

X20(c)BC8084

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



1.2.1 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
Expandable bus controllers		
X20BC8084	X20 bus controller, 1 POWERLINK interface, 1x link selector for POWERLINK cable redundancy, supports expansion with active X20 hub modules, 2x RJ45, order bus base, power supply module and terminal block separately!	
X20cBC8084	X20 bus controller, coated, 1 POWERLINK interface, 1x link selector for POWERLINK cable redundancy, supports expansion with active X20 hub modules, 2x RJ45, order bus base, power supply module and terminal block separately!	
Required accessories		
System modules for bus controllers		
X20BB80	X20 bus base, for X20 base module (BC, HB, etc.) and X20 power supply module, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20PS9400	X20 power supply module, for bus controller and internal I/O power supply X2X Link power supply	
X20PS9402	X20 power supply module, for bus controller and internal I/O power supply, X2X Link supply, supply not galvanically isolated	
X20cBB80	X20 bus base, coated, for X20 base module (BC, HB, etc.) and X20 power supply module, X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20cPS9400	X20 power supply module, coated, for bus controller and internal I/O power supply X2X Link power supply	
System modules for expandable bus controllers		
X20BB82	X20 bus base, for X20 base module (BC, HB, etc.) and X20 power supply module, with 2 expansion slots for 2 X20 add-on modules (IF, HB, etc.), X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
X20cBB82	X20 bus base, coated, for X20 base module (BC, HB, etc.) and X20 power supply module, with 2 expansion slots for 2 X20 add-on modules (IF, HB, etc.), X20 end cover plates (left and right) X20AC0SL1/X20AC0SR1 included	
Terminal blocks		
X20TB12	X20 terminal block, 12-pin, 24 VDC keyed	
Optional accessories		
System modules for X20 redundancy systems		
X20HB2885	X20 hub expansion module, integrated active 2-port hub, 2x RJ45	
X20HB2886	X20 hub expansion module, integrated active 2-port hub, 2x fiber optic connections	
X20cHB2885	X20 hub expansion module, coated, integrated active 2-port hub, 2x RJ45	

Table 1: X20BC8084, X20cBC8084 - Order data

1.4 Module description

The bus controller makes it possible to connect X2X Link I/O nodes to POWERLINK. It is also possible to operate the X2X Link cycle synchronously 1:1 or synchronous to POWERLINK using a prescaler.

Functions:

- [POWERLINK](#)
- [POWERLINK redundancy system](#)

POWERLINK

POWERLINK is a standard protocol for Fast Ethernet equipped with hard real-time characteristics.

Redundancy system

In cable redundancy systems, data is fed into 2 cable lines simultaneously via a corresponding mechanism.

In ring redundancy systems, multiple nodes are connected within a ring and data packets can be transmitted in both directions if needed.

2 Technical description

2.1 Technical data

Order number	X20BC8084	X20cBC8084
Short description		
Bus controller	POWERLINK (V1/V2) controlled node with compact link selector	
General information		
B&R ID code	0x2674	0xDF10
Status indicators	Module status, bus function	
Diagnostics		
Module status	Yes, using LED status indicator and software	
Bus function	Yes, using LED status indicator and software	
Support		
Dynamic node allocation (DNA)	Yes	
Power consumption		
Bus	2 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) FTZÜ 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)	
LR	ENV1	
KR	Yes	
ABS	Yes	
BV	EC33B Temperature: 5 - 55°C Vibration: 4 g EMC: Bridge and open deck	
EAC	Yes	
KC	Yes	-
Interfaces		
Fieldbus	POWERLINK (V1/V2) controlled node	
Type	Type 2 ¹⁾	
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	
Min. cycle time ²⁾		
Fieldbus	200 µs	
X2X Link	200 µs	
Synchronization between bus systems possible	Yes	
Electrical properties		
Electrical isolation	POWERLINK isolated from bus and I/O	
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	

