



CX1000 Embedded PC Hardware documentation

CX1000-0xxx
CX1000-Nxxx

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1. Foreword

Notes on the Manual

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards. It is essential that the following notes and explanations are followed when installing and commissioning these components.

Liability Conditions

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

The documentation has been prepared with care. The products described are, however, constantly under development. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics. None of the statements of this manual represents a guarantee (Garantie) in the meaning of § 443 BGB of the German Civil Code or a statement about the contractually expected fitness for a particular purpose in the meaning of § 434 par. 1 sentence 1 BGB. In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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Associated publication

For commissioning the use of the appropriate hardware documentation is recommended apart from this documentation.

Safety Instructions

Safety Rules

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

State at Delivery

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH.

Personnel Qualification

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.

Description of safety symbols

The following safety symbols are used in this operating manual. They are intended to alert the reader to the associated safety instructions.

Danger



This symbol is intended to highlight risks for the life or health of personnel.

Warning



This symbol is intended to highlight risks for equipment, materials or the environment.

Note



This symbol indicates information that contributes to better understanding.

Documentation Issue Status

Version	Changes
1.1	comments on hardware watchdog added
1.0	updated version
0.1	preliminarily version

2. Product Overview

Appropriate Use

The CX1000 device series is a modular control system that can be mounted on top hat rails. Its components are plugged together and installed in the control cabinet or junction box, depending on the required function.

System Overview

The System

The CX1000 system covers the whole range of Beckhoff control technology both in terms of price and performance: The new product range is designed for tasks requiring the characteristics and computing capacity of Industrial PCs, but whose budget does not stretch to full-blown Industrial PCs.

The system only uses those components that are actually required. For example, a CX1000 can be operated in „headless“ mode, i.e. without display or keyboard; in this case, the associated interface is not required. Whilst the resulting control system has no visualisation, it does have communications capability via the built-in Ethernet and RS 232 interfaces.

If local visualisation is required, this can be implemented via a DVI (digital video interface), to which all Beckhoff Control Panels and all commercially available monitors with DVI-input can be connected. The touch screen signal is read via one of the two available USB interfaces.



The components

The modules of the CX1000 series system are connected with each other via the standardised PC104 bus (16 bit). The individual system components are modules that can be arranged in series. The basic unit consists of a CPU module (CX1000-0000) and a power supply module (CX1100-000x). Further system interfaces for serial communication (2x RS 232, and RS422, RS485) as well as audio signals are available separately.

CPU base module

The CPU module is available in several variants. These relate to:

- Internal memory configuration: there are two options – either 16 MB Flash/32 MB RAM or 64 MB Flash / 128 MB RAM. The latter is required if the system is to be equipped with Windows XP Embedded.
- System interface configuration: as an option, a DVI and two USB Interfaces can be added to the combination of Ethernet and RS 232 that is always present.
- Operating system: There is a choice between Microsoft Windows CE.NET and Microsoft Windows XP Embedded.
- Pre-installed TwinCAT software: CX1000 can be preinstalled without a TwinCAT system, with TwinCAT CE PLC or with TwinCAT CE NC PTP, or with the associated full version of the individual TwinCAT levels for PLC and Motion Control.

System interfaces

Further system interfaces for serial communication (2x RS 232, and RS422, RS485) as well as audio signals are available separately.

Fieldbus interfaces

The range of optional modules for the CX1000 is complemented by fieldbus connections for Profibus, CANopen, DeviceNet, SERCOS interface and Lightbus, both as master and slave versions.

The following fieldbus interfaces are available:

Beckhoff Lightbus (master and slave), Profibus DP (master and slave), CANopen (master and slave), DeviceNet (master and slave) und SERCOS Interface (only master).

The use of fieldbus master modules in a CX1000 system enables the utilisation of all Beckhoff fieldbus components (e. g. Bus Coupler, Bus Terminal Controller, drive technology) as distributed control components for the assembly of complex systems

The use of fieldbus slave modules enables the utilisation of a CX1000 system as subordinate distributed control for the configuration of complex or modular systems.

The Software

In combination with the TwinCAT automation software, the CX1000 Industrial PC becomes a powerful IEC 61131-3 PLC with up to four user tasks. Additionally, MotionControl tasks can also be executed. Depending on the required cycle time, several servo axes can be controlled. Even special functions such as flying saw, electronic gearbox and cam plate can be realised.

The CX1000 system can be programmed in two ways, depending on the operating system used:

Remote programming via Ethernet

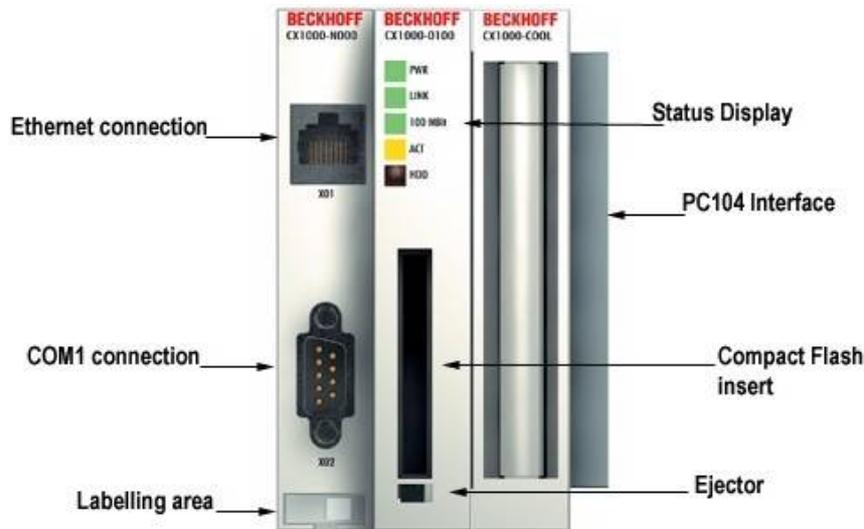
This option is used if the basic unit is equipped with Windows CE.NET. In this case, the system is programmed via a laptop or a desktop PC, which is connected to the CX1000 via Ethernet (network or crossover cable). The programs are developed on the laptop with a standard TwinCAT software licence and then loaded into the target device.

Visualisation

The Beckhoff OPC server is available for interfacing with SCADA software on both operating system variants Windows CE.NET or Windows XP Embedded. In other words, the CX1000 also offers unproblematic visualisation and simultaneous control in realtime on a single system. Beckhoff control devices

Base Modules

Technical Data



The CX1000 CPU module is the basic module of the CX system. It comprises the CPU and the internal flash memory in two implementation levels and offers the option to operate an additional memory medium in Compact Flash type II format. Ethernet and an RS 232 interface are also part of the basic configuration. All other CX family components can be connected via the PC104 interface that is available on both sides. The CPU module requires a CX1100 type power supply module.

Technical data	CX1000-0000
Processor	compatible with Pentium MMX, clock frequency 266 MHz
Flash memory	64 MByte Compact Flash card
Internal main memory	32 MByte RAM (expandable to 128 MByte)
Interfaces	1 x RJ45 (Ethernet) and 1 x 9-pinD-Sub (RS 232)
Diagnostics LED	1 x Power, 1 x Link, 1x 100 MBit , 1 x LAN Aktivität, 1 x Flash access
Expansion slot	1 x Compact Flash type II insert with ejector
Clock	battery-powered internal clock for time and date
Operating system	Microsoft Windows CE.NET or Microsoft Windows XP Embedded
Control software	TwinCAT PLC Runtime or TwinCAT NC PTP Runtime
System bus	16 Bit ISA (PC104 standard)
Power supply	via system bus (through CX1100 power supply module)
Dimensions	57 mm x 100 mm x 91 mm
Weight approx.	355 g (with DVI/USB 435 g)

The passive cooling module CX1000-COOL is included in the scope of supply.

