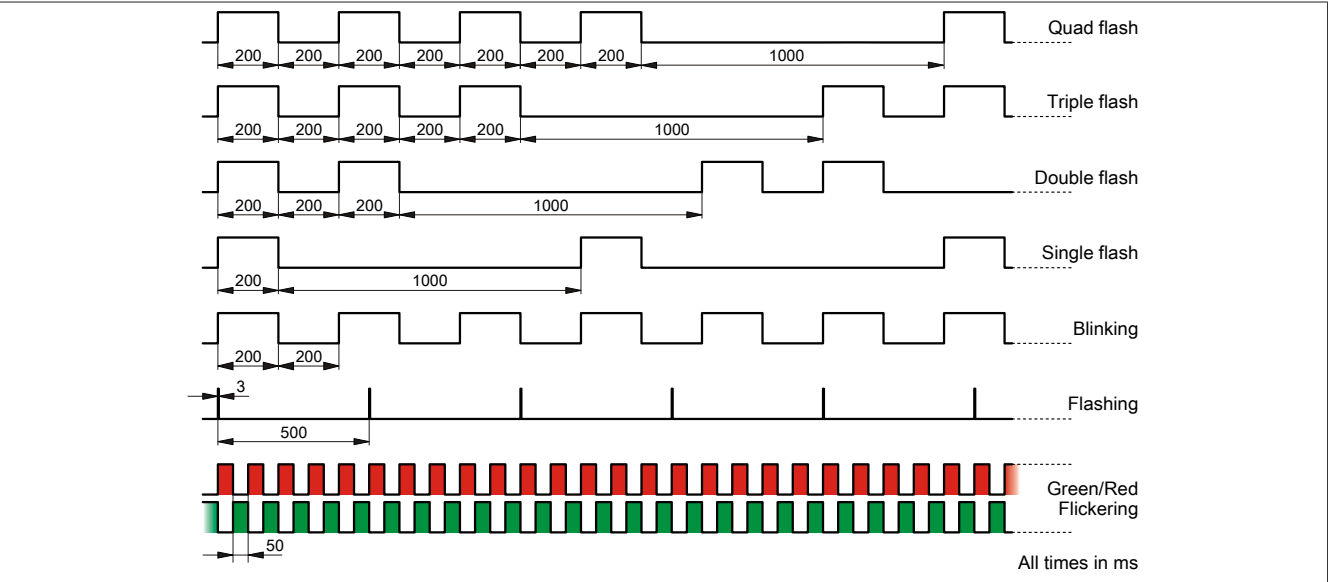
- 1) The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring.  
2) Pitch is based on the width of bus base X20BB80. In addition, power supply module X20PS9400 or X20PS9402 is always required for the bus controller.

## 5 LED status indicators

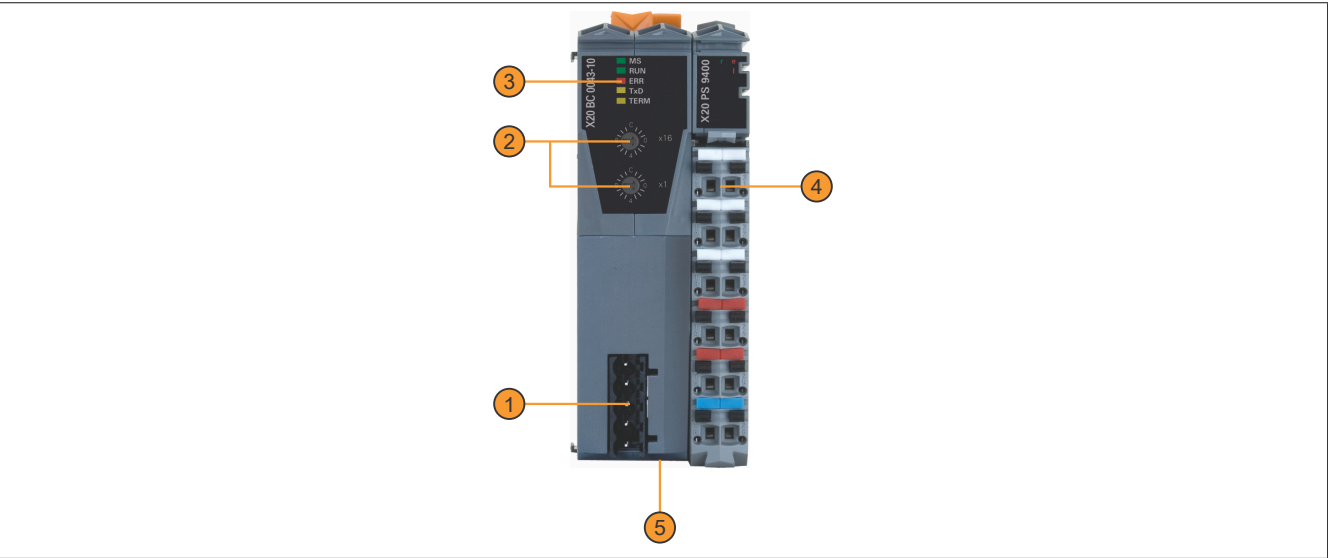
Figure	LED	Color	Status	Description
	MS <sup>1)</sup>	Green	Off	No power supply
			Flashing	5-second time window for deleting all configuration settings
			On	Boot procedure OK, I/O modules OK
		Red	Double flash	Successfully erased flash memory
			Triple flash	Successfully saved transfer rate
			Quad flash	Successfully saved configuration
	RUN	Green	On <sup>2)</sup>	I/O modules: Error message or incorrect configuration
			Off	No power supply
			Single flash	STOP mode
			Triple flash	Firmware download in progress
			Blinking	Mode PREOPERATIONAL
			On	Mode OPERATIONAL
	ERR	Red	Off	No power supply or everything OK
			Single flash	CAN warning limit reached
			Double flash	Node guarding / Heartbeat error
			Blinking	Invalid node number or configuration
			On	Bus error: Bus off
	RUN/ERR	Green/Red	Flickering	Transfer rate detection in progress
	TxD	Yellow	Off	No data is being transmitted from the bus controller via the CANopen fieldbus.
			On	The bus controller is transmitting data via the CANopen fieldbus.
	TERM	Yellow	Off	The terminating resistor integrated in the bus controller is switched off.
			On	The terminating resistor integrated in the bus controller is switched on.