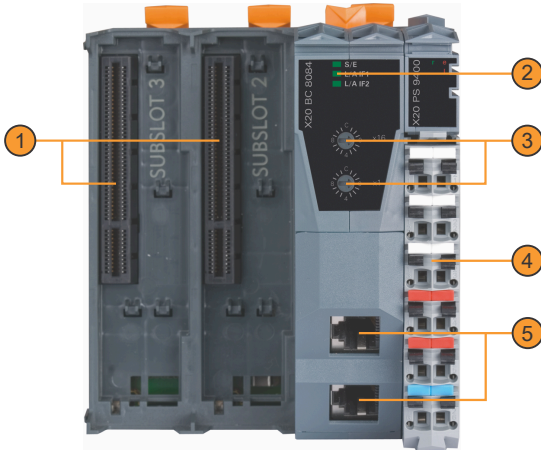
Table 2: X20BC8084, X20cBC8084 - Technical data

Order number	X20BC8084		X20cBC8084
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			
Note	Order 1x terminal block X20TB12 separately. Order 1x power supply module X20PS9400 or X20PS9402 separately. Order 1x bus base X20B-B80 or X20BB82 separately.		Order 1x terminal block X20TB12 separately. Order 1x power supply module X20cPS9400 separately. Order 1x bus base X20cB-B80 or X20cBB82 separately
Pitch ³⁾			
X20BB80			37.5 ^{+0.2} mm
X20BB82			87.5 ^{+0.2} mm

Table 2: X20BC8084, X20cBC8084 - Technical data

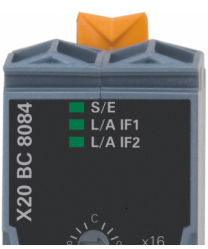
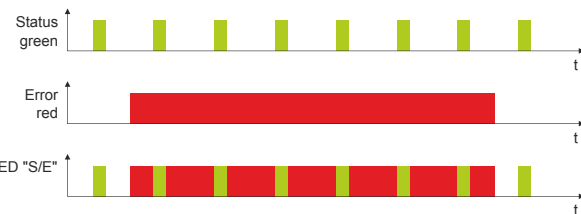
- 1) For additional information, see section "Communication / POWERLINK / General information / Hardware - CN" in Automation Help.
- 2) The minimum cycle time specifies how far the bus cycle can be reduced without communication errors occurring.
- 3) Pitch is based on the width of bus base X20BB80 or X20BB82. In addition, 1 power supply module X20PS9400 or X20PS9402 is always required for the bus controller. To save wiring for external hubs, the X20BC8084 can be expanded with 2 active hub modules, the X20HB2885 or X20HB2886.

2.2 Operating and connection elements



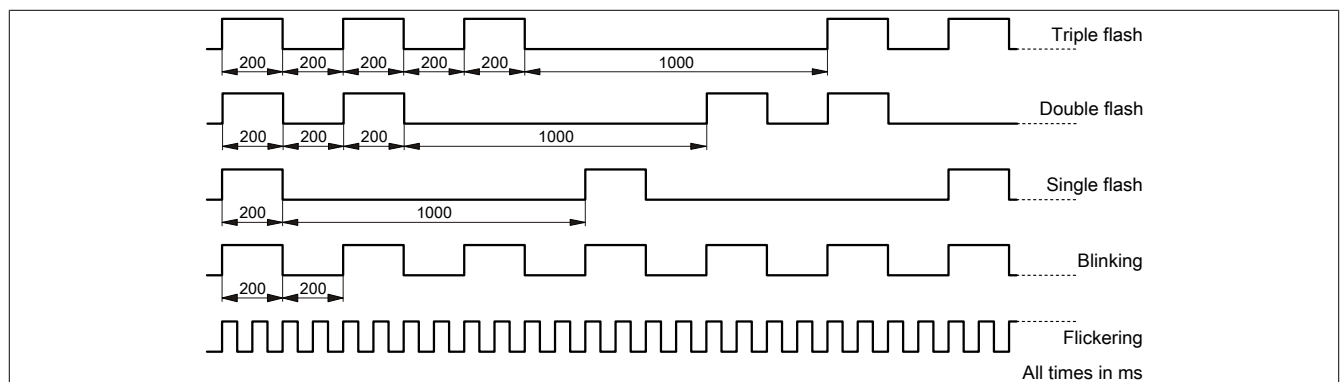
1	Slot for 2 hub expansion modules (with X20BB82)	2	LED status indicators
3	Node number switch	4	Terminal block for bus controller and I/O supply
5	POWERLINK connection with 2x RJ45 for simple wiring	6	-

