

X20(c)HB2880

Data sheet
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Publishing information

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Version history

B&R makes every effort to keep documents as current as possible. The most current versions are available for download on the B&R website (www.br-automation.com).

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

Additional documentation

Document name	Title
MAREDSYS	Redundancy for control systems

1.2 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



1.2.1 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.

1.3 Order data


Order number	Short description	Figure
	System modules for the X20 hub system	
X20HB2880	X20 hub expansion module, integrated 2-port hub, 2x RJ45	
X20cHB2880	X20 hub expansion module, coated, integrated 2-port hub, 2x RJ45	

Table 1: X20HB2880, X20cHB2880 - Order data

1.4 Module description

POWERLINK bus controller X20BC8083, standalone hub X20HB8880 and the POWERLINK TCP/IP gateway X20HB8815 are equipped with a modular hub extension. 1 or 2 additional slots are available depending on the bus base. The X20HB2880 hub expansion module can be operated in these slots.

The status of the module and network are indicated by LEDs.

- Hub expansion module
- 2x hub 100 BASE-TX

2 Technical description

2.1 Technical data

Order number	X20HB2880		X20cHB2880
Short description			
Hub	2-port Fast Ethernet hub for hub expansion		
General information			
Status indicators	Module status, bus function		
Diagnostics			
Module status	Yes, using LED status indicator		
Bus function	Yes, using LED status indicator		
Power consumption	1.17 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			
Type	Hub expansion module		
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	No		
Autonegotiation	Yes		
Auto-MDI/MDIX	Yes		
Hub propagation delay	0.96 to 1 µs		
Electrical properties			
Electrical isolation	Power supply isolated from Ethernet (IF1 and IF2)		
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: X20HB2880, X20cHB2880 - Technical data

Technical description

Order number	X20HB2880		X20cHB2880	
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				
Slot	Hub expansion for X20BC8083 and X20HB8880		Hub expansion for X20cBC8083 and X20cHB8880	

Table 2: X20HB2880, X20cHB2880 - Technical data

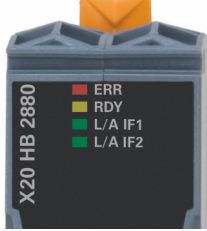
2.2 Operating and connection elements



The diagram shows a vertical industrial device, the X20HB2880. At the top, there is a label with four status indicators: ERR (red), RDY (yellow), L/A IF1 (green), and L/A IF2 (blue). Below the label, there are two RJ45 ports, each with a label 'X20 HB 2880'. Two callout lines point to these ports, labeled '1'. Another callout line points to the status indicators, labeled '2'.

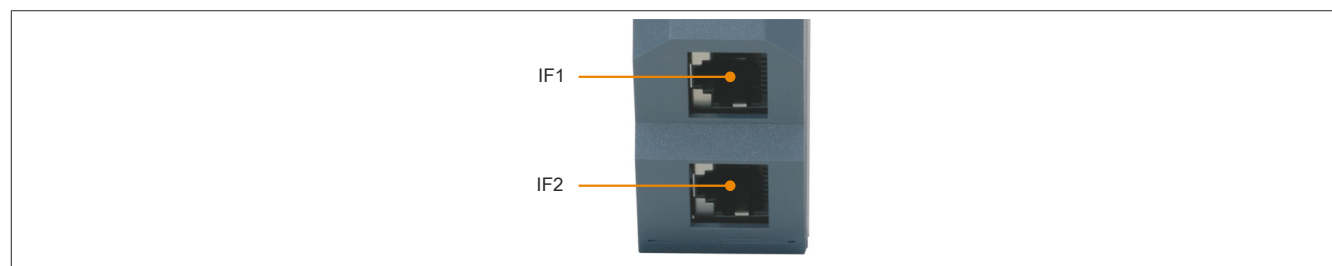
1	2 Ethernet interfaces	2	LED status indicators
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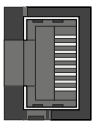
2.2.1 LED status indicators

Figure	LED	Color	Status	Description
	ERR	Red	On	Slot not detected
	RDY	Orange	On	Slot detected, module is active
	L/A IFx	Green	On	A link to the remote station has been established.
			Blinking	A link to the remote station has been established. Indicates Ethernet activity is taking place on the bus.

