Industrial PC

CPS21_3 / CPS21_4
Interface Conditions

Edition

103

BOSCH

Automation

Industrial PC

CPS21_3 / CPS21_4
Interface Conditions

1070 073 825-103 (02.04) GB

Contents

1   Safety Instructions

Before you start working with the Bosch CPS21_3 or CPS21_4 PC control, we recommend that you thoroughly familiarize yourself with the contents of this manual. Keep this manual in a place where it is always accessible to all users.

1.1   Intended use

This manual contains information required for the proper use of this product. However, for reasons of structural clarity, the manual cannot provide exhaustive details regarding all available combinations of functional options. Similarly, it is feasible to consider every conceivable integration or operating scenario within the confines of this manual.

The described industrial PCs serve as **operating and visualization units** for Bosch proprietary application software running on Microsoft Windows 95 or Microsoft Windows NT 4.0 operating systems. They are intended as control platforms for testing, adjustment and assembly station applications.

While it is possible in principle to operate other proprietary operating systems or application software on the industrial PCs, the occurrence of unexpected effects, even with Bosch applications, cannot be entirely ruled out. With this type of nonstandard operation, Bosch shall not assume any liability for either hardware and/or software.

The products described hereunder

- were developed, manufactured, tested and documented in accordance with the relevant safety standards. In standard operation, and provided that the specifications and safety instructions relating to the project phase, installation and correct operation of the product are followed, there should arise no risk of danger to personnel or property.

- are certified to be in full compliance with the requirements of the
  - COUNCIL DIRECTIVE 89/336/EEC of May 3rd 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 93/68/EEC (amendments of Directives), and 93/44/EEC (relating to machinery)
  - COUNCIL DIRECTIVE 73/23/EEC (electrical equipment designed for use within certain voltage limits)
  - Harmonized standards EN 50081-2 and EN 50082-2

- are designed for operation in an industrial environment (Class A emissions). The following restrictions apply:
  - No direct connection to the public low-voltage power supply is permitted.
  - Connection to the medium and/or high-voltage system must be provided via transformer.

  The operation of Class A devices in private residences, in business or small-industry settings is permitted only if their operation does not produce undue interference with other devices.

☞ **This is a Class A device. In a residential area, this device may cause radio interference. In such case, the user may be required to introduce suitable countermeasures, and to bear the cost of the same.**

Proper transport, handling and storage, placement and installation of the product are indispensable prerequisites for its subsequent flawless service and safe operation.

1.2   Qualified personnel

This instruction manual is designed for specially trained personnel. The relevant requirements are based on the job specifications as outlined by the ZVEI and VDMA professional associations in Germany. Please refer to the following German-Language publication:

Weiterbildung in der Automatisierungstechnik
Publishers: ZVEI and VDMA Maschinenbau Verlag
Postfach 71 08 64
60498 Frankfurt/Germany

The present manual is designed for **engineering personnel** and **PC specialists**. These persons need special knowledge of the configuration and commissioning of electrical equipment.

Interventions in the hardware and software of our products not described in this instruction manual may only be performed by our skilled personnel.

Unqualified interventions in the hardware or software or non-compliance with the warnings listed in this instruction manual or indicated on the product may result in serious personal injury or damage to property.

Installation and maintenance of the products described hereunder is the exclusive domain of trained electricians as per IEV 826-09-01 (modified) who are familiar with the contents of this manual.

Trained electricians are persons of whom the following is true:

- They are capable, due to their professional training, skills and expertise, and based upon their knowledge of and familiarity with applicable technical standards, of assessing the work to be carried out, and of recognizing possible dangers.
- They possess, subsequent to several years' experience in a comparable field of endeavour, a level of knowledge and skills that may be deemed commensurate with that attainable in the course of a formal professional education.

With regard to the foregoing, please read the information about our comprehensive training program. The professional staff at our training centre will be pleased to provide detailed information. You may contact the centre by telephone at (★49) 6062 78-600.

1.3   Safety markings on components

  DANGER! High voltage!

  DANGER! Corrosive battery acid!

  CAUTION! Electrostatically sensitive components!

  Disconnect mains power before opening!

  Lug for connecting PE conductor only!

  Screened conductor only!

1.4   Safety instructions in this manual

DANGEROUS ELECTRICAL VOLTAGE
This symbol warns of the presence of a **dangerous electrical voltage**. Insufficient of lacking compliance with this warning can result in **personal injury.**

DANGER
This symbol is used wherever insufficient or lacking observance of this instruction can result in **personal injury.**

CAUTION
This symbol is used wherever insufficient or lacking observance of instructions can result in **damage to equipment or data files.**

☞   This symbol is used to alert the user to an item of special interest.

★   This asterisk symbol indicates that the manual is describing an activity which the user will be required to perform.

1.5   Safety instructions for the described product

DANGER
Fatal injury hazard through ineffective Emergency-OFF devices!
Emergency-OFF safety devices must remain effective and accessible during all operating modes of the system. The release of functional locks imposed by Emergency-OFF devices must never be allowed to cause an uncontrolled system restart! Before restoring power to the system, test the Emergency-OFF sequence!

DANGER
Retrofits or modifications may interfere with the safety of the products described hereunder!

The consequences may be severe personal injury or damage to equipment or the environment. Therefore, any system retrofitting or modification utilizing equipment components from other manufacturers will require express approval by Bosch.

DANGEROUS ELECTRICAL VOLTAGE
Unless described otherwise, maintenance procedures must always be carried out only while the system is isolated from the power supply. During this process, the system must be blocked to prevent an unauthorized or inadvertent restart.

If measuring or testing procedures must be carried out on the active system, these must be carried out by trained electricians.

CAUTION
Only Bosch-approved spare parts may be used!

CAUTION
Danger to the module!
All ESD protection measures must be observed when using the module! Prevent electrostatic discharges!

Observe the following protective measures for electrostatically endangered modules (EEM)!

- The Employees responsible for storage, transport and handling must be trained in ESD protection.

- EEMs must be stored and transported in the protective packaging specified.

- Out of principle, EEMs may be handled only at special ESD work stations equipped for this particular purpose.

- Employees, work surfaces and all devices and tools that could come into contact with EEMs must be on the same potential (e.g. earthed).

- An approved earthing wrist strap must be worn. It must be connected to the work surface via a cable with integrated 1 MΩ resistor.

- EEMs may under no circumstances come into contact with objects susceptible to accumulating an electrostatic charge. Most items made of plastic belong to this category.

- When installing EEMs in or removing them from an electronic device, the power supply of the device must be switched OFF.

1.6 Documentation, software release and trademarks

Documentation

The present manual contains information on technical data, the operation and configuration of the CPS21_3 / CPS21_4 PC control.

Overview of available documentation	Part no.	
	English	**German**
CPS21_3 / CPS21_4 PC control Interface conditions	1070 073 825	1070 073 815

☞ **In this manual the floppy disk drive always uses drive letter A:, and the hard disk drive always uses drive letter C:.**

Special keys or key combinations are shown enclosed in pointed brackets:
- Named keys: e.g. <Enter>, <PgUp>, <Del>
- Key combinations (pressed simultaneously): e.g. <Ctrl> + <PgUp>

Release

☞ **The software version of Windows NT may be displayed as follows:**
   1. Click with right mouse key on the "My Computer" icon on your desktop
   2. Select menu item "Properties".

Trademarks

All trademarks referring to software that is installed on Bosch products when shipped from the factory represent the property of their respective owners.

At the time of shipment from the factory, all installed software is protected by copyright. Software may therefore be duplicated only with the prior permission of the respective manufacturer or copyright owner.

MS-DOS® and Windows™ are registered trademarks of Microsoft Corporation.

PROFIBUS® is a registered trademark of the PROFIBUS Nutzerorganisation e.V. (user organization).

2   System Overview CPS21_3 / CPS21_4

2.1   Components

The CPS21_3 / CPS21_4 control unit is a complete mechanical unit consisting of:

- closed aluminum housing with
- color LC Display (CPS21_3: 13,8"; CPS21_4: 15"),
- a membrane keyboard with additional operating and display devices and
- a built-in high performance industrial PC.

The CPS21_3 / CPS21_4 is distinguished by the following:

- **being largely fail-safe** (e.g. shock and vibration resistant hard disk suspension , UPS – uninterruptible power supply) and
- **simple maintenance.**

The standard operating system Windows NT 4.0 and the Bosch application software are preinstalled on the CPS21_3 / CPS21_4 (see section 2.3).

Front view CPS21_3

Front view CPS21_4

Housing:	The PC is completely covered by an anodized aluminum housing and is internally and externally equipped with cooling fins. Under the given operating conditions (see section 2.6), this ensures passive cooling for the integrated PC.
Frame and Handles:	A plastic frame is connected to the housing by 2 hinges. A handlebar with three navigation buttons is fastened on each side – left and right – of the frame in order to provide a user friendly operation. On its rear side, the PC is fastened to the plastic frame.
Front panel:	Display, membrane keyboard and the PC which, at its rear side, is fixed to the plastic frame are fastened to the front panel. If the frame and the front panel are swung to the side, the display and the hard disk can easily be replaced after the PC box has been removed (see section 8).
Insertion-labels:	Up to five labels are available for **individual** button description.
Suspension:	The entire unit is suitable for floor or suspended mounting. (refer to section 4.3).

CPS21_3

Tilt/tip adapter

LEDs

Battery (internal)

BOSCH   CPS 21

13.8" Color TFT Display

Navigation keys

Handle   Front panel   Keyboard   Handle

Aluminum housing   PC (internal)   Plastic frame

CPS21_4

Tilt/tip adapter

LEDs

Battery (internal)

15" Color TFT Display

Navigation keys

P1 P2 P3 P4 P5 P6 P7 P8

BOSCH

CPS 21

Handle

Front panel   Keyboard   Handle

Aluminum housing   PC (internal)   Plastic frame

2.2   Technical Data

☞ **All specifications are subject to change as a result of technological de-velopments. This also means that components providing higher than the specified performance (e.g. a faster processor) may be integrated in the devices without explicit reference in this documentation.**

Feature	CPS21_3 / CPS21_4
Processor	≥ Intel Pentium 266 MHz with MMX™ tech-nology (socket 7) or compatible CPU
Second level cache	512 KB
Random Access Memory (DIMM-modules)	128 MB SDRAM
Hard Disk	≥ 3.2 GB (IDE)
Display	13.8" Color-TFT (CPS21_3) or 15" Color-TFT (CPS21_4) with non–reflecting and scratch–resistant front screen
3 expansion slots	PCI / ISA: 3 / 0 or 2 / 1, ex works including 2 PCI cards
Power supply	24 VDC
UPS (uninterruptible power supply)	via integrated rechargeable battery pack (2 series-connected 6 V battery packs)
Interfaces (for detailed information, refer to Section 6)	4 x serial, 1x parallel, PS/2-keyboard and mouse Ethernet, USB, key codes via 24 V out 2 x CAN bus and 1 x busmaster (via expansion slots)
Weight:	approx. 18.8 kg (without adapter)
Dimensions	Housing external: 509 x 432 x 177 mm
	PC housing: 448 x 195 x 101 mm
	Front panel: 499.5 x 409.5 x 5 mm
Operating system	Windows NT4.0

2.3 Software

☞ **For subsequent loading of software and for data backup, a floppy disk drive or the connection to an Ethernet network is necessary. The drive can be purchased separately.**

BIOS software

The BIOS software is licensed by **Phoenix**. With the BIOS software, the PC boots until it finds an operating system that provides a more convenient and user–friendly platform for running the application software.

The BIOS setup must not be altered. It is documented in the manual "BT150, BT200, BT250, CPS21_3 Software Configuration".

Operating system

The CPS21_3 / CPS21_4 has been equipped and tested with the following operating systems from Microsoft Corp.:

● **Windows NT** (version 4.0), including possibly necessary NT service releases from Microsoft Corp.

Utility programs

Additionally, the following utility program is installed:

● **UPS$_{NT}$** – Uninterruptible Power Supply Program for Windows NT (is not part of the Windows NT operating system software).

Application software

The following optional Bosch software is available:

Application		CPS21_3 / CPS21_4
PCL	Software PLC	●
MMI-Madap	Software for control and diagnosis of plant	on request
WinSPS	PLC programming software	on request
WinCan	Fieldbus parameter assignment for CAN bus	on request
TSWIN	Programming interface for operating terminals	on request

● = available;

2.4   Expansion Cards

The CPS21_3 / CPS21_4 has 3 slots for expansion cards with a maximum length of 180 mm:

- 2 PCI BUS cards and
- 1 combination slot for 1 PCI **or** 1 ISA BUS card
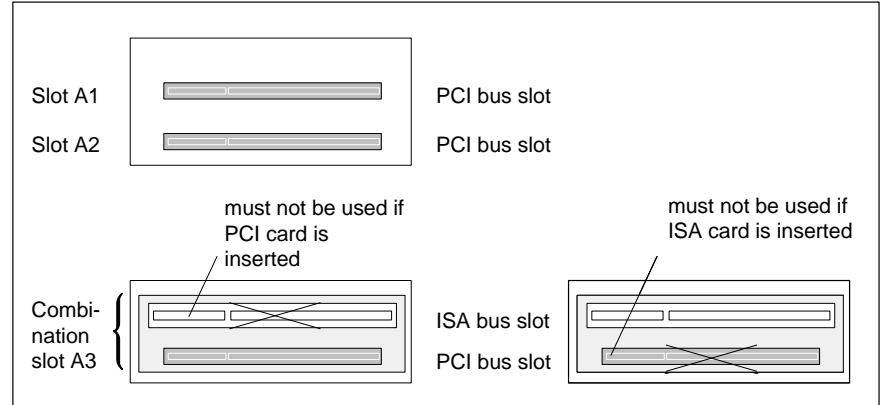
CAUTION
Destruction of an expansion card or the motherboard!
PCI and ISA cards must never be inserted simultaneously in the PCI/ISA-BUS combination slot!

The following expansion cards are used in the CPS21_3 / CPS21_4:

- PCI-CAN card: – CAN bus interface
- PCI_BM-CAN card: – CAN bus interface
                            – busmaster interface
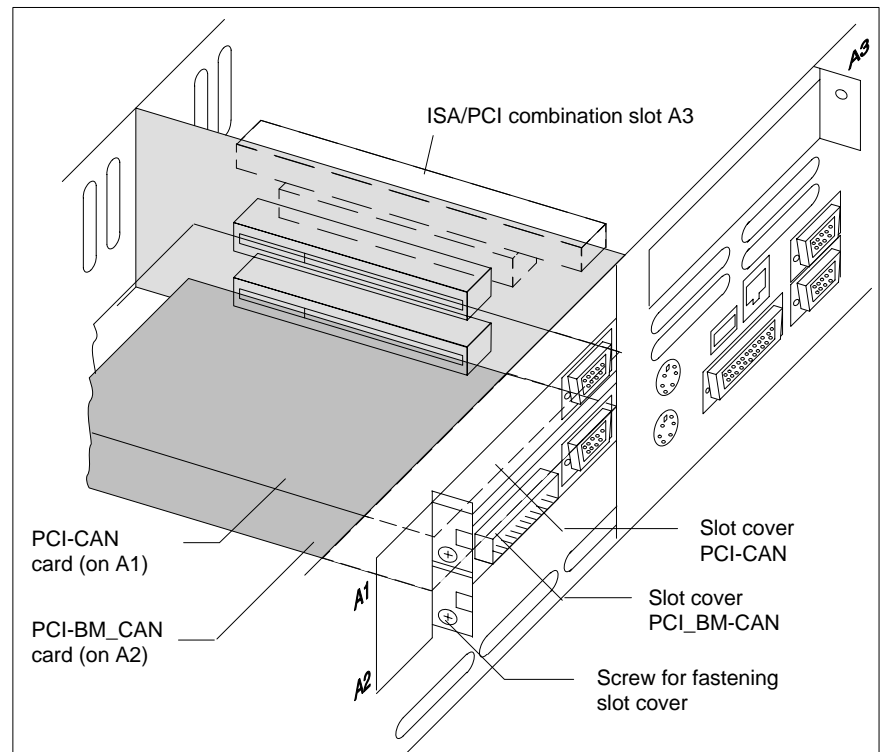
☞ **For interfaces, refer to section 6.14.2**

In order to use other expansion cards, a driver software that is recommended by the card manufacturer might be necessary.

CAUTION
Using unauthorized expansion cards may result in damage to the PC and/or the application software.
Please use only approved expansion cards, and have them installed by a specialist.

2.4.1 BIOS Setup

PCI slot x

In the BIOS submenu called "The Advanced Menu / PCI Configuration sub menu" you can assign the interrupt request (IRQ) address to a specific PCI slot. At the same time, the number of the IRQ address also defines the priority. If only PnP cards are used, then the BIOS setup "**AUTO**" must be maintained.

BIOS selection:PCI IRQ line 1, PCI IRQ line 2, PCI IRQ line 3, PCI IRQ line 4

Option: Disabled, Auto, IRQ: 3, 4, 5, 7, 9, 10, 11, 12, 14, 15,

Default: AUTO

ISA slot (IRQ)

In the BIOS submenu "The Advanced Menu / PCI Configuration sub menu / PCI/PNP ISA IRQ Resource Exclusion / IRQx", the IRQ Address for Legacy ISA cards (ISA cards without plug-and-play capability) can be assigned **permanently**.

BIOS selection: IRQ:3, 4, 5, 7, 9, 10, 11, 15

Option: Available, Reserved

Default: Available

ISA slot (UMB)

In the BIOS menu "The Advanced Menu / PCI Configuration sub menu /PCI/PNP ISA UMB Region Exclusion" you can reserve a specific upper memory block for Legacy ISA cards (without "plug–and–play" capability) .

BIOS selection: C800 - CBFF, CC00 - CFFF, D000 - D3FF, D400 - D7FF, D800 - DBFF, DC00 - DFFF

Option: Available, Reserved

Default: Available

CAUTION
 Address conflicts (IRQ, memory access, I/O address) may cause destruction of motherboard or ISA cards!
Please follow the instructions provided by the card manufacturer. If necessary you must make new configuration settings in the BIOS and in the operating system (e.g. Windows NT control panel).

2.5 Rechargeable Battery Pack

The CPS21_3 / CPS21_4 is equipped with a rechargeable battery pack (composed of 2 series-connected 6V rechargeable batteries) that ensures a controlled shutdown of the PC operating system by means of the uninterruptible power supply (UPS), in the event of a power failure. This prevents data losses in the PC's random access memory.

☞ **UPS, refer to section 3**

The rechargeable battery pack is located on the back of the front panel, next to the PC in the aluminum housing. It is connected to the X19 connector on the carrier board by a 2-conductor cable.