2.2.1 LED status indicators

Figure	LED	Color	Status	Description
	S/E ¹⁾	Green	Off	No power supply or mode NOT_ACTIVE. The controlled node (CN) is either not supplied with power or it is in state NOT_ACTIVE. The CN waits in this state for about 5 s after a restart. Communication is not possible with the CN. If no POWERLINK communication is detected during these 5 s, the CN changes to state BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the CN immediately changes to state PRE_OPERATIONAL_1.
			Flickering	Mode BASIC_ETHERNET. The CN has not detected any POWERLINK communication. In this state, it is possible to communicate directly with the CN (e.g. with UDP, IP). If POWERLINK communication is detected in this state, the CN changes to state PRE_OPERATIONAL_1.
			Single flash	Mode PRE_OPERATIONAL_1. When operating on a POWERLINK V1 manager, the CN immediately changes to state PRE_OPERATIONAL_2. When operating on a POWERLINK V2 manager, the CN waits until an SoC frame is received and then changes to state PRE_OPERATIONAL_2.
			Double flash	Mode PRE_OPERATIONAL_2. The CN is normally configured by the manager in this state. It is then switched to state READY_TO_OPERATE by command (POWERLINK V2) or by setting flag "Data valid" in the output data (POWERLINK V1).
			Triple flash	Mode READY_TO_OPERATE. In a POWERLINK V1 network, the CN switches to state OPERATIONAL automatically as soon as input data is present. In a POWERLINK V2 network, the manager switches to state OPERATIONAL by command.
			On	Mode OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
			Blinking	Mode STOPPED. Output data is not being output, and no input data is being provided. It is only possible to switch to or leave this state after the manager has given the appropriate command.
	L/A IFx	Red	On	The controlled node (CN) is in an error state (failed Ethernet frames, increased number of collisions on the network, etc.). If an error occurs in the following states, the red LED is superimposed by the green flashing LED: <ul style="list-style-type: none"> • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE  <p>Note:</p> <ul style="list-style-type: none"> • Several red blinking signals are displayed immediately after the device is switched on. This is not an error, however. • The LED lights up red for CNs with set physical node number 0 that have not yet been assigned a node number via dynamic node allocation (DNA).
	L/A IFx	Green	On	Link established to the remote station
			Blinking	A link to the remote station has been established and there is activity on bus.

1) The Status/Error LED "S/E" is a green/red dual LED.