Note



The Watchdog function is only supported by Beckhoff in combination of TwinCAT with WINDOWS NT based systems. For other operating systems without TwinCAT it is not possible to give a general solution. The user must find a solution to the implementation of watchdog access on his own. As the only support Beckhoff can provide

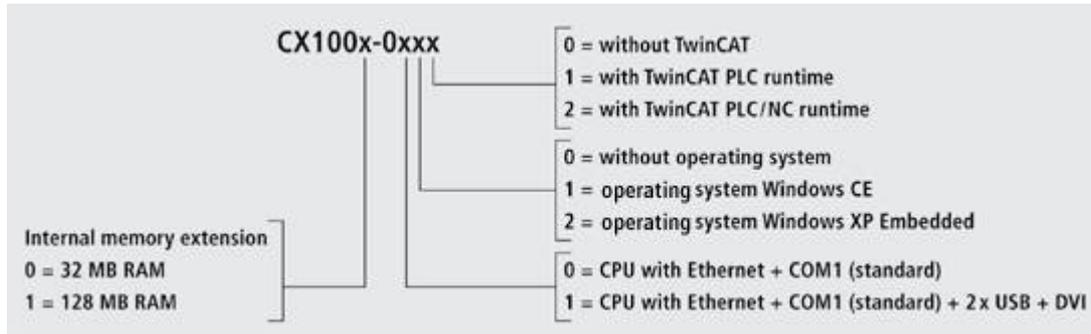
- the processor hardware description
- the CX-architecture description (CX1100-000x power supply manual)

The documents can be found in the Download area of our webserver (www.beckhoff.com).

Types

The CPU module can be equipped with different hardware and software options: the internal memory is expandable to 32 MB Flash/128 MB RAM; the operating systems can be Windows CE.NET or Windows XP Embedded. The TwinCAT automation software transforms a CX1000 system into powerful PLC and Motion Control system that can be operated with or without visualisation. Further system interfaces (pre-installed in the factory) or fieldbus connections can be added to the basic CPU module.

Since not all combinations are sensible, the following table contains a breakdown of the permissible combinations.



The CX 1000 modules are available in the following types:

Modules	16/32 MB	64/128 MB	DVI / USB	Windows CE.NET	Windows XPE	without TwinCAT	TwinCAT PLC Runtime	TwinCAT NC PTP Runtime
CX1000-0010	*			*		*		
CX1000-0011	*			*			*	
CX1000-0012	*			*				*
CX1000-0110	*		*	*		*		
CX1000-0111	*		*	*			*	
CX1000-0112	*		*	*				*
CX1001-0000	*							
CX1001-0010		*		*		*		
CX1001-0011		*		*			*	
CX1001-0012		*		*				*
CX1001-0020		*			*	*		
CX1001-0021		*			*		*	
CX1001-0022		*			*			*
CX1001-0110		*	*	*		*		
CX1001-0111		*	*	*			*	

CX1001-0112		*	*	*				*
CX1001-0120		*	*		*	*		
CX1001-0121		*	*		*		*	
CX1001-0122		*	*		*			*

CX1000 systems with Windows XP Embedded require a Compact Flash card with a minimum capacity of 128 MB.

Note:

A list of the different software images can be found in the CX1000 Software Documentation.

Connections

The basic CPU module is available with different hardware and software options. It is supplied from the power supply unit, so that only the connections are described here.

Basic CPU module with Ethernet RJ 45 and COM1 (RS232) interface:

RJ 45 interface (socket):

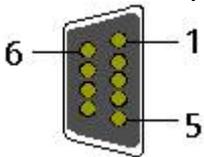


Assignment of the RJ45 interface:

PIN	Signal	Description
1	TD +	Transmit +
2	TD -	Transmit -
3	RD +	Receive +
4	connected	not used
5		
6	RD -	Receive -
7	connected	not used
8		

TD & RD are exchanged at the hubs or between two PCs.

COM1 interface (connector):



Assignment of the COM1 interface:

PIN	Signal	Type	Description
1	DCD	Signal in	Data Carrier Detect
2	RxD	Signal in	Receive Data
3	TxD	Signal out	Transmit Data
4	DTR	Signal out	Data Terminal Ready
5	GND	Ground	Ground
6	DSR	Signal in	Data Set Ready
7	RTS	Signal out	Request to Send
8	CTS	Signal in	Clear to Send
9	RI	Signal in	Ring Indicator

Basic CPU module with DVI/USB interface:

In addition to the Ethernet and COM interface, this basic module features a DVI-I and two USB interfaces. The pin assignment of the basic CPU module with two USB and a DVI-I interface is explained under the associated system interface CX1000-N001.

Applicable to all basic CPU modules:**LED**

The green power LED (PWR) is on if the basic CPU module is connected correctly to a live power supply unit.

Compact Flash slot

Further information can be found under Compact Flash slot.

PC 104 Bus

The PC 104 bus is a standardised bus with 104 ISA signals for compact embedded systems.

Compact Flash slot

A Compact Flash slot is provided at the front of the basic CPU module. This enables an additional Compact Flash memory medium (format I or II) to be operated. The change is only allowed while the system is powered down - otherwise the system could crash. The card can be removed for maintenance or to extend the system storage capacity. The Compact Flash cards (CF cards) are available as accessories with different storage capacities. It is

Activating the eject mechanism below the slot with a screwdriver causes the card to be ejected by approx. 4 mm (FIGURE 1), so that it can be pulled out (FIGURE 2). If the card is pushed in (FIGURE 3), the eject mechanism will re-engage. The card is positioned correctly, if it is located approx. 1 mm lower than the front of the housing.



Figure 1 Ejecting the CF card



Figure 2 Removing CF-card



Figure 3 Inserting the CF card

Warning



The Compact Flash slot is a memory interface, not an I/O type CF slot.

Compact-Flash card

The Compact Flash card (CF card) is a non-volatile memory medium.

Data to be retained in the event of a power failure should be saved on the CF card. The CF card operates similar to a hard disk.

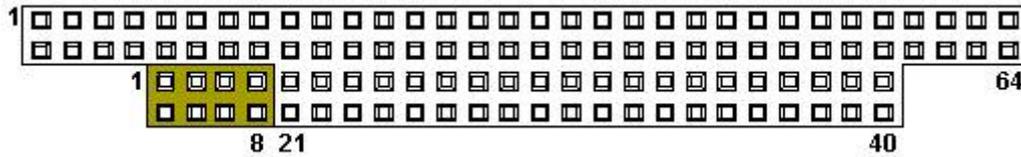
Warning



It is recommended **only** use CF cards supplied by Beckhoff Automation GmbH. The CF cards are made for industrial use. They possess a higher number of read / write cycles and an enhance temperature range (up to + 85°C). A proper operation of the CX-System can **only** be guaranteed with the use of CF cards from Beckhoff Automation GmbH!

PC 104 Bus

The PC 104 bus is a standardised bus with 104ISA signals for compact embedded systems.



For the functionality of the CX1000 modules eight further signals have been added (here marked with color).

Pin assignment of 16 bit PC 104 bus:

Pin Number	J1/P1 Row A	J1/P1 Row B	J1/P1 Row C	J1/P1 Row D
0	--	--	GND	GND
1	IOCHCHK*	GND	SBHE*	MEMCS16*
2	SD7	RESETDRV	LA23	IOCS16*
3	SD6	+5V	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	-5V	LA20	IRQ12
6	SD3	DRQ2	LA19	IRQ13
7	SD2	-12V	LA18	IRQ14
8	SD1	ENDXFR*	LA17	DACK0*
9	SD0	+12V	MEMR*	DRQ0
10	IOCHRDY	(KEY) ²	MEMW*	DACK5*
11	AEN	SMEMW*	SD8	DRQ5
12	SA19	SMEMR*	SD9	DACK6*
13	SA18	IOW*	SD10	DRQ6
14	SA17	IOR*	SD11	DACK7*
15	SA16	DACK3*	SD12	DRQ7
16	SA15	DRQ3	SD13	+5V
17	SA14	DACK1*	SD14	MASTER*
18	SA13	DRQ1	SD15	GND
19	SA12	REFRESH*	(KEY) ²	GND
20	SA11	SYSCLK	--	--
21	SA10	IRQ7	--	--
22	SA9	IRQ6	--	--
23	SA8	IRQ5	--	--
24	SA7	IRQ4	--	--
25	SA6	IRQ3	--	--
26	SA5	DACK2*	--	--
27	SA4	TC	--	--
28	SA3	BALE	--	--
29	SA2	+5V	--	--
30	SA1	OSC	--	--
31	SA0	GND	--	--
32	GND	GND	--	--

Remarks:

2. B10 and C19 are key locations.
3. Signal timing and function are as specified in ISA specification.
4. Signal source/sink current differ from ISA values.

