



Installation and Operating instructions for
19 Inch Rack Mount
Industrial PC C5102 up to -0050

Version: 2.1
Date: 2018-02-16

BECKHOFF

Table of contents

1. Foreword	4
Notes on the Documentation	4
Liability Conditions	4
Trademarks	4
Patent Pending	4
Copyright	4
State at Delivery	4
Delivery conditions	4
Description of safety symbols	5
Basic safety measures	6
Operator's obligation to exercise diligence	7
Operator requirements	7
2. Product Description	8
Appropriate Use	8
Structure	8
Interfaces up to C5102-0040	10
PS/2 Connections	10
Parallel interface	10
Serial interfaces	10
Video connection	10
USB interfaces	10
Network connection	10
Sound-On-Board	10
Additional plug-in cards (optional)	10
Interfaces C5102-0050	11
PS/2 connections	11
Serial interfaces	11
USB interfaces	11
Network connection	11
Sound-On-Board	11
DVI-I (Digital Visual Interface)	11
DVI-D (Digital Visual Interface)	11
DisplayPort	11
Additional plug-in cards (optional)	11
Interfaces behind the front flap	12
Reset pushbutton	12
Keyboard-Lock	12
LEDs	12
USB interfaces	12
Power pushbutton	12
3. Installation Instructions	13
Transport and Unpacking	13
Transport	13
Unpacking	13
Installation of the PC in the control cabinet	14
Power Supply Connection	15
Mains Socket	15
Power supply cords	15
Connecting devices	16
Connecting cables	16
Check voltage rating and connect.	16
4. Operating Instructions	17
Switching the Industrial PC on and off	17
First switching on and driver installation	17
Servicing and Maintenance	18
Cleaning the Industrial PC	18
Servicing	18

Replacing the battery on the motherboard	18
Changing the filter mat	19
Shutting down	19
Disposal	19
5. Troubleshooting	20
Fault correction	20
Service and Support	21
Beckhoff's branch offices and representatives	21
Beckhoff headquarters	21
Beckhoff Support	21
Beckhoff Service	21
6. Assembly dimensions	22
7. Appendix	23
Technical data	23
Approvals	23
FCC: Federal Communications Commission	Radio Frequency Interference
Statement	23
FCC: Canadian Notice	23

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.

Liability Conditions

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. 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.

All pictures shown in the documentation are exemplary. Illustrated configurations can differ from standard.

Trademarks

Beckhoff®, TwinCAT®, EtherCAT®, Safety over EtherCAT®, TwinSAFE® and XFC® are registered trademarks of and licensed by Beckhoff Automation GmbH.

Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents:

EP1590927, EP1789857, DE102004044764, DE102007017835 with corresponding applications or registrations in various other countries.

The TwinCAT Technology is covered, including but not limited to the following patent applications and patents:

EP0851348, US6167425 with corresponding applications or registrations in various other countries.

Copyright

© Beckhoff Automation GmbH & Co.KG.

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization are prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

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 & Co.KG.

Delivery conditions

In addition, the general delivery conditions of the company Beckhoff Automation GmbH & Co.KG 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.

Basic safety measures

Only switch the PC off after closing the software

Before the Industrial PC is switched off, software that is running must be properly closed.

Otherwise it is possible that data on the hard disk is lost. Please read the section [Switching the Industrial PC on and off](#).

 Attention	<p>Switch off all parts of the equipment, then uncouple the fieldbus</p> <p>Before opening the housing of the PC, and whenever the PC is being used for purposes other than plant control, such as during functional tests following repair, all parts of the equipment must first be switched off, after which the Industrial PC can be uncoupled from the plant.</p> <p>Pulling out the fieldbus connection plug uncouples the PC (optional).</p> <p>Items of equipment that have been switched off must be secured against being switched on again.</p>
---	---

The Industrial PC's power supply unit must be supplied with 100 V_{AC} - 240 V_{AC}.