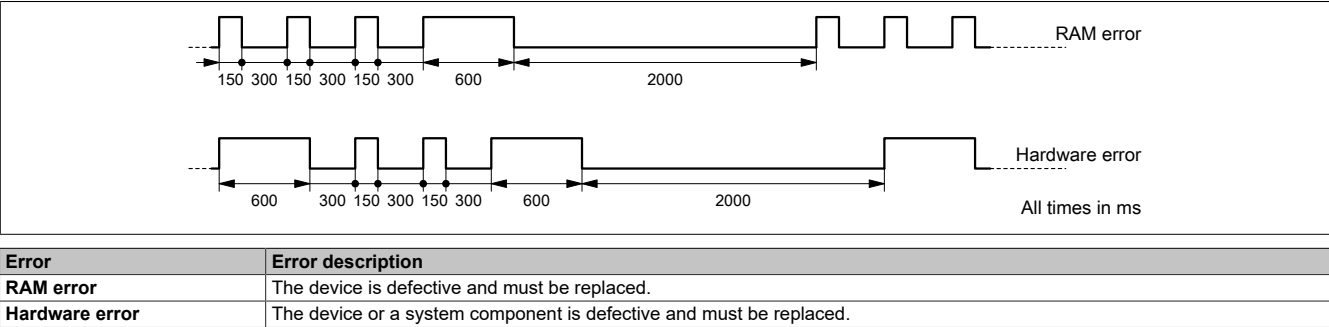
LED status indicators - Blink times



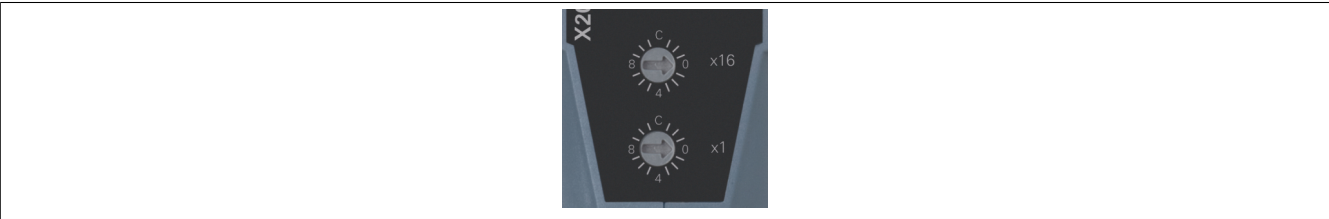
System stop error codes

A system stop error can occur due to incorrect configuration or defective hardware.

The error code is indicated by LED "S/E" blinking red. The blinking signal of the error code consists of 4 switch-on phases with short (150 ms) or long (600 ms) duration. The error code is repeated every 2 seconds.



2.2.2 POWERLINK node number

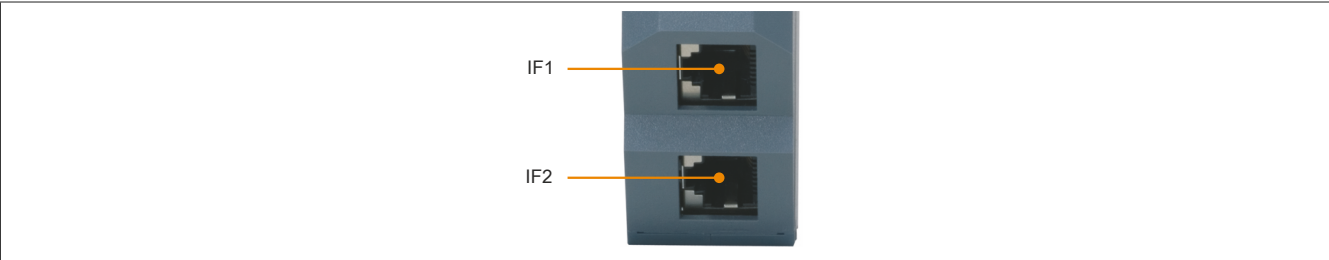


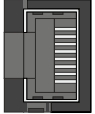
The node number for the POWERLINK node is set using the two number switches.

Switch position	Description
0x00	Reserved, switch position not permitted.
0x01 - 0xEF	Node number of the POWERLINK node. Operation as a controlled node (CN).
0xF0 - 0xFF	Reserved, switch position not permitted.

2.2.3 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 Function description

3.1 POWERLINK

POWERLINK is an Ethernet-based, real-time capable fieldbus. POWERLINK extends the IEEE 802.3 Ethernet standard by a deterministic access method and also defines a CANopen-compatible fieldbus interface. POWERLINK distinguishes between process and service data in the same way as CANopen. Process data (PDO) is exchanged cyclically in the cyclic phase, while service data (SDO) is transferred acyclically. Service data objects are transmitted in the acyclic phases of POWERLINK using a connection-oriented protocol. The cyclic transfer of data in PDOs is enabled by "mapping".

