

X20EM061x and X20EM161x

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

1.2 Order data


 <p>The image shows two X20 Embedded PLC units. On the left is the X20EM061x and on the right is the X20EM161x. Both units are black, rack-mountable devices with a terminal block on top and various ports on the front. The X20EM161x has an additional slot for X20 interface modules.</p>	
X20EM061x	X20EM161x
Order number	Short description
Embedded PLC	
X20EM0611	X20 Embedded PLC, Atom 0.4 GHz (compatible), 512 MB DDR4 RAM, 64 kB FRAM, 1 GB onboard flash drive, 2 USB interfaces, 1 RS485 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T
X20EM1611	X20 Embedded PLC, Atom 0.4 GHz (compatible), 512 MB DDR4 RAM, 64 kB FRAM, 1 GB onboard flash drive, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS485 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T
X20EM0612	X20 Embedded PLC, Atom 0.8 GHz, 768 MB DDR4 RAM, 64 kB FRAM, 1 GB onboard flash drive, 2 USB interfaces, 1 RS485 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T
X20EM1612	X20 Embedded PLC, Atom 0.8 GHz, 768 MB DDR4 RAM, 64 kB FRAM, 1 GB onboard flash drive, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS485 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T
X20EM0613	X20 Embedded PLC, Atom 1.3 GHz, 1 GB DDR4 RAM, 64 kB FRAM, 2 GB onboard flash drive, 2 USB interfaces, 1 RS485 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T
X20EM1613	X20 Embedded PLC, Atom 1.3 GHz, 1 GB DDR4 RAM, 64 kB FRAM, 2 GB onboard flash drive, 1 insert slot for X20 interface modules, 2 USB interfaces, 1 RS485 interface, 1 POWERLINK interface, 1 Ethernet interface 10/100BASE-T
Included in delivery	
Accessory package for X20 Embedded PLC	
X20ACEMTB1	Accessories X20 Embedded PLCs: 2-pin terminal block for I/O power supply, 6-pin terminal block for RS485 interface and PLC power supply, X20 end cover plate, right (X20AC0SR1)
Optional accessories	
Technology Guard	
0TGF016.01	Technology Guard (MSD) with integrated flash drive, 16 GB (MLC)

Table 1: X20EMx61x - Order data

Included in delivery

Order number	Short description
-	Interface module slot cover ¹⁾
X20ACEMTB1	Accessory package for X20 Embedded PLCs: <ul style="list-style-type: none"> • 2-pin terminal block for I/O power supply • 6-pin terminal block for RS485 interface and controller power supply • X20 end cover plate, right (order number X20AC0SR1)

1) For controllers with a slot for X20 interface modules.

1.3 General information

This compact yet powerful controller series is based on Intel Atom processor technology. The fanless, battery-free design of these controllers means they are completely maintenance-free.

The basic configuration includes USB, Ethernet, POWERLINK V2, RS485 and a flash drive. A controller with a flexibly usable slot for X20 interface modules is available for each processor variant.

- Intel Atom processor with 400 MHz (compatible) to 1.3 GHz with integrated I/O processor
- Ethernet, POWERLINK V2 with poll-response chaining, onboard USB and RS485
- Scalable: 0 or 1 slot for modular interface expansion
- 512 MB to 1 GB LPDDR4 SDRAM
- 1 to 2 GB onboard flash drive
- Fanless
- No battery

2 Technical description

2.1 X20EM061x - Technical data

Order number	X20EM0611		X20EM0612		X20EM0613	
Short description						
Interfaces		1x RS485, 1x Ethernet (2-port switch), 1x POWERLINK (V2), 2x USB, 1x X2X Link				
System module		Controller				
General information						
B&R ID code		0x289B	0x289A	0x288F		
Cooling		Fanless				
Status indicators		CPU function, Ethernet, POWERLINK, RS485, I/O power supply				
Diagnostics						
CPU function		Yes, using LED status indicator				
Ethernet		Yes, using LED status indicator				
I/O power supply		Yes, using software and LED status indicator				
POWERLINK		Yes, using LED status indicator				
Temperature		Yes, using software register				
Support						
Controller redundancy		No				
Storage health data support ¹⁾		Yes				
ACOPOS support		Yes				
Visual Components support		Yes				
Power consumption		4.6 W ²⁾	4.7 W ²⁾			
Power consumption for X2X Link power supply ³⁾		0.6 W				
Power consumption ³⁾						
Internal I/O		0.56 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				
CPU and X2X Link power supply						
Input voltage		24 VDC -20% / +25% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 34 W)				
Input current		Max. 1.4 A at 24 VDC				
Fuse		Integrated, cannot be replaced				
Reverse polarity protection		Yes				
X2X Link power supply output						
Nominal output power		3.5 W				
Parallel connection		Yes ⁴⁾				
Redundant operation		Yes				
Input I/O power supply						
Input voltage		24 VDC -15% / +20% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 240 W)				
Fuse		Required line fuse: Max. 10 A, slow-blow				
Output I/O power supply						
Nominal output voltage		24 VDC				
Permissible contact load		10 A				
Controller						
Real-time clock		Retention for at least 300 hours, typ. 1000 hours at 25°C, 1 s resolution, <30 s/month accuracy at 25°C				
FPU		Yes				
Processor						
Type		Atom E3915				
Clock frequency		400 MHz (compatible).	800 MHz	1.3 GHz		
L1 cache						
Data code		24 kB				
Program code		32 kB				
L2 cache		1 MB				
Integrated I/O processor		Processes I/O data points in the background				
Modular interface slots		0				
Remanent variables		Max. 64 kB, retention >10 years ⁵⁾				
Shortest task class cycle time		400 µs	200 µs	100 µs		