 DANGER	<p>Do not open the power supply unit while voltage is applied!</p> <p>The supply voltage must be switched off before the power supply unit housing is opened.</p>
--	--

 Attention	<p>Do not exchange any parts when under power</p> <p>When components are being fitted or removed, the supply voltage must be switched off.</p> <p>Fitting work on the Industrial PC can result in damage:</p> <ul style="list-style-type: none"> • if metal objects such as screws or tools fall onto operating circuit boards. • if connecting cables internal to the PC are removed or inserted during operation. • if plug-in cards are removed or inserted when the PC is switched on.
---	--

Operator's obligation to exercise diligence

The operator must ensure that

- the Industrial PC is only used for its intended use (see also [Product Description](#)).
- the Industrial PC is in a sound condition and in working order during operation (see also chapter [Servicing and Maintenance](#)).
- the operation manual is in good condition and complete, and always available for reference at the location of the Industrial PC.
- the Industrial PC is operated, maintained and repaired only by sufficiently qualified and authorized personnel.
- the personnel is instructed regularly about relevant occupational safety and environmental protection aspects, and is familiar with the operating manual and in particular the safety notes contained herein.
- none of the safety and warning notes attached to the Industrial PC are removed, and that all notes remain legible.

National regulations depending on the machine type

Depending on the type of machine and plant in which the Industrial PC is being used, there will be national regulations for the control of such machines and plant that the operator must observe. These regulations cover, amongst other things, the intervals between inspections of the controller.

The operator must initiate such inspections in good time.

 Attention	<p>Only trained persons may open the Industrial PC housing!</p> <p>The operator is responsible for ensuring that only trained electrical staff opens the housing of the Industrial PC.</p>
---	---

Procedure in the event of a fault

In the event of a fault in the Industrial PC, appropriate measures can be determined with the aid of the list in the [Fault correction](#) section.

Operator requirements

Read the operating instructions

Every user of the Industrial PC must have read these operating instructions.

Software knowledge

Every user must be familiar with any of the functions of the software installed on the PC that he can reach.

Product Description

Appropriate Use

The C5102 Industrial PC has been designed as a rack mount PC for fitting into 19 inch racks used in machine and plant engineering applications.

Structure

Front view of the C5102



Opening the front flap

In order to gain access to the power pushbutton and to the drives, open the flap on the front with the key provided for the purpose (see photo above).

Rear view of the C5102



 Attention	<p>Only trained persons may open the Industrial PC housing!</p> <p>Before opening the PC housing, the power plug must be drawn.</p>
---	--

 DANGER	<p>Fire enclosure!</p> <p>The Industrial PC is equipped with a fire enclosure. Before switching on the PC, the casing must be closed!</p>
--	--

Opening the housing

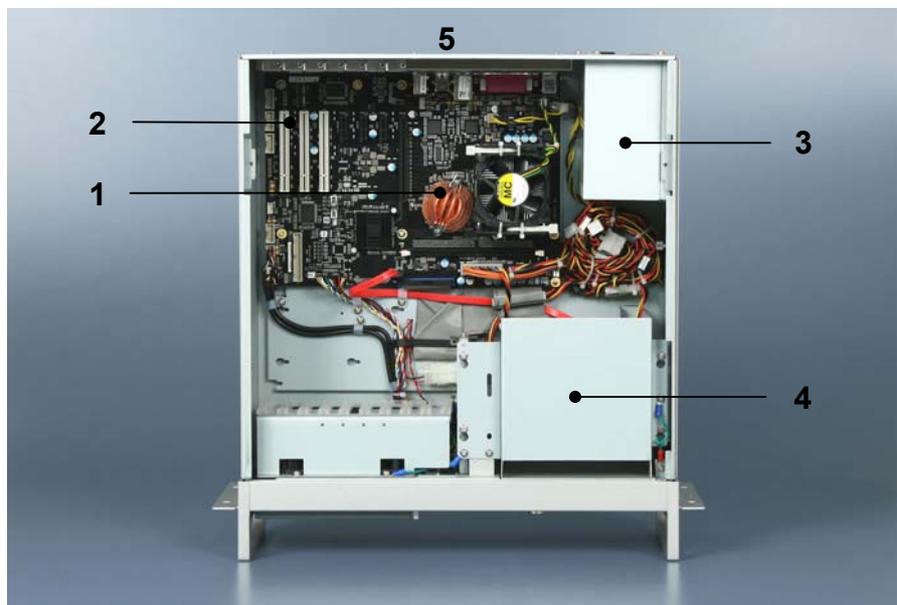
In order to open the PC housing, remove the 4 fastening screws at the side of the housing cover (see photo *Rear view of the C5102*) using a cross-head screwdriver. The cover of the housing can then be lifted up, providing access to the hard drive, processor, memory and plug-in cards, see following photographer.

