C9900-U3x0

Uninterruptible Power Supply (UPS)
for industrial PC with 24 V_{DC} supply voltage

Version: 1.5
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BECKHOFF

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Foreword

Notes on the Documentation

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.
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.

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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.

Delivery conditions

In addition, the general delivery conditions of the company Beckhoff Automation GmbH apply.

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.

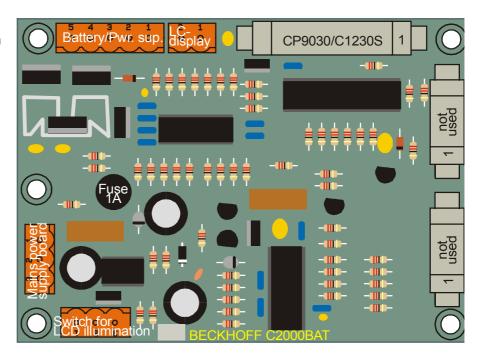|	
DANGER	**Acute risk of injury!!** If you **do not** adhere the safety advise adjoining this symbol, there is immediate danger to life and health of individuals!
WARNING	**Risk of injury!** If you **do not** adhere the safety advise adjoining this symbol, there is danger to life and health of individuals!
CAUTION	**Hazard to individuals!** If you **do not** adhere the safety advise adjoining this symbol, there is obvious hazard to individuals!
Attention	**Hazard to devices and environment** If you **do not** adhere the notice adjoining this symbol, there is obvious hazard to materials and environment.
Note	**Note or pointer** This symbol indicates information that contributes to better understanding.

The C2000BAT UPS control board

Uninterruptible power supply

An industry PC with a 24 V power supply can optionally be fitted with an uninterruptible power supply, which maintains correct operation of the device for about 15 minutes by means of a NiCad battery, after failure of the main power supply. The control is performed by the C2000BAT UPS control board.

Not all connections are used in the application with the C1230S

Battery reverse connection protection

The UPS control board is fitted with a simple form of protection against reverse battery connection. If the battery is accidentally connected with the wrong polarity, high current flows for a short period, and this blows the fuse (3,15 A) on the C2000BAT board. The location of the fuse on the board can be seen in figure 1. There is also a fuse (8 A) inside the battery, to provide short circuit.

Fuse inside the battery

Switch for the LCD background illumination (only older devices, e.g. C20xx, C32xx)

The UPS control board allows the LCD back light to be switched on and off by means of a switch on the side of the housing, or by software through the PIO chips on the C1230S. Switching the LCD back light off can save current under battery operation. If the software has switched the back light off when under battery power, it can be switched on again using the switch.

The NiCad battery (18 V / 0.65 Ah / 1,8 Ah / 2,5 Ah) supplies the device for up to 15 minutes, depending on how fully charged the battery is and on the hardware installed in the IPC, giving the software time to save all its data. This time may be only app. 4 minutes with devices of higher energy consumption.
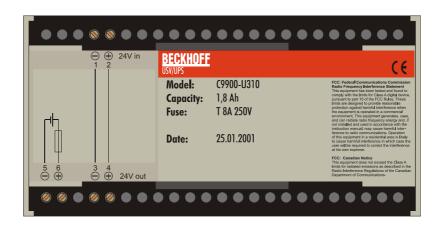
Power pack for Beckhoff IPC with UPS

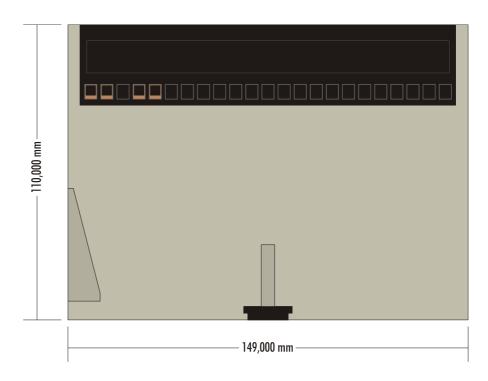There are three types for the uninterruptible power system (UPS):

- C9900-U300: Power pack 18 V / 0,6 Ah
- C9900-U310: Power pack 18 V / 1,8 Ah
- C9900-U320: Power pack 18 V / 2,5 Ah

C9900-U310, C9900-U320
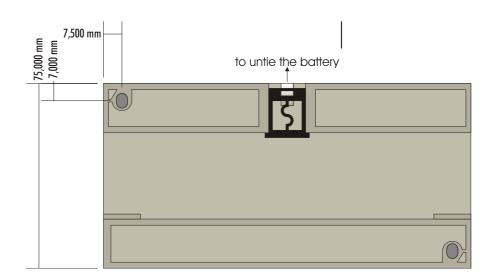
Front view U310, U320