Table 2: X20EM061x - Technical data

X20EM061x and X20EM161x

Order number	X20EM0611	X20EM0612	X20EM0613
Typical instruction cycle time	0.0044 μs	0.0028 μs	0.0015 μs
Standard memory			
RAM	512 MB LPDDR4 SDRAM	768 MB LPDDR4 SDRAM	1 GB LPDDR4 SDRAM
Application memory			
Type	1 GB eMMC flash memory		2 GB eMMC flash memory
Data retention	10 years		
Writable data amount			
Guaranteed	40 TB		
Results for 5 years	21.9 GB/day		
Guaranteed erase/write cycles	20,000		
Error-correcting code (ECC)	Yes		
Interfaces			
Interface IF2			
Signal	Ethernet		
Variant	2x shielded RJ45 (switch)		
Line length	Max. 100 m between 2 stations (segment length)		
Transfer rate	10/100 Mbit/s		
Transfer			
Physical layer	10BASE-T/100BASE-TX		
Half-duplex	Yes		
Full-duplex	Yes		
Autonegotiation	Yes		
Auto-MDI/MDIX	Yes		
Interface IF3			
Fieldbus	POWERLINK (V2) managing or controlled node		
Type	Type 4 ⁶⁾		
Variant	1x RJ45 shielded		
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	POWERLINK mode: No / Ethernet mode: Yes		
Autonegotiation	Yes		
Auto-MDI/MDIX	Yes		
Interface IF4			
Type	USB 1.1/2.0		
Variant	Type A		
Max. output current	0.5 A		
Interface IF5			
Type	USB 1.1/2.0		
Variant	Type A		
Max. output current	0.5 A		
Interface IF6			
Fieldbus	X2X Link master		
Interface IF7			
Signal	RS485		
Variant	Connection via 6-pin terminal block		
Max. distance	1000 m		
Transfer rate	Max. 115.2 kbit/s		
Terminating resistor	Integrated in PLC, not switchable		
Electrical properties			
Electrical isolation	Ethernet (IF2), POWERLINK (IF3), X2X (IF6) and RS485 (IF7) isolated from each other, from other interfaces and from PLC I/O to PLC isolated from all interfaces USB (IF4 and IF5) not isolated from PLC ⁷⁾		
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 0.6°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 70°C		
Transport	-40 to 70°C		

Table 2: X20EM061x - Technical data

Order number	X20EM0611	X20EM0612	X20EM0613
Relative humidity			
Operation	5 to 95%, non-condensing		
Storage	5 to 95%, non-condensing		
Transport	5 to 95%, non-condensing		
Mechanical properties			
Note	X20 end cover plate (right) included in delivery 2- and 6-pin terminal block included in delivery		
Dimensions			
Width	55 mm		
Height	124 mm		
Depth	92 mm		
Weight	475 g ⁸⁾		

Table 2: X20EM061x - Technical data

- 1) For details about *storage health data*, see Automation Help.
- 2) Without USB interface.
- 3) The specified values are maximum values. For examples of the exact calculation, see section "Mechanical and electrical configuration" in the X20 system user's manual.
- 4) In parallel operation, it is only permitted to expect 75% of the nominal power. It is important to make sure that all power supply units operated in parallel are switched on and off at the same time.
- 5) The memory size for remanent variables is configurable in Automation Studio.
- 6) For additional information, see section "Communication / POWERLINK / General information / Hardware - IF/LS" in Automation Help.
- 7) The PLC power supply and USB interfaces have the same GND contact.
- 8) The PLC was weighed with the two terminal blocks. The X20 end cover plate (right) was not included in the weighing.

2.2 X20EM161x - Technical data

Order number	X20EM1611	X20EM1612	X20EM1613
Short description			
Interfaces	1x RS485, 1x Ethernet (2-port switch), 1x POWERLINK (V2), 2x USB, 1x X2X Link		
System module	Controller		
General information			
B&R ID code	0x289E	0x289D	0x289C
Cooling	Fanless		
Status indicators	CPU function, Ethernet, POWERLINK, RS485, I/O power supply		
Diagnostics			
CPU function	Yes, using LED status indicator		
Ethernet	Yes, using LED status indicator		
I/O power supply	Yes, using software and LED status indicator		
POWERLINK	Yes, using LED status indicator		
Temperature	Yes, using software register		
Support			
Controller redundancy	No		
Storage health data support ¹⁾	Yes		
ACOPOS support	Yes		
Visual Components support	Yes		
Power consumption	5.3 W ²⁾	5.4 W ²⁾	5.5 W ²⁾
Power consumption for X2X Link power supply ³⁾	0.6 W		
Power consumption ³⁾			
Internal I/O	0.56 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		
CPU and X2X Link power supply			
Input voltage	24 VDC -20% / +25% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 34 W)		
Input current	Max. 1.4 A at 24 VDC		
Fuse	Integrated, cannot be replaced		
Reverse polarity protection	Yes		
X2X Link power supply output			
Nominal output power	3.5 W		
Parallel connection	Yes ⁴⁾		