Pin assignment of the additional signals

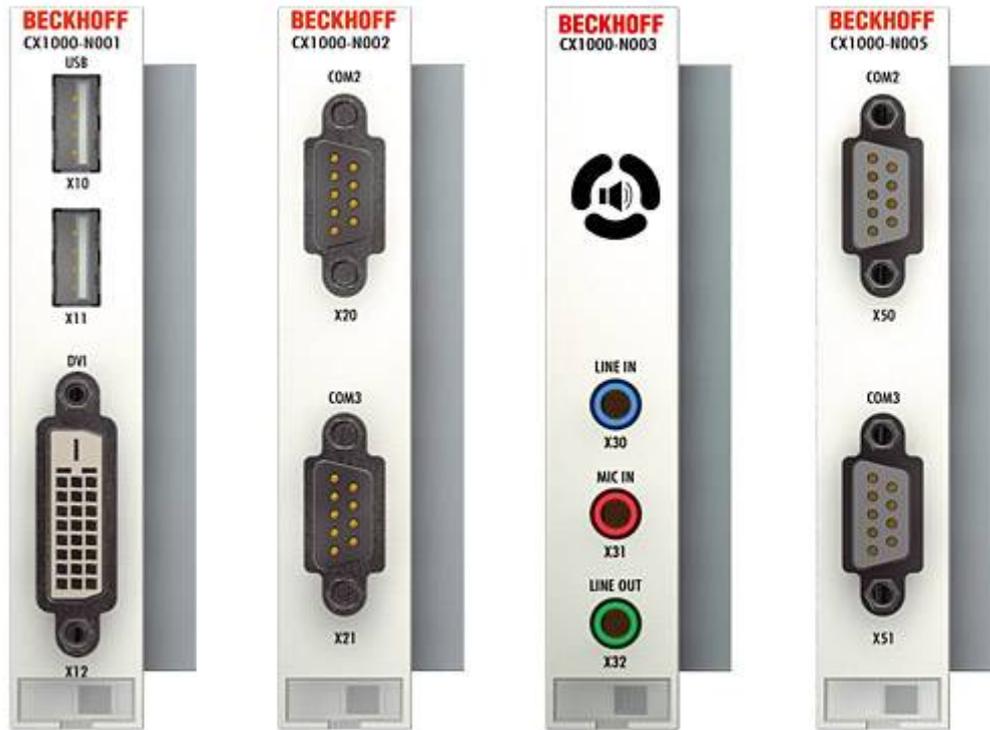
Pin number	Assignment
1	I ² C SCL
2	USB D+
3	I ² C SDA
4	USB D-
5	ONCTRL
6	U _{stby} 5 V
7	POR
8	PWRBTN

Note:

Further information about the PC 104 bus can be found under <http://www.pc104.org>

System interfaces

Technical Data



Unlike other CX components, the system interfaces cannot be upgraded or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The system interfaces run through the internal PC104, so that further CX components can be connected. The power supply of the system interface modules is ensured via the internal PC104 bus.

Technical data	CX1000-N001	CX1000-N002	CX1000-N003	CX1000-N005*
Interfaces	1 x DVI + 2 x USB 1.1	1 x COM2 + 1 x COM3	Line IN, Line Mic IN, Line OUT	1 x COM2 + 1 x COM3
Connection type	DVI-I 29-pin socket + 2 USB ports type A	2 x 9-pin D-Sub	3.5 mm socket for jack plug	2 x 9-pin D-Sub
Properties	DVI-I interface also carries out VGA signals (DVI-A)	max. Baud rate 115 kBaud on both interfaces COM1: RXD, TXD, DTR COM2: RXD, TXD	built-in PC Beeper Line OUT output, max. 200 mW, suitable for earphones	max. Baud rate 115 kBaud on both interfaces 2 x RS485/422, optically isolated
Power supply	via system bus (through CX1100 power supply module)			
Dimensions	19 mm x 100 mm x 91 mm			
Weight approx.	80 g			

* can only be used instead of and not at the same time as CX1000-N002

CX1000-N001 connections

In addition to the Ethernet and RS232 interface, this module features a DVI-I and two USB interfaces.

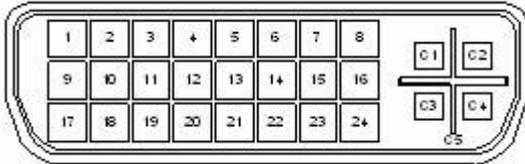
DVI-I interface

The DVI-I interface transfers analog and digital data and is suitable for connection to analog graphics cards with 15 pin D-Sub connector and digital graphics cards with DVI-D output. The resolution at the screen or the Beckhoff Control Panel depends on the distance (maximum 7 m).

The DVI interface uses VGA signals, so that the connection of CRT VGA monitors to the CX1000 system using a DVI to VGA adapter is also possible.

This adapter is available as an accessory.

DVI-I socket:



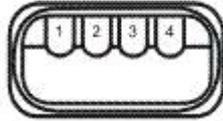
Pin	Assignment	Pin	Assignment	Pin	Assignment
1	TMDS Data 2-	9	TMDS Data 1-	17	TMDS Data 0-
2	TMDS Data 2+	10	TMDS Data 1+	18	TMDS Data 0+
3	TMDS Data 2/4 Shield	11	TMDS Data 1/3 Shield	19	TMDS Data 0/5 Shield
4	not connected	12	not connected	20	not connected
5	not connected	13	not connected	21	not connected
6	DDC Clock	14	+ 5V Power	22	TMDS Clock Shield
7	DDC Data	15	Ground (+5V, Analog H/V Sync)	23	TMDS Clock +
8	Analog Vertical Sync	16	Hot Plug Detect	24	TMDS Clock -

Pin assignment (cross)

Pin	Assignment
C1	Analog Red Video Out
C2	Analog Green Video Out
C3	Analog Blue Video Out
C4	Analog Horizontal Sync

Resolution at the monitor:

Resolution in pixels	Distance of the interface from the monitor
1024 x 768	5 m
800 x 600	6 m
640 x 480	7 m

USB interface:

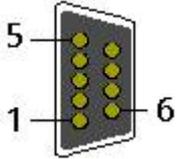
The USB socket is a type A socket. The USB interface complies to USB 1.1 specification

Pin	Assignment	Typical assignment
1	VBUS	Red
2	D-	White
3	D+	Green
4	GND	Black
Shell	Shield	Drain Wire

CX1000-N002 connections

The CX1000-N002 system interface features two RS232 interfaces, COM2 and COM3 (9 pin Sub-D plug connector). The maximum baud rate on both channels is 115 kBit.

RS232 COM interface (connector):



Pin assignment of the COM2 interface:

PIN	Signal	Type	Description
2	RxD	Signal in	Receive Data
3	TxD	Signal out	Transmit Data
4	DTR	Signal out	Data Terminal Ready
5	GND	Ground	Ground

The pins not listed are not used.

Pin assignment of the COM3 interface:

PIN	Signal	Type	Description
2	RxD	Signal in	Receive Data
3	TxD	Signal out	Transmit Data
5	GND	Ground	Ground

The pins not listed are not used.

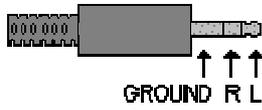
CX1000-N003 connections

This system interface contains the audio interfaces Line In, Mic In (microphone signal input) and Line Out (also for earphones), max. 200 mW.

It also features a PC beeper.

The 3.5 mm sockets are designed for jack plugs.

Line In / Line Out stereo jack plugs:

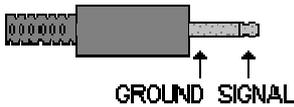


Pin assignment Line In /Line Out:

Signal	Description
L	Left Signal
R	Right Signal
Gound	Ground

The left channel is transferred via the tip of the jack plug, the right channel via the first ring. The remainder of the sleeve is used for earthing.

Mic In mono jack plug:



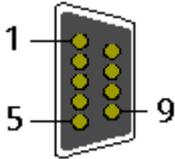
The only existing channel is transferred via the tip, the remainder of the sleeve is used for earthing.

CX1000-N005 connections

The system interface CX1000-N005 contains two RS422, RS485 interfaces, COM2 and COM3 (9 pin Sub-D plug connector).

The maximum baud rate on both channels is 115 kBit.

COM interface (plug):



Pin assignment of the COM interface:

PIN	Signal	Type	Description
2	TxD+	Data-Out +	Transmit 422
3	RxD+	Data-In +	Receive 422
5	GND	Ground	Ground
6	VCC	VCC	+5V
7	TxD-	Data-Out -	Transmit 422
8	RxD-	Data-In -	Receive 422

For RS 485 Pin 2 and 3 (Data +) as well as Pin7 and 8 (Data -) have to be connected.

The pins not listed are not used.

