# X67HB8880.L12

## 1 General information

The Ethernet hub is a standalone device that can be used universally as a hub in POWERLINK networks. It is suitable for both 100 Mbit/s (Fast Ethernet) and 10 Mbit/s networks. The hub automatically recognizes the transfer speed for the channels.

The Ethernet connections are made using D-keyed M12 connectors. All ports are equipped with auto-MDIX (auto-crossover).

The module is designed for a voltage range of 8 to 32 VDC and equipped with a power supply protected against load dump.

- 8-port industrial hub
- Large voltage range of 8 to 32 VDC
- Load dump protection

## 2 Order data

| Model number | Short description | Figure |
|---|---|---|
| | **Hub system** |  |
| X67HB8880.L12 | X67 8-port industrial hub (layer 2), 10/100 Mbit/s with autonegotiation, automatic MDIX, 8x M12, 8-32 VDC | |

Table 1: X67HB8880.L12 - Order data

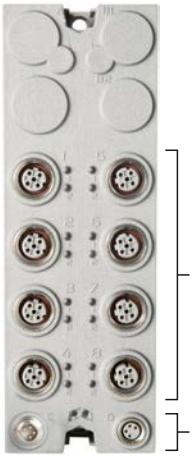
| Required accessories |
|---|
| For a general overview, see section "Accessories - General overview" of the X67 system user's manual. |

# 3 Technical data

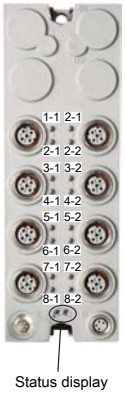
| Model number | X67HB8880.L12 |
|---|---|
| **Short description** | |
| Hub | 8-port industrial hub |
| **General information** | |
| Status indicators | Network activity for each channel, link/collision for each channel, supply voltage |
| Diagnostics | |
| Bus function | Yes, using status LED |
| Hub power supply | Yes, using status LED |
| Connection type | |
| Fieldbus | 8x M12, D-keyed |
| I/O power supply | M8, 4-pin |
| Power consumption | |
| Internal | Max. 2.5 W |
| Certifications | |
| CE | Yes |
| UL | cULus E115267<br>Industrial control equipment |
| **Interfaces** | |
| Type | Ethernet |
| Standard (compliance) | ANSI/IEEE 802.3 Class II |
| Variant | M12 interface (male connector on the module) |
| Line length | Max. 100 m between 2 stations (segment length) |
| Transfer rate | 10/100 Mbit/s |
| Transfer | |
| Physical layer | 10 BASE-T/100 BASE-TX |
| Half-duplex | Yes |
| Full-duplex | No |
| Autonegotiation | Yes |
| Auto-MDI / MDIX | Yes |
| Hub propagation delay | 0.79 to 0.86 µs |
| **I/O power supply** | |
| Nominal voltage | 12/24 VDC |
| Voltage range | 8 to 32 VDC |
| Integrated protection | Reverse polarity protection, overvoltage protection |
| **Operating conditions** | |
| Mounting orientation | |
| Any | 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 | IP67 |
| **Ambient conditions** | |
| Temperature | |
| Operation | -40 to 60°C |
| Derating | See section "Derating" |
| Storage | -40 to 85°C |
| Transport | -40 to 85°C |
| **Mechanical properties** | |
| Dimensions | |
| Width | 53 mm |
| Height | 155 mm |
| Depth | 42 mm |
| Weight | 320 g |
| Torque for connections | |
| M8 | Max. 0.4 Nm |
| M12 | Max. 0.6 Nm |

Table 2: X67HB8880.L12 - Technical data

# 4 Connection elements




# 5 LED status indicators

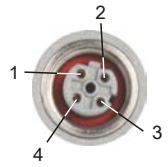
| Figure | LED | Color | Status | Description |
|---|---|---|---|---|
|  | **Ethernet LEDs** | | | |
| | 1/1 - 8/1 L/C[1)] | Green | On | A link to the remote station has been established. |
| | | Red | On | A network collision has been detected. |
| | 1/2 - 8/2 Run | Orange | On | A link to the remote station has been established. Indicates Ethernet activity is taking place on the bus. |
| | **Status indicator:** Status indicator for module function | | | |
| | Left | Green | Off | No power supplied to the module |
| | | | On | RUN mode |
| | Right | Red | Off | No power to module or everything OK |
| | | | On | Supply voltage not in the valid range |



1) LED "L/C" is a red/green dual LED.

# 6 Ethernet interface

The module is connected to the network using pre-assembled cables. The connection is made using M12 circular connectors.