Table 3: X20EM161x - Technical data

X20EM061x and X20EM161x

Order number	X20EM1611		X20EM1612	X20EM1613
Redundant operation	Yes			
Input I/O power supply				
Input voltage	24 VDC -15% / +20% (nominal voltage: 24 VDC) (max. input power at nominal voltage: 240 W)			
Fuse	Required line fuse: Max. 10 A, slow-blow			
Output I/O power supply				
Nominal output voltage	24 VDC			
Permissible contact load	10 A			
Controller				
Real-time clock	Retention for at least 300 hours, typ. 1000 hours at 25°C, 1 s resolution, <30 s/month accuracy at 25°C			
FPU	Yes			
Processor				
Type	Atom E3915			
Clock frequency	400 MHz (compatible).	800 MHz	1.3 GHz	
L1 cache				
Data code	24 kB			
Program code	32 kB			
L2 cache	1 MB			
Integrated I/O processor	Processes I/O data points in the background			
Modular interface slots	1			
Remanent variables	Max. 64 kB, retention >10 years ⁵⁾			
Shortest task class cycle time	400 µs	200 µs	100 µs	
Typical instruction cycle time	0.0044 µs	0.0028 µs	0.0015 µs	
Standard memory				
RAM	512 MB LPDDR4 SDRAM	768 MB LPDDR4 SDRAM	1 GB LPDDR4 SDRAM	
Application memory				
Type	1 GB eMMC flash memory		2 GB eMMC flash memory	
Data retention	10 years			
Writable data amount				
Guaranteed	40 TB			
Results for 5 years	21.9 GB/day			
Guaranteed erase/write cycles	20,000			
Error-correcting code (ECC)	Yes			
Interfaces				
Interface IF2				
Signal	Ethernet			
Variant	2x shielded RJ45 (switch)			
Line length	Max. 100 m between 2 stations (segment length)			
Transfer rate	10/100 Mbit/s			
Transfer				
Physical layer	10BASE-T/100BASE-TX			
Half-duplex	Yes			
Full-duplex	Yes			
Autonegotiation	Yes			
Auto-MDI/MDIX	Yes			
Interface IF3				
Fieldbus	POWERLINK (V2) managing or controlled node			
Type	Type 4 ⁶⁾			
Variant	1x RJ45 shielded			
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	POWERLINK mode: No / Ethernet mode: Yes			
Autonegotiation	Yes			
Auto-MDI/MDIX	Yes			
Interface IF4				
Type	USB 1.1/2.0			
Variant	Type A			
Max. output current	0.5 A			
Interface IF5				
Type	USB 1.1/2.0			
Variant	Type A			
Max. output current	0.5 A			
Interface IF6				
Fieldbus	X2X Link master			

Table 3: X20EM161x - Technical data

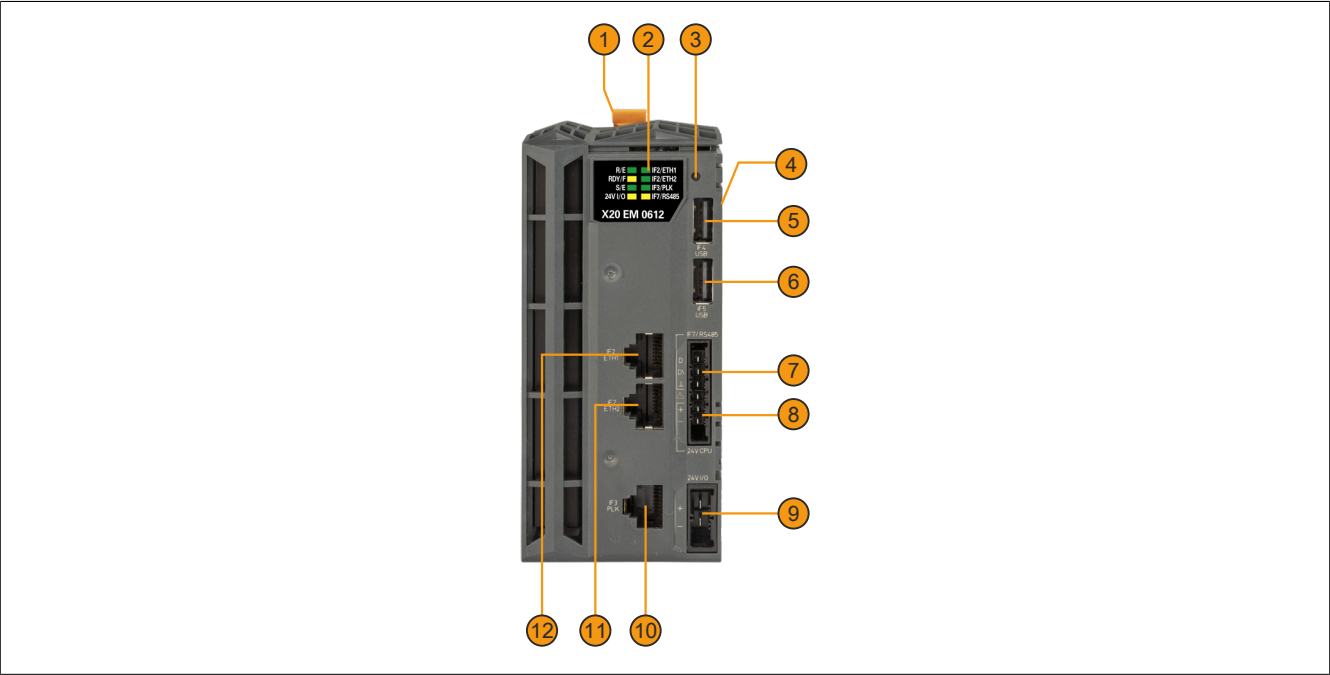
Order number	X20EM1611	X20EM1612	X20EM1613
Interface IF7			
Signal		RS485	
Variant		Connection via 6-pin terminal block	
Max. distance		1000 m	
Transfer rate		Max. 115.2 kbit/s	
Terminating resistor		Integrated in PLC, not switchable	
Electrical properties			
Electrical isolation	Ethernet (IF2), POWERLINK (IF3), X2X (IF6) and RS485 (IF7) isolated from each other, from other interfaces and from PLC I/O to PLC isolated from all interfaces USB (IF4 and IF5) and slot for X20 interface modules not isolated from PLC ⁷⁾		
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 0.6°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 70°C	
Transport		-40 to 70°C	
Relative humidity			
Operation		5 to 95%, non-condensing	
Storage		5 to 95%, non-condensing	
Transport		5 to 95%, non-condensing	
Mechanical properties			
Note	X20 end cover plate (right) included in delivery 2- and 6-pin terminal block included in delivery Interface module slot cover included in delivery		
Dimensions			
Width		82.5 mm	
Height		124 mm	
Depth		92 mm	
Weight		530 g ⁸⁾	