For additional information, see [POWERLINK bus controller user's manual](#) and www.br-automation.com/en/technologies/powerlink.

3.2 POWERLINK redundancy system

It is often indispensable to have redundant network cabling, especially in systems that handle technical processes. The potential for danger, especially to the lines that run through the system, is disproportionately high in relation to the need to keep communication active in all operating situations. This risk is effectively reduced with double cabling that is routed separately.

The POWERLINK cable redundancy system is based on the principle of doubling transfer paths and their constant and simultaneous monitoring. This means that data is fed into 2 cable lines simultaneously via a corresponding mechanism. The same mechanisms are used to receive these telegrams again from the redundant network. In contrast to ring redundancy, cable redundancy eliminates the sometimes problematic cable return routing. The design of arbitrary tree structures is therefore possible.

Information:

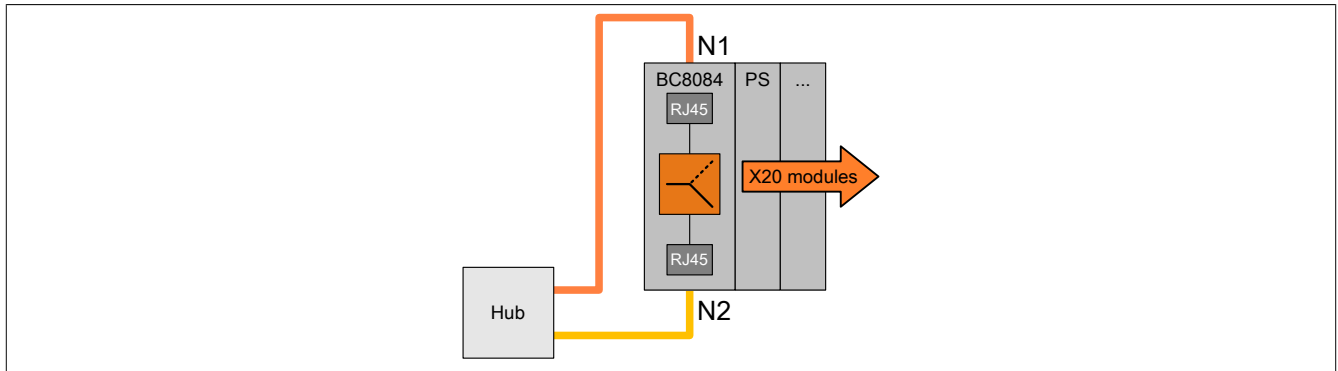
Details about the structure of a redundancy system can be found in the "Redundancy for control systems" user's manual. The user's manual is available in the Downloads section of the B&R website www.br-automation.com.

3.2.1 Link selector

POWERLINK can be used to implement systems with redundant cable routing. Data is always transferred via the best quality network line using the link selector function built into the device.

3.2.2 Redundancy Tx mode

Bus controller X20BC8084 was designed so that the redundant network lines can run from the bus controller to 1 hub:



The frames coming to the bus controller are selected accordingly via internal logic.

However, the bus controller itself only sends the frames on one of the two (active) redundant network lines. As a result, no collisions occur at the hub. This allows the bus controller to also be operated in a "real" cable redundant network (with X20HB8884 and X20IF2181-2). The following disadvantages or problems arise, however:

- The network is not as robust due to the lack of frame duplication.
- If the bus controller is operated in conjunction with an X20HB8884, the X20HB8884 reports a network failure since it only receives frames from one side of the redundant network.

As a workaround, it is possible to use Automation Studio to configure bus controller X20BC8084 with the following parameter so that it always transmits its response frames on both networks.

Redundancy Tx mode

- **Only transmit on one active network port:** Default mode. The bus controller sends the frames only on one of the two active networks.
- **Always transmit on both network ports:** The bus controller always transmits the frames to both networks.