Charging function

During standard operation, the rechargeable battery pack is recharged by means of a charging circuit. If the rechargeable battery pack (2.5 Ah) is absolutely empty, the charging process lasts 5 hours.

The number of charging cycles that the rechargeable battery pack can withstand and therefore its useful life, depend on the ambient temperature in which the battery pack is used. Ambient temperature here is defined as the one in which the operating terminal is situated, e.g. the temperature in the control cabinet or in the operating housing.

The following table can be used as a guideline:

Ambient temperature	Charging cycles	Maintenance interval
+ 25 °C	4000 cycles	6 years
+ 35 °C	2000 cycles	3 years
+ 45 °C	1000 cycles	1.5 years

☞ **If there is some uncertainty concerning the temperature conditions of the operating terminal, then we recommend exchanging the battery pack every 1.5 years.**

Replacing the battery pack

For position and replacement of installed battery, refer to section 8.2.3.

Charge level

With the UPS$_{NT}$ software program that can be called up via an icon on the Windows NT status bar, a number of status data and settings related to the UPS and battery operation can be read off (refer to section 3.3):

- Charging cycles: Number of previously performed charging cycles (shutdown count).
- Checking the battery   Presence of a rechargeable battery pack is charge level: checked with each system startup (e.g. rechargeable battery pack not defective, no cable break, positive plug contact)
- UPS interface: COM4

In case of an insufficient level of charge, it might be necessary to replace the battery packs.

2.6   Operating Conditions

The CPS21_3 / CPS21_4 is designed for continuous 24 hours/day operation. The display backlight can be switched off.
Unless stated otherwise in individual sections of this manual, the following specifications apply:

Temperatures

Storage temperature:

–20°C   to +60°C

Ambient temperature: (outside the aluminum housing)

+5°C   to +35°C (basic unit)

+5°C   to +40°C (with external fan kit)

Ambient temperatures apply to installation conditions described in section 4.
Temperature fluctuations of up to 3°C per minute are permitted.

CAUTION
Excessive operating temperature!
Please do not expose the housing of the CPS21 to direct sunlight or other sources of heat radiation!

Humidity

Climate class 3K3, to EN 60721, condensation not permitted.

Clearances and creeping distances In accordance with prEN50178 (11/96) at pollution level 2

Atmospheric pressure

Operation at up to 2000 m above sea level, to DIN 60204

Degrees of Protection

Front panel: IP 65, otherwise IP 54

Resistance

∫ll surfaces are resistant to abrasion and media such as:

- Solvent naphtha (CH20V3)
- n-Heptane
- Test oil (VS15665)
- Hydraulic oil
- Lubricants
- Water

CAUTION
Conditions hazardous to the product!
The ambient air must be free of electrically conductive pollutants (e.g., acids, alkali, corrosives, salts, metallic vapors, etc.).

Vibration resistance during operation

Frequency range: 10...150 Hz
Deflection: 0.075 mm at 10...57 Hz, according to EN 60068-2-6
Acceleration: 1 g   with 57...150 Hz

Impact resistance

15 g, according to DIN IEC 68-2-27, no functional interruption

2.7 Applicable Standards

The CPS21 system components comply with the following standards:

- EN 60,204-1   Electrical systems on machines
- EN 50,081-2   Basic specification for interference emission (industrial environment)
- EN 50 082-2   Basic technical standard, interference resistance (industrial environment)
- EN 60,742   Tranformer for 24 V power supply, safety isolation
- EN 61,131   24 V output requirements
- EN 61,131-2   Requirements for 24 VDC power supply
- EN 418   Machine safety, EMERGENCY–OFF devices
- EN 60,529   Protection categories (incl. housings and installation compartments)
- EN 60 721   Classification of environmental conditions
- EN 60 068-2-6   Vibration test
- EN 60068-2-27   Impact test
- .IS.114   X-ray radiation directive, as per Official Federal Gazette

☞ **When leaving the plant, CPS21_3 / CPS21_4 complies fully with CE certification requirements.**
However, the subsequent insertion of additional expansion cards will necessitate a new CE certification.

3   Safety Functions

3.1   Temperature Monitoring

The temperature inside the CPS21_3 / CPS21_4 must not exceed +45°C (refer to section 2.6). For safety reasons, the PC features a temperature monitoring function that measures the temperature inside the aluminum housing.

If the **temperature** inside the housing **exceeds +50°C**, a temperature warning is issued:

- via the red flashing LED "TEMP" on the front panel of the operating terminal
- via a window displayed by the operating system.
  This message must be interpreted by all application programs as well, especially by I/O processes. Bosch application programs comply fully with this requirement.

The temperature warning function can be disabled via the program:

- UPS$_{NT}$ for Windows NT 4.0 (refer to section 3.3).

If the **temperature > inside the housing exceeds >65°C**, the control terminal is **shut down and switched off** via the UPS logic circuits (refer to section 3.2).

3.2   Function of Uninterruptible Power Supply (UPS)

In the event of a power failure or a temperature condition above 65 °C (refer to section 3.1), the UPS logic circuit in the CPS21 power supply will facilitate a safe shutdown of the PC operating system with the aid of the rechargeable batteries.

Operating power will be drawn from rechargeable batteries (provided that the batteries are working correctly) as soon as a **voltage dip in excess of 20 ms** has occurred.

☞ **The UPS logic circuit of the CPS21 power supply is designed to ensure the proper termination of all active application programs, followed by a safe shutdown of the operating system. The UPS is not designed, however, to maintain the operation over a longer period of time!**

⚠ **DANGER**
In the event that rechargeable batteries are found to be missing, defective or in a discharged condition, a voltage dip exceeding 20 ms will trigger a RESET of the CPS21 without prior warning!
Possible consequences might be uncontrolled machine movements and loss of data.

Users are advised to check the rechargeable batteries for proper charge levels at regular intervals!

Power failure interval shorter than 800 ms

In the event that the mains power returns within the waiting interval of 800 ms, the power supply unit will again switch to standard operation.
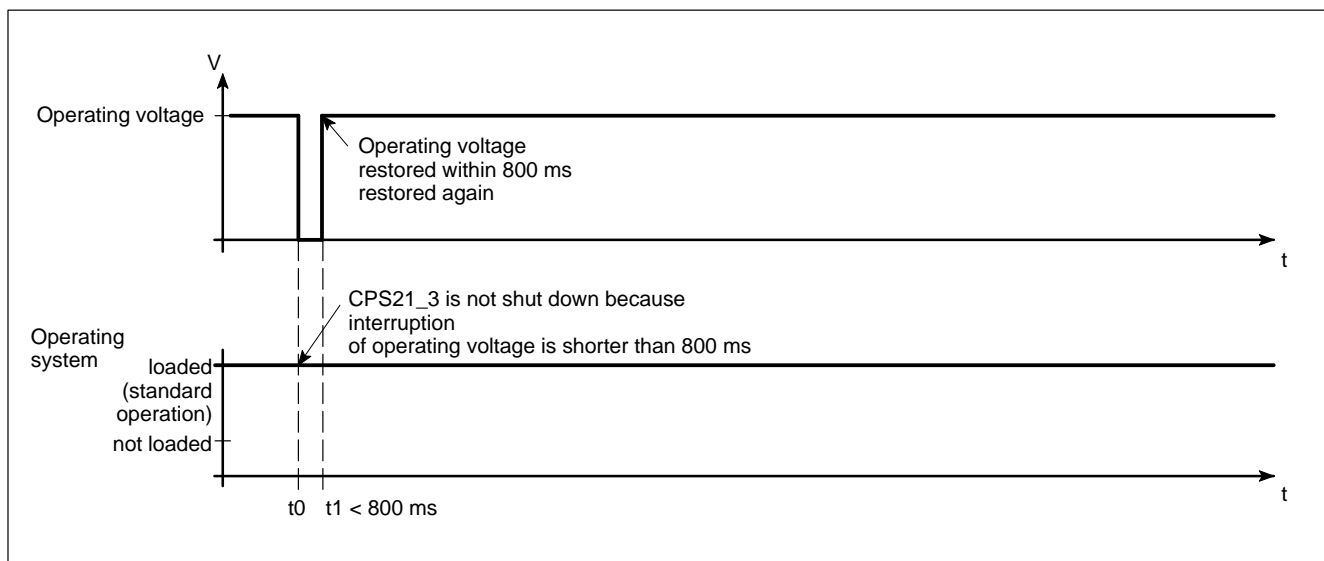
Power failure interval between 800 ms and 60 sec

A power failure interval exceeding 800 ms causes the operating system to be shut down **after** a preset time (Delay Time). If the mains voltage returns within 60 sec. the UPS will interrupt the operating voltage for an additional 8 sec. When point t3 has been reached, the operating system is again started up.
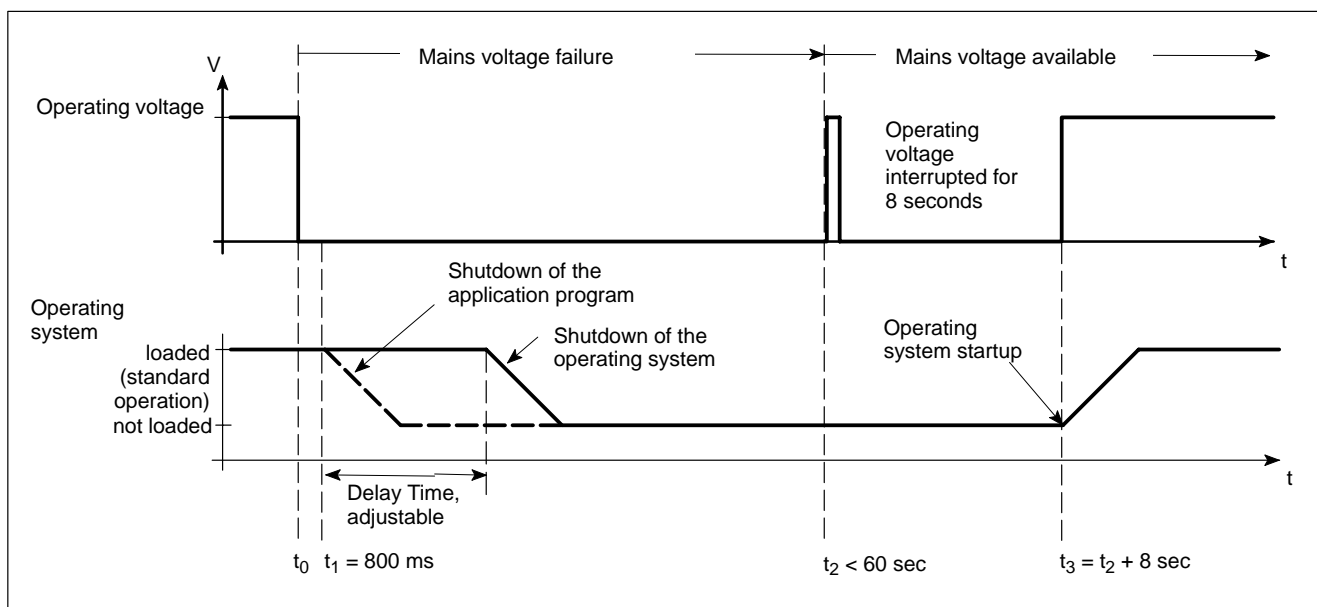
Power failure interval exceeding 60 sec

When approx. 60 seconds have elapsed, the UPS will internally de-energize the power supply.
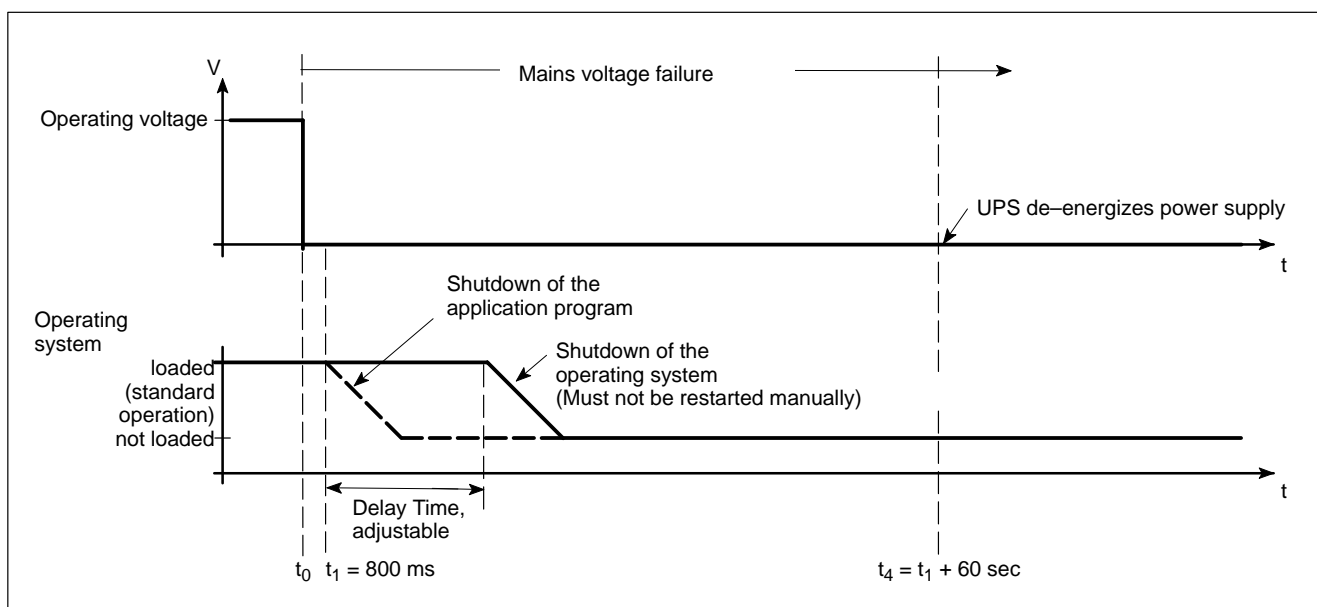
☞ **Setting the Delay Time is done in the "UPS$_{NT}$" software (refer to section 3.3.2).**

3.3   UPS Program

3.3.1   Function

The "UPS$_{NT}$" program (Uninterruptible Power Supply) serves to control and monitor the integrated uninterruptible power supply. In addition, the program checks the functioning of the rechargeable battery and controls the system's temperature monitoring function.

Program and UPS communicate via the COM4 serial port.

In case of a power failure, it is the UPS program's task within a preset time (Delay Time: max. 60 seconds)

- to provide a message to all active applications on the control terminal, enabling them to be terminated either by the user or by means of special application routines, and

- to shut down the operating system after expiration of the Delay Time. When the voltage monitoring function has responded, the system shut down can no longer be avoided.

Closing down all active applications prevents loss of data in case of sudden power failure.
After a maximum of 60 seconds, the UPS shuts down the CPS21_3 / CPS21_4 power supply unit if the mains voltage has not yet returned (refer to section 3.2 Function of uninterruptible power supply).

CAUTION
Restarting the system manually leads to loss of data!
The UPS turns off the CPS21_3 / CPS21_4 in any case. Consequently the dialog "Restart" must not be activated after the shutdown of the operating system.
In case of a voltage failure that lasts less than 60 seconds, the operating system restarts automatically.

During normal operation, the operator does not have access to the UPS$_{NT}$ program. It can only be operated and parameterized by persons with special administrator rights and after restart of the operating system.

☞ **Modifications to the UPS$_{NT}$ parameters require the prior consent of Bosch.**

3.3.2   Operation

☞ **Administrator rights are required for operation!**

Start/Stop

When starting Windows NT, the UPS$_{NT}$ program is launched **automatically**.

For interrupting, shutting down or restarting the service (e.g. for new installation or update), select "Services" from the "Control Panel" window (see the following illustration, left of UPS$_{NT}$ Control).

In the Services window of Windows NT, the status of the UPS$_{NT}$ Service is displayed:

- UPS$_{NT}$ stopped: Status column is empty
- UPS$_{NT}$ started: Status column displays "Started"

Start and stop the selected entry UPS$_{NT}$ Service with the Start and Stop buttons, respectively.
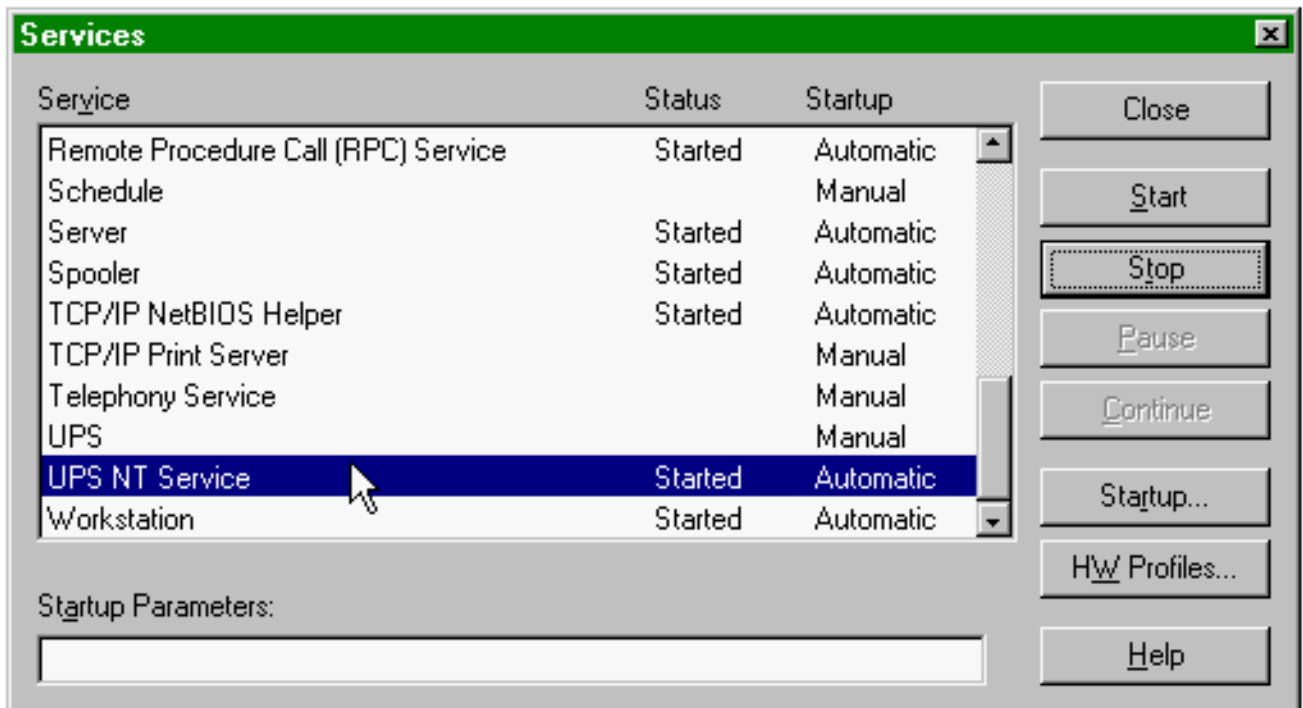
☞ **The UPS$_{NT}$ program always runs as a Windows NT service**. **Changing the user has no influence on this. A user without Administrator privileges is neither able to terminate the program nor to stop the monitoring function.**

Configuration

In order to configure UPS$_{NT}$, select "UPS NT Control" from the "Control Panel" window (see below).
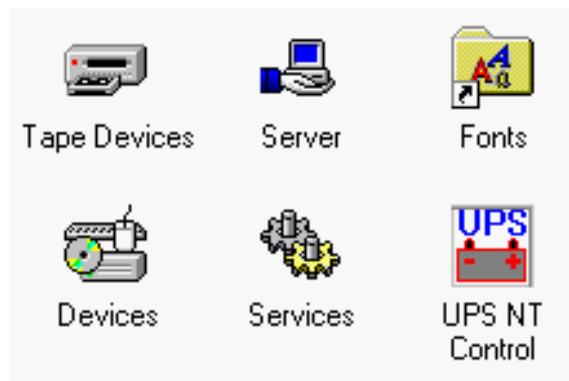
The dialog "UPS NT Configuration" determines the start and runtime behavior of UPS control.
The individual values of the configuration are stored in the Registry. The parameters can be changed at any time.

