X20(c)BC8083

1 General information

The bus controller makes it possible to connect X2X Link I/O nodes to POWERLINK. It is also possible to operate the X2X Link cycle synchronously 1:1 or synchronous to POWERLINK using a prescaler.

POWERLINK is a standard protocol for Fast Ethernet with hard real-time characteristics. The POWERLINK Standardization Group (EPSG) ensures that the standard remains open and is continually developed. www.ethernet-powerlink.org

The bus modules expanded to the left allow connection of up to 2 hub expansion modules in addition to the bus controller. Each expansion module is equipped with 2 RJ45 connections. This means that a basic device provides up to 6 hub connections.

- POWERLINK
- I/O configuration and firmware update via the fieldbus
- Integrated hub for efficient cabling
- Up to 2 slots for hub expansion modules
- 2x/4x/6x Fast Ethernet hub

Notice!

Using the bus controller together with the X20HB1881 and X20HB2881 fiber optic cable connectors.

- **X20BC8083: Hardware revision G0 up to and including I0**
- **X20cBC8083: All hardware revisions up to and including I0**

In rare cases, a firmware update or reconnection of the bus controller may make it so the connection to the connected X20HB modules can no longer be established.
This problem can be corrected by restarting (removing power to) the bus controller or reconnecting (hot plugging) the X20HB modules.

Combining the bus controller with other X20HB modules does not cause any problems.

1.1 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

1.1.1 Starting temperature

The starting temperature describes the minimum permissible ambient temperature in a voltage-free state at the time the coated module is switched on. This is permitted to be as low as -40°C. During operation, the conditions as specified in the technical data continue to apply.

Information:

It is important to absolutely ensure that there is no forced cooling by air currents in the closed control cabinet, e.g. due to the use of a fan or ventilation slots.

1.2 Other applicable documents

For additional and supplementary information, see the following documents.

Other applicable documents

Document name	Title
MAX20	X20 system user's manual
MAEMV	Installation / EMC guide

Additional documentation

Document name	Title
MAREDSYS	Redundancy for control systems

2 Order data

Order number	Short description	Figure
	Expandable bus controllers	
X20BC8083	X20 bus controller, 1 POWERLINK interface, integrated 2-port hub, supports expansion with X20 hub modules, 2 RJ45, order bus base, power supply module and terminal block separately.	
X20cBC8083	X20 bus controller, coated, 1 POWERLINK interface, integrated 2-port hub, supports X20 hub module expansions, 2 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 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	
X20cBB80	X20 bus base, coated, for X20 base module (BC, HB, etc.) and X20 power supply module, X20 end cover 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	
	System modules for expandable bus controllers	
X20BB81	X20 bus base, for X20 base module (BC, HB, etc.) and X20 power supply module, with one expansion slot for X20 add-on module (IF, HB, etc.), X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20BB82	X20 bus base, for X20 base module (BC, HB, etc.) and X20 power supply module, with 2 expansion slots for 2 X20 add-on modules (IF, HB, etc.), X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20cBB81	X20 bus base, coated, for X20 base module (BC, HB, etc.) and X20 power supply module, with one expansion slot for X20 add-on module (IF, HB, etc.), X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20cBB82	X20 bus base, coated, for X20 base module (BC, HB, etc.) and X20 power supply module, with 2 expansion slots for 2 X20 add-on modules (IF, HB, etc.), X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
	Terminal blocks	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	
	Optional accessories	
	System modules for the X20 hub system	
X20HB1881	X20 hub expansion module, integrated 1-port hub, for multimode fiber optic cables	
X20HB1882	X20 hub expansion module, integrated 1-port hub, for monomode fiber optic cables	
X20HB2880	X20 hub expansion module, integrated 2-port hub, 2x RJ45	
X20HB2881	X20 hub expansion module, integrated 2-port hub, for fiber optic cables	
X20cHB1881	X20 hub expansion module, coated, integrated 1-port hub for fiber optic cables	
X20cHB2880	X20 hub expansion module, coated, integrated 2-port hub, 2x RJ45	
X20cHB2881	X20 hub expansion module, coated, integrated 2-port hub for fiber optic cables	

Table 1: X20BC8083, X20cBC8083 - Order data

3 Technical description

3.1 Technical data

Order number	X20BC8083	X20cBC8083
Short description		
Bus controller	POWERLINK (V1/V2) controlled node with up to 2 slots for hub expansion modules	
General information		
B&R ID code	0x2673	0xE218
Status indicators	Module status, bus function	
Diagnostics		
Module status	Yes, using LED status indicator and software	
Bus function	Yes, using LED status indicator and software	
Power consumption		
Bus	2 W	
Additional power dissipation caused by actuators (resistive) [W]	-	
Certifications		
CE	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 - 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)	
LR	ENV1	
KR	Yes	
ABS	Yes	
EAC	Yes	
KC	Yes	-
Interfaces		
Fieldbus	POWERLINK (V1/V2) controlled node	
Type	Type 2 [1)]	
Variant	2x shielded RJ45 (hub)	
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	No	
Autonegotiation	Yes	
Auto-MDI/MDIX	Yes	
Hub propagation delay	0.96 to 1 µs	
Min. cycle time [2)]		
Fieldbus	200 µs	
X2X Link	200 µs	
Synchronization between bus systems possible	Yes	
Electrical properties		
Electrical isolation	POWERLINK isolated from bus and I/O	
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	-	
Starting temperature	-	Yes, -40°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	