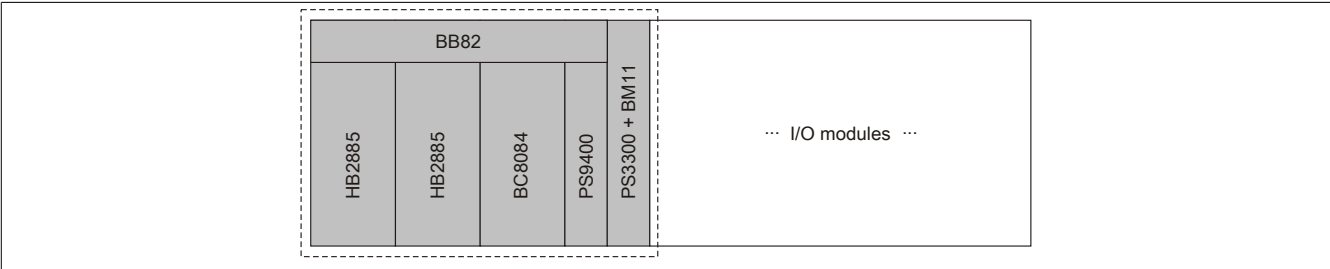
Information:

This parameter is only available in hardware upgrade 2.12.1.0 or later.

3.3 Redundant supply voltage

When operating the bus controller with two X20HB2885 hub modules, a redundant supply voltage for the system can be easily implemented using two X20 supply modules.

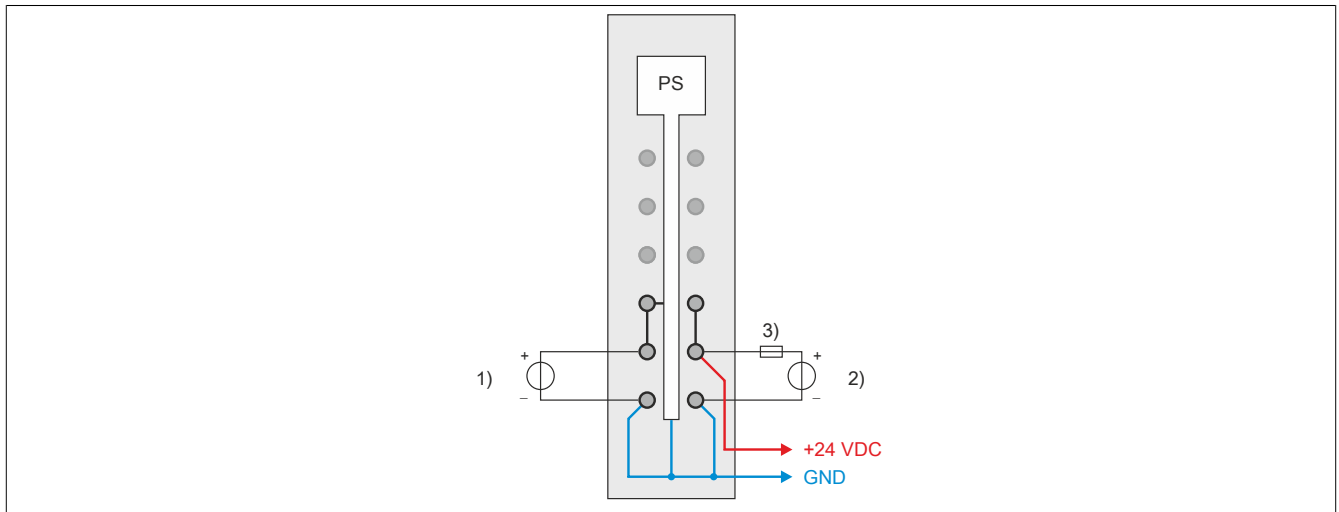
Hardware configuration for redundant supply voltage



Connection example for supply modules

X20PS9400

Power supply module X20PS9400 is connected as usual.