☞ **After modifying the parameters, the UPS program must be stopped and restarted in order to become operative.**
This can be achieved by restarting the computer or with the help of the Services manager.
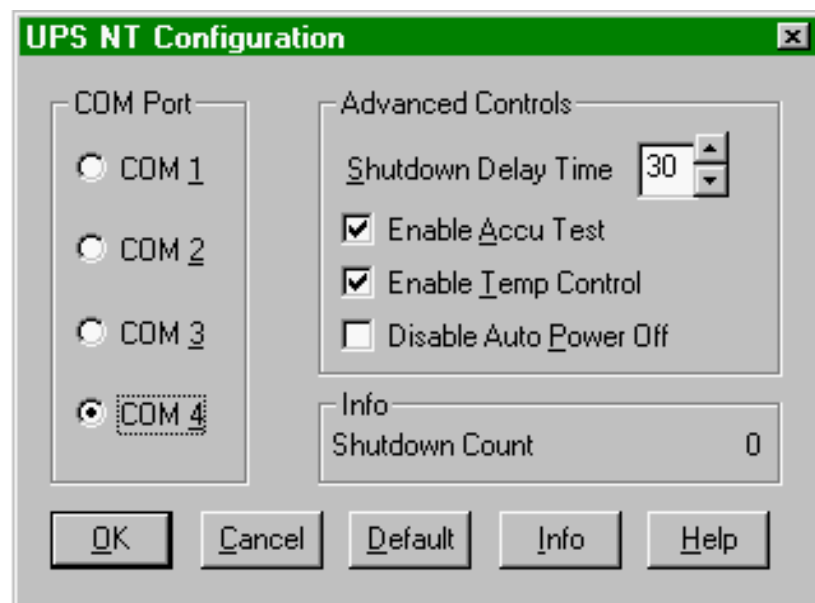
☞ **For details and parameter settings refer to section 3.3.3 .**

3.3.3   Parameter Settings

COM Port

The UPS program is always connected to the UPS via the COM4 serial port.

UPS Shutdown Parameter

Smart Shutdown

When the Power Down signal has been received from the UPS, the Delay Time starts.

Shutdown Delay Time

Here the time (0 to 60 seconds) for **delaying the shutdown is entered**. Within this time frame, a request to close down is sent to all open windows. During this time, the user can save his data. When the Delay Time has expired, all application programs are shut down without further notice!

When choosing the Delay Time, make sure that the time between the end of the Delay Time and the end of the 60 seconds after the Power Down Signal is long enough to shut down the operating system (close all Windows system files and make backups). If the period of time chosen is too short, the shutdown process is interrupted because the UPS interrupts the power supply of the CPS21_3 / CPS21_4. This might lead to data loss.

CAUTION
On expiry of the Delay Time, the operating system is shut down without further notice. Data from open application programs that has not been backed up, is lost.

Advanced Controls

Enable Accu (i.e. Rechargeable Battery) Test

If this checkbox is activated, the system tests the rechargeable battery pack with each new start.

In the case of a faulty battery pack (e.g. defective battery pack, cable break, plug not connected), battery monitoring is disabled. The UPS program continues only with its temperature monitoring function.
If temperature monitoring is not activated, the UPS program is shut down.

☞ **A message that the rechargeable battery pack is empty is displayed.**

Enable Temp Control

If this checkbox is activated, the system temperature is monitored permanently. If the system temperature is exceeded, the following warning is displayed:
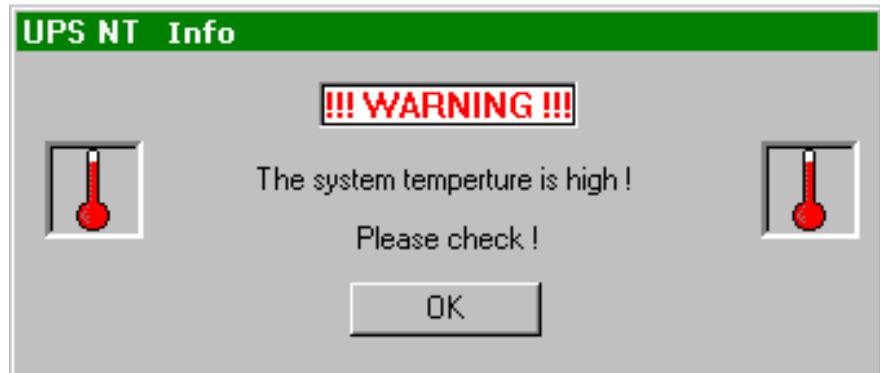
After a temperature warning, the UPS program is reactivated. During this reactivation period of about 2 seconds, voltage monitoring does not take place although the battery pack is functioning correctly.

Disable Auto Power Off

The function "Disable Auto Power Off" makes sense only during system start-up or during software installation. Make sure that the checkbox is deactivated during normal operation!

CAUTION
Loss of data!
If this checkbox is activated, a regular shutdown of the operating system is not possible after a voltage breakdown. The CPS21_3 / CPS21_4 shuts down immediately!

Info

Shutdown count

The displayed value shows how often the system was shut down by UPS, i.e. how many charging cycles the battery has been subjected to. More details regarding after how many charging cycles it is necessaary to replace the rechargebale batteries is contained in section 8.2.3.

Default Setting UPS$_{NT}$

With this button, the **standard values** of the dialog elements can be preset.

These are:

- COM port: COM4
- Shutdown Delay Time: 30 sec
- Accu Test (battery test): active
- Temp Control: active
- Disable Auto Power Off: inactive

4   Installation

When installing, please observe the applicable standards and operating conditions in sections 2.7 and 2.6.

CAUTION
Conditions hazardous to the product!
The ambient air must be free of electrically conductive pollutants (e.g., acids, alkali, corrosives, salts, metallic vapors, etc.).

☞ **Note**

- **The use of silicon-based sealing compounds, adhesives and insulating agents is prohibited.**
- **Ensure that the installation is easy to maintain, i.e. that it provides unrestricted access to connecting cables and fuses.**
- **Prior to installation, please write down the information on equipment rating plates. In the event that rating plates are hidden from view as a result of the installation, you will still have quick access to this information whenever required.**

4.1   Installed Positions and Clearances

Housing:	Front panel:	Protection category IP 65
	Aluminium housing:	Protection category IP 54
Weight:	approx. 18 kg	
Installation position:	vertical, 0° up to max. ±45° inclination	
Installation type:	floor or suspended installation, sealed according to IP 54.	

☞ **Please remember that the front panel may become dirty more readily if installed at an angle.**

Install. position max. ±45° incline
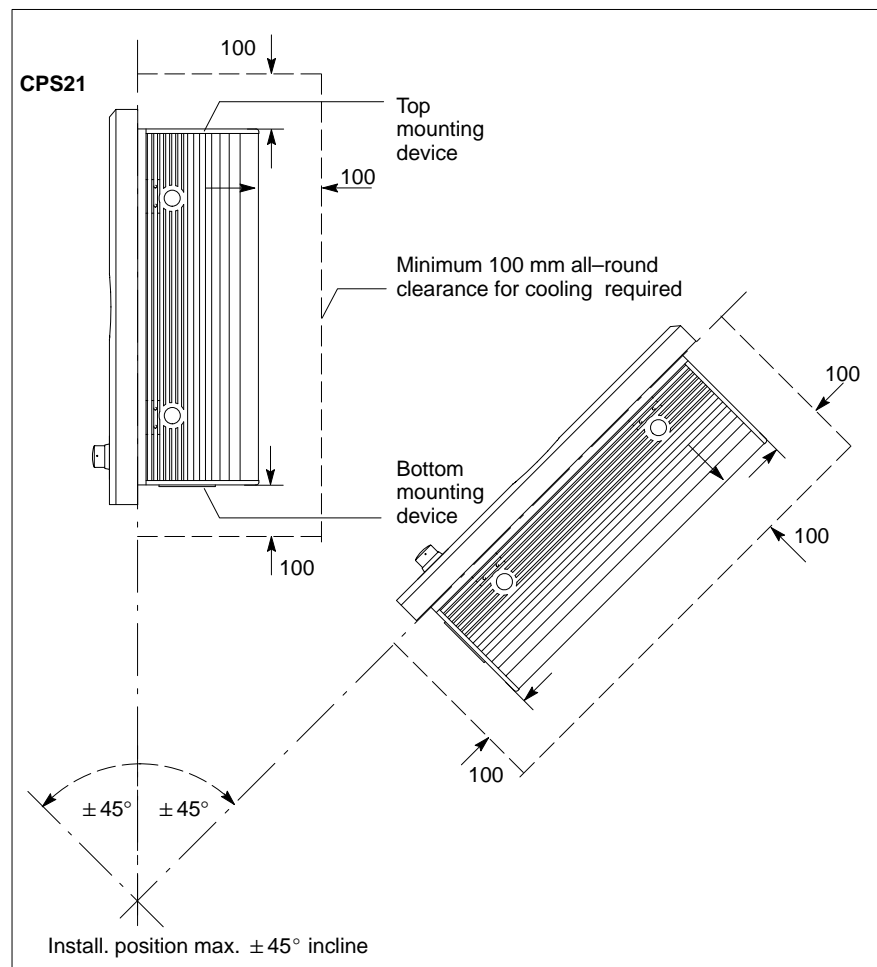
- Install the CPS21 control panel, ensuring that it can be operated ergonomically. In addition, the operator must be provided with a permanent and unobstructed line of sight to moving machine parts!
- To prevent reduced screen readability and additional thermal load, avoid installation locations that are exposed to direct sunlight.
- The LEDs on the front panel must not be obstructed or concealed.
- To ensure there is sufficient ventilation space, provide an all-round minimum clearance of 100 mm (see drawing).
- Allow for connecting loops in all cable routings. Use drag chain qualified cables. Provide strain relief for all cables.
- Keep as far away as possible from sources of interference.

Clearance

The following clearances must be maintained:

- for passive cooling of CPS21:   **100 mm min.** to all sides
- for maintenance procedures on the PC:**400 mm min.** in front of front panel,

opening angle **max. 120°**
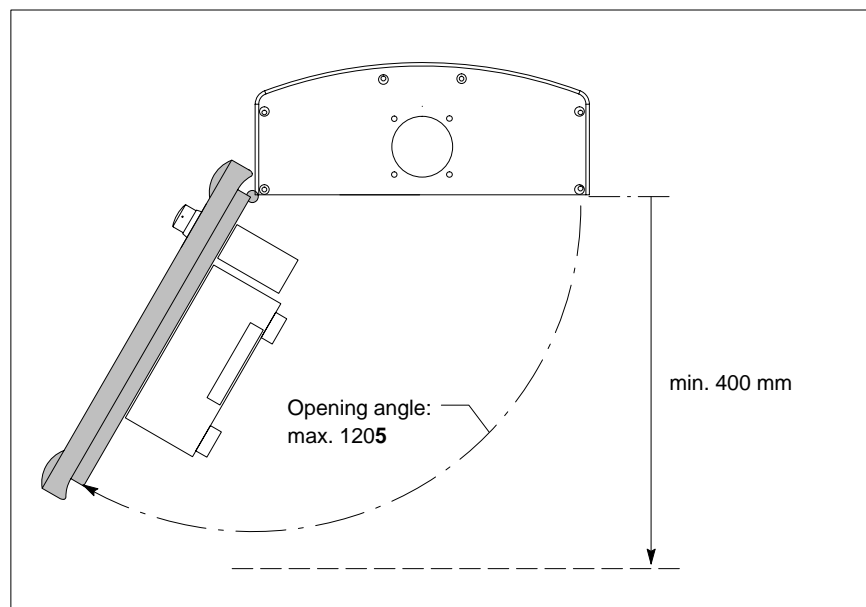
Opening angle:
max. 120**5**

min. 400 mm

☞ **CAUTION**
Excessive operating temperature!
Please do not expose the housing of the CPS21 to direct sunlight or other sources of heat radiation!

4.2   Dimensioned Drawing

Plastic frame

Housing bottom

Aluminium housing with cooling fins

Housing lock (5 double–bit-key)

Front view CPS21_3

Handle bar (plastic)

509

432

Front view CPS21_4

509

432

383

Housing top

177

151.5
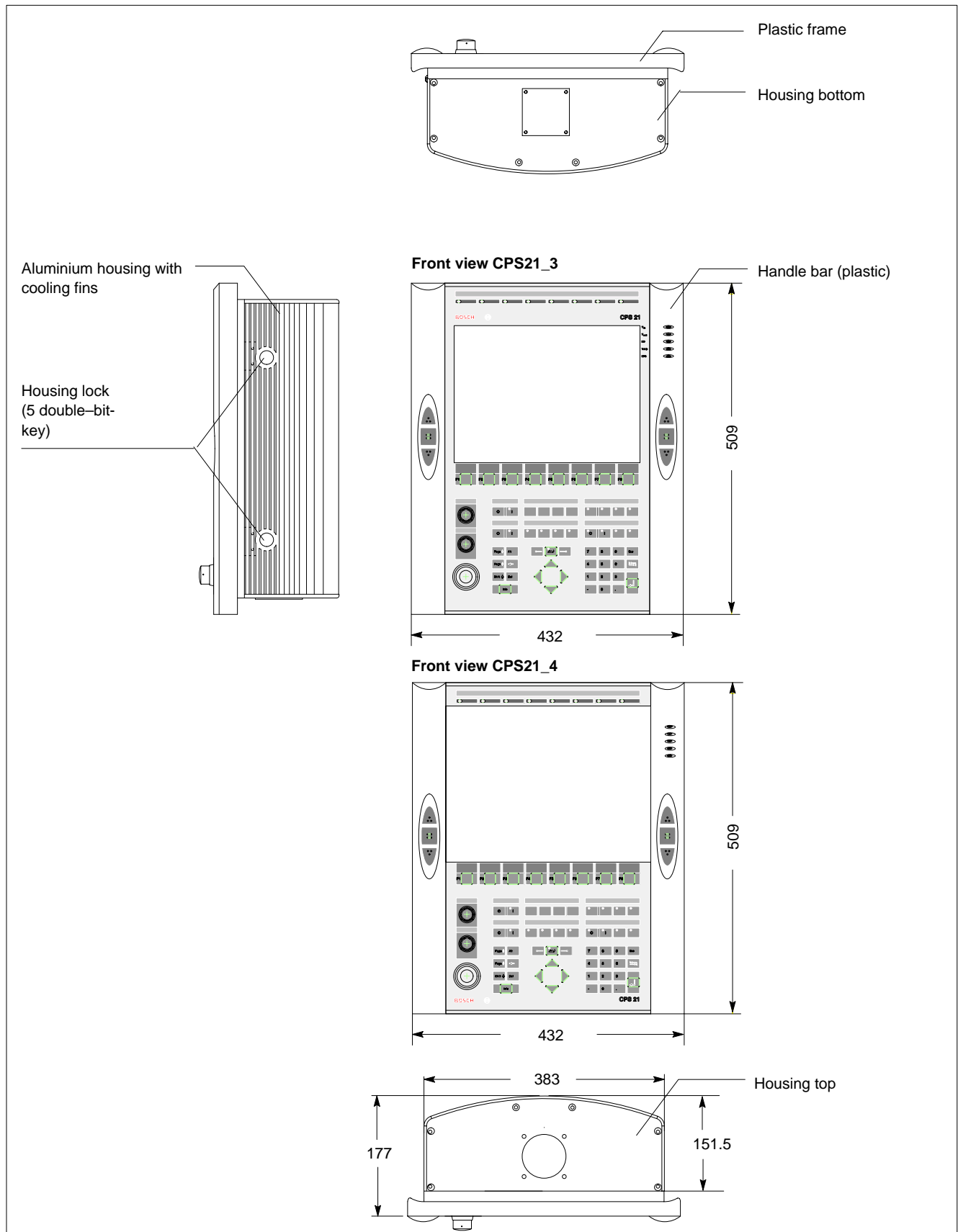
4.3   Installation with Tip/Tilt Adapter

The CPS21 is designed for:

- suspended mounting (e.g.bracket system KSE 60) or
- Floor mounting

with an adjustable tip/tilt adapter.

For this purpose, the housing top and bottom are each provided with a circular opening (70 mm in diameter with 4 bores 5 mm in diameter) for fastening the tip/tilt adapter and through which all cables are led into the housing.