Removing the card holder



Remove the 2 fastening screws of the card holder (see arrows) using a cross-head screwdriver. The holder can then be lifted up.

View of the open PC



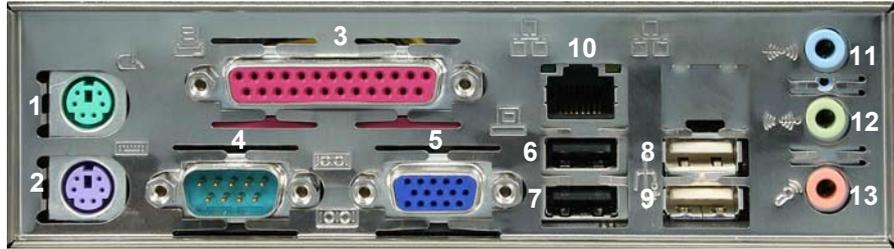
The standard ATX Motherboard (1) with six slots for plug-in cards (2) is located under the housing cover.

The power supply unit (3), the hard drive and the CD/ DVD-drives (4) are easily accessible.

The connections to the outside are located at the rear of the housing (5) and behind the front flap.

Interfaces up to C5102-0040

ATX motherboard
interfaces



PS/2 Connections

PS/2

The upper PS/2 connector (1) allows a PS/2 mouse to be used, while a PC keyboard can be connected to the lower PS/2 connector (2).

Parallel interface

Printer
LPT1

The parallel interface (3) corresponds to the Centronics standard, and is addressed by the software as LPT1.

Serial interfaces

R-S 232
COM1 - COM2

The Basic version of the Industrial PC has two serial interfaces, COM1 (4) and COM2, using the character R-S 232, which are each brought to a 9-pin SUB-D plug connector. The interface COM2 is located in the upper part of the first slot right beside the ATX-slot.

Video connection

Video

A 15-pin SUB-D socket connector (5) allows a VGA monitor to be connected.

USB interfaces

USB1 – USB4

The four USB interfaces (6 - 9) are used to connect peripheral devices with USB connections.

Two more USB interfaces are located behind the front flap.

USB2.0 standard is supported.

Network connection

Network

The RJ-45 connector (10) allows the PC to be connected to a 10/100BASE-T Local Area Network (LAN).

Sound-On-Board

Sound

The Industrial PC has an on-board interface with the following connectors: Line In jack (11), Line Out jack (12) and Microphone jack (13).

Additional plug-in cards (optional)

Type plate

There is a type plate on the top of the Industrial PC which provides information about the hardware configuration of the Industrial PC at the time it was supplied.

Interfaces C5102-0050

ATX motherboard
interfaces



PS/2 connections

PS/2

The upper PS/2 connector (**X104**) allows a PS/2 mouse to be used, while a PC keyboard can be connected to the lower PS/2 connector (**X103**).

Serial interfaces

RS 232
COM1 - COM2

The basic version of the Industrial PC has two serial interfaces, COM1 (**X105**) and COM2, using the type RS 232, which are each brought to a 9 pin SUB-D plug connector. The interface COM2 is located in the upper part of the first slot right beside the ATX-slot.

USB interfaces

USB1 – USB4

The four USB interfaces (**X108 – X111**) are used to connect peripheral devices with USB connections.

Two more USB interfaces are located behind the front flap.

USB2.0 standard is supported.

Network connection

LAN1

The RJ-45 connector (**X112**) allows the PC to be connected to a 10/100/1000BASE-T Local Area Network (LAN).

LAN2

The RJ-45 connector (**X113**) allows the PC to be connected to a 10/100/1000BASE-T Local Area Network (LAN).

Sound-On-Board

Sound

The Industrial PC has a on-board-interface with the following connectors: Line In (**X116**), Line Out (**X115**) and Microphone jack (**X114**).

DVI-I (Digital Visual Interface)

DVI-I out

The DVI connection (**X117**) is used for transferring the video signal. DVI-I standard is supported.

DVI-D (Digital Visual Interface)

DVI-D out

The DVI connection (**X118**) is used for transferring the video signal. DVI-D standard is supported.

DisplayPort

DisplayPort

The DisplayPort (**X119**) is used for transferring the video signal.

