

X20BC00G3

1 General information

EtherCAT is an Ethernet-based fieldbus developed by Beckhoff. This protocol is suitable for both hard and soft real-time requirements in automation technology. In addition to a ring structure, which becomes logically necessary because of the summation frame telegram used, the EtherCAT technology also physically supports topologies such as line, tree, star (limited) and combinations of these topologies. B&R's X20BC80G3 (expandable bus controller module) and X20HB88G0 (standalone junction base module) are available for implementing these topologies.

EtherCAT slave devices take the data designated for them from a telegram as it is passing through the device. Input data is also added to the telegram as it is passing through. The bus controller allows X2X Link I/O modules to be coupled to EtherCAT and operated on any EtherCAT master system. A transition between IP20 and IP67 protection outside of the control cabinet is possible by arranging X20, X67 or XV modules one after the other as needed at distances up to 100 m.

Master systems without FoE (File access over EtherCAT) support require an appropriate configuration tool to transfer the configuration (optional).

- Fieldbus: EtherCAT
- Auto-configuration of I/O modules
- I/O configuration and firmware update via the fieldbus (FoE)
- Full support of the modular slice concept via CoE (CANopen over EtherCAT)
- Configurable I/O cycle (0.2 to 4 ms)
- Synchronization between the fieldbus and X2X Link

Information:

Only the standard function model (see the respective module description) is supported when the bus controller is used together with multi-function modules it has automatically configured itself.

All other function models are supported when configured accordingly in Automation Studio V4.3 or later.

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.

2 Order data


Model number	Short description	Figure
	Bus controllers	
X20BC00G3	X20 bus controller, 1 EtherCAT interface, 2x RJ45, 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 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	
	Terminal blocks	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20BC00G3 - Order data

3 Technical data


Model number	X20BC00G3
Short description	
Bus controller	EtherCAT slave
General information	
B&R ID code	0xAC23
Status indicators	Module status, bus function
Diagnostics	
Module status	Yes, using status LED and software
Bus function	Yes, using status LED and software
Power consumption	
Bus	1.68 W
Additional power dissipation caused by actuators (resistive) [W]	-
Certifications	
CE	Yes
KC	Yes
EAC	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cCSAus 244665 Process control equipment for hazardous locations Class I, Division 2, Groups ABCD, T5
ATEX	Zone 2, II 3G Ex nA nC IIA T5 Gc IP20, Ta (see X20 user's manual) FTZÜ 09 ATEX 0083X
Interfaces	
Fieldbus	EtherCAT slave
Variant	2x shielded RJ45
Line length	Max. 100 m between 2 stations (segment length)
Transfer rate	100 Mbit/s
Transfer	
Physical layer	100BASE-TX
Half-duplex	Yes
Full-duplex	Yes
Autonegotiation	Yes
Auto-MDI/MDIX	Yes
Hub propagation delay	750 ns
Min. cycle time ¹⁾	
Fieldbus	200 µs
X2X Link	200 µs
Synchronization between bus systems possible	Yes
Electrical properties	
Electrical isolation	EtherCAT isolated from bus and I/O
Operating conditions	
Mounting orientation	
Horizontal	Yes
Vertical	Yes
Installation elevation above sea level	
0 to 2000 m	No limitations
>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	0 to 55°C
Vertical mounting orientation	0 to 50°C
Derating	-
Storage	-25 to 70°C
Transport	-25 to 70°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
Spacing ²⁾	37.5 ^{+0.2} mm

Table 2: X20BC00G3 - Technical data

1) The minimum cycle time defines how far the bus cycle can be reduced without communication errors occurring.

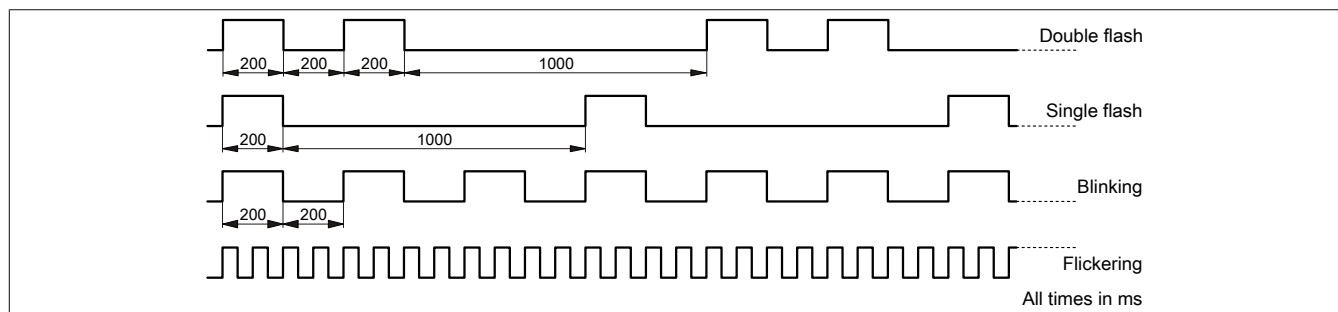
2) Spacing is based on the width of bus base X20BB80. In addition, power supply module X20PS9400 or X20PS9402 is always required for the bus controller.