Table 3: X20EM161x - Technical data

- 1) For details about *storage health data*, see Automation Help.
- 2) Without interface module and without USB interface.
- 3) The specified values are maximum values. For examples of the exact calculation, see section "Mechanical and electrical configuration" in the X20 system user's manual.
- 4) In parallel operation, it is only permitted to expect 75% of the nominal power. It is important to make sure that all power supply units operated in parallel are switched on and off at the same time.
- 5) The memory size for remanent variables is configurable in Automation Studio.
- 6) For additional information, see section "Communication / POWERLINK / General information / Hardware - IF/LS" in Automation Help.
- 7) The PLC power supply and USB interfaces have the same GND contact.
- 8) The PLC was weighed with the two terminal blocks. The interface module slot cover and X20 end cover plate (right) were not included in the weighing.

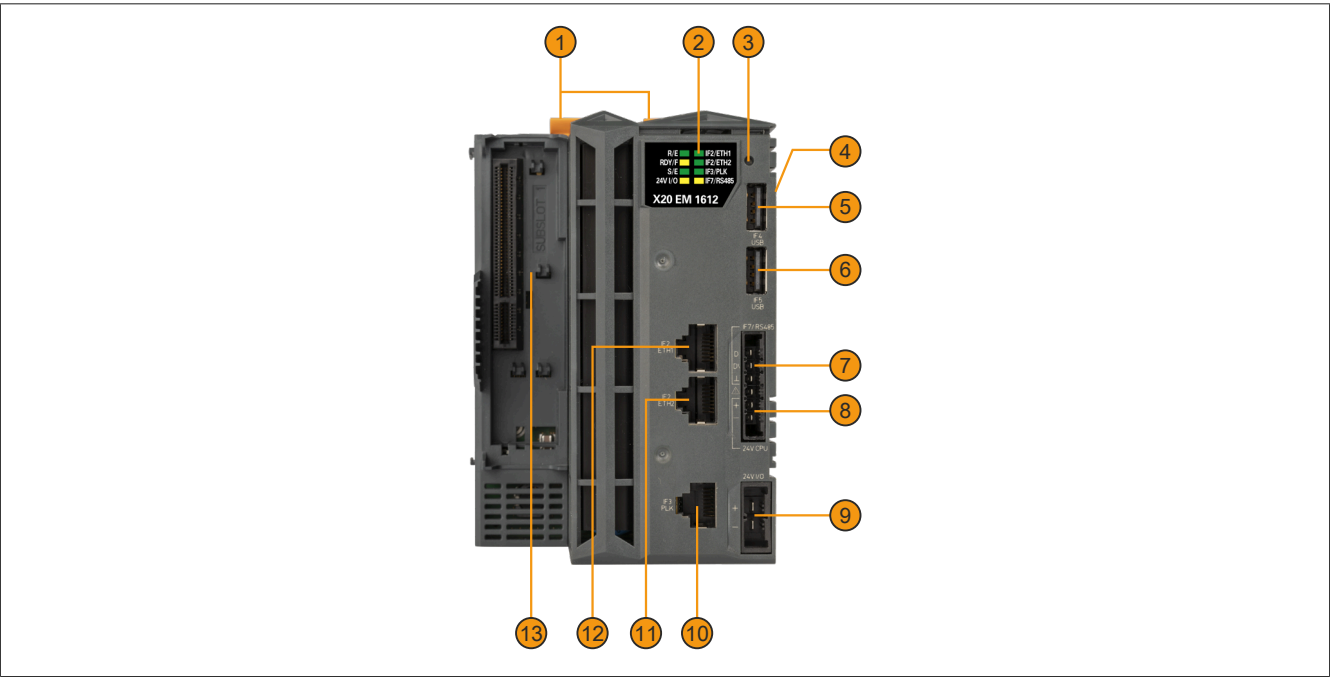
2.3 Operating and connection elements

X20EM061x



1	Top-hat rail latch	2	LED status indicators
3	Button for reset and operating mode	4	IF6 - X2X Link
5	IF4 - USB	6	IF5 - USB
7	IF7 - RS485	8	Controller and X2X Link power supply
9	I/O power supply	10	IF3 - POWERLINK
11	IF2/ETH2 - Ethernet	12	IF2/ETH1 - Ethernet