Additional plug-in cards (optional)

Type plate

There is a type plate on the top of the Industrial PC which provides information about the hardware configuration of the Industrial PC at the time it was supplied.

Interfaces behind the front flap

Interfaces behind the front flap



Reset pushbutton

Reset-pushbutton

The reset pushbutton (1) allows to reboot the PC.

Keyboard-Lock

Keyboard-Lock

The pushbutton *KB-LK* (2) locks the keyboard.

LEDs

Power

The LED *Power* (3) indicates correct power supply.

HDD

The LED *HDD* (4) indicates HDD access.

KB-LK

The LED *KB-LK* (5) indicates a locked keyboard.

USB interfaces

USB4 – USB5

The two USB interfaces (6) are used to connect peripheral devices with USB connections.

USB2.0 standard is supported.

Power pushbutton

Power pushbutton

The Industrial PC is switched on via the power pushbutton (7).

Installation Instructions

Please also refer to chapter [Foreword](#).

Transport and Unpacking

The specified storage conditions must be observed (see chapter [Technical data](#)).

Transport

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

 <p>Attention</p>	<p>Danger of damage to the unit</p> <p>If the device is transported in cold weather or is exposed to extreme variations in temperature, make sure that moisture (condensation) does not form on or inside the device.</p> <p>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.</p>
---	--

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.

Installation of the PC in the control cabinet

The C5102 Industrial PC is designed for rack mounting in machine and plant engineering applications.

The ambient conditions specified for operation must be observed (see chapter [Technical data](#)).

Preparation of the control cabinet

Four holes for the fixing bolts have to be provided in the control cabinet according to the dimensions of the PC (see chapter [Assembly dimensions](#)).

 <p>Note</p>	<p>Circulation of air</p> <p>When the unit is installed in an enclosure, adequate space for ventilation and for opening the PC must be provided.</p> <p>The clearance above and below the housing must be at least 5 cm in order to ensure adequate ventilation of the PC.</p>
 <p>Attention</p>	<p>Avoid extreme environmental conditions</p> <p>Extreme environmental conditions should be avoided as far as possible. Protect the PC from dust, moisture and heat.</p> <p>The ventilation slots of the PC must not be covered.</p>

Power Supply Connection

Supplied mains power unit The Industrial PC is fitted with a 100-240 V/ 3 A max., 50-60 Hz full range power supply unit (with the option of an uninterruptible power supply UPS).

Current carrying capacity of the 100-240 V power supply unit

Output voltages from the 100-240 V power supply unit	Current loading maximum
+3,3 V	13 A
+5 V stand by	2 A
+5 V	13 A
-5 V	0,3 A
+12 V	6 A
-12 V	0,8 A

Mains Socket

A mains socket is located at the rear of the PC housing in order to connect the power supply.

Socket at the PC housing



Power supply cords

Power cords Europe In the area Europe you use the provided cable with inlet connector for non-heating apparatus to connect the Industrial-PC to the power supply.

Power cords USA / Canada In the area USA / Canada the power supply cable must show the following specifications according to the supply voltage:

Listed, Detachable, maximum 4.5 m (14.76 ft.) long; rated minimum 125 V, 10 A, Type SJT or Type SVT; one end terminates in NEMA 5-15P/-20P grounding-type attachment plug, other end in appliance coupler
or

Listed, Detachable, maximum 4.5 m (14.76 ft.) long; rated minimum 250 V, 10 A, Type SJT or Type SVT; one end terminates in NEMA 6-15P/-20P grounding-type attachment plug, other end in appliance coupler.

Connecting devices



Attention

Power supply plug

The power supply plug must be withdrawn!

Please read the documentation for the external devices prior to connecting them.

During thunderstorms, plug connector must neither be inserted nor removed.

When disconnecting a plug connector, always handle it at the plug. Do not pull the cable!

Connecting cables

The connections are located at the top of the Industrial PC and are documented in the product description chapter.

When connecting the cables to the Industrial PC, proceed according to the following sequence:

- Switch off all the devices that are to be connected.
- Disconnect all the devices that are to be connected from the power supply.
- Connect all the cables between the Industrial PC and to the devices that are to be connected.
- Connect all data transfer cables (if present) to the appropriate plug-in receptacles of the data/telecommunication networks.
- Reconnect all devices to the power supply.

Check voltage rating and connect.