Settings DIP switches RS485:

RS485 without Echo, End-Point (Terminated) DEFAULT SETTING

DIP	Status	Function
1	off	Echo on
2	on	Echo off
3	on	Auto send on
4	off	Always send on
5	on	Auto receive on
6	off	Always receive on
7	on	Term on
8	on	Term on

RS485 with Echo, End-Point (Terminated)

DIP	Status	Function
1	on	Echo on
2	off	Echo off
3	on	Auto send on
4	off	Always send on
5	off	Auto receive on
6	on	Always receive on
7	on	Term on
8	on	Term on

RS485 without Echo, Drop-Point (without Termination)

DIP	Status	Function
1	off	Echo on
2	on	Echo off
3	on	Auto send on
4	off	Always send on
5	off	Auto receive on
6	on	Always receive on
7	off	Term on
8	off	Term on

RS485 with Echo, Drop-Point (without Termination)

DIP	Status	Function
1	on	Echo on
2	off	Echo off
3	on	Auto send on
4	off	Always send on
5	off	Auto receive on
6	on	Always receive on
7	off	Term on
8	off	Term on

Settings DIP Switches RS422:

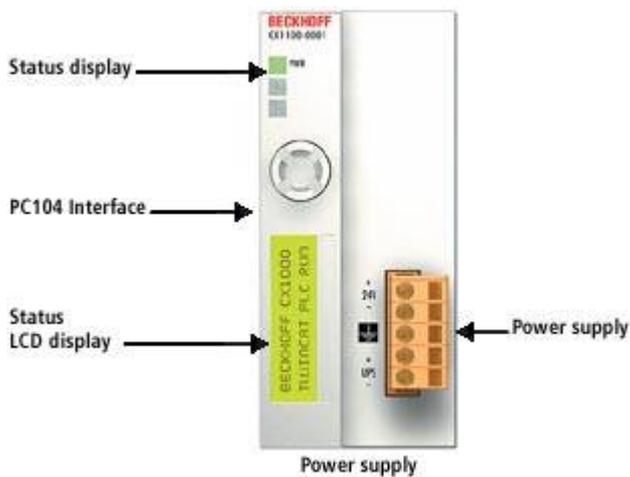
RS422 full duplex end point

DIP	Status	Function
1	on	Echo on
2	off	Echo off
3	off	Auto send on
4	on	Always send on
5	off	Auto receive on
6	on	Always receive on
7	on	Term on
8	on	Term on

The dip switches for the configuration of the RS485/422 interfaces can be found at the left side of the module. If you remove the grey cover you can see the switch.

Power supply

Technical Data CX1100-0001

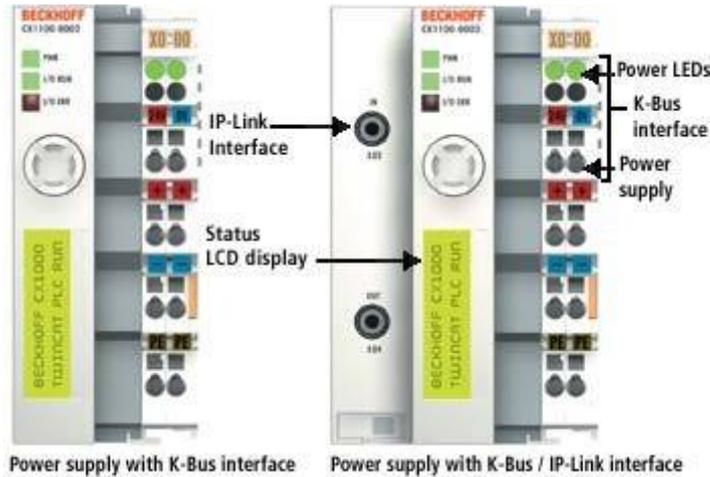


One of three power supply modules can be selected for a CX1000 system. The power supply of all other system components is ensured via the internal PC104 bus; no separate supply lines are required. However, the CX1100 components offer further important characteristics that go beyond a pure power supply: an integrated NOVRAM enables the fail-safe storage of process data, an LCD display with two lines of 16 characters each is used for displaying system and user messages.

The power supply CX1100-N001 has no I/O interfaces.

Technical data	CX1100-0001
Power supply	24 V DC (-15%/+20%)
Dielectric strength	500 Veff (supply / internal electronics)
Max. power consumption	30 W
Recommended fuse at 24 V	2 A
K-Bus connection	-
IP-Link connection	-
Connection type	1 x open pluggable connector, 5-pin
NOVRAM	8 kByte
Display	FSTN display 2 lines x 16 characters of text, illuminated
I/O-DPRAM	-
Diagnostics LED	1 x PWR
Dimensions	45 mm x 100 mm x 91 mm
Weight approx.	180 g

Technical Data CX1100-0002 / CX1100-0003

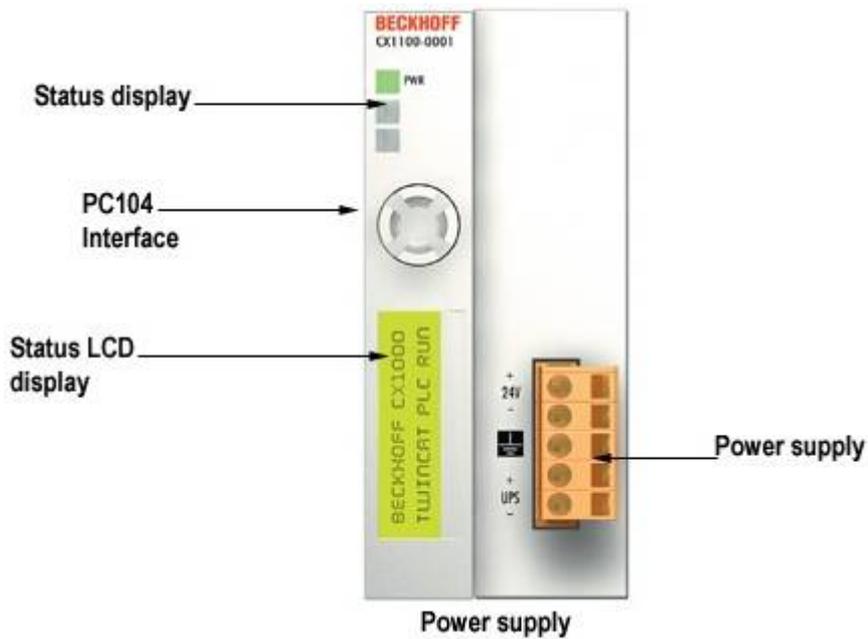


Local I/O signals are connected via the CX1100-0002 power supply variant, to which all Beckhoff Bus Terminals can be connected, or via CX1100-0003, which in addition to the Bus Terminals enables the connection of Extension Box IExxxx type Beckhoff Fieldbus Box modules. The option to connect Bus Terminals or a Fieldbus Box creates a control system with a very variable, expandable I/O level with large signal variety. The I/O data are stored in a DPRAM, which is accessible by the CPU via the system bus. The power supplies of the CX system can be changed in the field.

Technical Data	CX1100-0002	CX1100-0003
Power supply	24 V DC (-15%/+20%)	
Dielectric strength	500 Veff (supply / internal electronics)	
Max. power consumption	30 W	
Recommended fuse at 24 V	2 A	
K-Bus connection	yes (adapter terminal)	
IP-Link connection	-	yes
Connection type	Cage Clamp (adapter terminal)	
NOVRAM	8 kByte	
Display	FSTN display 2 lines x 16 characters of text, illuminated	
I/O-DPRAM	2 kByte	4 kByte
Diagnostics LED	1 x PWR, 1 x I/O Run, 1 x I/O Err	
Dimensions	39 mm x 100 mm x 91 mm	58 mm x 100 mm x 91 mm
Weight approx.	250 g	330 g

CX1100-0001 Connections

This power supply unit does not have an I/O interface. The power supply is therefore connected through the 5-pin open pluggable connector. The power supply unit supplies all further system components with a voltage of 24 V DC (-15 %/+20%) via the PC104 bus. The dielectric strength of the power supply unit is 500 V_{rms}. The integrated NOVRAM permits storage of process data that is safe against power failure.