X20EM161x



1	Top-hat rail latch	2	LED status indicators
3	Button for reset and operating mode	4	IF6 - X2X Link
5	IF4 - USB	6	IF5 - USB
7	IF7 - RS485	8	Controller and X2X Link power supply
9	I/O power supply	10	IF3 - POWERLINK
11	IF2/ETH2 - Ethernet	12	IF2/ETH1 - Ethernet
13	Slot for interface modules	-	-

2.3.1 LED status indicators

Figure	LED	Color	Status	Description
	R/E	Green/Red	Off	Controller not supplied
		Green	On	Application running
			Blinking	System startup: The controller is initializing the application, all bus systems and I/O modules. ¹⁾
			Double flash	System startup during firmware update ¹⁾
		Red	On	The controller is in mode SERVICE ²⁾ or BOOT ²⁾ , or one of the following errors is present: <ul style="list-style-type: none"> Controller and X2X Link supply voltage too low The controller has switched off due to one of the following reasons: <ul style="list-style-type: none"> Overtemperature Overload on the X2X bus power supply There is an internal defect.
			Blinking	If LED "R/E" blinks red and LED "RDY/F" blinks yellow, a license violation has occurred.
		Yellow	On	Mode SERVICE ²⁾ or BOOT ²⁾
			Blinking	If LED "RDY/F" blinks yellow and LED "R/E" blinks red, a license violation has occurred.
	S/E	Green/Red		Status/Error LED. LED states are described in section "LED "S/E" (status/error LED)" on page 9.
	24 V / IO	Yellow	On	I/O power supply voltage within the valid range
		Red	Double flash	I/O supply voltage too low
	IF2 / ETH1, IF2 / ETH2	Green	On	The link to the Ethernet remote station is established.
			Blinking	The link to the Ethernet remote station is established. The LED blinks if Ethernet activity is taking place on the bus.
	IF3 / PLK	Green	On	The link to the POWERLINK remote station is established.
			Blinking	The link to the POWERLINK remote station is established. The LED blinks if Ethernet activity is taking place on the bus.
	IF7 / RS485	Yellow	On/Blinking	The module is transmitting/receiving data via the RS485 interface.

1) This process can take several minutes depending on the configuration.

2) The operating states are described in "Real-time operating system - Method of operation - Operating states" in Automation Help.

3) AR 4.93 and later: The project installation (initial installation or update) via USB flash drive was aborted with an error.

2.3.1.1 LED "S/E" (status/error LED)

This LED is a green/red dual LED and indicates the state of the POWERLINK interface. The LED states have a different meaning depending on the operating mode of the POWERLINK interface.

2.3.1.1.1 Ethernet mode

In this mode, the interface is operated as an Ethernet interface.

LED "S/E"		Description
Green	Red	
On	Off	The interface is operated as an Ethernet interface.

Table: LED "S/E": Interface in Ethernet mode

2.3.1.1.2 POWERLINK V2 mode

Error message

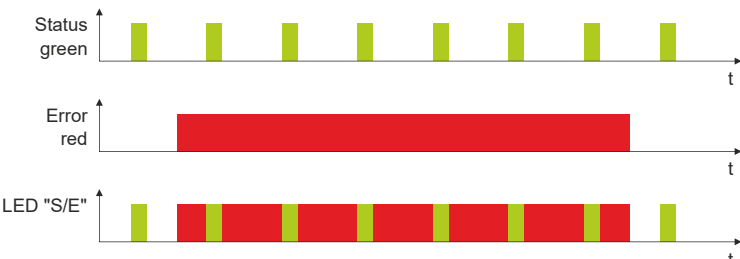
LED "S/E"		Description
Green	Red	
Off	On	The interface is in error mode (failed Ethernet frames, increased number of collisions on the network, etc.). Note: Several red blinking signals are displayed immediately after the device is switched on. These are not errors, however.
Blinking	On	<p>If an error occurs in the following modes, then the green LED blinks over the red LED:</p> <ul style="list-style-type: none"> PRE_OPERATIONAL_1 PRE_OPERATIONAL_2 READY_TO_OPERATE 

Table: LED "S/E" - Error message (interface in POWERLINK mode)