1. Check that the mains voltage is correct.
2. Insert the provided power supply cable into the Industrial PC's power supply socket. Then connect it to a power socket with a grounded earth connection.

Operating Instructions

Please also refer to chapter [Foreword](#).

Switching the Industrial PC on and off

Switch on

The Industrial PC is switched on with the power pushbutton behind the front flap.

Shutting down and switching off

The Industrial PC is switched off when either of these switches is off.

Control software such as is typically used on Industrial PCs permits various users to be given different rights. A user who may not close software may also not switch the Industrial PC off, since data can be lost from the hard disk by switching off while software is running.

 <p>Attention</p>	<p>First shut down, then switch off the PC</p> <p>If the Industrial PC is switched off as the software is writing a file to the hard disk, the file will be destroyed. Control software typically writes something to the hard disk every few seconds, so that the probability of causing damage by switching off while the software is running is very high.</p>
 <p>Attention</p>	<p>Switch off power supply</p> <p>When you have shut down the Industrial PC, you have to switch off power supply for at least 10 seconds before rebooting the system. After resetting power supply the PC will start booting automatically.</p>

First switching on and driver installation

When you switch on the Industrial PC for the first time, the pre-installed operating system (optional) will be started. In this case, all the required drivers for any additional, optional hardware components ordered with the PC will already have been installed.

If the PC was ordered without operating system, you have to install the operating system and the driver software for any auxiliary hardware yourself. Please follow the instructions in the documentation for the operating system and the additional devices.

Servicing and Maintenance

Please also refer to chapter [Foreword](#).

Cleaning the Industrial PC



Attention

Disconnect from power supply

Switch off the Industrial PC and all connected devices, and disconnect the Industrial PC from the power supply.

The Industrial PC can be cleaned with a soft, damp cloth. Do not use any aggressive cleaning materials, thinners, scouring material or hard objects that could cause scratches.

Servicing

The Industrial PC requires no maintenance.

Replacing the battery on the motherboard

A used battery on the motherboard has to be replaced.



WARNING

Danger of Explosion!

Replace battery only with the identical type or an alternative type recommended by the manufacturer. Notice correct polarity!



WARNING

Handling of Lithium Batteries

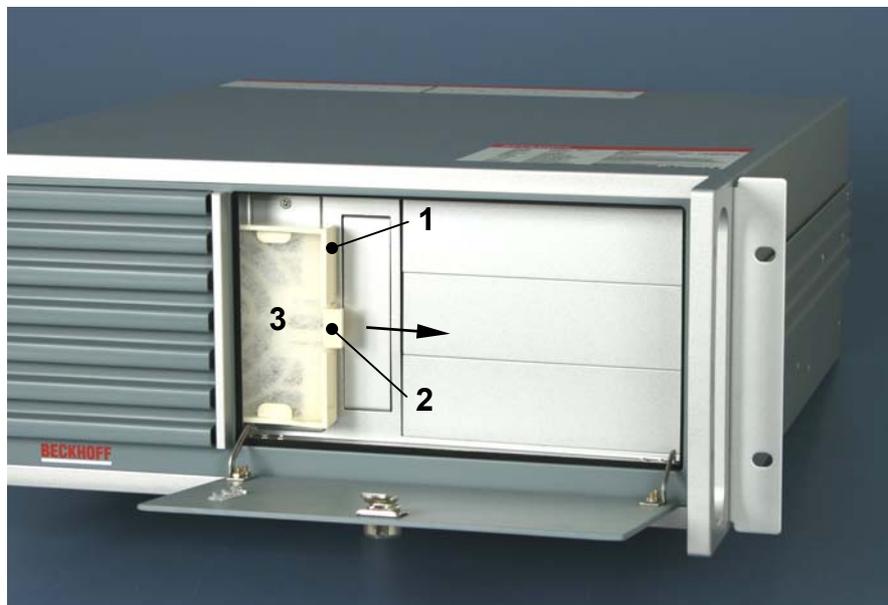
Lithium Batteries should not be recharged, exposed to fire, opened and they should be protected against sunlight and moisture.

The used battery must be disposed of in accordance with national electronics scrap regulations.

