X20HB1882

1 General information

POWERLINK bus controllers X20BC8083 and X20BC8084 (revision D0 and later) and standalone hub X20HB8880 are equipped with a modular hub expansion. An additional 1 or 2 slots are available depending on the bus base being used. Hub expansion module X20HB1882 can be operated in these slots. Note that the hardware revision of the X20BC8083 and X20HB8880 must be ≥F0.

The hub expansion module is designed as a 1-port hub. The Ethernet connection is made using 9/125 µm single-mode glass fiber cables with a duplex LC connector. The module state and network status are indicated using LEDs.

- Hub expansion module
- 1-port hub, 100BASE-FX
- Single-mode glass fiber cables
- Range up to 50 km
- Hot-swappable

Information:

This module is not suitable for POWERLINK ring redundancy applications.

2 Order data

Model number	Short description	Figure
	System modules for the X20 hub system	
X20HB1882	X20 hub expansion module, integrated 1-port hub, for monomode fiber optic cables	

Table 1: X20HB1882 - Order data

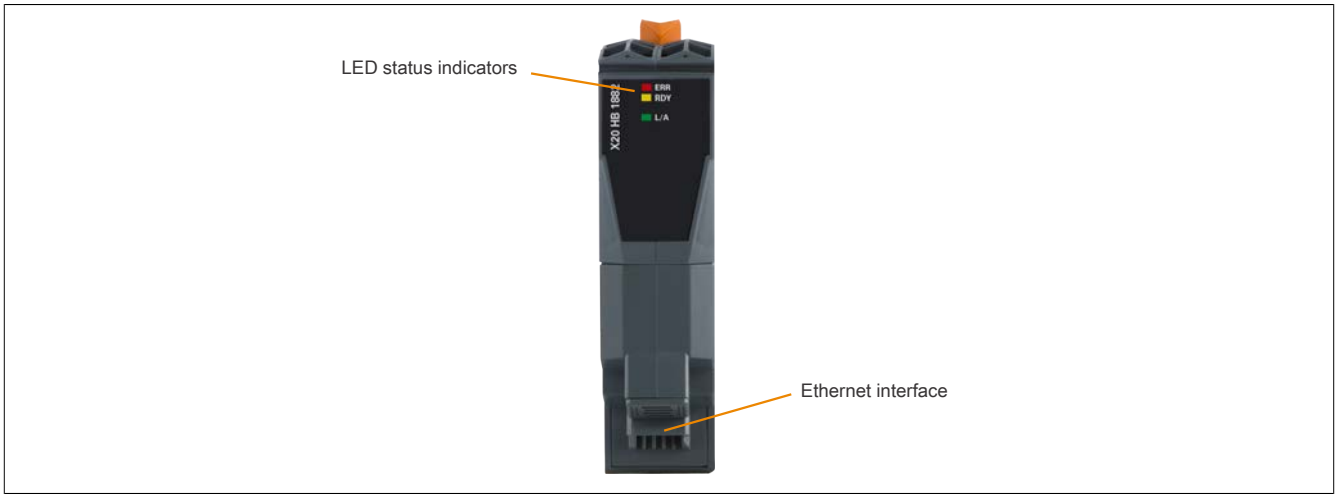
3 Technical data

Model number	X20HB1882
Short description	
Hub	1 Fast Ethernet interface for single-mode 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	1.65 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
EAC	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	Single-mode fiber with 9/125 µm core diameter On both sides: Male duplex LC connector
Optical power budget	30 dB
Cable length	
Half-duplex	Max. 175 m between 2 stations (segment length)
POWERLINK	Max. 50 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
Ambient conditions	
Temperature	
Operation	
Horizontal mounting orientation	-25 to 55°C
Vertical mounting orientation	-25 to 45°C
Derating	-
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical properties	
Slot	Hub expansion for X20BC8083, X20BC8084 and X20HB8880 [1]

Table 2: X20HB1882 - Technical data

1) The hardware revision of X20BC8083 and X20HB8880 must be ≥F0, and the hardware revision of X20BC8084 must be ≥D0.

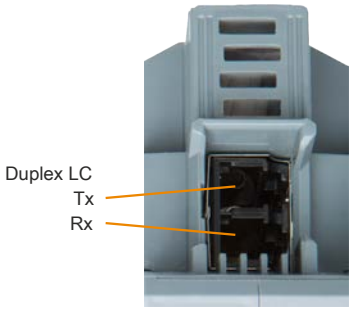
4 Operating and connection elements



4.1 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	Link to remote station established
			Blinking	Link to remote station established. The LED blinks if Ethernet activity is taking place on the bus.

4.2 Ethernet interface

Figure	Description
	100BASE-FX, female duplex LC

4.2.1 Cabling guidelines for X20 modules with fiber optic cables

The following cabling guidelines must be observed:

- Cable fiber type: Single-mode fiber with 9/125 µm core diameter
- On both sides: Male duplex LC connector
- Observe the minimum cable bend radius (see data sheet for the cable).

5 Network size and collision detection

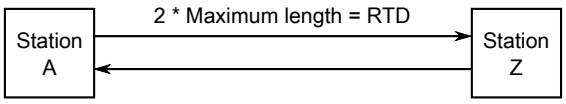
Information:

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.	