Interface status

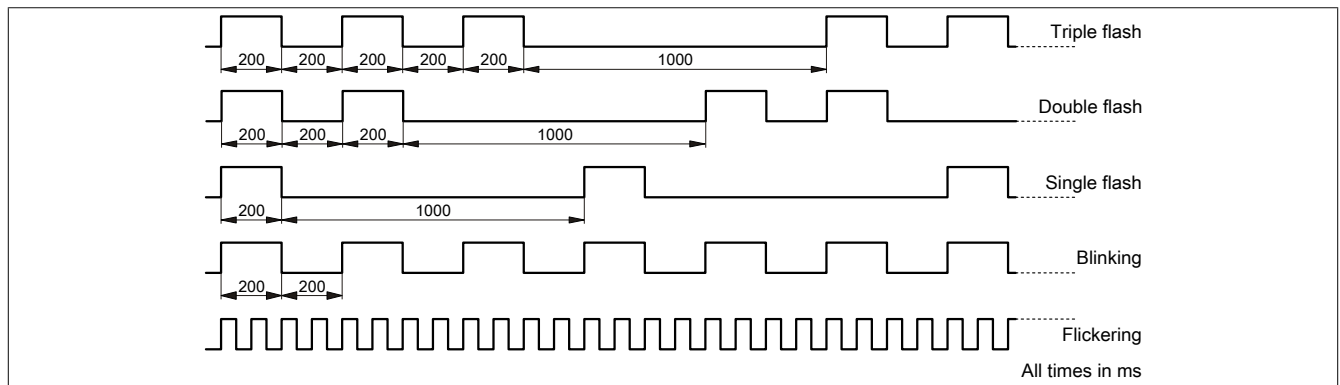
LED "S/E"		Description
Green	Red	
Off	Off	<p>Mode: NOT_ACTIVE The interface is either in mode NOT_ACTIVE or one of the following modes or errors is present:</p> <ul style="list-style-type: none"> The device is switched off. The device is in the startup phase. The interface or device is not configured correctly in Automation Studio. The interface or device is defective. <p>Managing node (MN) The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1. If POWERLINK communication is detected before the time has elapsed, however, the MN is not started.</p> <p>Controlled node (CN) The network is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode BASIC_ETHERNET. If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1.</p>
Flickering (approx. 10 Hz)	Off	<p>Mode: BASIC_ETHERNET The interface is in mode BASIC_ETHERNET. The interface is operated in Ethernet mode.</p> <p>Managing node (MN) This mode can only be exited by resetting the controller.</p> <p>Controlled node (CN) If POWERLINK communication is detected during this mode, the interface enters mode PRE_OPERATIONAL_1.</p>
Single flash (approx. 1 Hz)	Off	<p>Mode: PRE_OPERATIONAL_1 The interface is in mode PRE_OPERATIONAL_1.</p> <p>Managing node (MN) The MN is in "reduced cycle" mode. The CNs are configured in this mode. Cyclic communication is not yet taking place.</p> <p>Controlled node (CN) The CN can be configured by the MN in this mode. The CN waits until it receives an SoC frame and then switches to mode PRE_OPERATIONAL_2.</p>
	On	<p>Controlled node (CN) If the red LED lights up in this mode, this means that the MN has failed.</p>
Double flash (approx. 1 Hz)	Off	<p>Mode: PRE_OPERATIONAL_2 The interface is in mode PRE_OPERATIONAL_2.</p> <p>Managing node (MN) The MN starts cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this mode.</p> <p>Controlled node (CN) The CN can be configured by the MN in this mode. A command then switches the mode to READY_TO_OPERATE.</p>
	On	<p>Controlled node (CN) If the red LED lights up in this mode, this means that the MN has failed.</p>

Table: LED "S/E" - Interface state (interface in POWERLINK mode)

LED "S/E"		Description
Green	Red	
Triple flash (approx. 1 Hz)	Off	Mode: READY_TO_OPERATE The interface is in mode READY_TO_OPERATE. Managing node (MN) Cyclic and asynchronous communication. Received PDO data is ignored. Controlled node (CN) The configuration of the CN is completed. Normal cyclic and asynchronous communication. The transmitted PDO data corresponds to the PDO mapping. However, cyclic data is not yet evaluated.
	On	Controlled node (CN) If the red LED lights up in this mode, this means that the MN has failed.
On	Off	Mode: OPERATIONAL The interface is in mode OPERATIONAL. PDO mapping is active and cyclic data is evaluated.
Blinking (approx. 2.5 Hz)	Off	Mode: STOPPED The interface is in mode STOPPED. Managing node (MN) This mode does not occur for the MN. Controlled node (CN) Output data is not being output, and no input data is being provided. This mode can only be reached and exited by a corresponding command from the MN.

Table: LED "S/E" - Interface state (interface in POWERLINK mode)

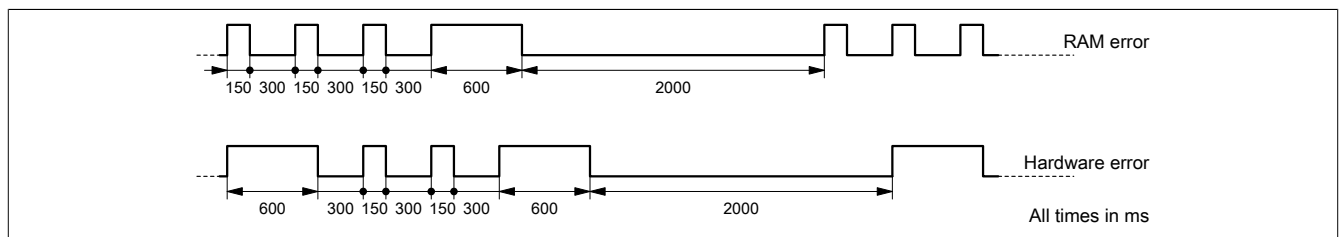
Blink times



2.3.1.2 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.



Error	Error description
RAM error	The device is defective and must be replaced.
Hardware error	The device or a system component is defective and must be replaced.

2.3.2 Button for reset and operating mode

The button can be pressed with a suitable object (e.g. paper clip or ballpoint pen).

2.3.2.1 Reset

The button must be pressed for less than 2 seconds to trigger a reset. This triggers a hardware reset on the controller, which means that:

- All application programs are stopped.
- All outputs are set to zero.