The opening that is not used is covered with a rectangular cover plate. Ex works, the bottom opening is covered.
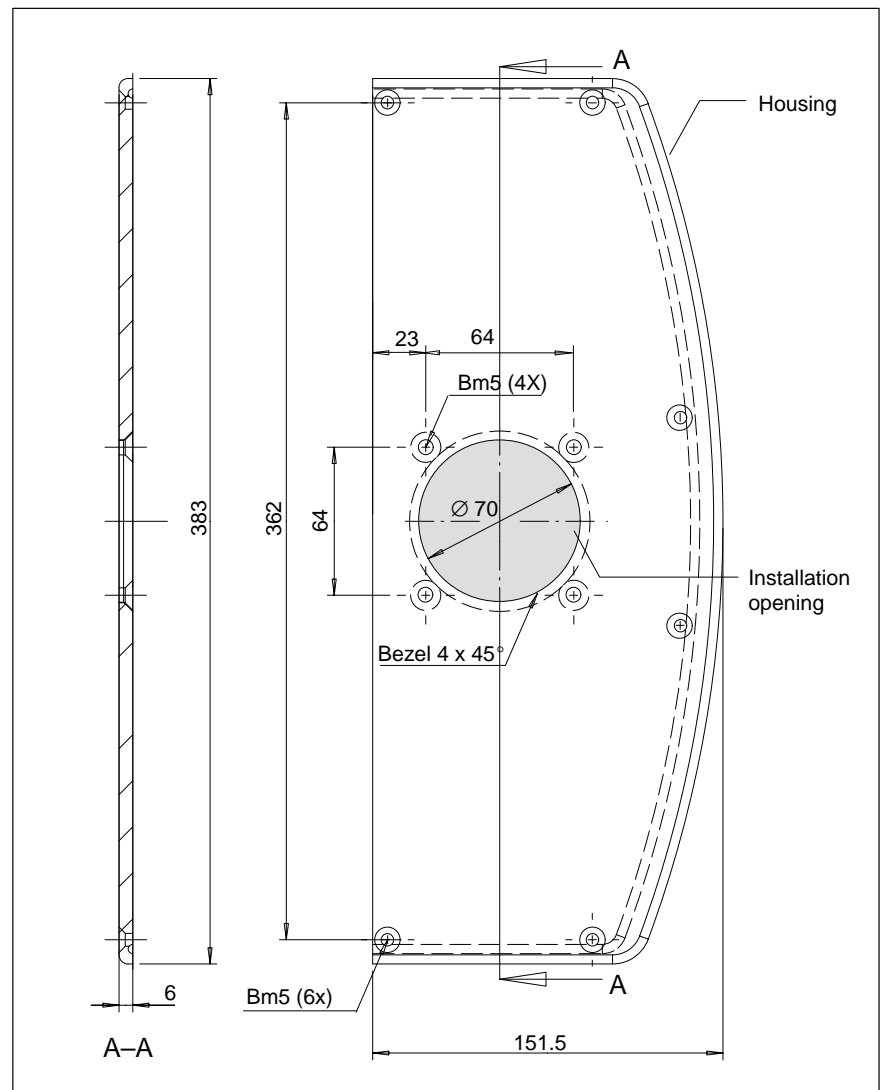
☞ **The flange for the suspended or floor installation must be sealed sufficiently in order to comply with the housing degree of protection IP 54.**

Installation Instructions

★   For suspended installation, please use the upper opening.
For floor installation, take off the cover from the bottom opening and close the upper opening.

★   Open the housing with a 5 mm double-bit key and swing out the PC.

★   Insert the cables that lead to the PC and the distribution card through the opening.

★   Fasten the tip/tilt adapter of the swivel arm or the stand to the opening with 4 screws. Make sure the connection is impermeable (IP54).

★   Connect all cables with the corresponding plugs on the PC and the distribution card.

★   Close the housing.

4.4 Installation of the optional Coolkit

A Coolkit can be obtained separately as an optional extra. It must be used if the CPS21 is used under high ambient temperatures of up to + 40°C.

Installation Instructions

★ Remove the existing cover from the bottom of the CPS21 by unscrewing the 4 retaining screws (see diagram).

View of CPS21 from below (with cover)

Plastic frame

Retaining screws

Base plate

Cover (to be removed)
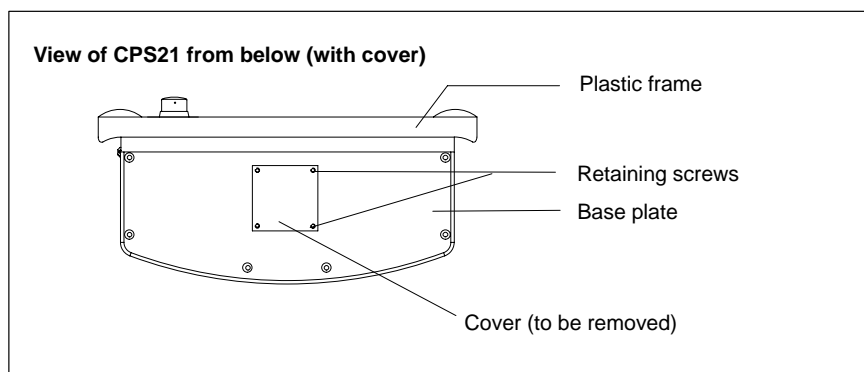
★ Open the CPS21 housing and fasten the CPS21 Coolkit with the new cover from the accessory kit to the base plate from below (see diagram).

CPS21 side view
(with Coolkit in place)

View of CPS21 from below
(with Coolkit in place)

Plastic frame

PC box

Screw holes not used

CPS21 base plate with outlet

Coolkit

New cover

New cover from the accessory kit with 4 threaded holes
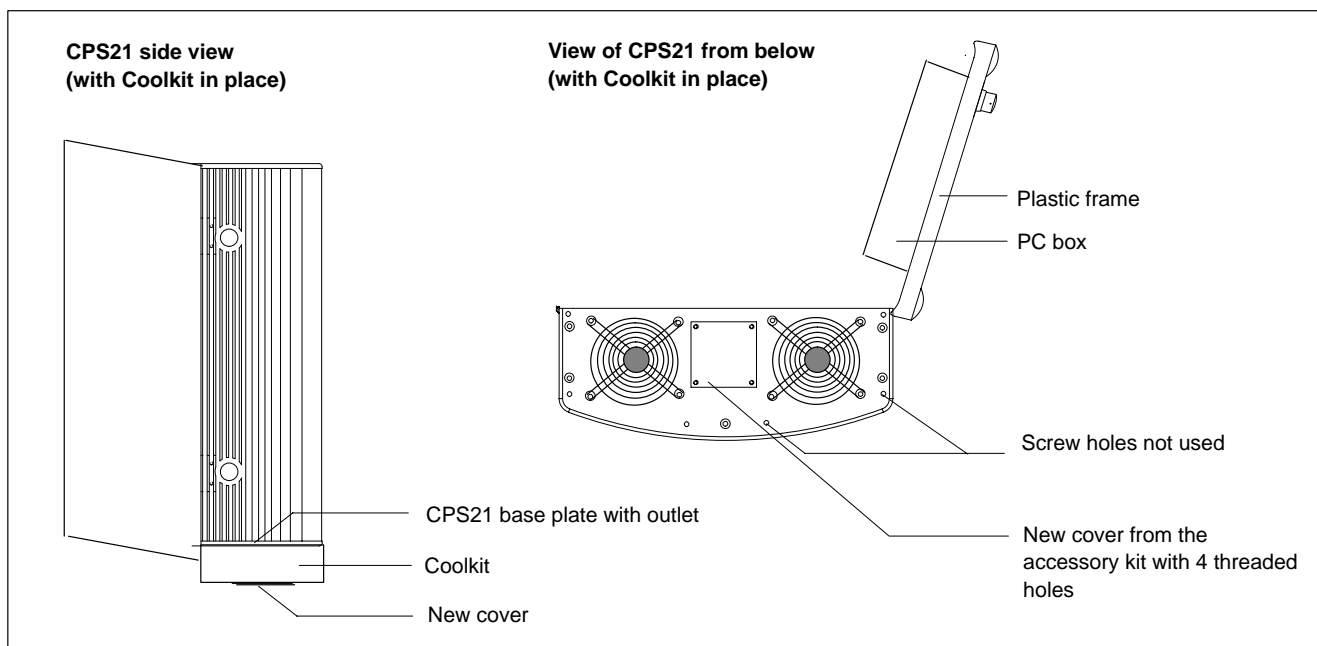
★ Screw the Coolkit on using the 4 long screws from the accessory kit. They should be introduced from the top into the interior of the open CPS21 through holes in the base plate (where the old cover that has been removed was screwed onto) and screw them into the threaded holes of the new cover (see diagram on next page).

Plastic frame

CPS21 housing opened

PC box

Insert 4 retaining screws from **here** and screw tightly into new cover

CPS21 base plate

Coolkit

New cover with 4 threaded holes
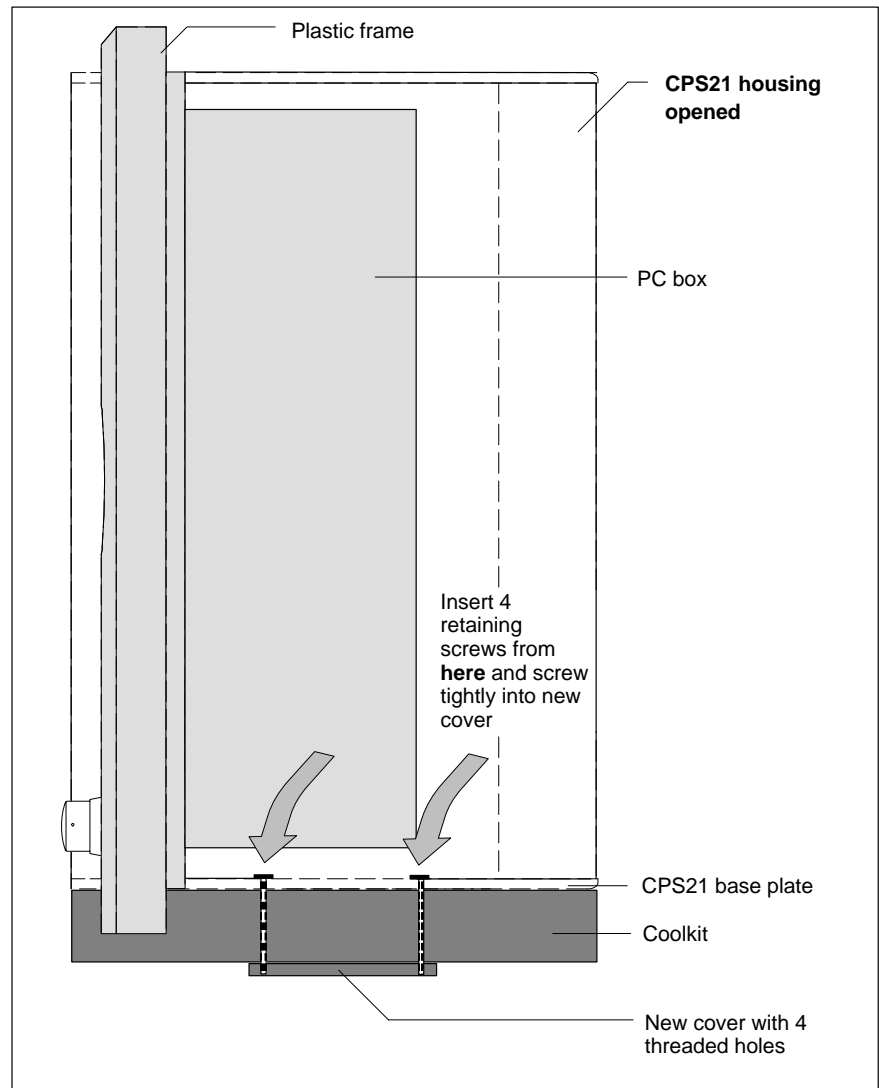
★   The 6 screw holes not used on the bottom of the Coolkit can be covered from below with stoppers from the accessory kit.

★   Instructions for making the electrical connections to the Coolkit are in section 6.4.

5 Electrical Connections

Please note that, with respect to all electrical connections, the terminal connection plans and work instructions provided by the machine manufacturer shall always be binding!

The system planner is also charged with providing and planning for the integration and implementation of required components, such as Emergency-STOP circuits, mains switches, etc. in accordance with current technical standards and at the highest levels of safety attainable.

☞ **CAUTION**
Risk of damage to system components caused by insertion or removal of plug connectors on energized circuits!
Connections must be made only while the system is switched off.

Observe the following to prevent malfunction:

- Provide for isolated 24 VDC and 0 V terminal strips inside the control cabinet. With regard to cable routing, maintain a minimum distance of 10 cm from all power cables.
- Connect the CPS21and other industrial components (e.g. CNC, PLC) in such a way that they are always switched on simultaneously.

5.1   Protective Earth Conductor (PE) and Screening Information

DANGER
Dangerous conditions, functional failures and equipment damage to the system may be caused by substandard potential equalization or inadequate screening between individual components!

Potential equalization currents must not flow across the screening of interface cables.

★ The protective earthing conductors (earthing connections) of the system must be arranged in a tightly meshed grid. All components, control cabinet housings and doors, including the mounting plate, must be earthed.

★ The potential equalization lines / PE lines of all system components shall be kept as short as possible, thus providing low-resistance connections.

★ Install the PE lines, preferably electrically conductive, on the mounting plate inside the control cabinet. Both sides of the insulated installed PE rails must be connected to the mounting plate with max. 20 cm long, adequately dimensioned copper straps.
Arrange the PE lines so that the length of the outgoing protective earth conductor connections to the individual modules in the control cabinet does not exceed 1 m.

★ When specifying the PE wiring, ensure sufficiently dimensioned cross-section. In this regard, also observe EN 60204, Part 1 (max. electrical resistance and testing PE wiring installations).

★ If at all possible, apply screening connections on both ends of a cable.

★ Ensure that equipotential equalization currents do not flow across the interface signal lines via the shielded conductors. Therefore, before switching on for the first time , ensure that the potential equalization between devices which are to be connected is correct. Do not forget the interfaces which connect devices to each other at different locations (irrespective of distance or power supply).

DANGER
Dangerous shock currents due to poor PE connections!
The effectiveness of PE connections must not be impeded by mechanical, chemical or electrochemical influences. Connections must be permanent and tight.

5.2   Interference Suppression Information

When designing the plant, please observe and comply with governing regulations and statutory law with regard to interference suppression on individual components. This will increase the operational safety of the entire system.

⚠️

DANGER
Dangerous conditions, functional failures and equipment damage to the system may be caused by electromagnetic interference!

Install only screened signal voltage cables and at a sufficient distance from high-voltage cables. If this is not possible, separate metallic cable ducts must be used.

The following sections are designed to provide you with a brief overview of possible interference suppression measures in the control cabinet. Among these are, for example:

● Filters
● Spark quenching circuits
● Damping of inductive switching peaks
● Limitation of switching voltage of high-speed semiconductors
● Screening

To ensure optimum interference suppression, all of these components should be taken into consideration because they are most effective when working in conjunction with each other. In principle, interference suppression should be implemented as follows:

● Apply suppression measures as close to the source of interference as possible
● Use only components that are identified as interference suppressors
● Limit leakage currents in accordance with safety regulations
● Provide touch guards
● Prevent vibration fatigue breakage by providing secure mechanical support for interference suppressors.

To ensure that interference suppression measures are successful, electrical symmetry or asymmetry must also be taken into consideration.
Besides symmetrical components of interference voltage that occur between the mains connection cables, asymmetrical interference voltages occur as well. They are caused by capacitive coupling of the interference source with the mains network, for example.
The following diagram shows a commonly used interference suppression circuit. The asymmetrical interference voltages are discharged to the housing via C_y. C_x damps the symmetrical interference.
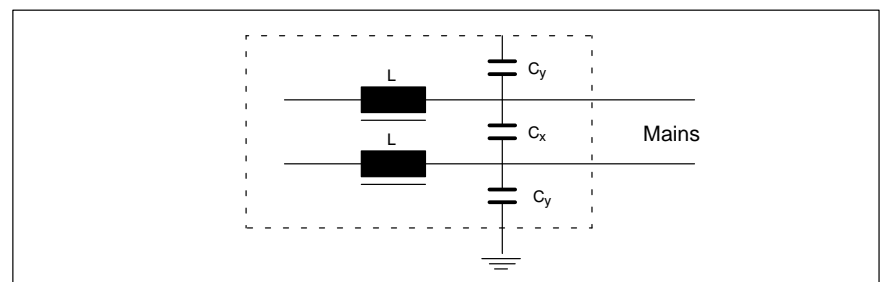
Interference suppression examples

Suppression of **contacts**

(Alternating current, direct current, offset DC current)
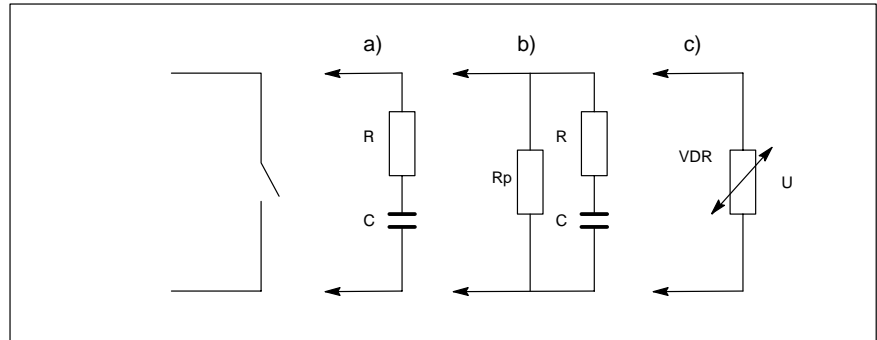
to b)   For sensitive contacts, residual current when contact open!

to c)   Voltage-dependent resistance, residual current when contact open!

Suppression of an **inductive load**

(Motors, solenoid, relay and contactor coils)
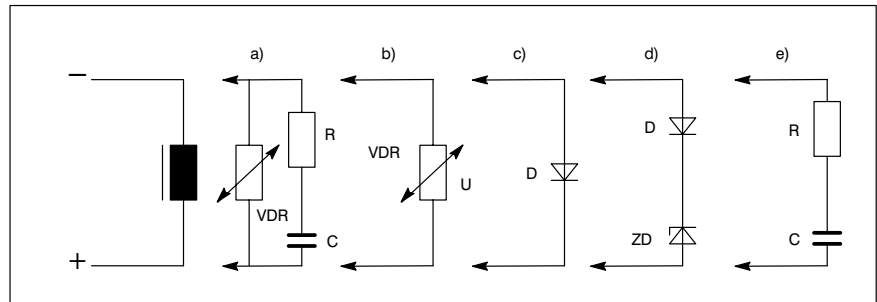
to c)   For relay, drop-off delay.

to d)   For relay, defined drop-off delay

to e)   Must be optimized for inductance!