Changing the filter mat

If the Industrial PC is used in an environment where the air is particularly dirty, the fan's filter mat should be examined at regular intervals to see how dirty it is, and should be exchanged, if necessary, for an original Beckhoff filter mat (item number C9900-Z213, filter mat for C510x, 10 per pack). Please also refer to chapter [Changing the filter mat](#).

Front view showing the filter drawer



Access to the filter mat

Access to the filter mat is obtained behind the front flap. This must be opened with its key. The filter drawer (1) can then be pulled out towards the right using the retention tongue (2). After the mat (3) has been changed the filter is refitted in the reverse sequence.

Shutting down

Disposal

Dismantling the Industrial PC

The device must be fully dismantled in order to dispose of it. The housing can be sent for metal recycling.

Observe national electronics scrap regulations

Electronic parts such as disk drives and circuit boards must be disposed of in accordance with national electronics scrap regulations.

Troubleshooting

Please also refer to chapter [Foreword](#).

Fault correction

Fault	Cause	Procedure
Nothing happens after the Industrial PC has been switched on	No power supply to the Industrial PC	Check power supply cable
	Other cause	Call Beckhoff Service
The Industrial PC does not boot fully	CD in drive	Remove CD and press any key
	Setup settings are incorrect	Check the setup settings
	Other cause	Call Beckhoff Service
Computer boots, software starts, but control does not operate correctly	Cause of the fault is either in the software or in parts of the plant outside the Industrial PC	Call the manufacturer of the machine or the software
Memory device access error	Faulty CD	Check the disk in another disk drive
	Faulty device	Call Beckhoff Service
The Industrial PC functions only partially or only part of the time, e.g. no or dark picture, but disk drive responds when switching on	Defective components in the Industrial PC	Call Beckhoff Service

Service and Support

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

Beckhoff's branch offices and representatives

Please contact your Beckhoff branch office or representative for [local support and service](#) on Beckhoff products!

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.

Beckhoff headquarters

Beckhoff Automation GmbH & Co. KG
Huelshorstweg 20
D-33415 Verl
Germany

Phone: +49(0)5246/963-0
Fax: +49(0)5246/963-198
e-mail: info@beckhoff.com

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

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

Hotline: +49(0)5246/963-460
Fax: +49(0)5246/963-479
e-mail: service@beckhoff.com

Quote the project number

If servicing is required, please quote the **project number** of your Industrial PC.

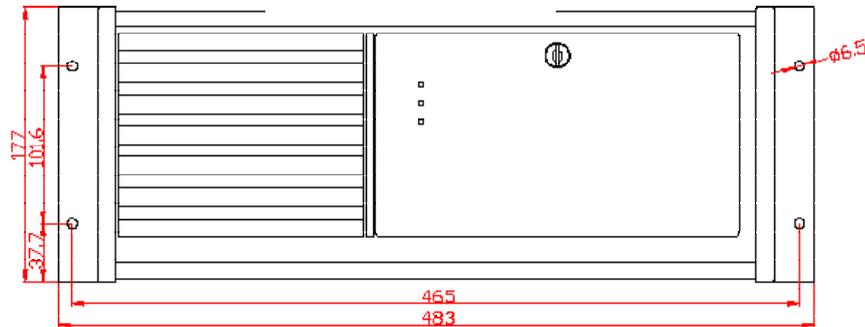
Assembly dimensions

Diagrams of the Industrial PC with dimensions in mm.