Side view U310, U320

Rear view U310, U320

7,500 mm

75,000 mm

7,000 mm

to untie the battery
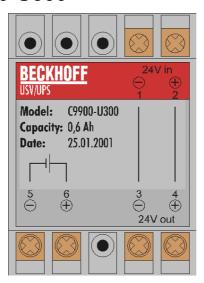
Side view U310, U320
(top-hat rail mounting)

Norm C Schiene
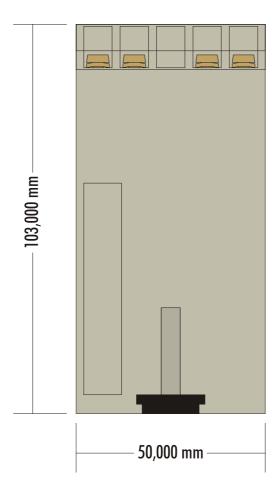
C9900-U300
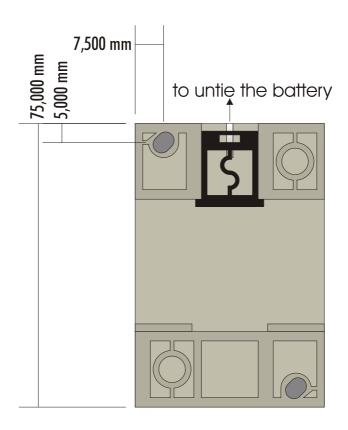
Front view U300
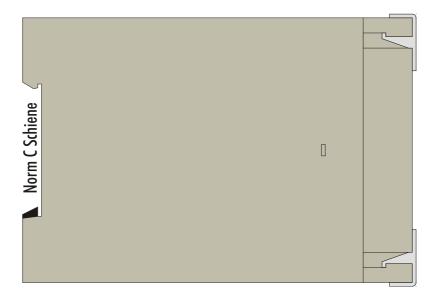
Side view U300

Rear view U300

7,500 mm

75,000 mm

5,000 mm

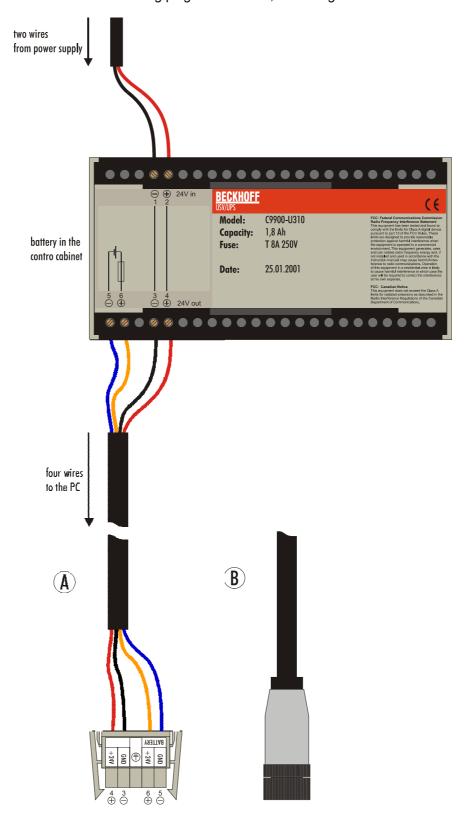to untie the battery

Side view U300
(top-hat rail mounting)

Norm C Schiene

Connecting the Battery

Normally, the battery is mounted in an control cabinet, near to the industrial PC. The fixing on DIN rail enables a simple and quick mounting and demounting.

The connection of the 24 V_{DC} to the battery should be made via a cable with 2 x 1.5mm². The transmission of the 24V_{DC} and the UPS-voltage is made via a cable with 4 x 1.5mm² (see .figure). At the end of the cable, the version of the connecting plug is connected, according to the PC series.

two wires
from power supply

battery in the
contro cabinet

24V in
1 2

BECKHOFF
USV/UPS

Model:	C9900-U310
Capacity:	1,8 Ah
Fuse:	T 8A 250V
Date:	25.01.2001

CE

FCC: Federal Communications Commission
Radio Frequency Interference Statement
This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC: Canadian Notice
This equipment does not exceed the Class A limits for radiated emissions as described in the Radio Interference Regulations of the Canadian Department of Communications.