Suppression example – mains input:
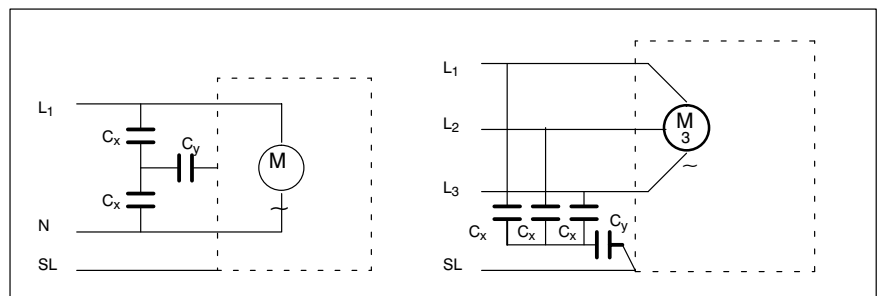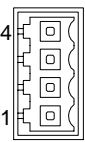
5.3   Power supply

5.3.1   24 VDC-power supply

X25   24 VDC connection

Weidmüller push-lock terminal, MSTB 1.5, 4-pin

Max. conductor   1.5 mm^2 (refer to next page)
cross-section:

Pin	Assignment
4	0 V
3	0 V
2	24 V
1	24 V

Rated voltage U_N:	24 VDC ; +20%, −15% with a max. of 1.5 Vss ripple voltage
Residual ripple at U_N:	refer to figure
Interference and surge immunity:	U_{max}= 35 V (for t < 100 ms)
Current draw at U_N:	max. 5 A
Input fuse:	M6.3A (5x20) medium time-lag fuse (position: refer to page 6–3)
Reverse voltage protection:	via decoupling diode. Polarity reversal will blow input fuse.

DANGEROUS ELECTRICAL VOLTAGE
The 24 VDC input voltage must fulfill the requirements of "Safety Isolation"!

Offset AC components of the type produced by an unregulated 3-phase current bridge circuit without smoothing with a ripple factor of 5% (refer to DIN 40110/10.75, Section 1.2) are permissible.
As an upper voltage limit, this produces a maximum absolute value of 30.2 V and, as a minimum voltage limit, a minimum absolute value of 18.5 V.

$1,05 \cdot 28.8\ V = 30.2\ V$
Upper limit   28.8 V
$0,866 \cdot 30.2\ V = 26.1\ V$
30^0 el
$\cos(30^0) = 0.866$
$1,05 \cdot 20.4\ V = 21.4\ V$
Lower limit   20.4 V
$0,866 \cdot 21.4\ V = 18.5\ V$

L1 L2 L3 PE

PE

10^2 (green/yellow)

Power supply with safety transformer as per EN 60742

400 VAC

24 VDC

Cross–sections depend on power demand, but min. of 4 mm^2. For higher power demand, 2 x 4 mm^2

Max. length 4 m

6^2 (1)(blue)

A

A

B

24 V Load

0 V Load

Earth bar

10^2 (green/yellow)(2)

A = Terminal row 4^2

B = Terminal row 10^2

: Terminals in insulated design

Cross–sections depend on power demand, but min. of 0.5 mm^2 (3)

CPS21

Display with front keyboard and PC

PE

10^2 (green/yellow)

Power supply (safety isolation, as per EN 60950)

X10_1

Supply and distribution circuit board

X25

X26 or X27

(1) Connection absolutely necessary. (Easily visible and removable).

(2) Preferred installation of PE terminal bars: electrically conductive on the mounting plate. PE terminal bars that are installed in an insulated design must be connected to the mounting plate by means of copper straps of a length not exceeding 200 mm.
The cross–section of the copper straps must equal at least that of the supply cable.

(3) 0.5 mm^2, up to 4 meters
     0.75 mm^2, up to 6 meters
     1.5 mm^2, up to 10 meters
     Distances in excess of 10 m require separate power supply close to load!

6 Interfaces and Connections

6.1 Overview

Overview of integrated connector types and their mating connectors.

	Legend on unit	Interface service	Connector type (integrated)	Mating connector or cable (from external device)
A	X24	START, STOP, EMERGENCY-STOP	Weidmüller MSTB 1.5, 8–pin	Female Weidmüller terminal, MSTB 1.5, 8-pin
A	X25	Supply voltage 24 V	Weidmüller MSTB 1.5, 4-pin	Female Weidmüller terminal, MSTB 1.5, 4-pin
A	X26	Supply voltage 24 V	Weidmüller MSTB 1.5, 4-pin	Female Weidmüller terminal, MSTB 1.5, 4-pin
A	X27	Supply voltage 24 V	Weidmüller MSTB 1.5, 2-pin	Female Weidmüller terminal, MSTB 1.5, 2-pin
A	X28	Distributor 24 Vout outputs	Weidmüller MSTB 1.5, 8–pin	Female Weidmüller terminal, MSTB 1.5, 8-pin
A	X29	Distributor 24 Vout outputs	Weidmüller MSTB 1.5, 8–pin	Female Weidmüller terminal, MSTB 1.5, 8-pin
P	Mouse	PS/2 mini DIN mouse	Female mini DIN PS/2, 6-pin	Male mini DIN PS/2, 6–pin
P	KBD	PS/2 mini DIN keyboard	Male mini DIN PS/2, 6–pin	Keyboard cable with male PS/2 mini DIN, 6-pin
P	USB	USB	USB socket, 4-pin	USB plug, 4-pin
P	24 Vout	Keyboard code output	Female DB–15	Male DB–15
P	Ethernet	Network connection: Ethernet 10/100BaseTX	Female RJ45, 8-pin	Male RJ45, (8-conductor twisted pair)
P	VGA	VGA connection for external CRT monitor	Female VGA HD connector, 15-pin.	Monitor cable with male VGA DB–HD, 15–pin
P	DP-Slave	PROFIBUS DP Keyboard code output **(not used)**	Female DB-9 connector	Male DB-9 bus connector, IP 20 (Comnet DP bus system)
P	X59	optional serial port: RS422/485 unused, alternative to RS232; cf. COM1	no plug available because optional (male DB-9)	Female DB-9 connector
P	COM1	Serial port:RS232 (UART 16550) free alternative, optional RS485/422; cf. X59	Male DB-9 connector	Female DB-9 connector
P	COM2	Serial port: RS232 (UART 16550) free	Male DB-9 connector	Female DB-9 connector
P	COM3	Serial port:RS232 (UART 16550) kbd download or unused	Male DB-9 connector	Female DB-9 connector
P	COM4	Serial port: RS232 (UART 16550) reserved for UPS logic	Male DB-9 with plug cover	–
P	LPT1	Parallel port: supports standard SPP, EPP, ECP mode	Female DB-25 connector	Male DB-25 connector (e.g., printer cable or parallel CD-ROM)
P	X10_1	PC power supply: 24 VDC	Weidmüller push-lock terminal, MSTB 1.5, 4-pin	Female Weidmüller terminal, MSTB 1.5, 4-pin
C	X76	Floppy disk power supply +5VDC	Female FDD mains connector, 4–pin	FDD mains cable with male 4–pin connector
C	X75	Data connector for 3 1/2" floppy disk drive (SD, HD, ED)	Male plug connector 34–pin (IDC)	Female plug connector, 34-pin (IDC) (data cable, floppy disk drive)
C	X19	Battery	Male plug connector 2–pin	Female connector. 2–pin, cable for internal battery
E	X71	CAN on PCI-CAN expansion card	Female DB-9 connector	Male DB-9 connector
E	X71	CAN on PCI_BM-CAN expansion card	Female DB-9 connector	Male DB 9-pin, separate CAN bus for PLC signals
E	X72	Busmaster on PCI_BM-CAN expansion card **(not used)**	Male Weidmüller terminal, MSTB 1.5, 10-pin	Female Weidmüller terminal, MSTB 1.5, 10-pin

Connector location:
A = connection and distribution card
C= on carrier board (in PC housing)
P= PC housing side
E = on expansion card

6.2   Position of Interfaces

Connection board and carrier board interfaces

Side view (side of hinges)

- Battery connection
- PE conductor lug
- Floppy disk data connector
- Floppy disk power supply
- Battery

X19   X75   X76

Rear view

- Rear covering plate
- Carrier board
- Supply and distribution circuit board

X29 X28 X27 X26 X25 X24

- Battery connection
- Supply and distribution circuit board
- DP–ADR DIP
- SEL COM3 DIP
- Floppy disk data connector (accessible through opening in housing)
- Floppy disk power supply (accessible through opening in housing)
- Battery

PC and PCI Expansion Cards Interfaces, Fuse

Side view (from right)

PCI_BM-CAN Card   PCI-CAN Card   PE conductor lug

A1

A2

Mouse

USB   Ethernet   VGA

KBD   24VOut   DP-Slave

Reset

A3

X59

COM1   COM3

COM2   COM4   LPT1   X10.1

Busmaster
(X72)

CAN for PCL
(X71)

CAN
(X71)

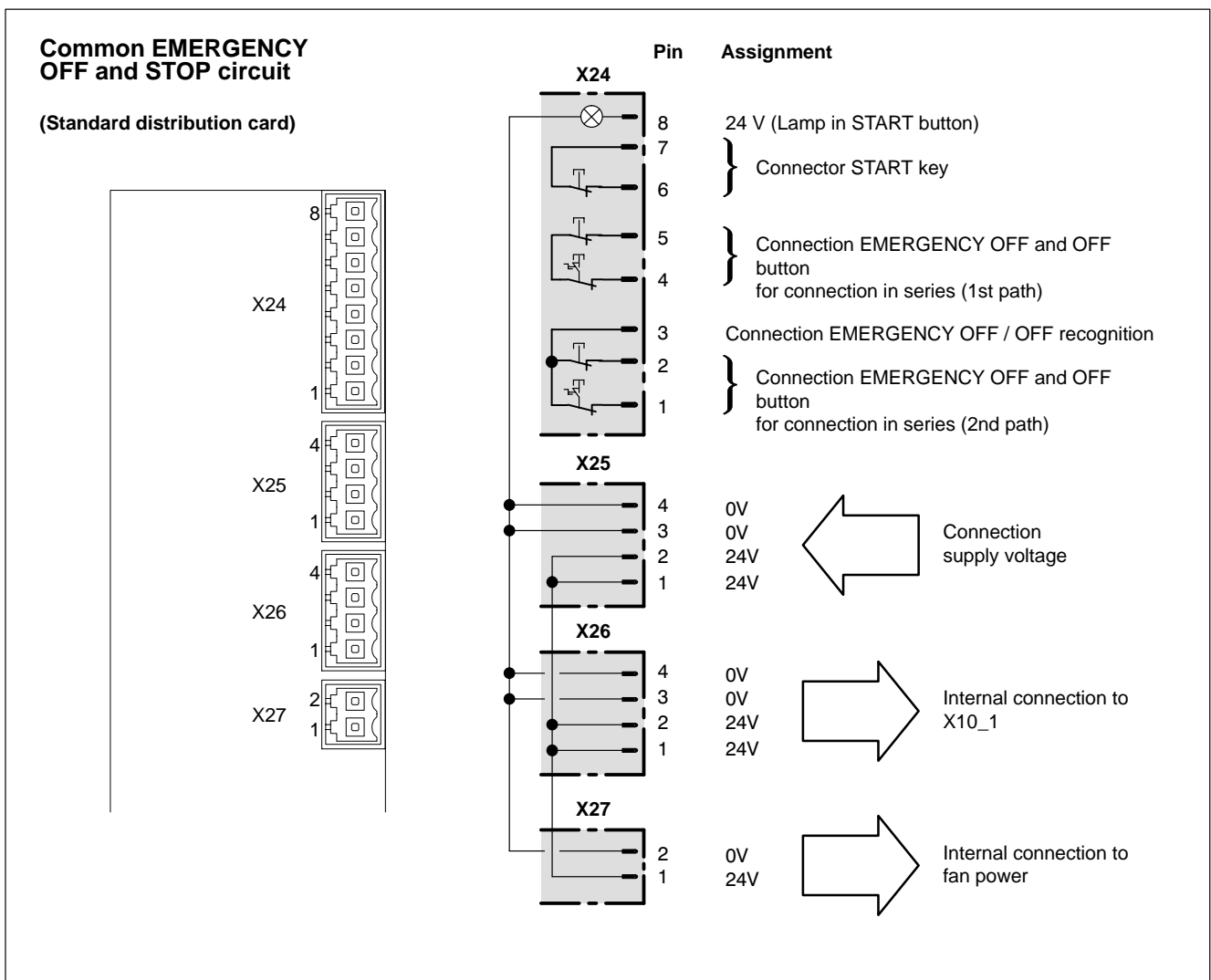24 VDC connector

24 V fuse (M6.3A)
unscrewable
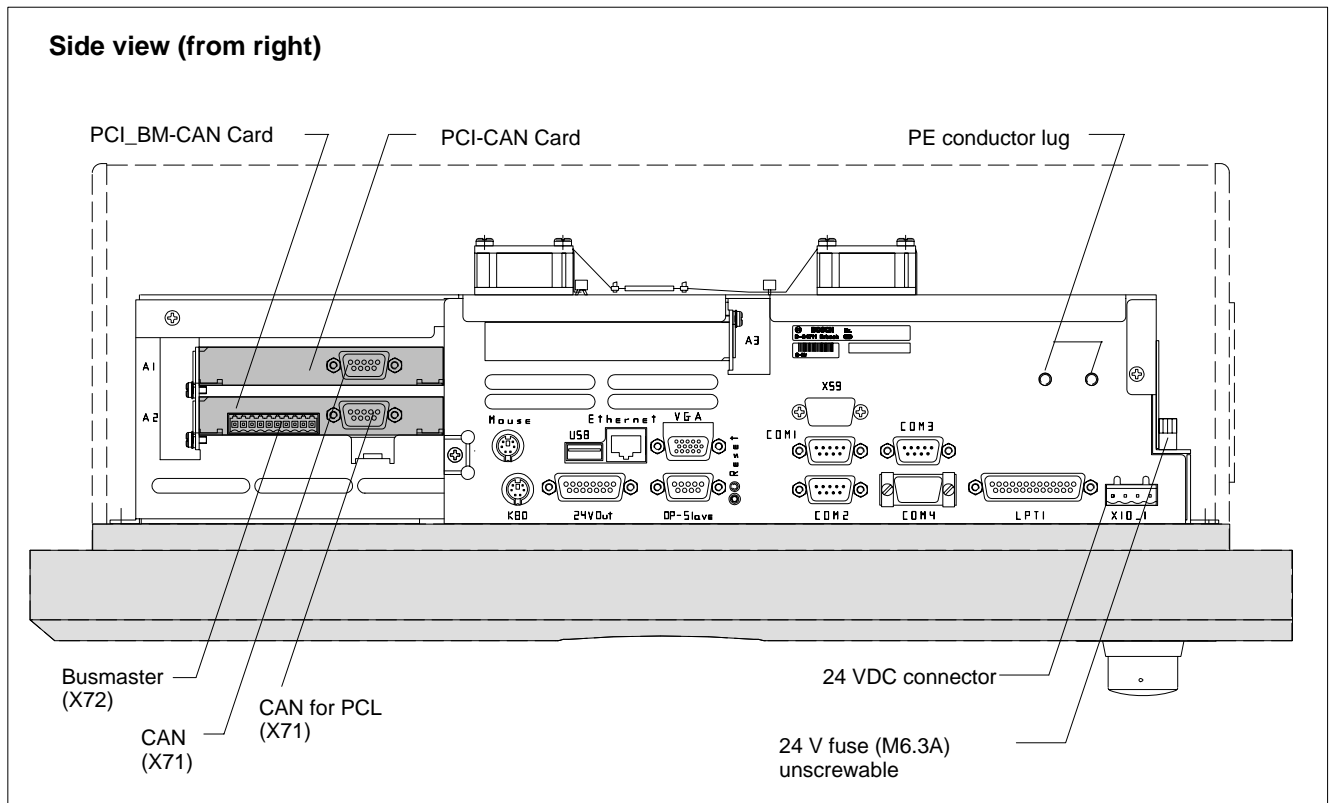
6.3   Connection and Distribution Card

The connection and distribution card is obtainable in two models depending on the configuration that was ordered.

- Standard distribution card with common EMERGENCY OFF and STOP circuit
- Special distribution card with separate EMERGENCY OFF and STOP circuits.