- 1) LED "MS" is a green/red dual LED. Several red blinking signals are displayed immediately after the device is switched on. These are startup messages, however, and not errors.  
2) The red "MS" LED can be cleared by writing to object 0x3001-Sub 0xA.

LED status indicators - Blink times



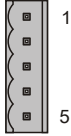
6 Operating and connection elements



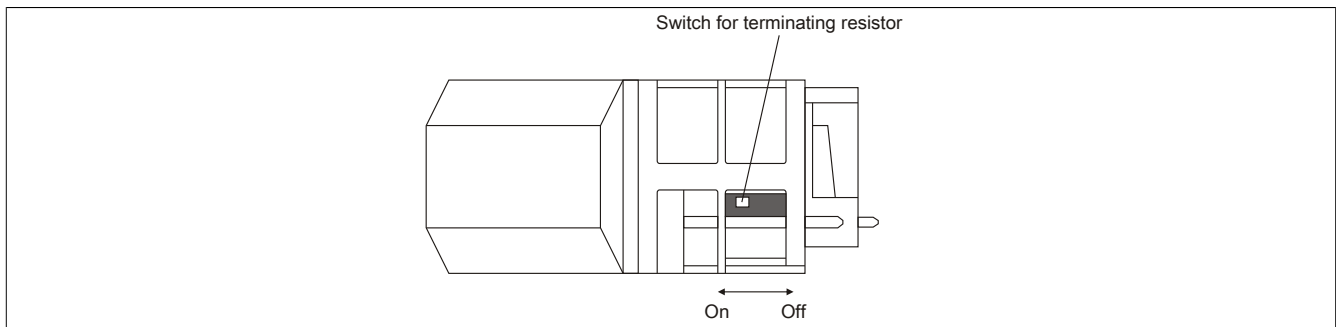
1	CANopen connection	2	Node number switches
3	LED status indicators	4	Terminal block for bus controller and I/O supply
5	Switch for terminating resistor on the bottom of the module	6	-

7 CAN bus interface

The interface is a 5-pin multipoint connector. Terminal block 0TB2105 must be ordered separately.

Interface		Pinout	
 5-pin male multipoint connector	1 2 3 4 5	Terminal	Function
		1	CAN <sub>L</sub> CAN ground
		2	CAN <sub>L</sub> CAN low
		3	SHLD Shield
		4	CAN <sub>H</sub> CAN high
		5	NC

## 8 Terminating resistor



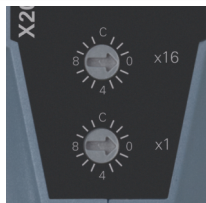
A terminating resistor is already integrated on the bus controller. It can be turned on and off with a switch on the bottom of the housing. An active terminating resistor is indicated by the "TERM" LED.

## 9 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 6](#))
- Fixed definition by user (see ["Setting the transfer rate" on page 6](#))



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 <a href="#">"Clearing parameters" on page 8</a>	-
0x91	Not allowed	-
0x92	Save configuration <sup>1)</sup> See <a href="#">"Save automatic configuration" on page 7</a>	-
0x93 - 0xFF	Not allowed	-

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

## 10 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

## 11 Setting the transfer rate

The bus controller will detect the transfer rate automatically 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 now 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.

## 12 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](http://www.br-automation.com)).

### Information:

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

## 13 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.

## 14 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](http://www.br-automation.com)).