5 6   3 4
⊖ ⊕   ⊖ ⊕   24V out

four wires
to the PC

Ⓐ   Ⓑ

BATTERY
+24V GND ⊕ +24V GND
4   3   6   5
⊕   ⊖   ⊕   ⊖

Maximum length of the feeder cable

Maximum cable length

The maximum length of the UPS feeder cable must not be longer than
- 4 meters at a conductor cross section of 1.5 mm²!
- 8 meters at a conductor cross section of 2.5 mm²!

Operating conditions

Ambient temperature:
C9900-U300	0 to 40 °C
C9900-U310	0 to 40 °C
C9900-U320	0 to 55 °C

Atmospheric humidity:
C9900-U3x0	Maximum 95 %, non-condensing

Supply voltage:
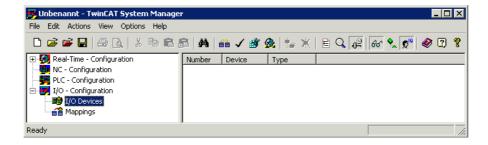|	
C9900-U3x0	from C2000BAT (charge controller)
CP9030	5 V direct voltage ± 5% 12 V direct voltage ±5 %
C1230S:	5 V direct voltage ± 5% 12 V direct voltage ±5 %

Installing the UPS

Two different circuit boards can be used to drive the UPS: the CP-Link card CP9030, or the interface card C1230S. See appendix *technical data* for detailed information.

The UPS can be configured under Windows NT/2000/XP with TwinCAT CP or under Windows 95/98/NT with the ActiveX component CP9090-S100.
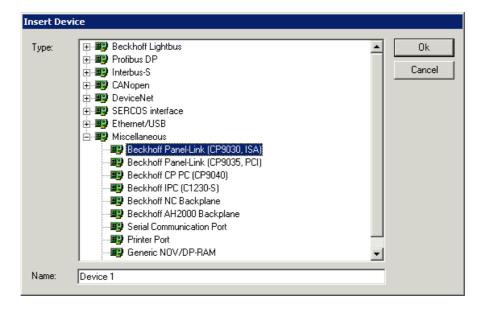
Configuration under TwinCAT
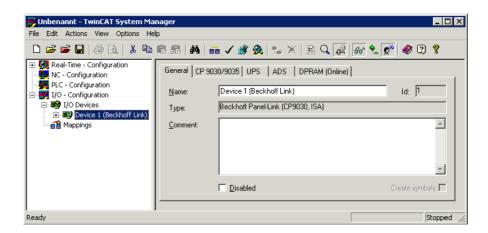
Configure the CP link card CP9030

Start the TwinCAT System Manager and click with the right mouse button onto I/O devices. Choose *append device*.

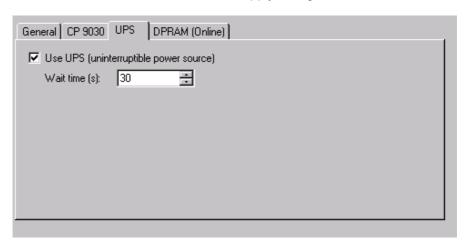Choose the I/O device *Beckhoff Panel-Link (CP9030)*

Make sure, that the address of the driving CP link card is correct. Click onto the tab UPS to complete the configuration of this device.

In order to activate the UPS under TwinCAT, the check box Use UPS must be selected. The wait time dictates the period of time before the PC will shut down after failure of the external supply voltage.

System Manager:
tab *UPS CP9030*

After the settings are made, make sure,
- to create the relations,
- check the configuration and
- safe the settings into the registry

These points can be found in the action menu.
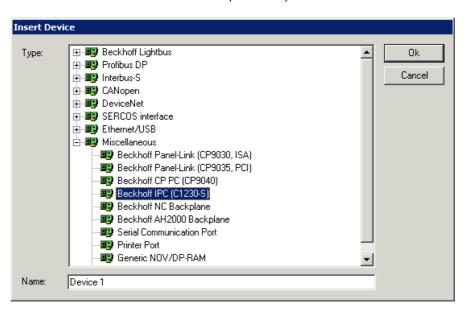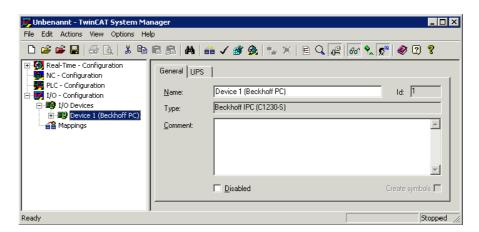
Configure the interface card C1230S