The connection and distribution card is to be wired in any case. The components to be connected are as follows:

- 24 VDC supply voltage of CPS21
- all buttons on the front panel
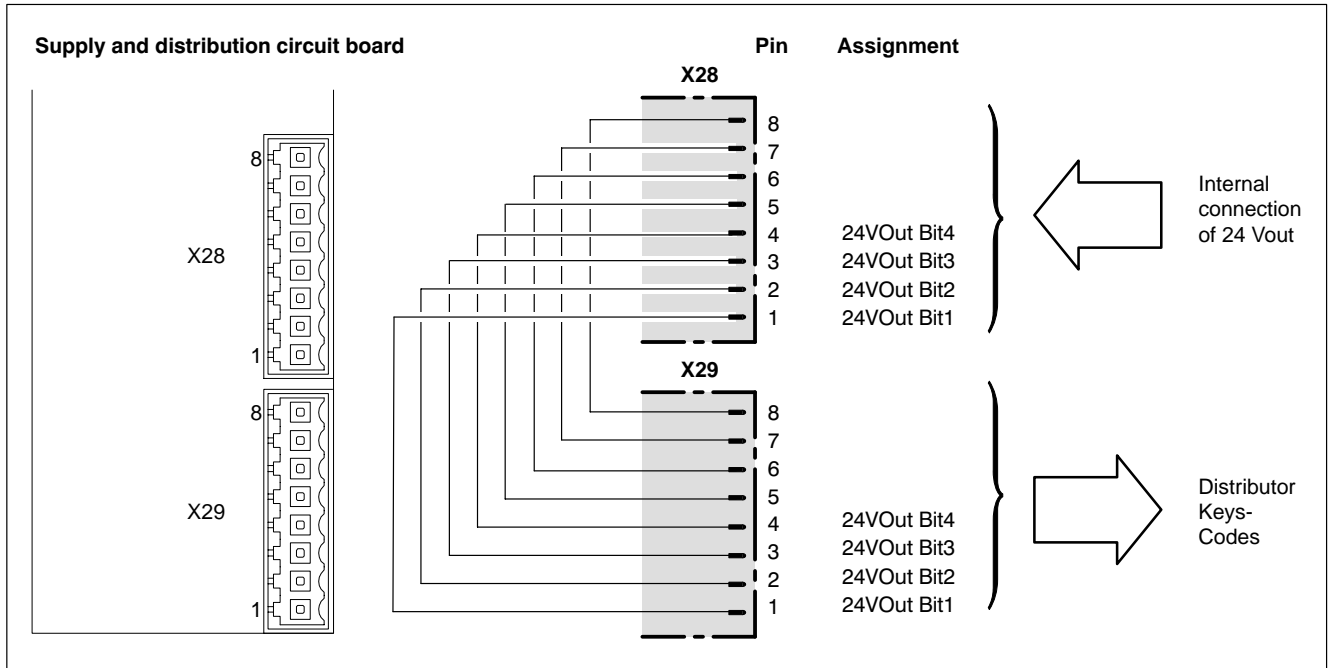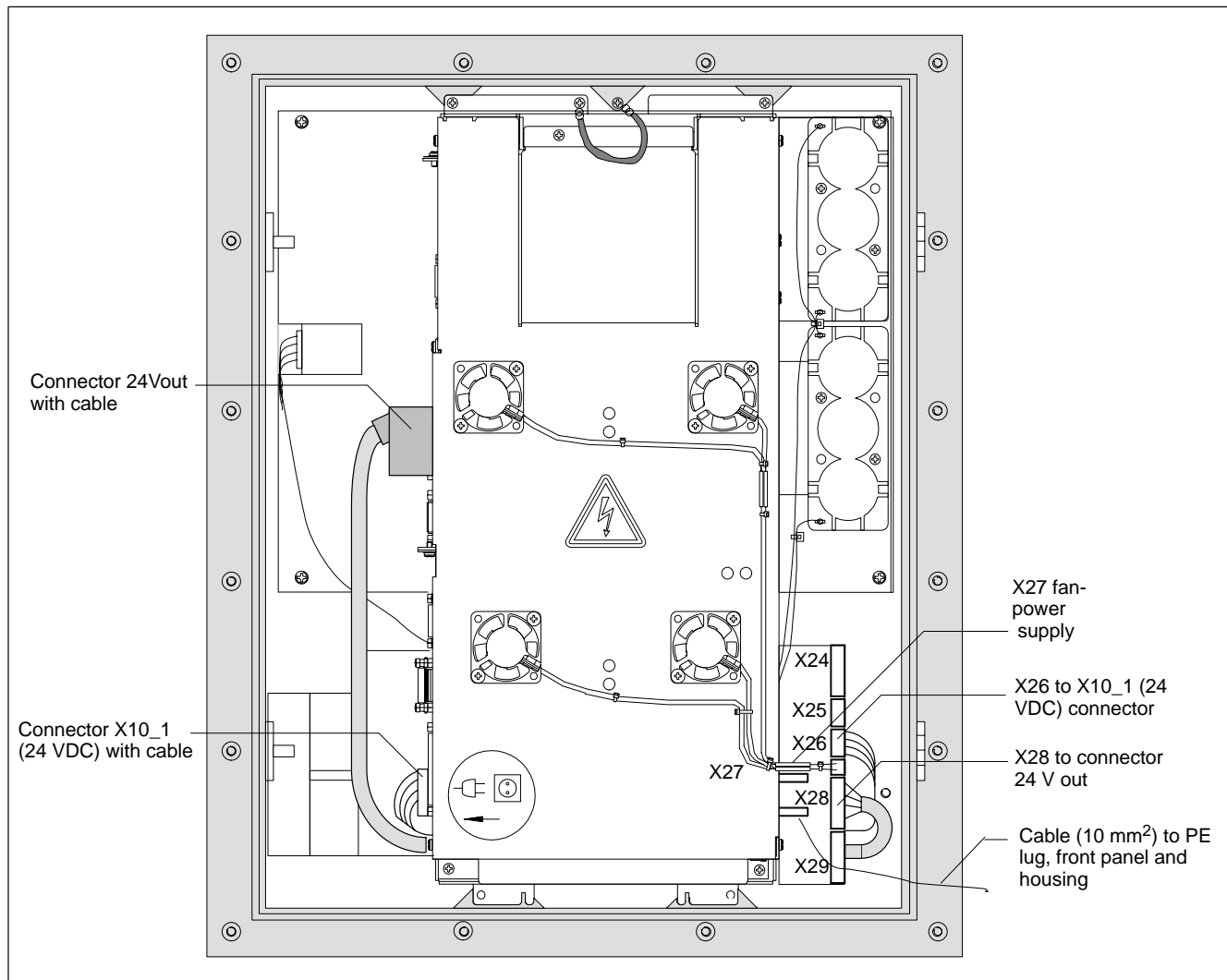 (START, STOP, EMERGENCY OFF)
- key codes of the front panel

Common EMERGENCY OFF and STOP circuit

(Standard distribution card)

Pin	Assignment
X24	
8	24 V (Lamp in START button)
7	} Connector START key
6	
5	} Connection EMERGENCY OFF and OFF button for connection in series (1st path)
4	
3	Connection EMERGENCY OFF / OFF recognition
2	
1	} Connection EMERGENCY OFF and OFF button for connection in series (2nd path)
X25	
4	0V — Connection supply voltage
3	0V
2	24V
1	24V
X26	
4	0V — Internal connection to X10_1
3	0V
2	24V
1	24V
X27	
2	0V — Internal connection to fan power
1	24V

⚠️ **DANGEROUS ELECTRICAL VOLTAGE**
Improperly or incorrectly installed EMERGENCY OFF circuit may lead to life endangering situations and substantial material damages!

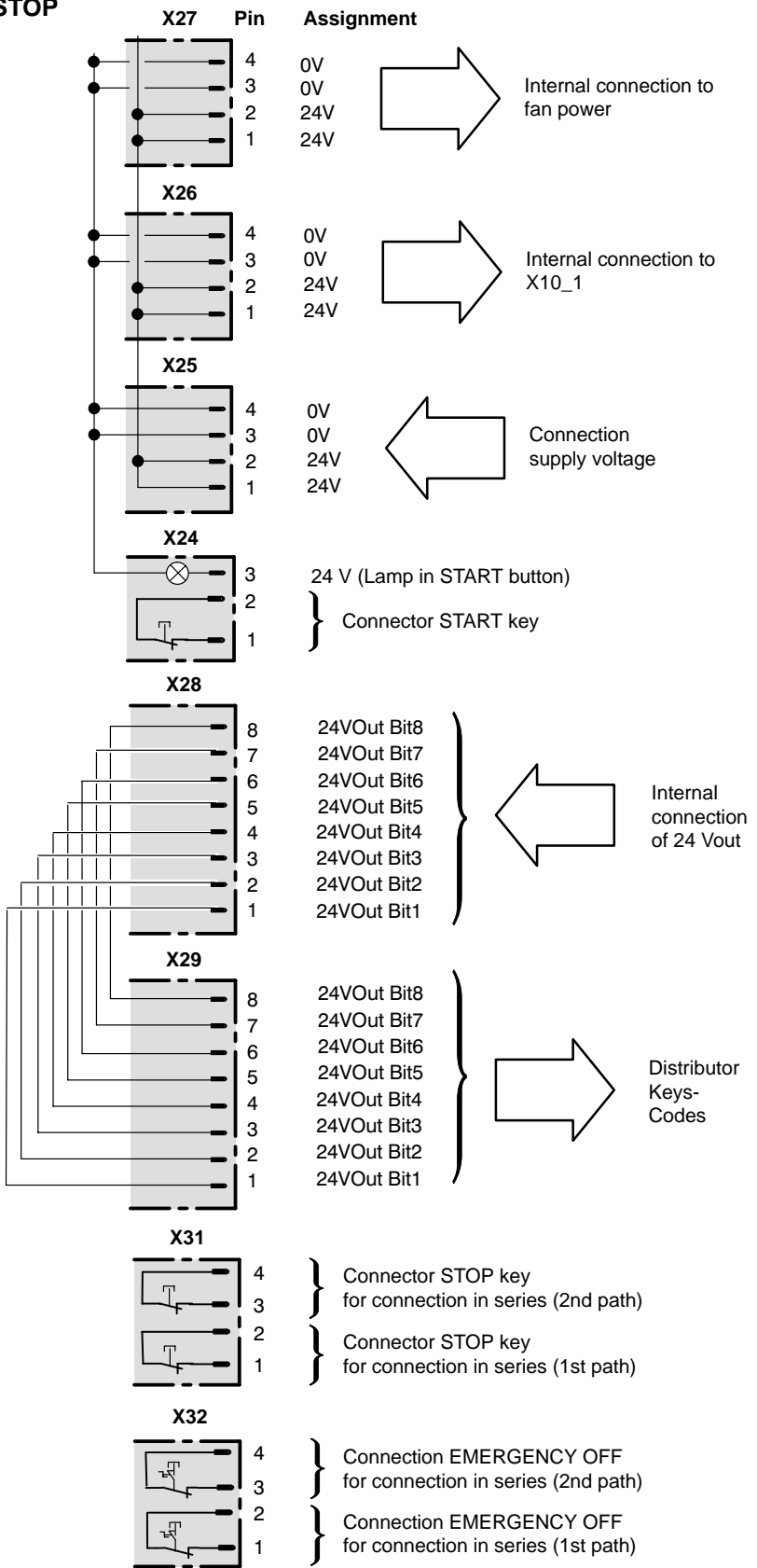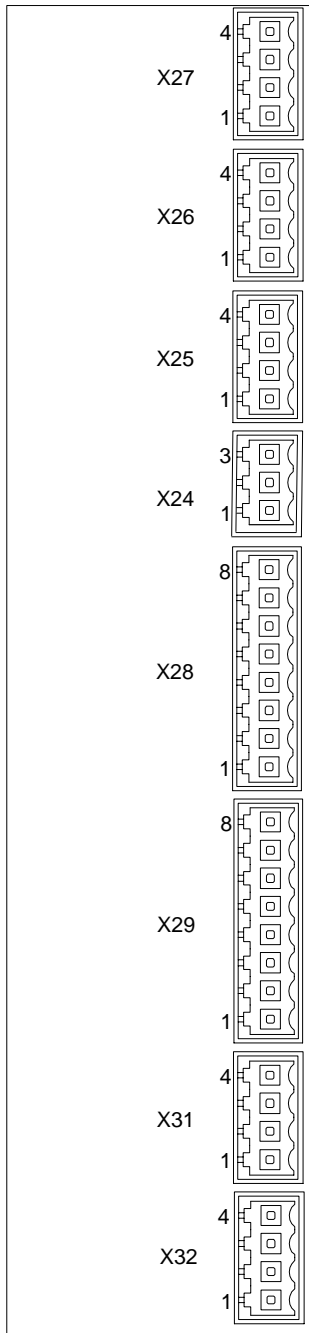**Please integrate the EMERGENCY OFF button of the CPS21 into the EMERGENCY OFF circuit as well!**

Supply and distribution circuit board   **Pin**   **Assignment**

X28

Pin	Assignment
8	
7	
6	
5	
4	24VOut Bit4
3	24VOut Bit3
2	24VOut Bit2
1	24VOut Bit1

Internal connection of 24 Vout

X29

Pin	Assignment
8	
7	
6	
5	
4	24VOut Bit4
3	24VOut Bit3
2	24VOut Bit2
1	24VOut Bit1

Distributor Keys-Codes

Overview of connections ex works:

Connector 24Vout with cable

Connector X10_1 (24 VDC) with cable

X24

X25

X26

X27

X28

X29

X27 fan-power supply

X26 to X10_1 (24 VDC) connector

X28 to connector 24 V out

Cable (10 mm^2) to PE lug, front panel and housing

Separate EMERGENCY OFF and STOP circuits

(Special distribution card)

X27	Pin	Assignment
	4	0V
	3	0V
	2	24V
	1	24V

Internal connection to fan power

X26

	4	0V
	3	0V
	2	24V
	1	24V

Internal connection to X10_1

X25

	4	0V
	3	0V
	2	24V
	1	24V

Connection supply voltage

X24

	3	24 V (Lamp in START button)
	2	} Connector START key
	1	

X28

	8	24VOut Bit8
	7	24VOut Bit7
	6	24VOut Bit6
	5	24VOut Bit5
	4	24VOut Bit4
	3	24VOut Bit3
	2	24VOut Bit2
	1	24VOut Bit1

Internal connection of 24 Vout

X29

	8	24VOut Bit8
	7	24VOut Bit7
	6	24VOut Bit6
	5	24VOut Bit5
	4	24VOut Bit4
	3	24VOut Bit3
	2	24VOut Bit2
	1	24VOut Bit1

Distributor Keys-Codes

X31

	4	} Connector STOP key
	3	for connection in series (2nd path)
	2	} Connector STOP key
	1	for connection in series (1st path)

X32

	4	} Connection EMERGENCY OFF
	3	for connection in series (2nd path)
	2	} Connection EMERGENCY OFF
	1	for connection in series (1st path)

6.4   Connection of the optional Coolkit to the connection and distribution card

If the CPS21 is equipped with the optional extra Coolkit (for installation see section 4.4), then the electrical connections for the Coolkit must be made via the connection and distribution card.

Standard connection and distribution card

The 24 VDC Coolkit connecting cables (red = + / black = 0 V) are connected as follows to the standard CPS21 connection and distribution card:

★ Replace the existing 4 conductor cable between the X26 plug and the X10_1 connecting plug by a 2 conductor cable 2 x 0.75^2. The cable is connected on the one side to the X26 / Pin 2 (+ 24 V) and X26 / Pin3 (0 V), and on the PC side to the X10_1 / Pin 2 (+ 24 V) and X10_1 / Pin 3 (0 V). Alternatively it is also possible to clamp off the two wires that are not needed on the existing 4 conductor cable.

★ Connect the Coolkit's red connection cable to the X26 / Pin 1 and the black cable to the X26 / Pin 4.
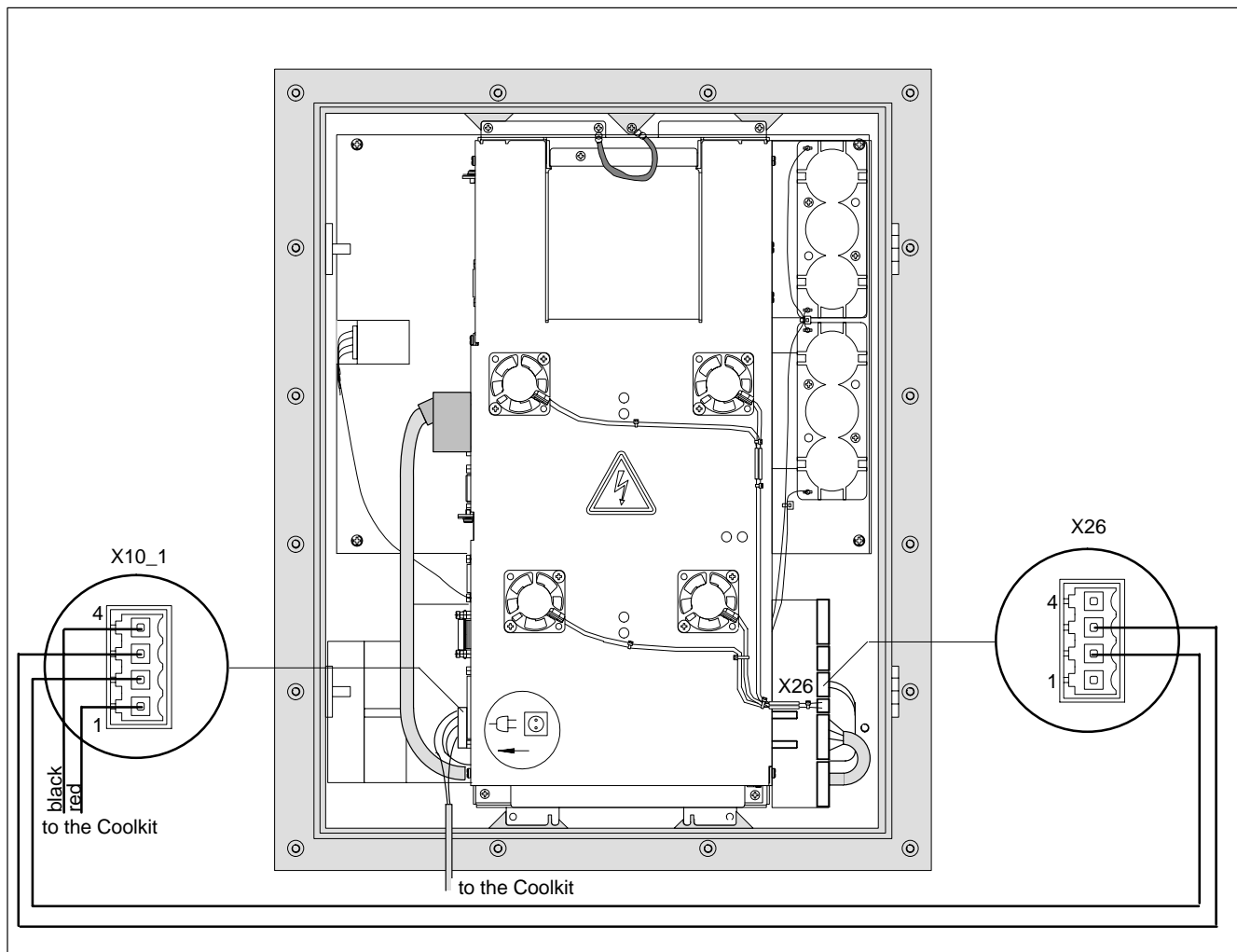
Special distribution card

The 24 VDC connecting cables (red = + / black = 0 V) are connected to the free pins of the X27 plug on the CPS21 special distribution card (see page 6-6) (Pin 1,2 = + 24 V; Pin 3,4 = 0V).

