X20(c)HB1881

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
MAEMV	Installation / EMC guide

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



1.3 Order data

Order number	Short description	Figure
	System modules for the X20 hub system	
X20HB1881	X20 hub expansion module, integrated 1-port hub, for multimode fiber optic cables	
X20cHB1881	X20 hub expansion module, coated, integrated 1-port hub for fiber optic cables	

Table 1: X20HB1881, X20cHB1881 - Order data

1.4 Module description

The POWERLINK bus controllers X20BC8083, X20BC8084 (revision D0 or higher) and the stand-alone hub X20HB8880 are equipped with a modular hub expansion. An additional 1 or 2 slots are available, depending on the bus base used. The X20HB1881 hub expansion module can be operated in these slots. Note that the hardware revision of the X20BC8083 and the X20HB8880 must be ≥F0.

The hub expansion module is a 1x hub. The Ethernet connection is made using 62.5/125 µm or 50/125 µm fiber optic multimode cable with a duplex LC connection. The module and network status is indicated using LEDs.

- Hub expansion module
- 1x hub 100 BASE-FX
- Fiber optic multimode cable
- Range up to 2 km
- Hot-swap-capable

2 Technical description

2.1 Technical data

Order number	X20HB1881	X20cHB1881
Short description		
Hub	1 Fast Ethernet interface for fiber optic cables 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	1.45 W (rev. <D0: 1.65 W)	1.45 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 - 55°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)	
LR	ENV1	
ABS	Yes	
BV	**EC33B** Temperature: 5 - 55°C Vibration: 4 g EMC: Bridge and open deck	
EAC	Yes	
KC	Yes	-
Interfaces		
Type	Hub expansion module	
Variant	1x female duplex LC	
Transfer rate	100 Mbit/s	
Transfer		
Physical layer	100BASE-FX	
Half-duplex	Yes	
Full-duplex	No	
Autonegotiation	No	
Auto-MDI/MDIX	No	
Hub propagation delay	0.96 to 1 µs	
Wave length	Typ. 1300 nm Rx range: 1270 to 1380 nm Tx range: 1270 to 1380 nm	
Cable fiber type	Multimode fiber with 62.5/125 µm or 50/125 µm core diameter On both sides: Male duplex LC connector	
Optical power budget		
Glass fiber 62.5/125 µm, NA = 0.275	11 dB	
Glass fiber 50/125 µm, NA = 0.200	7.5 dB	
Line length		
Half-duplex	Max. 175 m between 2 stations (segment length)	
POWERLINK	Max. 2 km between 2 stations (segment length)	
Electrical properties		
Electrical isolation	Power supply isolated from Ethernet	
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	

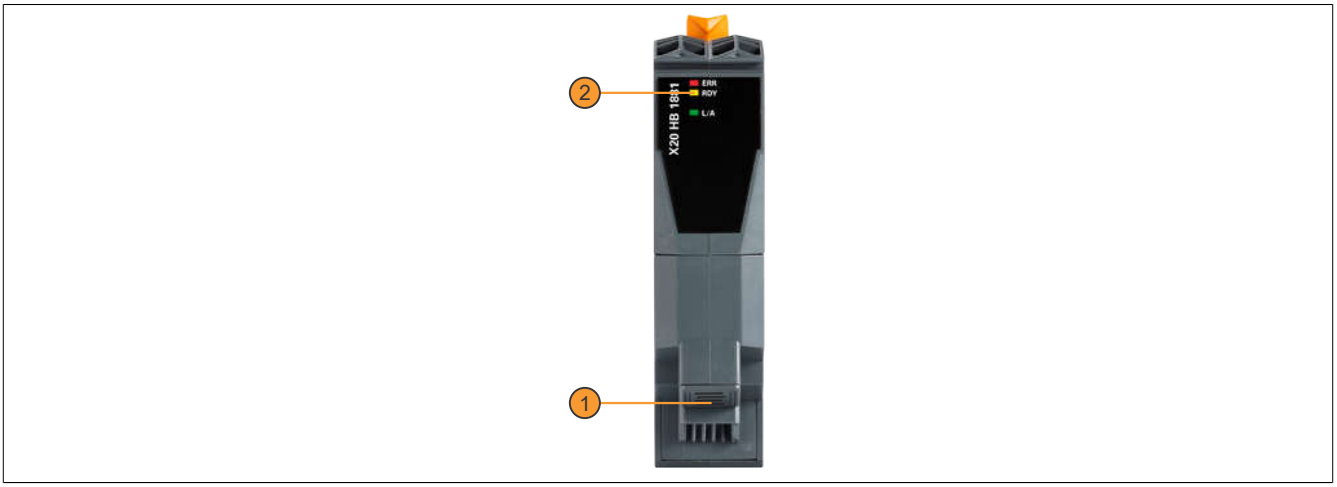
Table 2: X20HB1881, X20cHB1881 - Technical data