4 LED status indicators

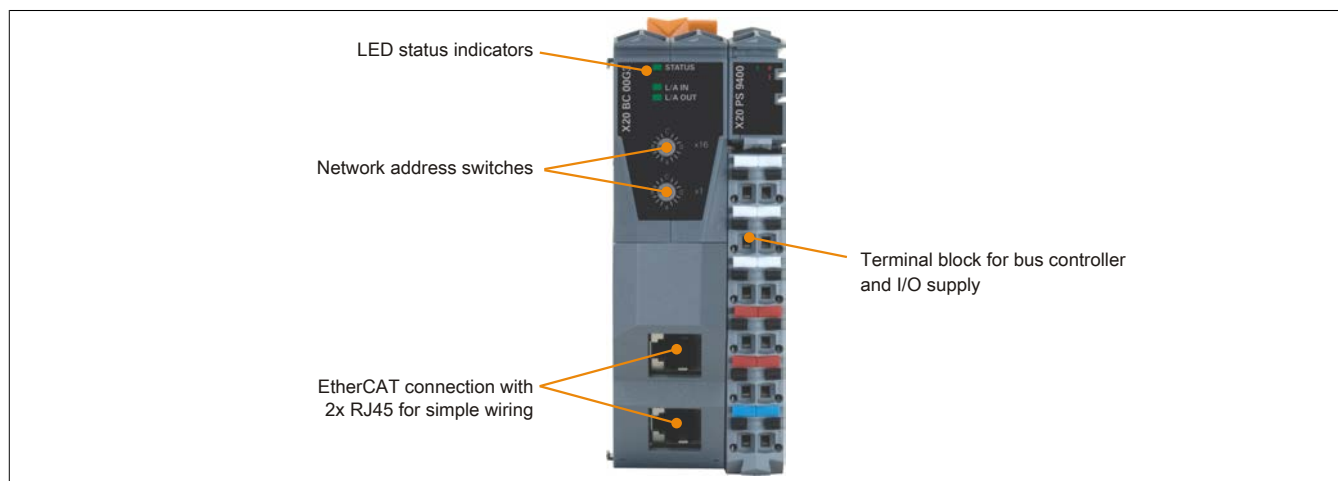
Figure	LED	Color	Status	Description
	STATUS ¹⁾	Green	On	The bus controller is in state OPERATIONAL.
			Blinking	State PREOPERATIONAL
			Single flash	State SAFE-OPERATIONAL
			Flickering	The bus controller has started and is not yet in state INIT, or it is in state BOOTSTRAP (e.g. during firmware download).
			Off	State INIT
		Red	On	A critical communication or application error has occurred.
			Blinking	Invalid configuration data
			Single flash	The bus controller has an internal error and has changed the EtherCAT state on its own.
	L/A IN L/A OUT	Green	Double flash	Watchdog timeout (process data watchdog or EtherCAT watchdog)
			Flickering	Error in startup procedure (state INIT achieved, but the error indicator bit in the AL status register is set)
			Off	No error
			On	A connection (link) is established, but no communication is taking place (PORT OPEN).
			Off	No physical Ethernet connection exists (PORT CLOSED).

1) LED "STATUS" is a green/red dual LED used to indicate EtherCAT states ERROR and RUN.

LED status indicators - Blink times

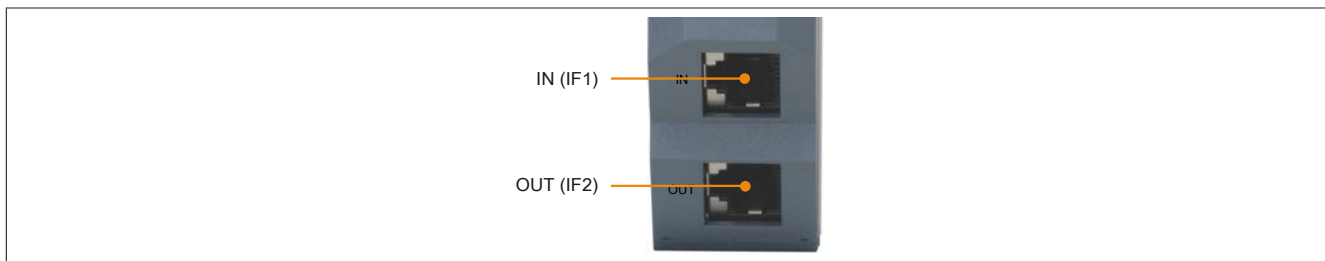


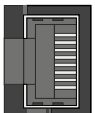
5 Operating and connection elements



6 RJ45 ports

For information about wiring X20 modules with an Ethernet interface, see section "Mechanical and electrical configuration - Wiring guidelines for X20 modules with Ethernet cables" of the X20 user's manual.



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

7 EtherCAT network address switches



A slave alias address can be set using the 2 network address switches on the bus controller. During the initialization phase (during startup), the bus controller writes the value of the address switches to ESC register 0x12 or 0x13. However, this value is only applied in the corresponding registers if the switch value is between 0x00 and 0xFA (decimal 250).

Switch position	Description
0x00 to 0xFA	Writes the address switch value to the "Station alias" register.
0xFB to 0xFE	Does not apply the address switch value. ESC alias registers are not changed.
0xFF	Does not apply the address switch value. ESC alias registers are not changed. If the address switches are set to value 0xFF and the bus controller is restarted, then it will boot with the default values. All set parameters remain unchanged in flash memory.

The master determines whether the alias address is used to address the slave by setting the corresponding bit (bit 24) in the ESC DL control register.

8 Deleting parameters

Various parameters can be stored in the bus controller's flash memory. Deleting these parameters using switch position F0 returns the bus controller to its factory settings.

Deleting the parameters

1. Switch off the power supply to the bus controller.
2. Set the node number to F0.
3. Switch on the power supply to the bus controller.
4. Wait until LED "STATUS" flashes green.
5. Set the node number switch to 0 and then back to F0.
6. Wait until LED "STATUS" blinks (parameters have been deleted).
7. Switch the power supply to the bus controller off and then back on.
8. The bus controller boots with its default settings.