6.5   Floppy Disk Connection

X75   **Drive "A" connector**

Used to connect an optional floppy disk drive. The integrated floppy disk adapter supports the following types of floppy disk drives:

- 3,5 "
- Double density (720 kB)
- High density (1.44 MB)
- Enhanced floppy mode (2.88 MB)

☞ **Only one type of drive can be connected at a time.**

Male connector, 34–pin (on carrier board)

Type:	3.5" HD (standard)
Cable length:	Max. 0.5 m
Cable type:	34–conductor ribbon cable, screened
Interrupt (IRQ):	empty
I/O address:	300H
BIOS preset:	Floppy disk controller: Enabled in the "I/O Device Configuration" submenu

Pin	Assignment	Pin	Assignment
1	GND	2	Density Select
3	GND	4	N/C
5	GND	6	N/C
7	GND	8	Index
9	GND	10	Motor Enable A
11	GND	12	Drive Sel B
13	GND	14	Drive Sel A
15	GND	16	Motor Enable B
17	GND	18	Direction
19	GND	20	Step
21	GND	22	Write Data
23	GND	24	Floppy Write Enable
25	GND	26	Track 0
27	GND	28	Write Protect
29	GND	30	Read Data
31	GND	32	Head Select
33	GND	34	Disk Change
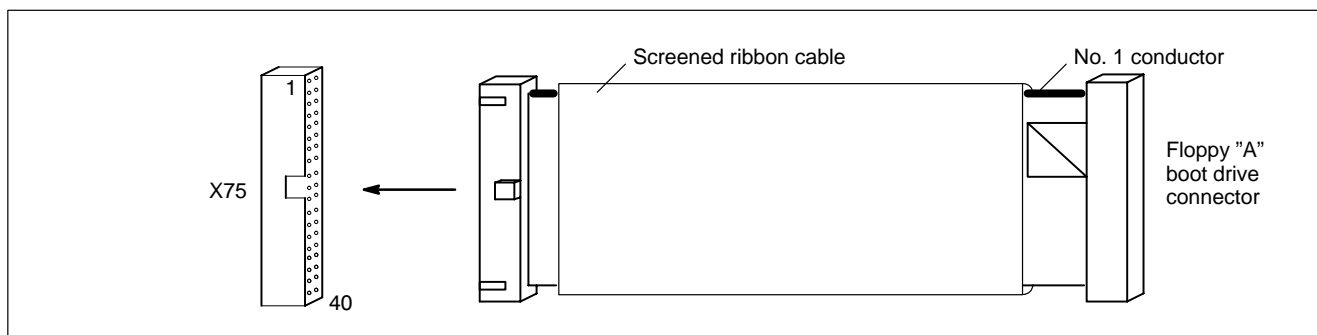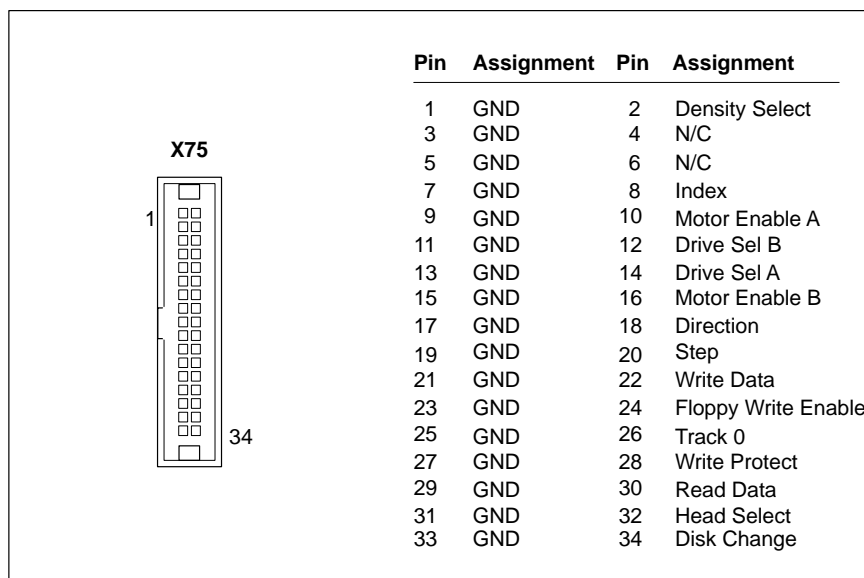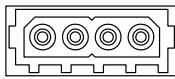
X76 Floppy disk drive power supply

Power supply for optional floppy disk drive.

Female coupler, 4-pin

Supply voltages: +5 V, +12 V, 0.9 A $_{max.}$

X76, socket	Pin	Assignment
1 2 3 4	1	+12 V
	2	GND
	3	GND
	4	+5 V

☞ **The +5 V and +12 V operating voltages are monitored for overvoltage and undervoltage conditions. The detection of a faulty voltage causes the PC power supply to switch off immediately. −12 V potential is not monitored.**

Installation

★ Connect the "Floppy A boot drive" connection end of the ribbon cable to the floppy disk drive. Connect the other end of the cable to the X75 floppy disk connector. On the ribbon cable, observe the red marking of the no. 1 conductor which must always be connected to PIN 1 of the connected devices. In most cases, notched connectors will provide for connections with proper conductor alignment.

★ The power supply for the floppy disk drive must also be connected. This is accomplished by connecting the connecting cable on the floppy disk drive (4–pin plug connector) to the X76 power supply connector.

★ If the system does not recognize the floppy disk drive, the latter must be activated in the **"I/O Device Configuration"** BIOS submenu by changing from "Disabled" to "AUTO" or "Enabled". If necessary, the floppy disk type must also be selected under "Diskette 1" in the main menu.

In order to start the BIOS setup function, press <F2> when the "Press <F2> to enter Setup" display appears during booting. Then the BIOS main menu will be displayed. Make the above mentioned settings. Leave BIOS via the "**Exit Saving Changes**" entry in the Exit menu.
To do so, press the <Z> key if you have a keyboard with a German layout (Z = Y for Yes).

★ If the floppy disk drive is not accessible, check the connections for
- proper seating of all cables and connectors.
- normally working supply voltage.

6.6   COM1 through COM4 Serial Ports, USB

6.6.1   Pin assignment

☞   **CAUTION**
Functional failures caused by poor screening!
Use only metallic or conductive connector/coupling shells providing large-area screen contact.

COM1   **Serial port, freely assignable**

Male DB-9 connector

Type:	RS232
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm^2
Transmission rate:	Max. 115200 bps
Handshake:	Hardware- and software handshake (X_{ON}, X_{OFF})
Interrupt (IRQ):	4
I/O address:	3F8H or AUTO (recommended)
BIOS preset:	Serial Port A: Enabled

COM1

DCD	1
RX	2
TX	3
DTR	4
GND	5
DSR	6
RTS	7
CTS	8
RI	9

to peripheral-devices

Screen applied to metal shell of DB-9 plug connector
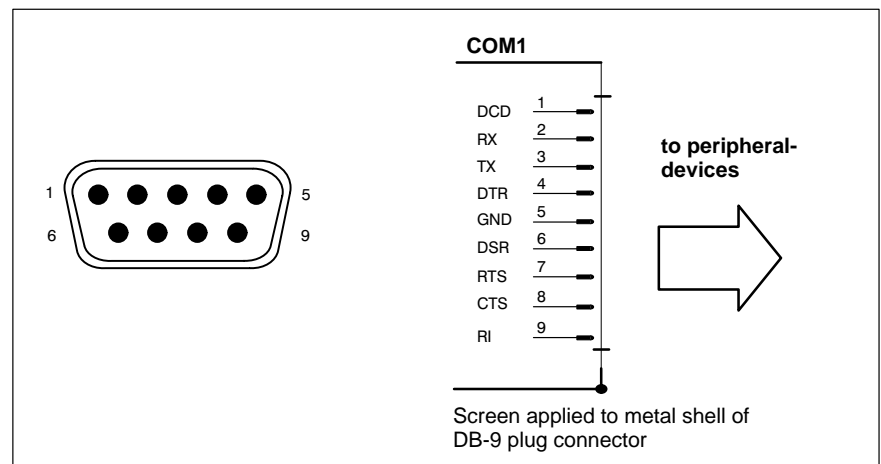
Assigned as RS-232 (COM1):

DCD	Data Carrier Detect. RCV channel used, for example, by a connected modem to inform the PC that it is receiving a carrier signal (active connection).
RX	Receive Data. Line on which data is received.
TX	Transmit Data. Line on which data is transmitted to peripheral.
DTR	Data Terminal Ready. XMIT channel used by the PC to signal to a connected peripheral device that its interface is switched on and initialized.
DSR	Data Set Ready. RCV channel used by the connected peripheral device to inform the PC that it is switched on and inilitalized.
GND	Signal Ground
RTS	Request to Send. RCV channel used by the connected peripheral device to signal to the PC that is wishes to transmit data.

CTS	Clear to Send. XMIT channel used by the PC to signal to the connected peripheral device that it is permitted to transmit data.
RI	Ring Indicator. Receive line on which a connected modem informs the PC of the presence of an active call.
Screen	Contact with housing frame via metallic shell of the D-Sub connector.

COM2   Serial port, freely assignable

Male DB-9 connector

Type:	RS232
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm^2
Transmission rate:	Max. 115200 bps
Handshake:	Hardware- and software handshake (X_{ON}, X_{OFF})
Interrupt (IRQ):	3
I/O address:	2F8H or AUTO (recommended)
BIOS preset:	Serial Port B: Enabled
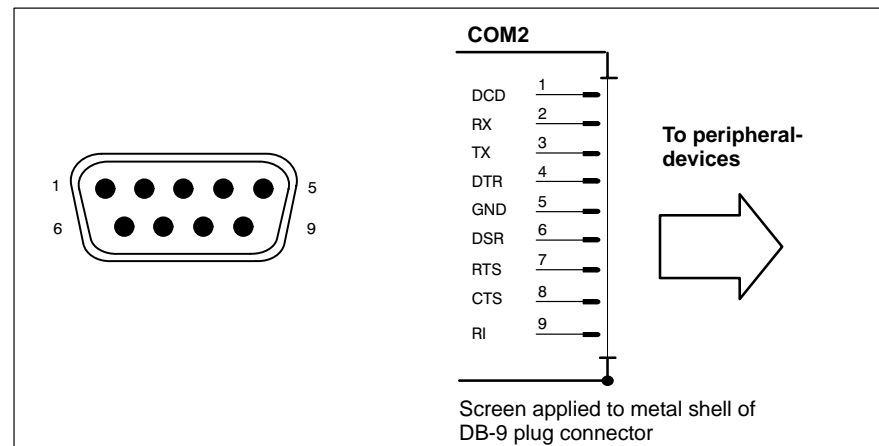
Refer to page 6–11 for explanations on pin assignments.

COM3   **Serial Port, assigned**

- Input for key codes and LED control on front panel
- If required, used for software download of new key codes (refer to section 7.5.4)

COM4   **Serial Port, assigned**

The COM4 port is internally occupied by the uninterruptible power supply (UPS), and thus, only available for external applications if an uninterruptible power supply is not required. The interface plug is covered by a hood.

USB   **Serial interface (Universal Serial Bus), currently not supported**

The USB interface provides for the connection of up to 128 devices equipped with USB functions.

USB socket, 4-pin
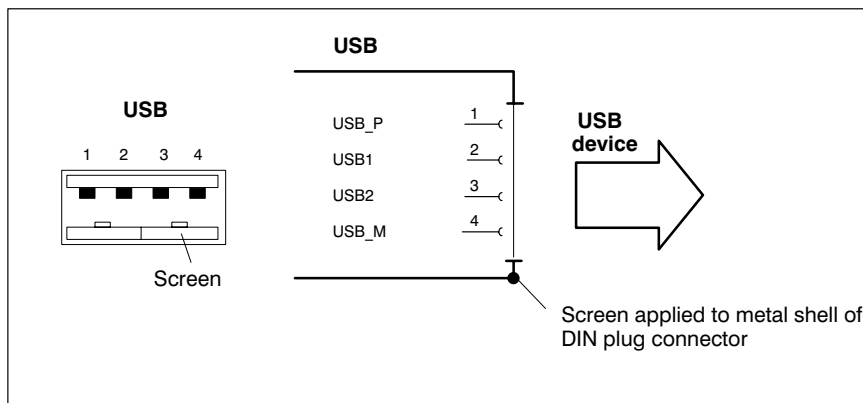
PIN	Function
1	USB power supply (max. 500 mA)
2	File
3	File
4	USB Ground

6.6.2 Settings

Control Panel

For information about setting the communication parameters for serial interfaces, refer to the manual supplied with the installed operating system. Windows NT: Go to Start / Settings / Control Panel, etc.

PhoenixBIOS

The default BIOS presets for COM1 (serial port A) and COM2 (serial port B) are **AUTO** (automatic parameter assignment). If you desire direct parameter assignment, you should adopt the following settings:

- COM1 = 3F8H
- COM2 = 2F8H

Ex works, the settings for COM3 and COM4 are preset to not available **(Disabled)**.

☞ **The modification of BIOS settings is discussed in the manual entitled "BT150, BT200, BT215 and CPS21_3, Software Configuration". Modifications are necessary only in the event that changing the default settings for COM1 through COM2 and USB serial ports is required.**

CAUTION
With regard to IRQ and I/O address, the connected devices must correspond to the BIOS settings made for the respective serial port.

6.7   LPT1 parallel port

LPT1   Parallel port for printer, scanner, CD-ROM, etc.

Male DB-25 connector
Type: SPP (ex works), EPP, ECP
Cable length: Max. 3 m
Cable type: Screened, min. cross-section 0.14 mm^2
Interrupt (IRQ):   7
I/O address: AUTO or 378H (recommended)
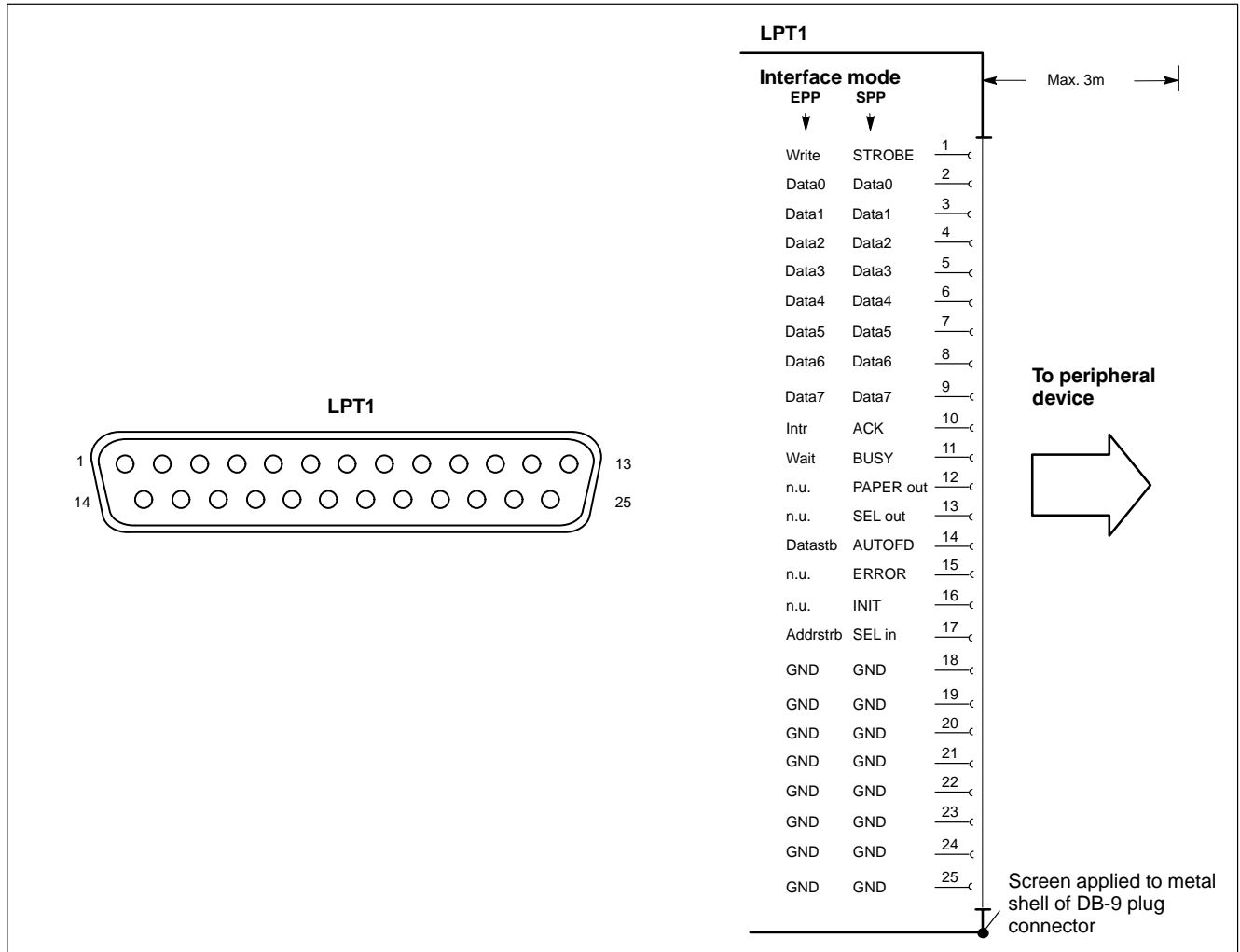
The parallel port normally runs in the default SPP mode. Provided that suitable peripheral devices are present, it can also be operated in EPP (Enhanced Parallel Port) or ECP (Extended Capabilities Port) mode. BIOS settings must be changed accordingly (refer to "BT150, BT200, BT250 and CPS21_3, Software Configuration" manual).

CAUTION
Functional failures caused by poor screening!
Use only metallic or conductive connector/coupling shells providing large-area screen contact.

6.7.1   Parallel Port for CD-ROM

To install a CD-ROM drive with a parallel interface connection, please follow the instructions of the manufacturer. New settings in the operating system and/or BIOS may be necessary.

The following CD-ROM drive with parallel interface connection may be used:

Type: CD-Jet SL (Multiport CD-ROM drive parallel port)

Manufacturer: Multiport Computer-Systeme GmbH, Ruselstr. 84, D-94469 Deggendorf

6.8   Ethernet Connector

Ethernet   network connection

The CPS21 can be connected to an Ethernet network via the Ethernet connector. To facilitate data communications, the required network protocols (e.g., TCP/IP) must be recognized by the operating system and the network application programs running on the PC.

Female RJ45, 8-pin

Type:	Ethernet 10/100BaseTX
Cable length:	Max. 100 m
Cable type:	Screened, twisted pair
Transmission rate:	10 or100 Mbit/s
Interrupt (IRQ):	5
I/O address:	340H
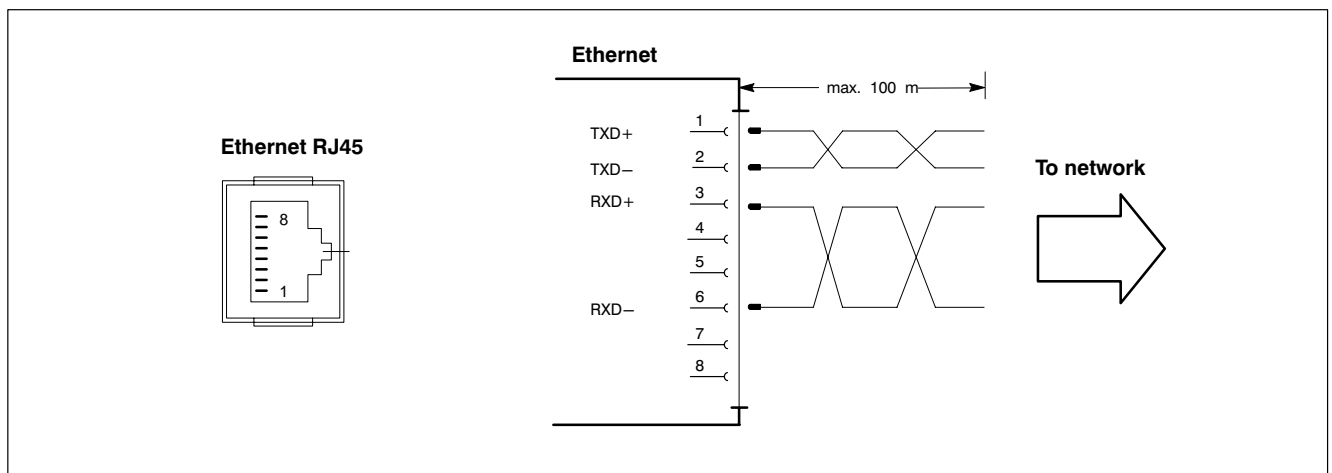
The driver configuration of the network connection can be called up in the task bar or in "Control Panel", with the icon "Network Interface card". Here it is possible to set the data transfer rate over the network to 10 Mbit/s or 100 Mbit/s.