Pin Allocation Open Style Connector:

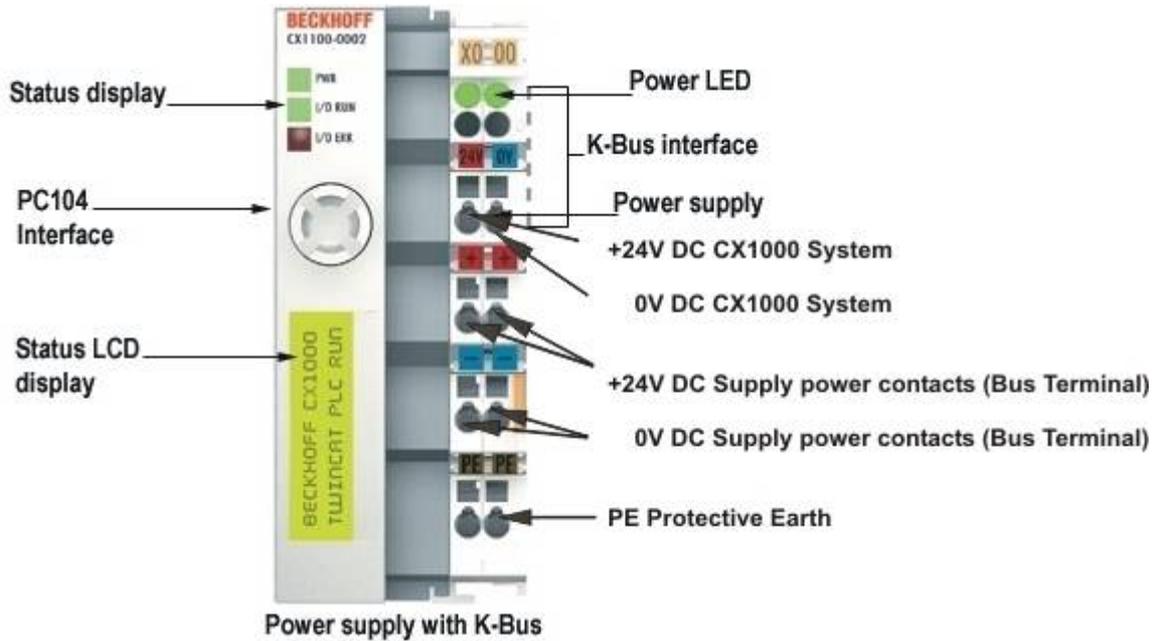
Pin	Assignment
1	+24 V DC
2	0 V DC
3	GROUND
4	+UPS (+ 24 V DC)
5	-UPS (0 V DC)

LED:

With proper connection of the power supply unit and with power supply turned on, the power LED (PWR) lights up green. In the case of a short-circuit, it lights up red.

CX1100-0002 Connections

This power supply unit is equipped with an I/O interface, which permits connection of the Beckhoff Bus Terminals. The power is supplied via the upper spring-loaded terminals labelled "24V" and "0V". The power voltage feeds the CX system and supplies a voltage of 24 V DC (-15 %/+20%) to the Bus Terminals via the K-Bus. The dielectric strength of the power supply unit is 500 V_{rms}. Since the K-Bus does no more than pass data on, a further power supply is necessary for the Bus Terminals. This is provided by means of the power contacts, which are not connected to the power supply. The integrated NOVRAM permits storage of process data that is safe against power failure.



LED:

With proper connection of the power supply unit and with power supply turned on, the power LED (PWR) lights up green. In the case of a short-circuit, it lights up red.

The I/O LEDs display the operation status of the Bus Terminals. Error-free start-up of the configuration is signalled by the red "I/O ERR" LED being extinguished. If the "I/O ERR" LED blinks, an error in the area of the terminals is indicated. The error code can be determined from the frequency and number of blinks.

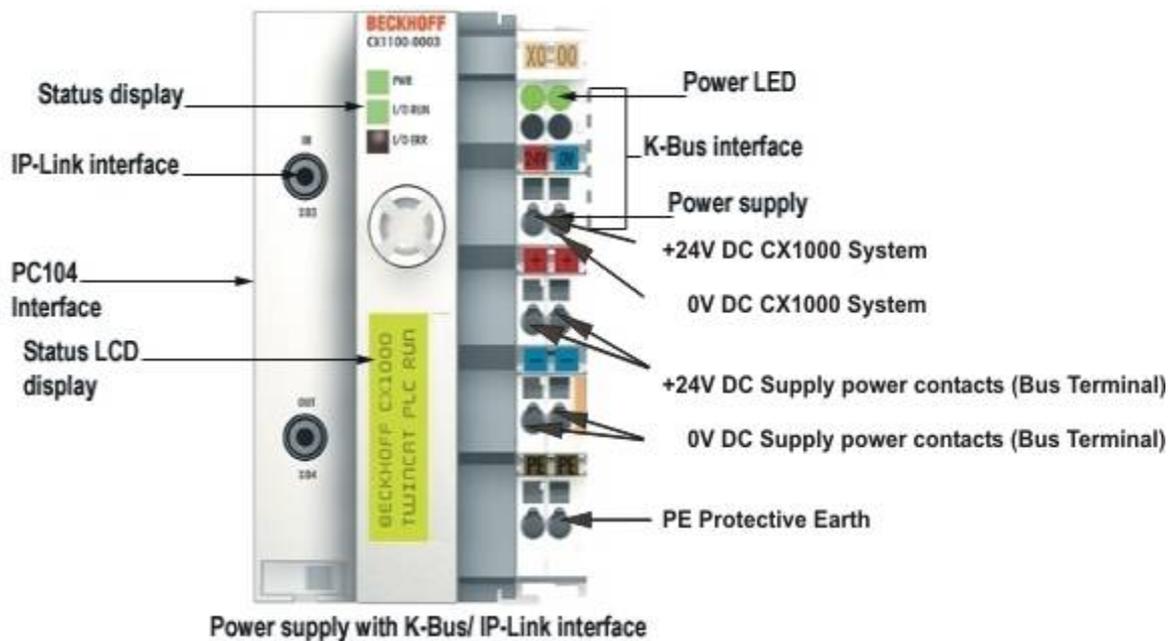
PE power contacts

The "PE" power contact must not be used for other potentials.

CX1100-0003 Connections

This power supply unit permits not only the connection of the Beckhoff Bus Terminals, but also the serial connection of the Beckhoff fieldbus box modules of the type extension box IExxxx. The power is supplied via the upper spring-loaded terminals labelled "24V" and "0V".

The supply voltage feeds the CX system and, over the K-Bus, the Bus Terminals. Since the K-Bus does no more than pass data on, a further power supply is necessary for the Bus Terminals. This is provided by means of the power contacts, which are not connected to the power supply.



Fieldbus connection:

Plug the IP link connector into the respective connections, i.e. one fibre-optic cable each into IN (x03) and OUT (x04). You then connect the other end with the corresponding IP link interface of the extension box. The connection must be made so that the output of the fieldbus connection is connected to the input of the extension box and vice versa.

LED:

With proper connection of the power supply unit and with power supply turned on, the power LED (PWR) lights up green. In the case of a short-circuit, it lights up red. The I/O LEDs display the operation status of the Bus Terminals. Error-free start-up of the configuration is signalled by the red "I/O ERR" LED being extinguished. If the "I/O ERR" LED blinks, an error in the area of the terminals is indicated. The error code can be determined from the frequency and number of blinks.

PE power contacts

The "PE" power contact must not be used for other potentials.

LCD Display

The LCD display of the power supply units has two rows of 16 characters each and is used for displaying system and user messages.

"Index-Group/Offset" Specification for the LCD Display

ADS Port 300

Index Group	Index Offset	Access	Data type	Phys. unit	Def. range	Description	Remarks
0x00005000 + DeviceID	0xFFFF90FF	R&W				Cursor OFF	
0x00005000 + DeviceID	0xFFFF91FF	R&W				Cursor ON	
0x00005000 + DeviceID	0xFFFF92FF	R&W				Cursor blink OFF	
0x00005000 + DeviceID	0xFFFF93FF	R&W				Cursor blink ON	
0x00005000 + DeviceID	0xFFFF94FF	R&W				Display OFF	
0x00005000 + DeviceID	0xFFFF95FF	R&W				Display ON	
0x00005000 + DeviceID	0xFFFF96FF	R&W				Backlight OFF	
0x00005000 + DeviceID	0xFFFF97FF	R&W				Backlight ON	
0x00005000 + DeviceID	0xFFFFA0FF	R&W				Write Text line 1	
0x00005000 + DeviceID	0xFFFF00FF	R&W				Write Text line 2	

3. Transport

Unpacking, installation and transport

The specified storage conditions must be adhered to (see "Technical data").

Dimensions and weight of the individual modules:

Dimensions (W x H x D): 19 x 100 x 91 mm (system interface) to 58 x 100 x 91 mm (power supply unit with I/O interface)

Weight: 80 g (system interface) to 435 g (basic module)

Unpacking

Proceed as follows to unpack the unit:

1. Remove packaging.
2. Do not discard the original packaging. Keep it for future relocation.
3. Check the delivery for completeness by comparing it with your order.
4. Please keep the associated paperwork. It contains important information for handling the unit.
5. Check the contents for visible shipping damage.
6. If you notice any shipping damage or inconsistencies between the contents and your order, you should notify Beckhoff Service.