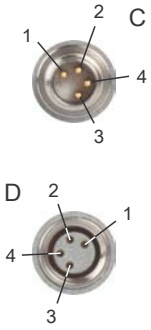
| Connection | Pinout | | |
|---|---|---|---|
| **X1 to X8** | **Pin** | **Name** | |
|  | 1 | TXD | Transmit data |
| | 2 | RXD | Receive data |
| | 3 | TXD\ | Transmit data\ |
| | 4 | RXD\ | Receive data\ |
| | Shield connection made via threaded insert in the module | | |
| | A → D-keyed (female), input | | |

# 7 I/O power supply

The module supply is connected via M8 connectors C and D. The I/O power supply is connected via connector C (male). Connector D (female) is used to route the I/O power supply to other modules.

## Information:

**The maximum permitted current for the circular connector is 8 A (4 A per pin).**

| Connection | Pinout | |
|---|---|---|
|  | **Pin** | **Name** |
| | 1 | 12/24 VDC[1)] |
| | 2 | 12/24 VDC[1)] |
| | 3 | GND |
| | 4 | GND |
|  | C → Connector (male) in module, feed for I/O power supply<br>D → Connector (female) in module, routing of I/O power supply | |

1) Nominal voltage. The valid supply voltage is 8 to 32 VDC.

# 8 Network size and collision detection

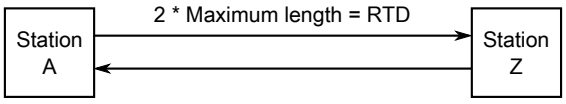
## Information:

**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**

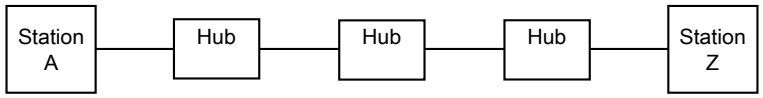
The following parameters are specified for a network:

- 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?<br>– 100 Mbit/s / 8 = 12.5 MB/s | $\frac{12{,}500{,}000}{1} = \frac{1}{x}$<br>$x = \frac{1s}{12{,}500{,}000} = 80ns$ |
| 2. Propagation delay of minimum Ethernet frame<br>– Minimum frame in Ethernet network: 72 bytes | $72 * 80ns = 5.76\mu s$ |
| 3. Propagation delay in cable and hub<br>– 100 m cable = 0.5 µs<br>– 2 hubs = 2 x 1 µs | $2\mu s + 0.5\mu s = 2.5\mu s$ |
| 4. Calculation of total propagation delay<br>– Outbound/Inbound propagation delay | $2.5\mu s * 2 = 5\mu s$ |
| **Result**<br>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:

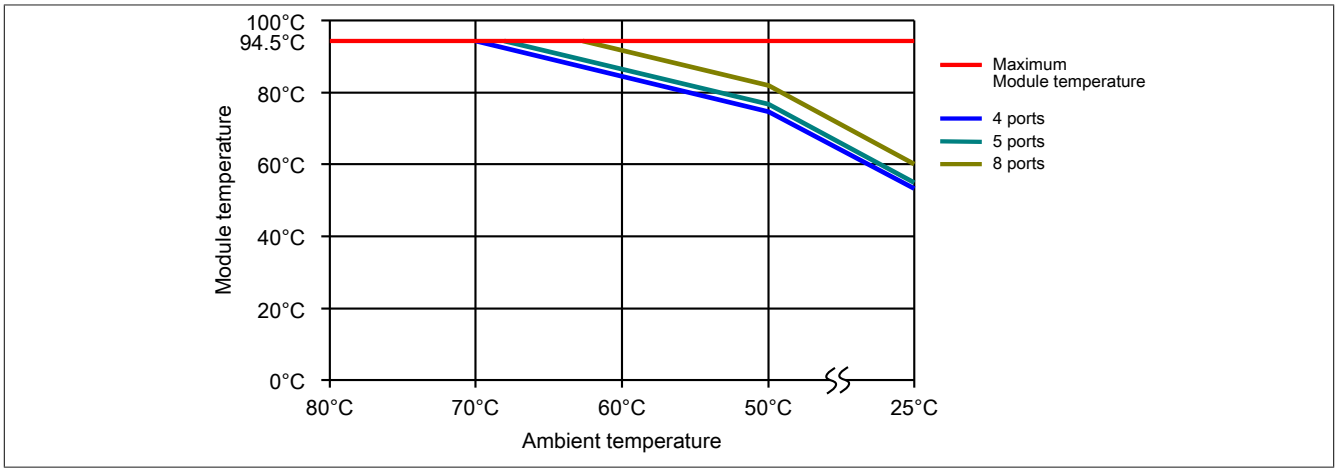
- The transmission duration of a frame of minimum length is 5.76 µs.

Calculation procedure

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

# 9 Derating

The module may become warm depending on the number of ports in use.




## Note:

**The maximum module temperature of 94.5°C is not permitted to be exceeded at any time since this will result in irreparable damage to the module.**