- 1) Supply for the bus controller or X2X Link power supply
- 2) Supply for the I/O power supply
- 3) Fuse, 10 A slow-blow

2)

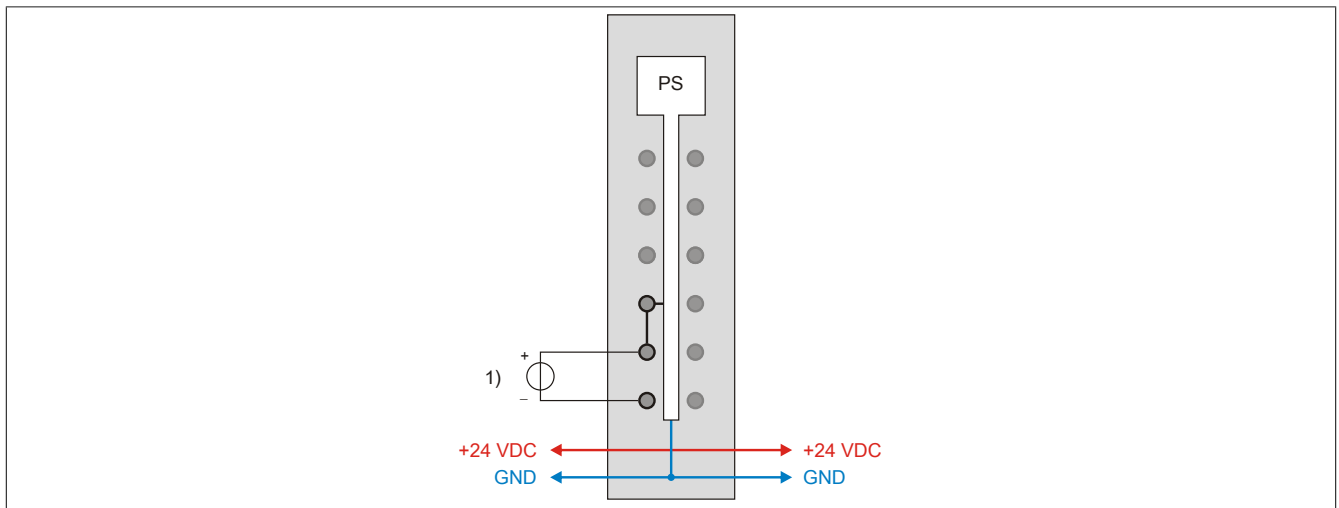
Supply for the I/O power supply

3)

Fuse, 10 A slow-blow

X20PS3300

Power supply module X20PS3300 is operated with bus module X20BM11. Only the bus controller / X2X Link power supply is connected. A redundant I/O power supply is not possible. By using bus module X20BM11, the I/O power supply of power supply module X20PS9400 is connected through to the I/O modules.



- 1) Supply for the bus controller or X2X Link power supply

1)

Supply for the bus controller or X2X Link power supply

4 Commissioning

4.1 SGx target systems

SG3

This module is not supported on SG3 target systems.

SG4

The module comes with preinstalled firmware. The firmware is also part of the Automation Runtime operating system for the PLC. With different versions, the Automation Runtime firmware is loaded onto the module.

Current firmware is made available automatically by updating Automation Runtime.

4.2 Using fiber optic cables

Notice!

Using the bus controller up to and including hardware revision G0 together with the X20HB1881 and X20HB2886 fiber optic cable connectors:

In rare cases, a firmware update or reconnection of the bus controller may make it so the connection to the connected X20HB modules can no longer be established.

This problem can be corrected by restarting (removing power to) the bus controller or reconnecting (hot plugging) the X20HB modules.

When using cable redundancy, the communication remains within the system if the redundant X20HB modules are reconnected individually and not at the same time!

Combining the bus controller with other X20HB modules does not cause any problems.