1.3 Order data

Order number	Short description	Figure
	Bus controllers	
X20BC0087	X20 bus controller, 1 Modbus TCP or Modbus UDP interface, integrated 2-port switch, 2x RJ45, order bus base, power supply module and terminal block separately!	
X20cBC0087	X20 bus controller, coated, Modbus TCP or Modbus UDP interface, integrated 2-port switch, 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 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	
	Terminal blocks	
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	

Table 1: X20BC0087, X20cBC0087 - Order data

1.4 Module description

This bus controller makes it possible to connect X2X Link I/O nodes to Modbus via Ethernet. The bus controller can be operated on B&R controllers through the use of Automation Studio or on third-party systems with Modbus TCP or -UDP master functionality.

- DHCP-capable
- BOOTP-capable
- Integrated 2-port switch for economical wiring
- Configurable I/O cycle (0.5 to 4 ms)
- Response time: <1 to 8 ms (depends on the load of the integrated switch)
- Check of validity for command sequences before their execution

Functions:

- Modbus TCP/UDP

Modbus TCP/UDP

Established in 1979, the Modbus protocol has approved the use of Ethernet with both Modbus TCP and Modbus/UDP. The Modbus services and the object model, which have been proven since the original version, have been retained unchanged.

2 Technical description

2.1 Technical data

Order number	X20BC0087	X20cBC0087
Short description		
Bus controller	Modbus TCP/UDP slave	
General information		
B&R ID code	0x227C	0xD577
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	
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	
KC	Yes	-
Interfaces		
Fieldbus	Modbus TCP/UDP slave	
Variant	2x shielded RJ45 (switch)	
Line length	Max. 100 m between 2 stations (segment length)	
Transfer rate	10/100 Mbit/s	
Transfer		
Physical layer	10BASE-T/100BASE-TX	
Half-duplex	Yes	
Full-duplex	Yes	
Autonegotiation	Yes	
Auto-MDI/MDIX	Yes	
Min. cycle time [1)]		
Fieldbus	1 ms	
X2X Link	500 µs	
Synchronization between bus systems possible	No	
Electrical properties		
Electrical isolation	Modbus 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	

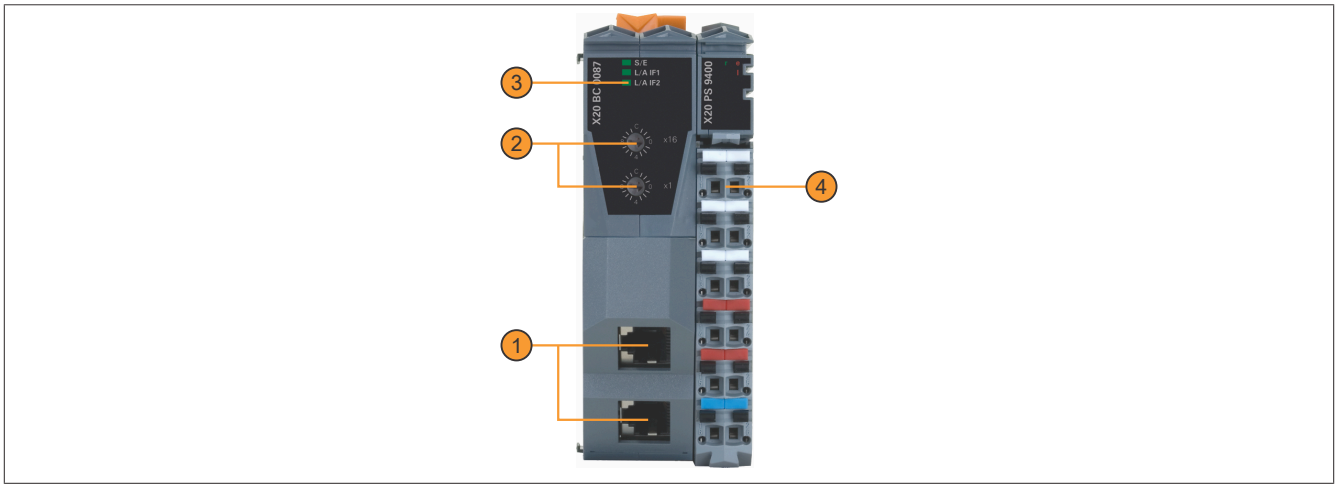
Table 2: X20BC0087, X20cBC0087 - Technical data

Order number	X20BC0087	X20cBC0087
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	
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 X20BB80 separately.	Order 1x terminal block X20TB12 separately. Order 1x power supply module X20cPS9400 separately. Order 1x bus base X20cBB80 separately.
Pitch [2]	37.5$^{+0.2}$ mm	

Table 2: X20BC0087, X20cBC0087 - Technical data

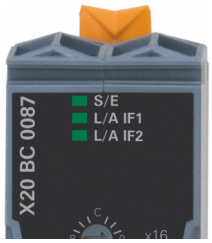
1) The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring.
2) Pitch is based on the width of bus base X20BB80. In addition, power supply module X20PS9400 or X20PS9402 is always required for the bus controller.