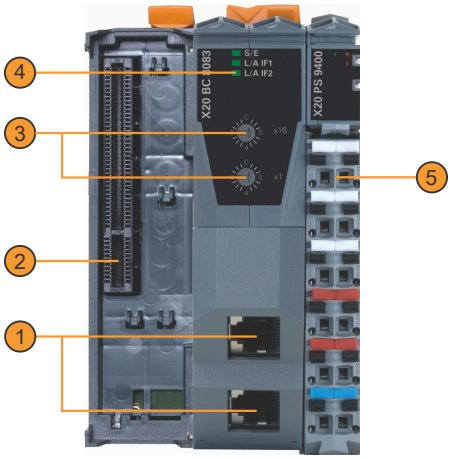
Table 2: X20BC8083, X20cBC8083 - Technical data

Order number	X20BC8083	X20cBC8083
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 X20TB12 separately. Order 1x power supply module X20PS9400 or X20PS9402 separately. Order 1x bus base X20BB8x separately.	Order 1x terminal block X20TB12 separately. Order 1x power supply module X20cPS9400 separately. Order 1x bus base X20cBB8x separately.
Pitch [3]		
X20BB80	37.5$^{+0.2}$ mm	
X20BB81	62.5$^{+0.2}$ mm	
X20BB82	87.5$^{+0.2}$ mm	

Table 2: X20BC8083, X20cBC8083 - Technical data

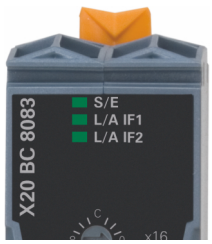
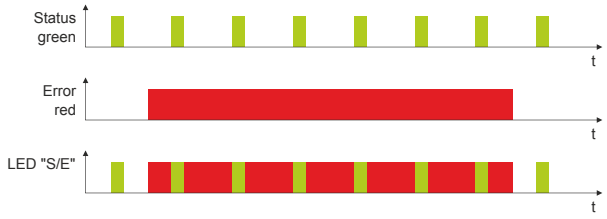
1) For additional information, see section "Communication / POWERLINK / General information / Hardware - CN" in Automation Help.
2) The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring.
3) Pitch is based on the width of bus base X20BB8x. Up to 2 hub expansion modules X20HB2880 and 1 power supply module X20PS9400 or X20PS9402 are always required for the bus controller.

3.2 Operating and connection elements



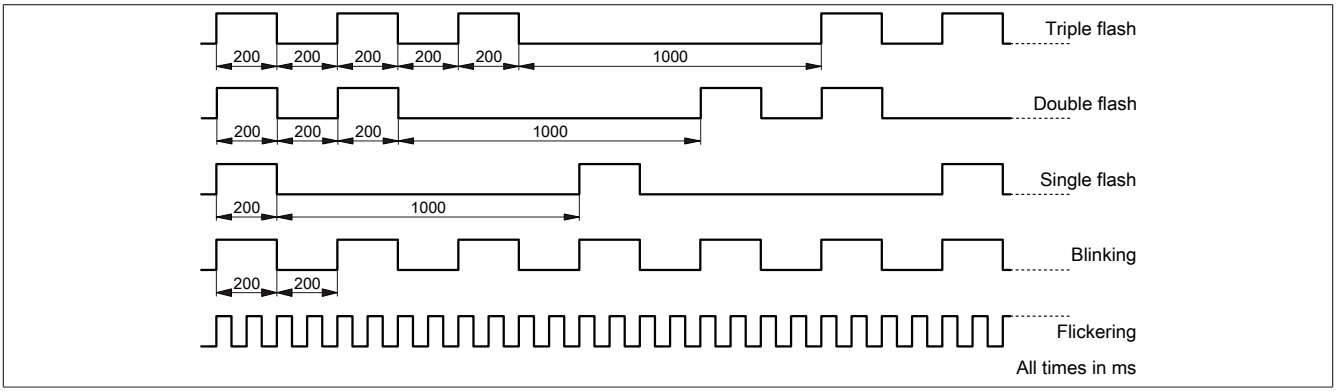
1	POWERLINK connection with 2x RJ45 for simple wiring	2	Slot for hub expansion module
3	Node number switch	4	LED status indicators
5	Terminal block for bus controller and I/O supply	6	-