The controller then boots into service mode by default. The startup mode after pressing the reset button can be set in Automation Studio:

- Service mode (default)
- Warm restart
- Cold restart
- Diagnostic mode

2.3.2.2 Operating mode

3 operating modes can be set using different button sequences:

Operating mode	Button sequence	Description
BOOT ¹⁾	Boot mode is enabled by the following button sequence: <ul style="list-style-type: none"> • Press the button for less than 2 s. • Then press the button within 2 s for longer than 2 s. 	Boot AR is started, and the runtime system can be installed via the online interface (Automation Studio). User flash memory is erased only when the download begins.
SERVICE/RUN ¹⁾	Press the button for less than 2 s.	Mode SERVICE/RUN: Triggering and startup behavior correspond to triggering a hardware reset (see "Reset" on page 12).
DIAGNOSE ¹⁾	Press the button for more than 2 s.	The controller is starting up in diagnostic mode. Program sections in User RAM and User FlashPROM are not initialized. After diagnostic mode, the controller always boots with a warm restart.

1) The operating states are described in "Real-time operating system - Method of operation - Operating states" in Automation Help.

2.3.3 Flash drive

This application memory is implemented as an integrated flash drive.

2.3.4 Project installation

Project installation is described in "Project management - Project installation" in Automation Help.

2.3.5 Ethernet interface (IF2)

General information

IF2 is a 10BASE-T/100BASE-TX Ethernet interface.

The INA2000 station number is set using the B&R Automation Studio software.

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.

Information:

The Ethernet interface is not suitable for POWERLINK.

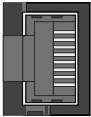
When using the POWERLINK interface, the Ethernet interface is not permitted to be operated with an IP address from the POWERLINK address range.

POWERLINK address range: 192.168.100.x

The interface is equipped with 2 female RJ45 connections. Both connections result in an integrated switch. This makes daisy-chain wiring easy.

The controller supports half-duplex and full-duplex communication. Mixed operation is not possible. Both connections must be operated in either half-duplex or full-duplex communication mode.

Pinout

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	

2.3.6 POWERLINK interface (IF3)

The controller are equipped with a POWERLINK V2 interface.

POWERLINK

By default, the POWERLINK interface is operated as a managing node (MN). In the managing node, the node number is set to a fixed value of 240.

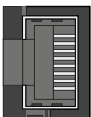
If the POWERLINK node is operated as a controlled node (CN), a node number from 1 to 239 can be set in the POWERLINK configuration in Automation Studio.

Ethernet mode

In this mode, the interface is operated as an Ethernet interface. The INA2000 station number is set using the Automation Studio software.

Pinout

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	Receive data
	2	RXD\	Receive data\
	3	TXD	Transmit data
	4	Termination	
	5	Termination	
	6	TXD\	Transmit data\
	7	Termination	
	8	Termination	

2.3.7 USB interfaces (IF4 and IF5)

IF4 and IF5 are non-galvanically isolated USB interfaces. The abbreviation USB stands for "Universal Serial Bus". Both USB interfaces support the USB 1.1 and 2.0 standards.

Information:

USB peripheral devices can be connected to the USB interfaces. Automation Runtime supports a selection of USB peripheral devices. For the supported USB classes, see the AR help documentation.

Information:


The following must be taken into account when using a USB peripheral device and grounded controller power supply (PELV):

- Only USB peripheral devices with no connection between GND and ground are permitted to be connected. This is the case, e.g. with the USB dongle from B&R.

2.3.8 RS485 interface (IF7)

Complex devices can be connected to the X20 system with this serial, galvanically isolated RS485 interface. The terminals of the signals are connected to the 6-pin terminal block.

A terminating resistor is integrated in the controller and not switchable.

Interface		Pinout	
 6-pin male multipoint connector	Terminal	RS485	
	1	D	Data
	2	D\	Data\
	3	⊥	GND
	4	NC	Not permitted to be used!

2.3.9 Slot for interface modules

A variant with a flexibly usable slot for X20 interface modules is available for each performance class.

Different bus or network systems can be flexibly integrated into the X20 system by selecting the appropriate interface module.

2.3.10 Data and real-time clock retention

The controllers do not use a battery. This makes them completely maintenance-free. Eliminating the backup battery was made possible by the following measures:

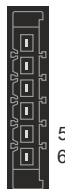
Data and real-time clock retention	Backup type	Note
Remanent variables	FRAM	This FRAM stores its contents ferroelectrically. Unlike normal SRAM, this does not require a battery.
Real-time clock	Gold foil capacitor	The real-time clock is backed up for approx. 1000 hours by a gold foil capacitor. The gold foil capacitor is completely charged after 3 continuous hours of operation.

2.4 Controller power supply

A power supply unit is already integrated in the controller. It is equipped with a supply for the controller, X2X Link and the internal I/O power supply. The bus power supply and internal I/O power supply are galvanically isolated from each other.


Controller and X2X Link power supply - Pinout

The terminals of the controller and X2X Link power supply are connected to the 6-pin terminal block.