Warning



Danger of damage to the unit!

During transport in cold conditions, or if the unit is subjected to extreme temperature swings, condensation on and inside the unit must be avoided.

Prior to operation, the unit must be allowed to slowly adjust to room temperature. Should condensation occur, a delay time of approximately 12 hours must be allowed before the unit is switched on.

Installation

The devices are designed for installation in control cabinets.
You will find installation instructions on the following pages.

Shipping and relocation

Despite the robust design of the unit, the components are sensitive to strong vibrations and impacts. During transport, your computer should therefore be protected from excessive mechanical stress. Therefore, please use the original packaging.

4. Fitting and wiring

Mechanical mounting

Dimensions

The CX1000 product range is characterised by small overall installed size and high modularity. For project planning purposes, a CPU module, a power supply unit and the associated system interfaces and fieldbus interfaces have to be provided.

The overall width of the application is made up of the individual modules.

With a height of 100 mm, the module dimensions exactly match those of the Beckhoff Bus Terminals. Together with the lowered connector surfaces, this means that it can be used in a standard terminal box with a height of 120 mm.

Basic CX1000 CPU modules:

The basic CPU module measures 57 x 100 x 91mm.

CX1000-N00x system interfaces:

The four system interfaces all measure 19 x 100 x 91 mm.

CX1100-000x power supplies:

CX1100-0001

Power supply without I/O interface

Dimensions in mm: 45 x 100 x 91

CX1100-0002

Power supply with I/O interface

Dimensions in mm: 39 x 100 x 91

CX1100-0003

Power supply with I/O interface and IP-Link

Dimensions in mm: 58 x 100 x 91

CX1100-0900 UPS module:

Dimensions in mm: 57 x 100 x 91

CX1500-Mxxx and CX1500-Bxxx fieldbus connections

The modules for the fieldbus connections measure 38 x 100 x 91 mm, irrespective of whether a master or slave type connection is used.

Mechanical Assembly of the base module

The installation of the modules takes place in three steps:

1. The Sequence of the Modules

The CPU basic module with system interfaces, which are factory-installed on the left side, is extended with the power supply unit on the right and with the fieldbus connection (master or slave) left side if available. The mounting of an fieldbus module is described on the next page.

2. Assembly with Other Modules

The attachment of the individual modules is done by simple plugging them together (FIG. 1). Care must be taken that the plug of the PC104 interface is not damaged.

When correctly assembled, no significant gap can be seen between the attached housings.



FIG. 1: Engaging of the Modules

3. Engaging on the top-hat rail

On the bottom of the modules, there is a white tension strap, which is connected with a latching mechanism. These tension straps must be pulled down before attaching to the mounting rail. This can be done with a slotted screwdriver and a small rotation. (FIG. 4). After engaging the module on the top-hat rail successfully (FIG. 5), the tension straps must be shifted into the starting position again (FIG. 6).

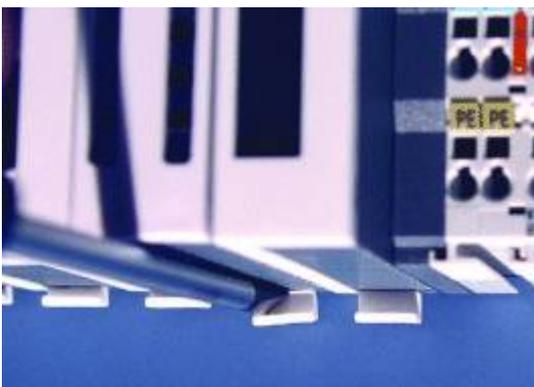


FIG. 4: Tension straps down

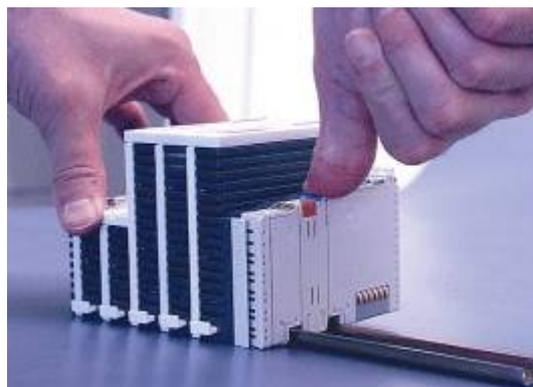


FIG. 5: Engaging on the top-hat rail

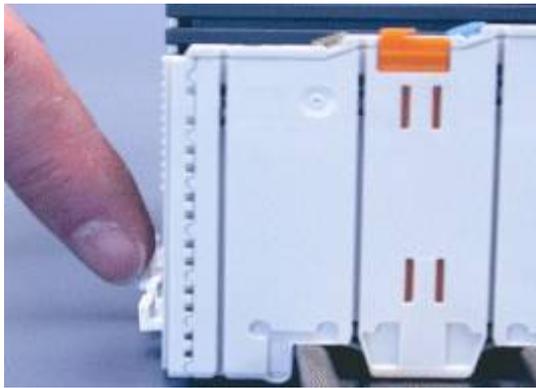


FIG. 6: Tension straps back in starting position

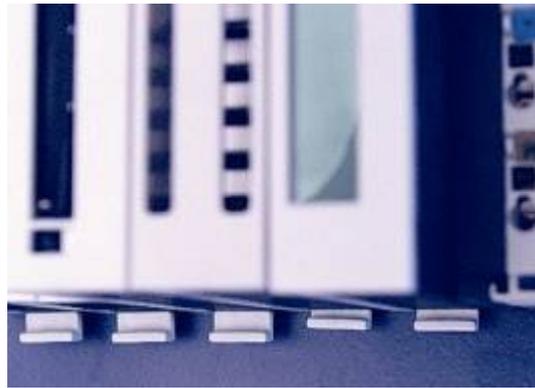


FIG.7: Tension straps not engaged / engaged

Note:

A locking mechanism prevents the individual housings from being pulled off again. More detailed information about disassembling the CX configuration from the top-hat rail can be found on the page decommissioning.

By lowering the front surfaces, which contain the interfaces, installation can easily be done in a standard terminal box of 120 mm height.

Installation position:

Warning



The CPU module installed on a top-hat rail may be operated only in case of ambient temperatures up to 55°C. The orientation in which the device is fitted must be selected in such a way that cooling air can flow vertically through the ventilation holes. The images show the permitted (FIG. 8 and FIG. 9) as well as a forbidden installation positions (FIG. 10).

Observe minimum clearance!

Mounting must provide a clearance of 30 mm both above and below a CX1000 device combination to ensure adequate ventilation of the CPU base module and the power supply unit.



FIG. 8: Allowable installation position



FIG. 9: Allowable installation position



FIG. 10: Unallowable installation position

Mechanical mounting of the Fieldbus modules

The mounting of the Fieldbus modules takes place in several steps:

1. Remove cover at CX1000/CX1020 basic module

In order to be able to fasten the connection of the fieldbus connection to the CPU basic module, the cover must first be removed (FIG 1, 2). This can be achieved by a small pressure against the cover.

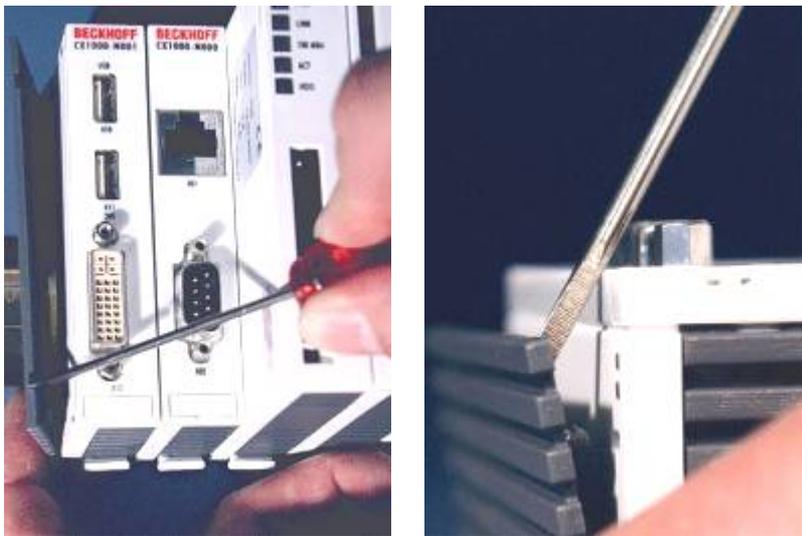


FIG.1+2: Remove Cover

2. Assembly with CX1000/CX1020 configuration

Because the CX1000 configuration is already on the top-hat rail, the fieldbus module first has to be pressed on the top-hat rail. For that purpose the locking of the latching mechanism with the white tension straps (pull down) is required.