Order number	X20HB1881	X20cHB1881
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, X20BC8084 and X20HB8880 1)	Hub expansion for X20cBC8084 and X20cHB8880 2)

Table 2: X20HB1881, X20cHB1881 - Technical data

1) The hardware revision of X20BC8083 and X20HB8880 must be F0 or later, and the hardware revision of X20BC8084 must be D0 or later.
2) The hardware revision of the X20cHB8880 must be F0 or later, and the hardware revision of the X20cBC8084 must be D0 or later.

2.2 Operating and connection elements

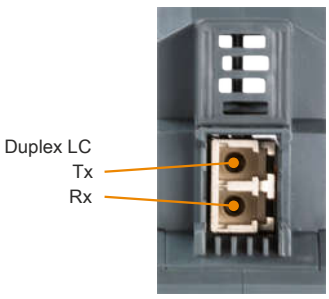


1	Ethernet interface	2	LED status indicators

2.2.1 LED status indicators

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

2.2.2 Ethernet interface

Figure	Description
	100BASE-FX, female duplex LC

2.2.2.1 Wiring guidelines for X20 modules with fiber optic cable

The following wiring guidelines must be observed:

- Cable fiber type: Multimode fiber with 62.5/125 µm or 50/125 µm core diameter
- On both sides: Duplex LC male connector
- Observe minimum cable flex radius (see data sheet for the cable)

3 Commissioning

3.1 Network size and collision detection

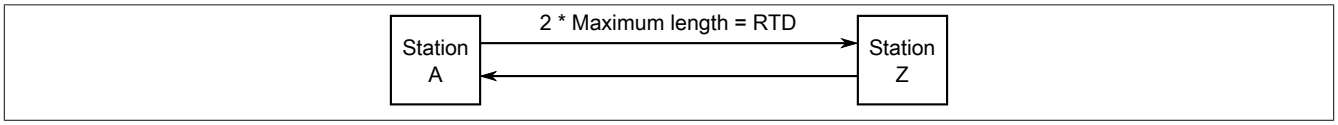
Information:

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 fiber optic cables, the default maximum size is 175 m. Since there are often different devices in a network using different PHYs, the propagation delay of the frames changes since each PHY has different latency. This also affects the network size, and collision detection can no longer be guaranteed at 175 m.

For this reason, it is necessary to re-check whether the transmission duration of a frame of minimum length is actually greater than the maximum RTD.

Example for calculating network size

- Transfer rate: 100 Mbit/s
- Length of the fiber optic cable: 175 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 need 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) – 175 m cable = 1.75 x 0.5 µs – 2 hubs = 2 x 1 µs	$\frac{175}{100} m * 0.5\mu s + 2\mu s = 2.875\mu s$
4. Calculation of total propagation delay – Outbound/Inbound propagation delay	$2.875\mu s * 2 = 5.75\mu s$
Result Collision detection is possible since the total time of 5.75 µs is less than the minimum Ethernet propagation delay of 5.76 µs. With a longer cable or device with different latency, collision detection would no longer exist.	