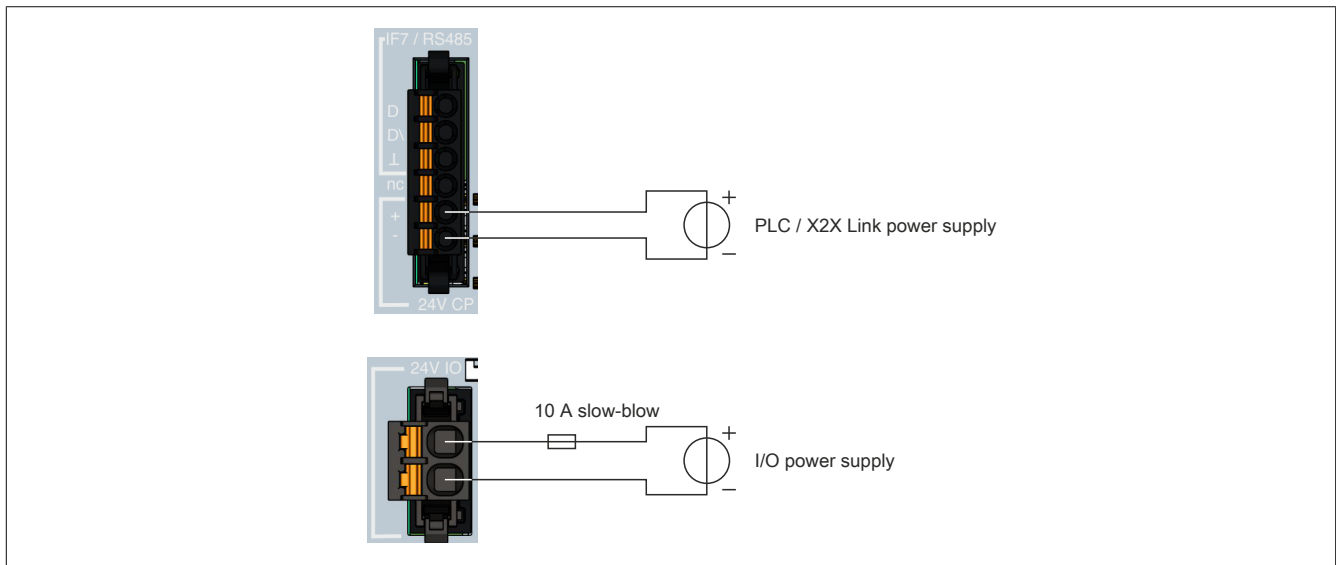
Controller and X2X Link power supply		Pinout	
 6-pin male multipoint connector	Terminal	Description	
	5	+	+24 VDC
	6	-	GND

I/O power supply - Pinout

The terminals of the I/O power supply are connected to the 2-pin terminal block.

I/O power supply		Pinout	
 2-pin male multipoint connector	Terminal	Description	
	1	+	+24 VDC
	2	-	GND

Connection example



2.5 Overtemperature shutdown

To prevent damage, a shutdown – reset state – of the controller takes place at 110°C processor temperature or 90°C board temperature.

The following errors are entered in the logbook in the event of shutdown:

Error number	Short error text
9204	PLC restart triggered by the PLC CPU's temperature monitoring.
9210	Warning: Halt/Service after watchdog or manual reset.

2.6 System requirements

The following minimum versions are recommended to generally be able to use all functions:

- Automation Studio 4.11
- Automation Runtime 4.92

2.7 Notes for operating certain modules with the embedded PLC

The minimum hardware upgrade versions listed in the table are required to operate the following modules with embedded PLCs. The upgrade can be installed from Automation Studio by selecting **Tools / Upgrades** from the menu.

Order number	Minimum hardware upgrade version
X20IF1041-1	1.3.1.0
X20IF1043-1	1.4.1.0
X20IF1051-1	1.2.4.0
X20IF1053-1	1.3.1.0
X20IF1061-1	1.8.0.0
X20IF1063-1	1.3.1.0
X20IF10A1-1	1.2.1.0
X20IF10D1-1	1.6.1.0
X20IF10D3-1	1.5.1.0
X20IF10E1-1	1.3.1.0
X20IF10E3-1	1.8.0.0
X20IF10G3-1	1.7.1.0
X20SLXyyy	1.10.10.4

3 General data points

This controller is equipped with general data points. These are not controller-specific; instead, they contain general information such as system time and heat sink temperature.

General data points are described in section "Additional information - General controller data points" in the X20 system user's manual.

4 UL Information

English

CAUTION!

- The external circuits intended to be connected to this device shall be separated from MAINS supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV (Class III) circuit of UL/CSA 61010-1, UL/CSA 61010-2-201.
- The module has to be built-in the final safety enclosure, which have adequate rigidity and meets the requirements with respect to spread of fire.
- Minimum temperature rating of the cables to be connected to the field wiring terminals: 80°C, AWG (Sol. / Str.) 28-16 / 28-16 (X2X / CPU) and AWG (Sol. / Str.) 26-12 / 26-12 (I/O). Use Copper Conductors Only.

Information:

- If the equipment is used in a not specified manner, the protection provided by the equipment may be impaired.
- For all Ethernet connections, only connections within a building are permitted, taking into account maximum lengths.

French

Attention!

- Les circuits externes destinés à être connectés à cet appareil doivent être séparés de l'alimentation SECTEUR ou des tensions dangereuses par une isolation renforcée ou double et satisfaire les exigences relatives aux circuits TBTS/TBTS (Classe III) spécifiées dans UL/CSA 61010-1, UL/CSA 61010-2-201.
- Le module doit être incorporé dans le boîtier de sécurité final. Ce dernier présente une rigidité adéquate et satisfait les exigences en matière de propagation du feu.
- Température minimale nominale des câbles à connecter aux bornes de câblage sur place : 80°C, AWG (Sol. / Str.) 28-16 / 28-16 (X2X / CPU) et AWG (Sol. / Str.) 26-12 / 26-12 (I/O). Utiliser des conducteurs en cuivre uniquement.

Information:

- Si l'équipement est utilisé d'une manière non spécifiée, la protection fournie par l'équipement peut être compromise.
- Pour toutes les connexions Ethernet, seules les connexions à l'intérieur d'un bâtiment sont autorisées, en tenant compte des longueurs maximales.