Start the TwinCAT System Manager and click with the right mouse button onto I/O devices. Choose *append device*.
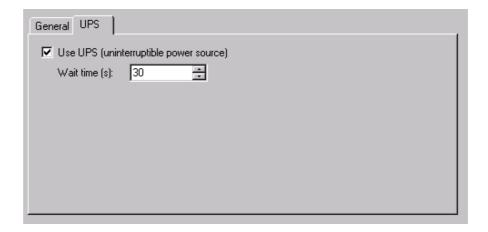
Choose the I/O device *Beckhoff IPC (C1230-S)*

In order to activate the UPS under TwinCAT, the check box *Use UPS* must be selected. The wait time dictates the period of time before the PC will shut down after failure of the external supply voltage.
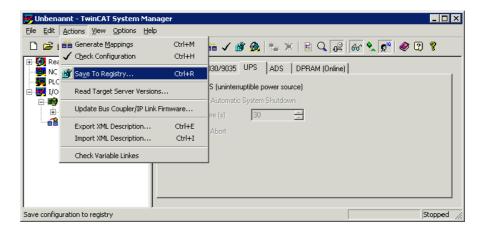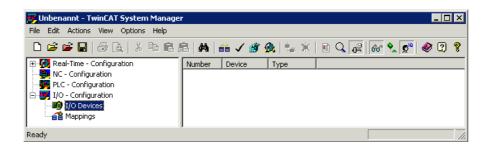
System Manager:
Tab *UPS C1230S*

General | UPS

☑ Use UPS (uninterruptible power source)

Wait time (s): 30

After the settings are made, make sure,
- to create the relations,
- check the configuration and
- safe the settings into the registry
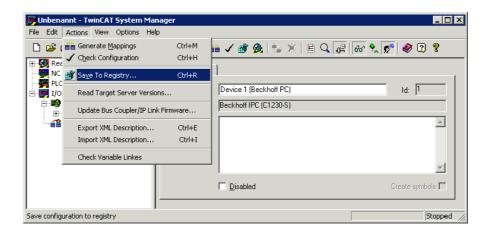
These points can be found in the action menu.

Unbenannt - TwinCAT System Manager

File Edit Actions View Options Help

Generate Mappings   Ctrl+M
Check Configuration   Ctrl+H
Save To Registry...   Ctrl+R

Read Target Server Versions...

Update Bus Coupler/IP Link Firmware...

Export XML Description...   Ctrl+E
Import XML Description...   Ctrl+I

Check Variable Linkes

Device 1 (Beckhoff PC)   Id: 1
Beckhoff IPC (C1230-S)

☐ Disabled   Create symbols ☐

Save configuration to registry   Stopped

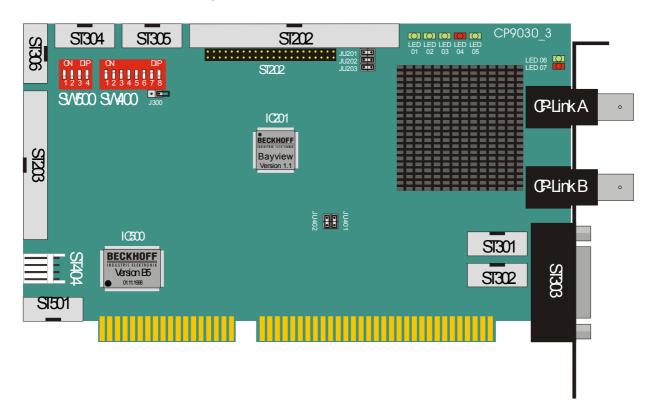# Configuration of the UPS with CP9090-S100

Information about setting the UPS by using the ActiveX component CP9090-S100 may be taken from the documentation CP9090-S100.PDF. It is to be found in the internet on our home page http://www.beckhoff.com under Download/TwinCAT/CP9090.

Technical data

The CP-Link board CP9030 and the interface card C1230S, allow a 24 V UPS (uninterruptible power supply) to be controlled. The connection of the UPS control board C2000BAT to the
- CP9030 is made by the ribbon cable ST501 (connector name)
- C1230S is made by the ribbon cable ST703 (connector name)

Layout of the CP-Link board CP9030

ST501 pin assignment (24 V, UPS control)

PIN	Signal	PIN	Signal
1	GND	6	PA0
2	PCL0	7	PA1
3	PCL1	8	PA2
4	PCH0	9	PA3
5	PCH1	10	PA4