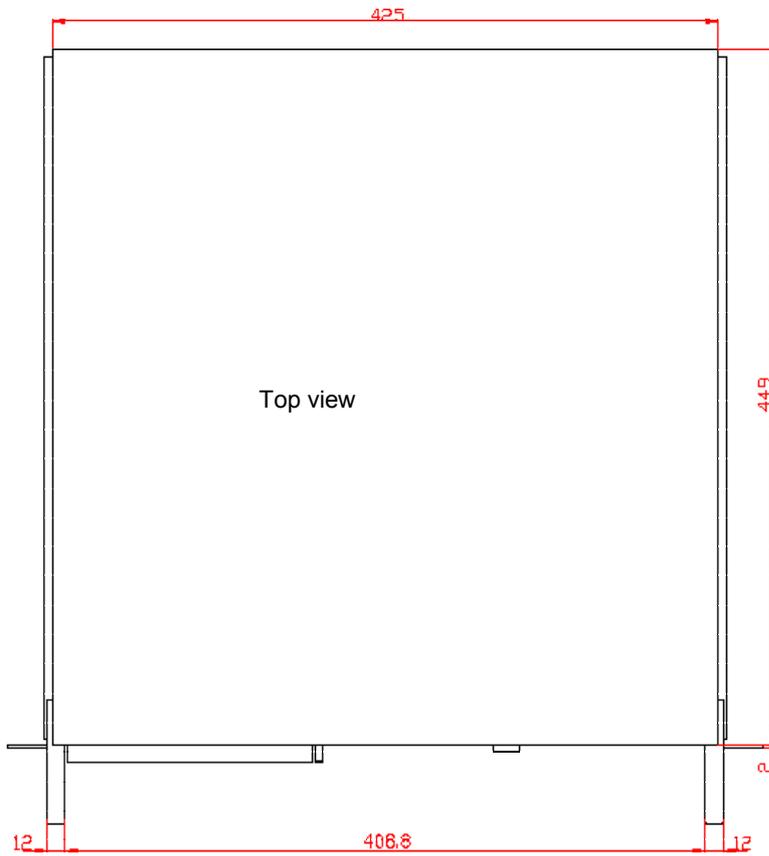
 Attention	<p>Assembly orientation</p> <p>The assembly of the unit must take place with the orientation diagrammed here.</p>
---	--

Industrie-PC C5102

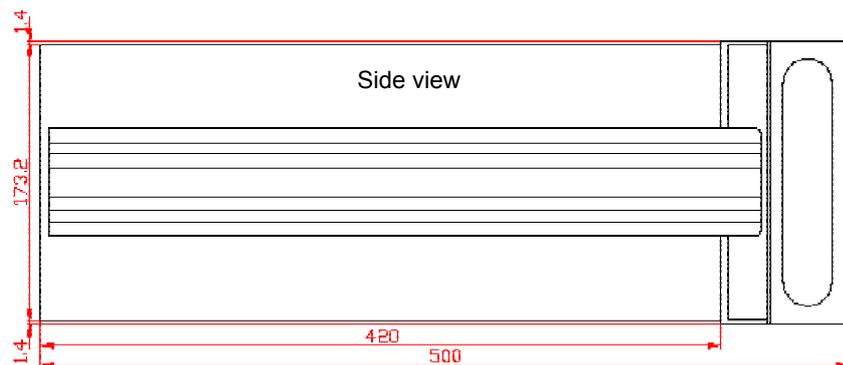
Front view



Top view



Side view



Appendix

Technical data

Dimensions	Dimensions (W x H x D):	483 x 177 x 449 (+ 51 with handles) mm
	Weight:	17.0 kg (basic configuration)
Do not use the PC in areas of explosive hazard	The Industrial PC may not be used in areas of explosive hazard.	
Environmental conditions	The following conditions must be observed during operation:	
	Ambient temperature:	0 to 55°C
	Atmospheric humidity:	Maximum 95%, non-condensing
Shock resistance	Sinusoidal vibration: (EN 60068-2-6)	10 to 58 Hz: 0.035 mm 58 to 500 Hz: 0.5 G (~ 5 m/ s ²)
	During reading of CD-ROM:	10 to 58 Hz: 0.019 mm 58 to 500 Hz: 0.25 G (~ 2.5 m/ s ²)
	Impact: (EN 60068-2-27)	5 G (~ 50 m/ s ²), duration: 30 ms
	During reading of CD-ROM:	5 G (~ 50 m/ s ²), duration: 11 ms
Protection class	Protection class:	IP60 while operation IP20 non-operated
Power supply 100-240 V _{AC} power supply unit	Supply voltage:	100-240 V, 50-60 Hz
	Power consumption:	C5102-0020: 70 W for the basic version C5102-0030: 95 W for the basic version
Electromagnetic Compatibility (EMC)	Interference resistance:	according to EN 61000-6-2
	Emitted resistance:	according to EN 61000-6-4
Transport and storage	The same values for atmospheric humidity and shock resistance are to be observed during transport and storage as in operation. The shock resistance during transport can be improved by means of suitably packing the Industrial PC. The ambient temperature during storage and transport must be between -20°C and +65°C.	

Approvals

FCC: Federal Communications Commission Radio Frequency Interference Statement

FCC Approval for USA

This equipment has been tested and found to comply with the limits for a 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

FCC Approval for Canada

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.