3.2.1 LED status indicators

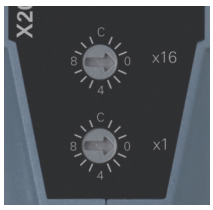
Figure	LED	Color	Status	Description
	S/E[1]	Green	Off	No power supply or mode NOT_ACTIVE. The controlled node (CN) is either not supplied with power or it is in state NOT_ACTIVE. The CN waits in this state for about 5 s after a restart. Communication is not possible with the CN. If no POWERLINK communication is detected during these 5 s, the CN changes to state BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the CN immediately changes to state PRE_OPERATIONAL_1.
			Flickering	Mode BASIC_ETHERNET. The CN has not detected any POWERLINK communication. In this state, it is possible to communicate directly with the CN (e.g. with UDP, IP). If POWERLINK communication is detected in this state, the CN changes to state PRE_OPERATIONAL_1.
			Single flash	Mode PRE_OPERATIONAL_1. When operating on a POWERLINK V1 manager, the CN immediately changes to state PRE_OPERATIONAL_2. When operating on a POWERLINK V2 manager, the CN waits until an SoC frame is received and then changes to state PRE_OPERATIONAL_2.
			Double flash	Mode PRE_OPERATIONAL_2. The CN is normally configured by the manager in this state. It is then switched to state READY_TO_OPERATE by command (POWERLINK V2) or by setting flag "Data valid" in the output data (POWERLINK V1).
			Triple flash	Mode READY_TO_OPERATE. In a POWERLINK V1 network, the CN switches to state OPERATIONAL automatically as soon as input data is present. In a POWERLINK V2 network, the manager switches to state OPERATIONAL by command.
			On	Mode OPERATIONAL. PDO mapping is active, and cyclic data is evaluated.
			Blinking	Mode STOPPED. Output data is not being output, and no input data is being provided. It is only possible to switch to or leave this state after the manager has given the appropriate command.
		Red	On	The controlled node (CN) is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE  Note: • Several red blinking signals are displayed immediately after the device is switched on. This is not an error, however. • The LED is lit red for CNs with configured physical node number 0 but that have not yet been assigned a node number via dynamic node allocation (DNA).
	L/A IFx	Green	On	Link established to the remote station
			Blinking	A link to the remote station has been established and there is activity on bus.

1) The Status/Error LED "S/E" is a green/red dual LED.

LED status indicators - Blink times



3.2.2 POWERLINK node number

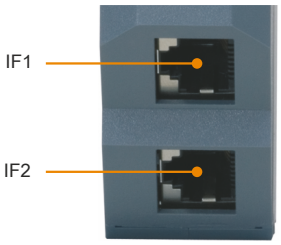


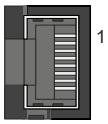
The node number for the POWERLINK node is set using the two number switches.

Switch position	Description
0x00	Only permitted when operating the POWERLINK node in DNA mode.
0x01 - 0xEF	Node number of the POWERLINK node. Operation as a controlled node (CN).
0xF0 - 0xFF	Reserved, switch position not permitted.

3.2.3 Ethernet interface

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



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	

3.2.4 Slot for hub expansion modules

Depending on the bus base, up to 2 hub expansion modules can be installed on the left side of the bus controller:

Bus base	Slots for hub expansion modules
X20BB81	1
X20BB82	2

Hub expansion module X20HB2880 can be connected to the bus controller and is equipped with 2 RJ45 connections, which means that up to 6 hub ports are available.

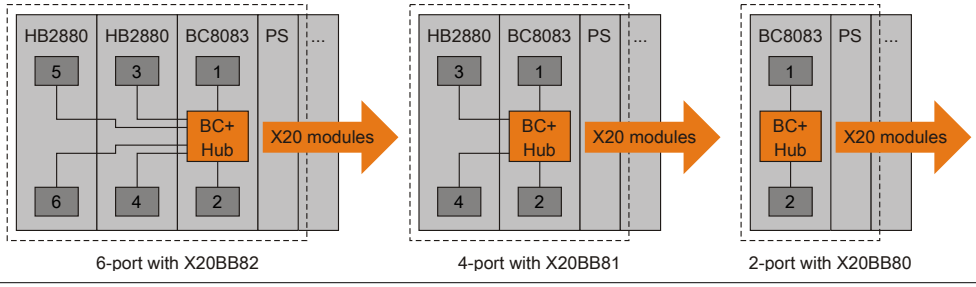


Figure 1: Numbering of hub ports

When using DNA, the desired hub port number must be specified under "Hub port on predecessor" in Automation Studio.

3.3 Dynamic node allocation (DNA)

Most POWERLINK bus controllers have the ability to dynamically assign node numbers. This has the following advantages:

- No setting of the node number switch
- Easier installation
- Reduced error sources

For information regarding configuration as well as an example, see Automation Help → Communication → POWERLINK → General information → Dynamic node allocation (DNA)

3.4 SG3

This module is not supported on SG3 target systems.

3.5 SG4

The module comes with preinstalled firmware. The firmware is also part of the Automation Runtime operating system for the PLC. With different versions, the Automation Runtime firmware is loaded onto the module.

The latest firmware is made available automatically when updating Automation Runtime.