2.2 Operating and connection elements



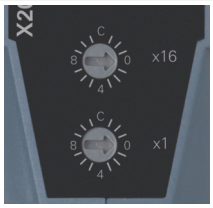
1	Modbus TCP connection with 2x RJ45 for simple wiring	2	Network address switches
3	LED status indicators	4	Terminal block for bus controller and I/O supply

2.2.1 LED status indicators

Figure	LED	Color	Status	Description
	S/E[1]	Green	On	Indicates that there is at least one client connection
			2 pulses	Indicates that there are no client connections
			4 pulses	Indicates that the controller is waiting for an address from the DHCP server
			Blinking	Initialization of connected I/O modules
		Red	2 pulses	Watchdog timeout
			3 pulses	Faulty I/O module configuration data
			4 pulses	Indicates that the controller has detected an IP address being used twice
			5 pulses	Indicates a missing, defective or incorrect I/O module
			6 pulses	Error reading flash memory. Last write operation was incomplete or contained errors.[2]
			On	Indicates a major unrecoverable fault
	L/A IFx	Green	Blinking	Ethernet activity taking place on the RJ45 port (IF1, IF2) indicated by the respective LED
			On	Indicates an established connection (link), but no communication is taking place
			Off	Indicates that no physical Ethernet connection exists

1) The Status/Error LED "S/E" 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.
2) Possible cause: The bus controller received a command to save, but was switched off before saving was complete. In this case, the bus controller continues to use the old configuration and indicates the failed write operation with a blink code.

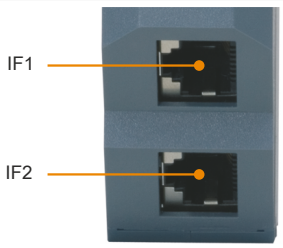
2.2.2 Modbus/TCP network address switch

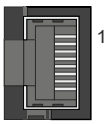


Switch position	Description
0x00	This switch position is the factory default setting. In this position, the address switches have no effect on system parameters. The bus controller parameters in flash memory are used (IP address or interface number). The bus controller is started with factory default values if valid flash data is not present.
0x01 - 0x7F	The last position of the IP address saved in flash memory is changed to the address switch value. The IP address saved in flash memory is not changed. The interface number is read from flash memory.
0x80 - 0xEF	Sets the bus controller to DHCP mode for this range. The DNS server is informed of the current hostname. A hostname is generated according to the setting of the address switch. **Example** The generated hostname is made up of 3 elements: "br" + "mb" + Address switch value (3 decimal places) This means, for example, that the following hostname is generated for address switch setting 0xD7 (dec. 215): "brmb215".
0xF0	Auto-store mode: The IP settings are obtained from the DHCP or BooTP server. If the IP settings are different than the values stored in flash memory, then the current IP parameters are saved. This function is available in firmware version 1.39 and later.
0xF1 - 0xFD	Reserved (same function as position 0xFF).
0xFE	Initializes all bus controller parameters with default values during booting. No values are read from flash memory. The communication parameters correspond to the values assigned with switch setting 0xFF.
0xFF	Initializes all communication parameters with default values. All other bus controller parameters are read from flash memory. Default parameters: • IP address: 192.168.100.1 • Subnet mask: 255.255.255.0 • Gateway: 192.168.100.254 • Primary NetBIOS name: "br" + MAC address • Secondary NetBIOS name: "br" + "mb" + address switch value (decimal) • Interface number: 502 • X2X Link configuration: 4 ms cycle time • X2X Link cable length: 0 m

2.2.3 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	
	1	RXD	Receive data
	2	RXD\	Receive data\
	3	TXD	Transmit data
	4	Termination	
	5	Termination	
	6	TXD\	Transmit data\
	7	Termination	
Shielded RJ45	8	Termination	

3 Function description

3.1 Modbus TCP/UDP

Established in 1979, the Modbus protocol has approved the use of Ethernet with both Modbus TCP and Modbus/UDP. Today, Modbus TCP is an open Internet draft standard introduced by Schneider Automation to the Internet Engineering Task Force (IETF), the organization responsible for Internet standardization. The Modbus services and object model have been preserved since the original version and left unchanged for use with the TCP/IP transmission medium.

Modbus/UDP differs from Modbus TCP in that it uses connectionless communication via UDP/IP. The advantages of faster and easier communication with UDP/IP also brings with it the disadvantage of requiring error detection and correction in the application layer. The Modbus protocol is based on a client/server architecture.

- I/O configuration via the fieldbus
- DHCP-capable
- Response time: <1 to 8 ms (depends on the load of the integrated switch)
- Check of validity of command sequences before their execution
- Integrated connection to local expansions via X2X Link for 250 additional modules
- Configurable I/O cycle (0.5 to 4 ms)

For additional information, see the Modbus/TCP bus controller user's manual.