The attachment of the individual modules is done by simple plugging them together (FIG. 3). Care must be taken that the plug of the PC104 interface is not damaged.

When correctly assembled, no significant gap can be seen between the attached housings. At the end the white tension strips must be shifted into the starting position again in order that the latching mechanism locks.



FIG. 3: Stick modules together

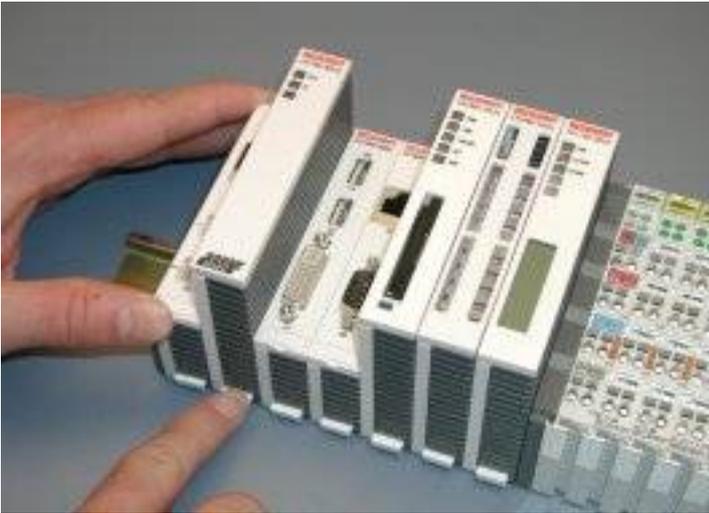


FIG. 4: Tension straps back in starting position

3. Attach Cover

If the connection area does not have a closing cover on the left-hand side, the cover that was previously removed should be pressed over the connections until it audibly engages.

Note:

If the CX1000/CX1020 configuration is not positioned on the top-hat rail it is possible to join the connection first with the CX1000/CX1020 configuration, as shown in FIG. 3, and then to clip the entire module onto the top-hat rail.

Note:

A locking mechanism prevents the individual housings from being pulled off again.

5. Error handling and diagnostics

CPU base module

LEDs of the basic CPU module

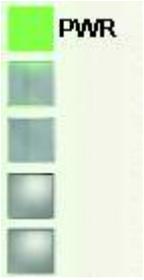
Display	LED	Meaning
 PWR	PWR	Power supply The Power LED comes on when the device is connected to a live power supply unit.
 Link	Link	LAN Link 10 MBit This LED comes on when the network speed is 10 MBit or 100 MBit (if the device is part of a network).
 100 MBit		LAN Link 100 MBit This LED comes on when the network speed is 100 MBit (if the device is part of a network).
 ACT	Activity	Transmit /Receive Packets This LED flashes once when data packets are being transferred within the LAN.
 HDD	HDD	Read/Write Compact Flash Indicates access to the CF card.

Network speed LED

- The LINK LED comes on when the network speed is 10 MBit or 100 MBit.
- The 100 MBit LED comes on when the network speed is 100 MBit.

Power supplies

CX1100-0001 power supply LEDs

Display	LED	Meaning
 PWR	Power	Power supply The LED lights up green when the power supply is correct, but red if there is a short circuit.

CX1100-0002 power supply LEDs

After switching on, the power supply immediately checks the connected Bus Terminal configuration. Error-free start-up is signalled by the red "I/O ERR" LED being extinguished. If the "I/O ERR" LED blinks, an error in the area of the terminals is indicated. The error code can be determined from the frequency and number of blinks. This permits rapid rectification of the error.

Display	LED	Meaning
 PWR	Power	Power supply The LED lights up green when the power supply is correct, but red if there is a short circuit.
 I/O RUN	I/O Run	K-Bus diagnostics The green LED lights up in order to indicate fault-free operation. "Fault-free" means that the communication with the fieldbus system is also running.
 I/O ERR		
	I/O Error	K-Bus diagnostics The red LED flashes to indicate an error. The red LED blinks with two different frequencies.

The I/O error LED blink code

Fast blinking	Start of the error code
First slow sequence	Error code
Second slow sequence	Error code argument

LEDs for K-Bus diagnosis

Error code	Error code argument	Description	Remedy
Persistent, continuous blinking		EMC problems	<ul style="list-style-type: none"> - Check power supply for overvoltage or undervoltage peaks - Implement EMC measures - If a K-Bus error is present, it can be localised by a restart of the power supply (by switching it off and then on again)
1 pulse	0	EEPROM checksum error	Revert to the manufacturer's setting
	1	Code buffer overflow	Insert fewer Bus Terminals. The programmed configuration has too many entries in the table
	2	Unknown data type	Software update required for the power supply
2 pulses	0	Programmed configuration has an incorrect table entry	Check programmed configuration for correctness
	n (n > 0)	Table comparison (Bus Terminal n)	Incorrect table entry
3 pulses	0	K-Bus command error	<ul style="list-style-type: none"> - No Bus Terminal inserted - One of the Bus Terminals is defective; halve the number of Bus Terminals attached and check whether the error is still present with the remaining Bus Terminals. Repeat until the defective Bus Terminal is located.
4 pulses	0	K-Bus data error, break behind the power supply	Check whether the n+1 Bus Terminal is correctly connected; replace if necessary.
	n	Break behind Bus Terminal n	Check whether the Bus End Terminal 9010 is connected.
5 pulses	n	K-Bus error in register communication with Bus Terminal n	Exchange the nth bus terminal
9 pulses	0	Checksum error in Flash program	Revert to the manufacturer's setting
	n (n>0)	Bus Terminal n is not	Revert to the manufacturer's setting which will

		consistent with the configuration that existed when the boot project was created	clear the boot project.
14 pulses	n	nth Bus Terminal has the wrong format	Start the power supply again, and if the error occurs again then exchange the Bus Terminal.
15 pulses	n	Number of Bus Terminals is no longer correct	Start the power supply up again.
16 pulses	n	Length of the K-Bus data is no longer correct	Start the power supply up again.

Error code argument

The number of pulses indicates the position of the last Bus Terminal before the fault. Passive Bus Terminals, such as a power feed terminal, are not included in the count.

In the case of some errors, rectification does not cause the power supply to leave the blink sequence. The power supply can only be restarted by switching its supply voltage off and on again.

Note:

The supply voltage of the power supply unit, which is necessary to supply power to the CX1000 system, must not be interrupted in the middle of operation. Switching off the supply voltage to the power supply unit refers here to the power supply on the power contacts.

CX1100-0003 power supply LEDs

After switching on, the power supply immediately checks the connected Bus Terminal configuration. Error-free start-up is signalled by the red "I/O ERR" LED being extinguished. If the "I/O ERR" LED blinks, an error in the area of the terminals is indicated. The error code can be determined from the frequency and number of blinks. This permits rapid rectification of the error.

Display	LED	Meaning
 PWR	Power	Power supply The LED lights up green when the power supply is correct, but red if there is a short circuit.
 I/O RUN	I/O Run	K-Bus diagnostics The green LED lights up in order to indicate fault-free operation. "Fault-free" means that the communication with the fieldbus system is also running.
 I/O ERR		
	I/O Error	K-Bus diagnostics The red LED flashes to indicate an error. The red LED blinks with two different frequencies.
		

The I/O error LED blink code

Fast blinking	Start of the error code
First slow sequence	Error code
Second slow sequence	Error code argument

LEDs for K-Bus diagnosis

Error code	Error code argument	Description	Remedy
Persistent, continuous blinking		EMC problems	<ul style="list-style-type: none"> - Check power supply for overvoltage or undervoltage peaks - Implement EMC measures - If a K-Bus error is present, it can be localised by a restart of the power supply (by switching it off and then on again)
1 pulse	0	EEPROM checksum error	Revert to the manufacturer's setting
	1	Code buffer overflow	Insert fewer Bus Terminals. The programmed configuration has too many entries in the table
	2	Unknown data type	Software update required for the power supply
2 pulses	0	Programmed configuration has an incorrect table entry	Check programmed configuration for correctness
	n (n > 0)	Table comparison (Bus Terminal n)	Incorrect table entry
3 pulses	0	K-Bus command error	<ul style="list-style-type: none"> - No Bus Terminal inserted - One of the Bus Terminals is defective; halve the number of Bus Terminals attached and check whether the error is still present with the remaining Bus Terminals. Repeat until the defective Bus Terminal is located.
4 pulses	0	K-Bus data error, break behind the power supply	Check whether the n+1 Bus Terminal is correctly connected; replace if necessary.
	n	Break behind Bus Terminal n	Check whether the Bus End Terminal 9010 is connected.
5 pulses	n	K-Bus error in register communication with Bus Terminal n	Exchange the nth bus terminal
9 pulses	0	Checksum error in Flash program	Revert to the manufacturer's setting
	n (n>0)	Bus Terminal n is not	Revert to the manufacturer's setting which will

		consistent with the configuration that existed when the boot project was created	clear the boot project.
14 pulses	n	nth Bus Terminal has the wrong format	Start the power supply again, and if the error occurs again then exchange the Bus Terminal.
15 pulses	n	Number of Bus Terminals is no longer correct	Start the power supply up again.
16 pulses	n	Length of the K-Bus data is no longer correct	Start the power supply up again.

