X20(c)HB2880

1 General information

The POWERLINK bus controller X20BC8083 and the stand-alone hubs X20HB8880 and X20HB8815 are equipped with a modular hub expansion. An additional 1 or 2 slots are available, depending on the bus base used. 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 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

2.1 -40°C starting temperature

The starting temperature describes the minimum permissible ambient temperature when the power is switched off 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 a closed control cabinet, for example using a fan or ventilation slots.

3 Order data

Model 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

4 Technical data

Model number	X20HB2880	X20cHB2880
Short description		
Hub	2 Fast Ethernet hubs for hub expansion	
General information		
Status indicators	Module status, bus function	
Diagnostics		
Module status	Yes, using status LED	
Bus function	Yes, using status LED	
Power consumption	1.17 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 GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)	
LR	ENV1	
KR	Yes	
EAC	Yes	
KC	Yes	-
Interfaces		
Type	Hub expansion module	
Variant	2x shielded RJ45	
Cable 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 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	-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		
Slot	Hub expansion for X20BC8083 and X20HB8880	Hub expansion for X20cBC8083 and X20cHB8880

Table 2: X20HB2880, X20cHB2880 - Technical data

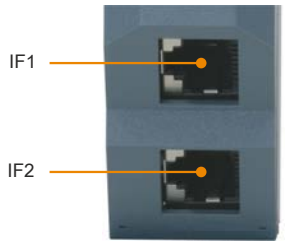
5 LED status indicators

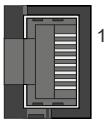
Figure	LED	Color	Status	Description
	ERR	Red	On	Slot not detected
	RDY	Orange	On	Slow detected, module is active
	L/A IFx	Green	On	A link to the remote station has been established.
			Blinking	A link to the remote station has been established. Indicates Ethernet activity is taking place on the bus.

6 Operating and connection elements

7 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" of 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	

8 Network size and collision detection

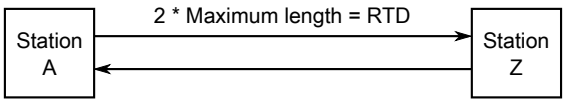
Information:

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 generally 100 m. 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

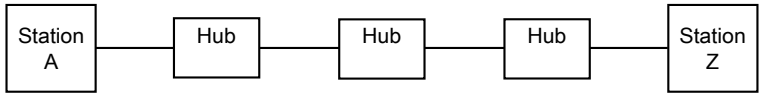
The following parameters are specified for a network:

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

Calculation procedure

1. How long does 1 byte take at 100 Mbit? – 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 µs – 2 hubs = 2 x 1 µs	$2\mu s + 0.5\mu s = 2.5\mu s$
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 µs is less than the minimum Ethernet propagation delay of 5.76 µs.	

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 µs.

Calculation procedure

1. Propagation delay in cable and hub – 100 m cable = 0.5 µs – 3 hubs = 3 x 1 µs	$3\mu s + 0.5\mu s = 3.5\mu s$
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 µs is greater than the minimum Ethernet propagation delay of 5.76 µs. The ≈1.3 µs missing for collision detection can only be recovered by removing a hub.	