2.2.2 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
	2	RXD\
	3	TXD
	4	Termination
	5	Termination
	6	TXD\
	7	Termination
	8	Termination

3 Commissioning

3.1 Using version G* in Automation Studio



Information:

In some versions starting with G0, the data points of connections 3 and 4 or 5 and 6 (EthPhy*Plugged, EthPhy*LinkOk and EthPhy*LinkLoss) are swapped in the Automation Studio I/O mapping and must therefore be used in reverse.

Affected versions:

- **X20HB2880:** ≥G0 to <H0
- **X20cHB2880:** ≥G0 to <G5

3.2 Network size and collision detection



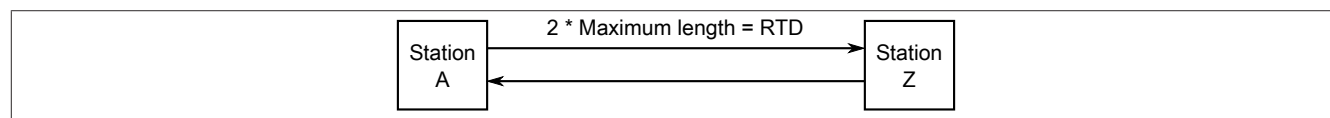
Information:

This section applies to the use of Ethernet networks, not POWERLINK networks.

According to Ethernet specification IEEE 802.3, the transmission duration of a frame of minimum length must always be greater than the round-trip delay time (RTD). RTD is the time needed by a data packet to travel from one end of the network to the other.

If this is not observed, collision detection can no longer be guaranteed.

Illustration of RTD



When using copper cables, the maximum distance is 100 m by default. Since there are often many different devices with different PHYs in a network, the propagation delay of the frames changes due to the different latency of each PHY. This also affects the network size, and collision detection can no longer be guaranteed at 100 m.

Example for calculating network size

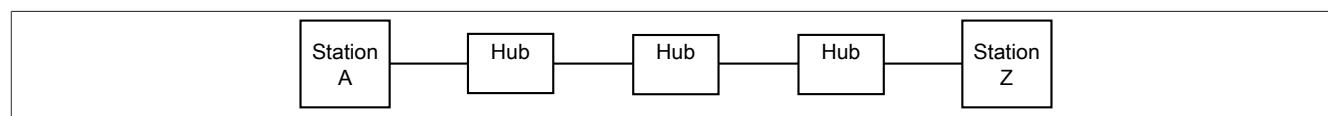
The following parameters are specified for a network:

- Transfer rate: 100 Mbit/s
- Cable length: 100 m
- Hub count: 2
- Hub propagation delay of a frame: 1 μ s
- Minimum frame size in the Ethernet network: 72 bytes

Calculation procedure

1. How long does 1 byte need at 100 Mbit/s? – 100 Mbit/s / 8 = 12.5 MB/s	$\frac{12,500,000}{1} = \frac{1}{x}$ $x = \frac{1s}{12,500,000} = 80ns$
2. Propagation delay of minimum Ethernet frame – Minimum frame in Ethernet network: 72 bytes	$72 * 80ns = 5.76\mu s$
3. Propagation delay in cable and hub – 100 m cable = 0.5 μ s – 2 hubs = 2 x 1 μ s	$2\mu s + 0.5\mu s = 2.5\mu s$
4. Calculation of total propagation delay – Outbound/Inbound propagation delay	$2.5\mu s * 2 = 5\mu s$
Result Collision detection is possible since the total time of 5 μ s is less than the minimum Ethernet propagation delay of 5.76 μ s.	

Example for calculating the network reach with devices between 2 stations



Corresponding to the previous example, the following situation occurs in a network with 3 hubs and 100 m cables:

- The transmission duration of a frame of minimum length is 5.76 μ s.

Calculation procedure

1. Propagation delay in cable and hub – 100 m cable = 0.5 μ s – 3 hubs = 3 x 1 μ s	$3\mu s + 0.5\mu s = 3.5\mu s$
2. Calculation of total propagation delay – Outbound/Inbound propagation delay	$3.5\mu s * 2 = 7\mu s$
Result Collision detection is not possible since the total time of 7 μ s is greater than the minimum Ethernet propagation delay of 5.76 μ s. The ≈ 1.3 μ s missing for collision detection can only be saved by removing one hub.	