Link label CP9030 → UPS
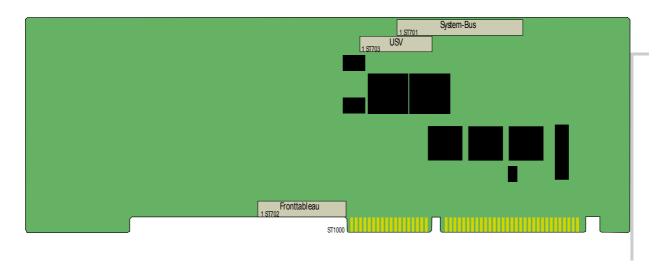
CP9030	PIN	C2000BAT	PIN	CP9030	PIN	C2000BAT	PIN
GND	1	GND	26	UPS-PCL0	2	UPS-activ-passive	24
UPS-PLC1	3	Not used	23	UPS-PCH0	4	Not used	22
UPS-PCH1	5	Not used	21	UPS-PA0	6	Load. controller	20
UPS-PA1	7	Ext.supply OK	19	UPS-PA2	8	Power pack volt.	12
UPS-PA3	9	Not used	11	UPS-PA4	10	Not used	10

Memory allocation in the DPRAM

The mentioned address means the offset from the base address of the CP link card (e.g. CP link card on **&HCC00:0000**, loading controller on **&HCC00:03ED**). Take care about the configuration of the PC, to avoid overlapping with other PC cards.

0x03ED	UPS status	Loading controller					Power pack volt.	Ext. supply OK
		Waiting	Loaded	No power pack	Loading			
0x03EC	UPS control							active

Layout of the UPS interface card C1230S

The charging system

An integrated charger ensures that the battery is always kept fully charged. The charging current is 1/3 of the full capacity, i.e. about 200-800 mA. The charging procedure therefore takes up to 4 hours, depending on the charge already in and the aging of the battery. Overcharging, and consequent damage to the battery, is prevented through the use of an integrated charging controller.

Pin assignment ST 703 UPS

PIN	Signal	PIN	Signal	PIN	Signal
1	PA0	10	PCL1	19	PB6
2	PA1	11	PCL2	20	PB7
3	PA2	12	PCL3	21	PCH0
4	PA3	13	PB0	22	PCH1
5	PA4	14	PB1	23	PCH2
6	PA5	15	PB2	24	PCH3
7	PA6	16	PB3	25	+5V
8	JUMP	17	PB4	26	GND
9	PCL0	18	PB5		

Link label C1230S → UPS

C1230S	PIN	C2000BAT	PIN	C1230S	PIN	C2000BAT	PIN
GND	26	GND	26	UPS-PCL0	9	UPS-activ-passive	24
UPS-PLC1	10	Not used	23	UPS-PCH0	21	Not used	22
UPS-PCH1	22	Not used	21	UPS-PA0	1	Load. controller	20
UPS-PA1	2	Ext.supply OK	19	UPS-PA2	3	Power pack volt.	12
UPS-PA3	4	Not used	11	UPS-PA4	5	Not used	10

Port B (&H231) of the input/output chip carries a signal that provides information about the state of charge. The mentioned I/O port has got a fixed address and can not be reconfigured. The interface card C1230S needs tree I/O port memory ranges: &H220-&H221, &H230-&H231, &H240-&H241. Take care about the configuration of the PC, to avoid overlapping with other PC cards.

Port B							
Address 231H							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Input							
No battery	not used	not used	HGB* 1=ON 0=OFF	USV 0=passive 1=active	not used	not used	not used

The signal from the charge controller provides information about the state of charge.

* HGB: LCD background illumination

The battery charger on the multi-function board can take up the following states:
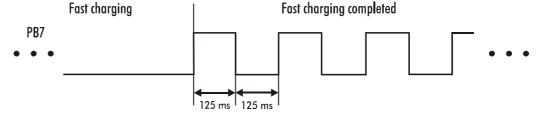
Fast charging

When the operating voltage has been switched on, the charger goes into the fast charging state if a battery is connected. The battery is charged with a constant current of about 200-800mA, depending on the battery type. Bit 7 of port B at address 231H is 0.

Battery not connected

The charger recognises whether or not the battery is connected. If there is no battery connection, bit 7 of port B at address 231H is set.
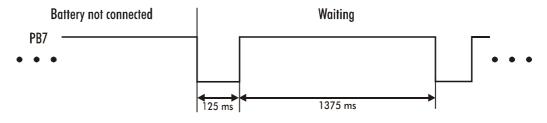
Fast charging completed

If the charging has been ended by the charging controller, bit 7 of port B at address 231H alternates between 0 and 1 with a period of 250 ms.

Waiting

In this state the charging controller waits for the presence of a valid battery voltage. Only then does the quick charging continue. Bit 7 of port B at address 231H alternates between 0 and 1 with a period of 1.5 seconds and a mark-space ratio of 1 to 11.

Appendix

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You will also find further documentation for Beckhoff components there.

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