Error code argument

The number of pulses indicates the position of the last Bus Terminal before the fault. Passive Bus Terminals, such as a power feed terminal, are not included in the count.

In the case of some errors, rectification does not cause the power supply to leave the blink sequence. The power supply can only be restarted by switching its supply voltage off and on again.

Note:

The supply voltage of the power supply unit, which is necessary to supply power to the CX1000 system, must not be interrupted in the middle of operation. Switching off the supply voltage to the power supply unit refers here to the power supply on the power contacts.

Störungen

Lesen Sie dazu auch das Kapitel Sicherheitshinweise.

Mögliche Störungen und ihre Beseitigung

Bitte geben Sie im Servicefall die Projektnummer Ihres PCs an, welche Sie dem Typenschild entnehmen können.

Die BECKHOFF-Support Nummer:
für Deutschland: 05246/963-157
international: +49-5246/963-157

Störung	Ursache	Maßnahmen
keine Funktion nach Starten des Embedded-PCs	fehlende Stromversorgung des Embedded-PCs andere Ursachen	1.Sicherung prüfen 2. Anschlussspannung messen, Steckerbelegung prüfen Beckhoff Support anrufen
Der Embedded-PC bootet nicht vollständig	Festplatte beschädigt (z.B. durch Abschalten bei laufender Software), Setupeinstellungen fehlerhaft, andere Ursachen	Setupeinstellungen prüfen Beckhoff Support anrufen
Rechner bootet, Software wird gestartet, aber Steuerung arbeitet nicht einwandfrei	Fehlerursache liegt bei der Software oder bei Anlagenteilen außerhalb des Embedded-PCs	Rufen Sie den Maschinen- oder Softwarehersteller an.
Fehler bei CF Card Zugriff	Fehlerhafte CF Card, fehlerhafter CF Einschub	Mit einer anderen CF Card den CF Einschub überprüfen Beckhoff Support anrufen
Embedded-PC funktioniert nur teilweise oder nur zeitweise	Komponenten im Embedded-PC defekt	Beckhoff Support anrufen

6. Decommissioning

Removal and disposal

A CX1000 hardware configuration is dismantled in 2 stages:

1. Removing from the top-hat rail:

The white straps on the underneath of all the modules must be pulled downwards (FIG 1). This can be done using an ordinary screwdriver and a slight turn. The latching mechanism that provides fixing to the top-hat rail opens up (this procedure is not visible).

If the configuration has a power supply unit with an I/O interfaces, it is first necessary to release the first terminal from the top-hat rail (FIG 2) so that the CX1000 configuration can be separated from the I/O hardware, allowing the module to be removed from the top-hat rail (FIG 3).

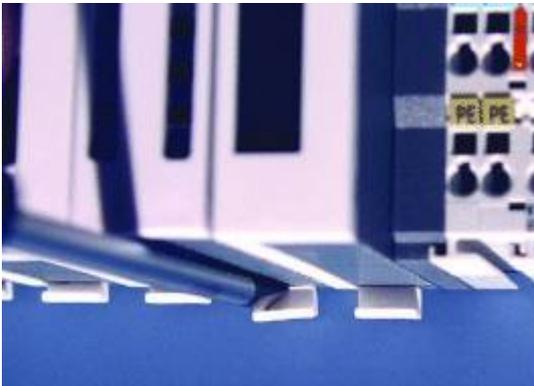


FIG 1: Straps down



FIG. 2: Releasing the I/O terminal from the top-hat rail

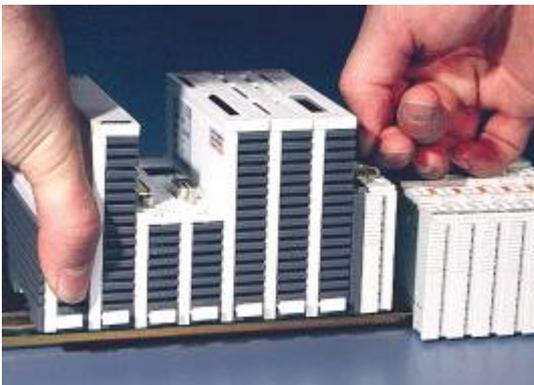


FIG. 3: Separating the module from the top-hat rail

2. Separating the individual modules:

Before separating the individual modules from one another, the entire CX1000 hardware block must first be removed from the top-hat rail, as described in Step 1. The individual modules can then be separated from one another by means of the separation mechanism mounted on the rear, as shown in Fig 4. This is done by inserting a flat screwdriver with dimensions 1.0 x 5.5 x 150 mm into the locking mechanism, and then operating the slider by turning it about 90 degrees. The rear-mounted locking mechanism creates a separation of approx. 2-3 mm in the mechanical engagement of the modules, pushing them apart, so that the PC 104 interface connectors can then carefully be pulled apart (FIG 5). Modules that cannot be separated from one another do not have a slider slot, but merely a marking point (which may or may not be sealed with red lacquer). Applying force to these elements will destroy them.



FIG. 4: Undoing the latching mechanism



FIG 5: Separating the modules

The CPU can be separated from the power supply unit and the fieldbus connections in this way.

Note:

If the configuration has a power supply unit with an I/O interface, it is first necessary to release one terminal from the top-hat rail so that the configuration can be separated from the I/O hardware.

Note:

The embedded PC must be shut down and the power supply disconnected before dismantling!

Warning

Forcibly opening the module housing (e.g. removing the cover) will destroy the housing.

Disposal

The device must be fully dismantled in order to dispose of it.

Electronic parts must be disposed of in accordance with national electronics scrap regulations.

7. Appendix

Accessories

Compact flash cards

order number	Description
CX1900-0015	128 MByte compact flash card type I
CX1900-0017	256 MByte compact flash card type I
CX1900-0021	512 MByte compact flash card type I
CX1900-0023	1 GByte compact flash card type I
CX1900-0025	2 GByte compact flash card type I
CX1900-0027	4 GByte compact flash card type I

Connectors and Adaptors

order number	Description
CX1900-0101	<p>DVI-to-VGA passive Adaptor for connecting a standard desktop VGA monitor to the CX1000 system</p> <ul style="list-style-type: none"> – singles out the VGA signals of the DVI-I interface of the CX1000-N001 module – 29-pin male DVI-A connector (bottom) to 15-pin female connector (top) – weight approx. 40 g – dimensions (W x H x D) 40 x 42 x 15 mm

Labelling Tags

order number	Description
CX1900-0200	<p>Universal plastic labels for the CX1000 system (package contains 1000 labels)</p> <ul style="list-style-type: none"> – snaps into the premoulded spots on the CX1000 components – labelling can be done with a X-Y plotter – dimension of the single label 15 x 5 mm – material: white coloured plastic – Murrplastik type KMR 5/15, order number 86401014

Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff Support

Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

- world-wide support
- design, programming and commissioning of complex automation systems
- and extensive training program for Beckhoff system components

Hotline:	+49(0)5246/963-157
Fax:	+49(0)5246/963-9157
e-mail:	support@beckhoff.com

Beckhoff Service

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- repair service
- spare parts service
- hotline service

Hotline:	+49(0)5246/963-460
Fax:	+49(0)5246/963-479
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You will find further support and service addresses on our Internet pages under <http://www.beckhoff.com>.

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e-mail:	info@beckhoff.com

The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages: <http://www.beckhoff.com>

You will also find further documentation for Beckhoff components there.

Certifications

All products of the Embedded PC family are CE, UL and GOST-R certified. Since the product family is continuously developed further, we are unable to provide a full listing here. The current list of certified products can be found on the Embedded PC certificates web page or at www.beckhoff.de under Embedded PC.