☞ **Note that the network card of the remote communication partner must be able to handle the same data transfer rate.**

6.9   VGA Video Port

VGA   External monitor port

The VGA port accepts an external monitor (CRT) for operation via the built-in video adapter. The external monitor may be operated concurrent with the integrated flat panel display.

Female VGA HD, 15-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm^2

Max. resolution: 1280 x 1024 pixels, max. 16 million colours
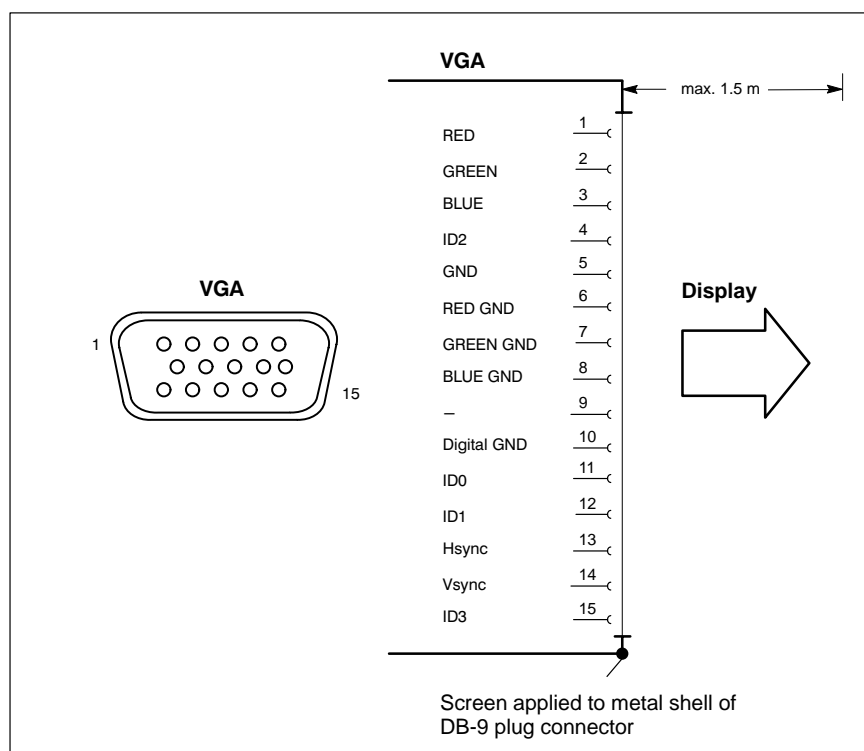
Video-Adapter CRT

Resolution and colours for the VGA port can be selected in the Control Panel of the operating system.

The following standard resolutions can be used with a minimum refresh rate of 72 Hz:

- VGA mode: 640 x 480 pixels, 72 Hz, 256 colors
- SVGA mode: 800 x 600 pixels, 72 Hz, 256 colors
- XGA mode: 1024 x 768 pixels, 72 Hz, 256 colors
- SXGA-Mode: 1280 x 1024 pixels, 72 Hz, 256 colors

Up to 16 million colors can be displayed.

☞ **The external monitor must be connected before the PC is booted in order for the VGA interface to be initialized.**

CAUTION
Setting incorrect resolutions and colors can destroy your monitor!
Observe the specifications applying to your CRT or LCD monitor, and adapt the operating system parameters accordingly.

Recommended monitors for external use are low-radiation models to TCO95. In addition, you should achieve the desired display resolution at a refresh rate of no less than 72 Hz.

☞ **The insertion of a graphics card disables the integrated video adapter.**

6.10   Keyboard Ports

KBD   **PS/2 mini DIN keyboard port**

An additional external keyboard can be connected to this port.

Female PS/2 mini DIN, 6-pin

Cable length:	Max. 1.5 m
Cable type:	Screened, min. cross-section 0.14 mm^2
BIOS preset:	System Keyboard: Present
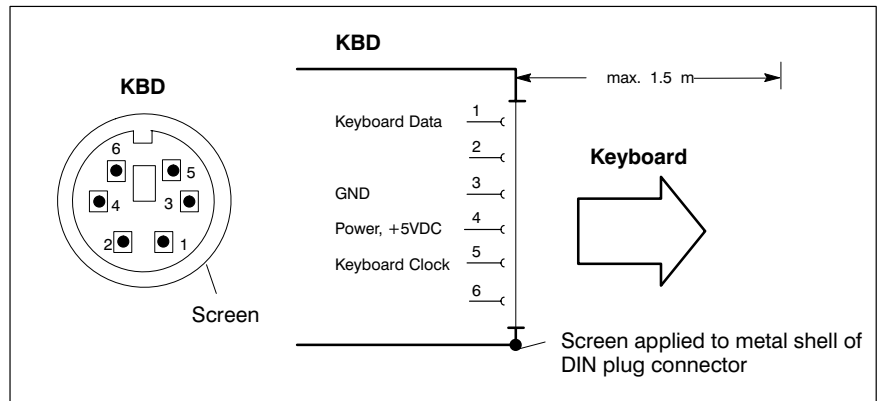
In the event that the system fails to recognize the keyboard, it must be activated by changing the BIOS setting from "Absent" to "Present".

Keyboard adapter

In the event that the MF2 keyboard is equipped with a standard 5-pin DIN plug, you will require a keyboard plug adapter to a female PS/2 Mini DIN connector.

A suitable adapter is approx. 20 cm in length with a DIN connector and a mini DIN coupling on the ends.
Connector assignment as per diagram below.
These premanufactured adapters are available from computer stores.
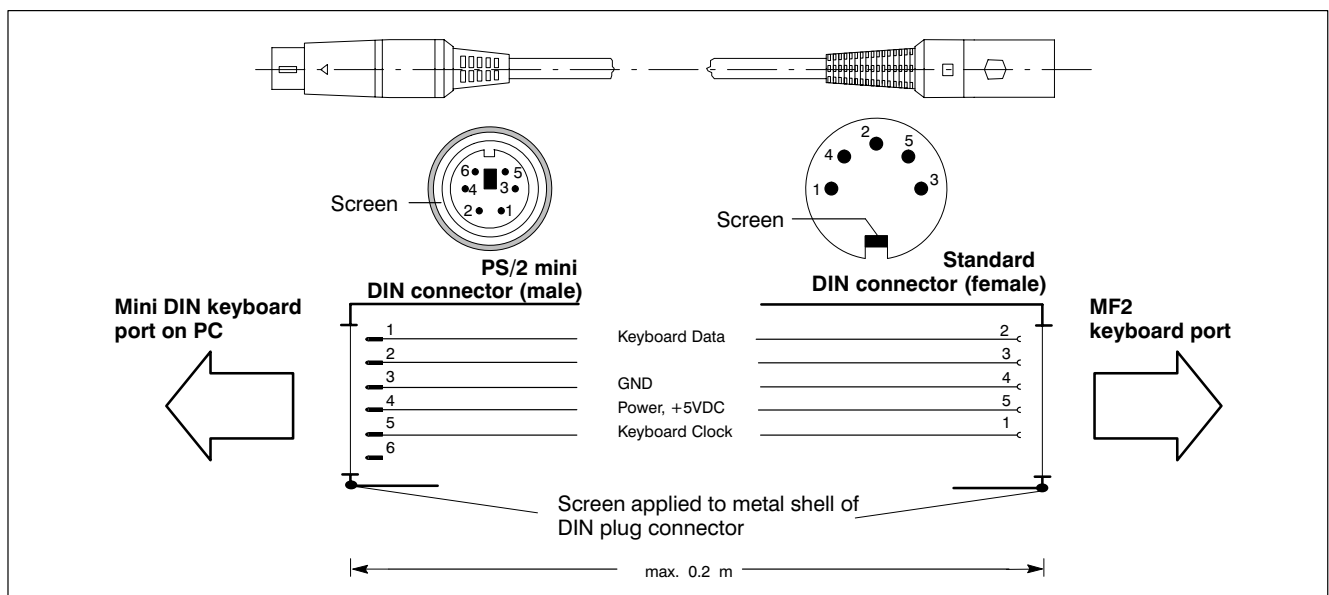
6.11 Mouse Port

Mouse **PS/2 mouse port**

An external mouse can be connected to this port if the integrated key mouse (see section 7.2.5) shall not be used.

Female PS/2 mini DIN, 6-pin

Cable length:	Max. 1.5 m
Cable type:	Screened, min. cross-section 0.14 mm^2
Interrupt (IRQ):	12
BIOS preset:	PS/2 Mouse: Auto Detect
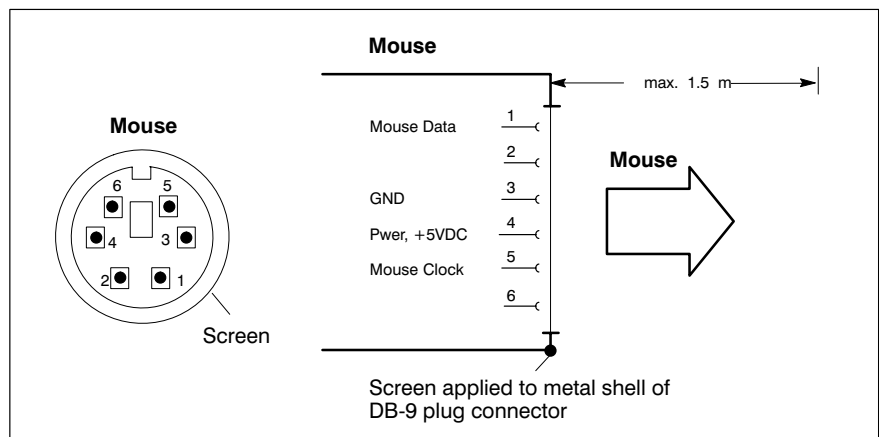
In the event that the system fails to recognize the PS/2 mouse, it must be activated by changing the BIOS setting from "Absent" to "Present".
A subsequent connection of the external mouse will not be recognized by the operating system because initialization is only possible during "booting".

☞ **The connected mouse must be PS/2-compatible.**
The BIOS normally reserves IRQ12 for the PS/2 mouse. If there are address conflicts, e.g. if IRQ 12 has already been occupied by another PC expansion card, you should change the IRQ of the expansion card to one that is still free.

6.12   DP-Slave Port

DP-Slave   PROFIBUS DP connector

The key codes of the front panel keys are transferred from the PC to this PROFIBUS slave connector.
This interface is not used.

6.13   24 Vout port

24 V out   output key codes

The codes of certain keys on the front panel keyboard are transferred to outputs of the 24 Vout port. From here, the key codes are transferred over the already existing wiring to the **X28** plug on the connection and distribution card (refer to section 6.3). At this point they can be read for further processing via an external input node.

Female DB-15

Cable length:	Max. 20 m
Cable type:	Screened, min. cross-section 0.14 mm^2
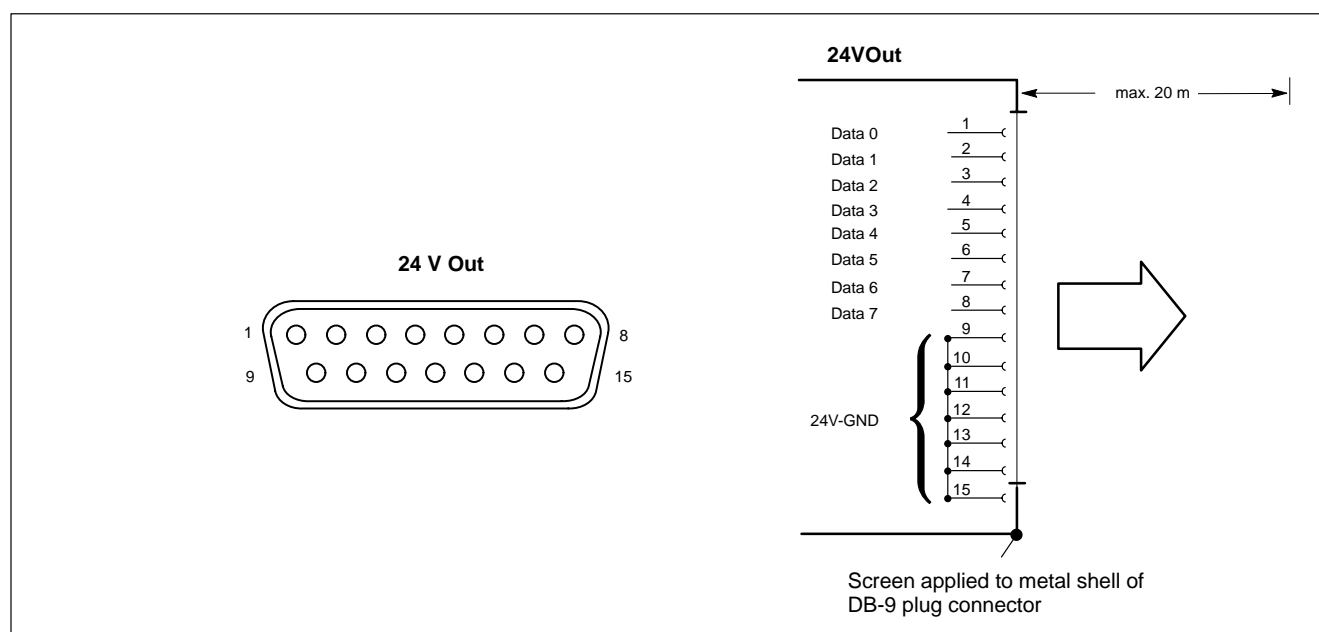
6.14 Expansion Card Interfaces

6.14.1 PCI_BM-xxx Card

This busmaster expansion card is the interface of the software PLC.
The PLC signals are transmitted over the integrated system bus.

Depending on model, X71 has been assigned one of the following **bus systems**:

Name	Bus system
PCI_BM–CAN	CAN bus
PCI_BM–IBS	InterBus-S
PCI_BM–DP	PROFIBUS-DP

X71   CAN-Bus "PCI_BM-CAN"

Male DB-9 connector

Type: CANopen bus
Cable length: depending on baud rate
                                   max. 25 m with 1 Mbit/s
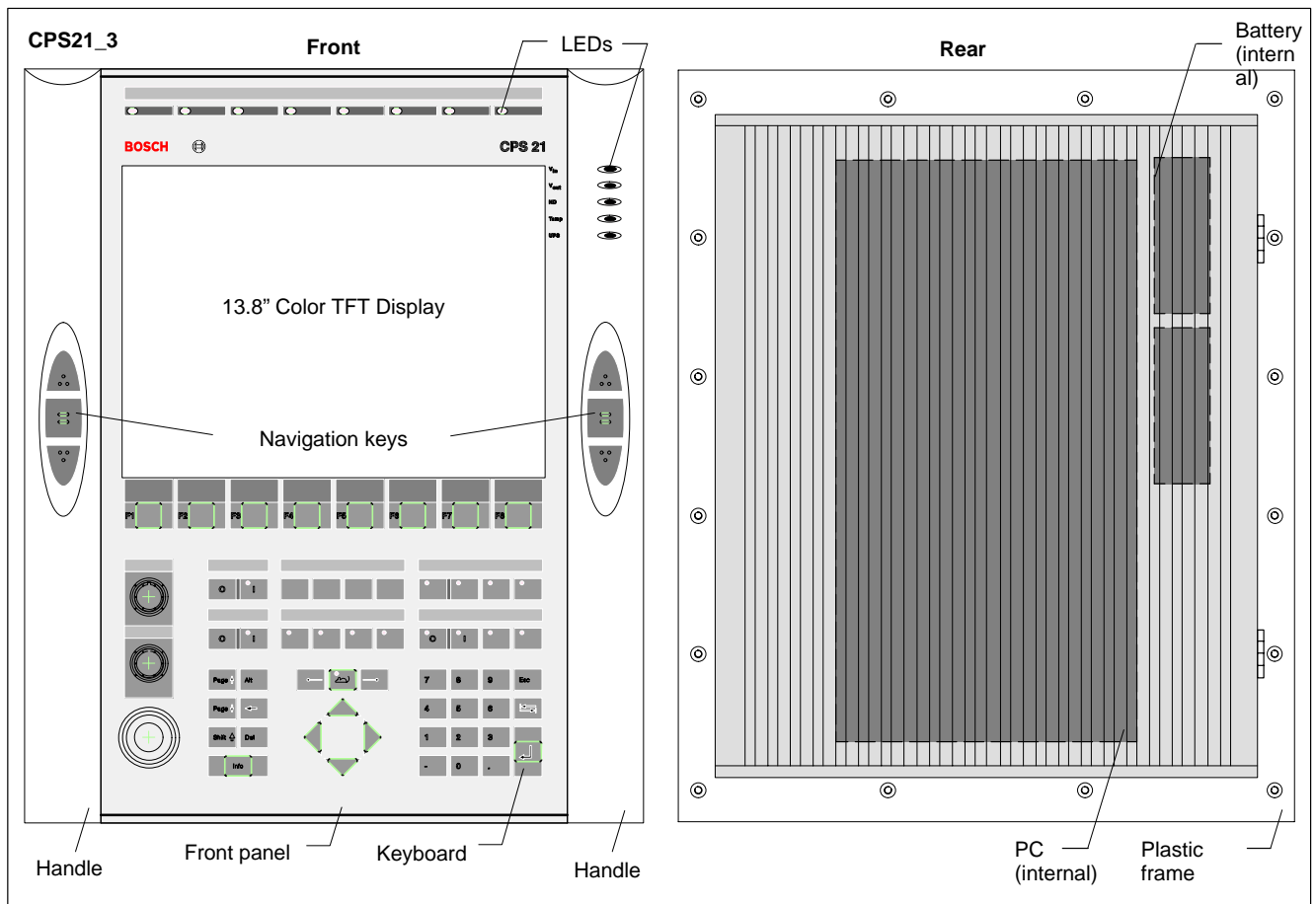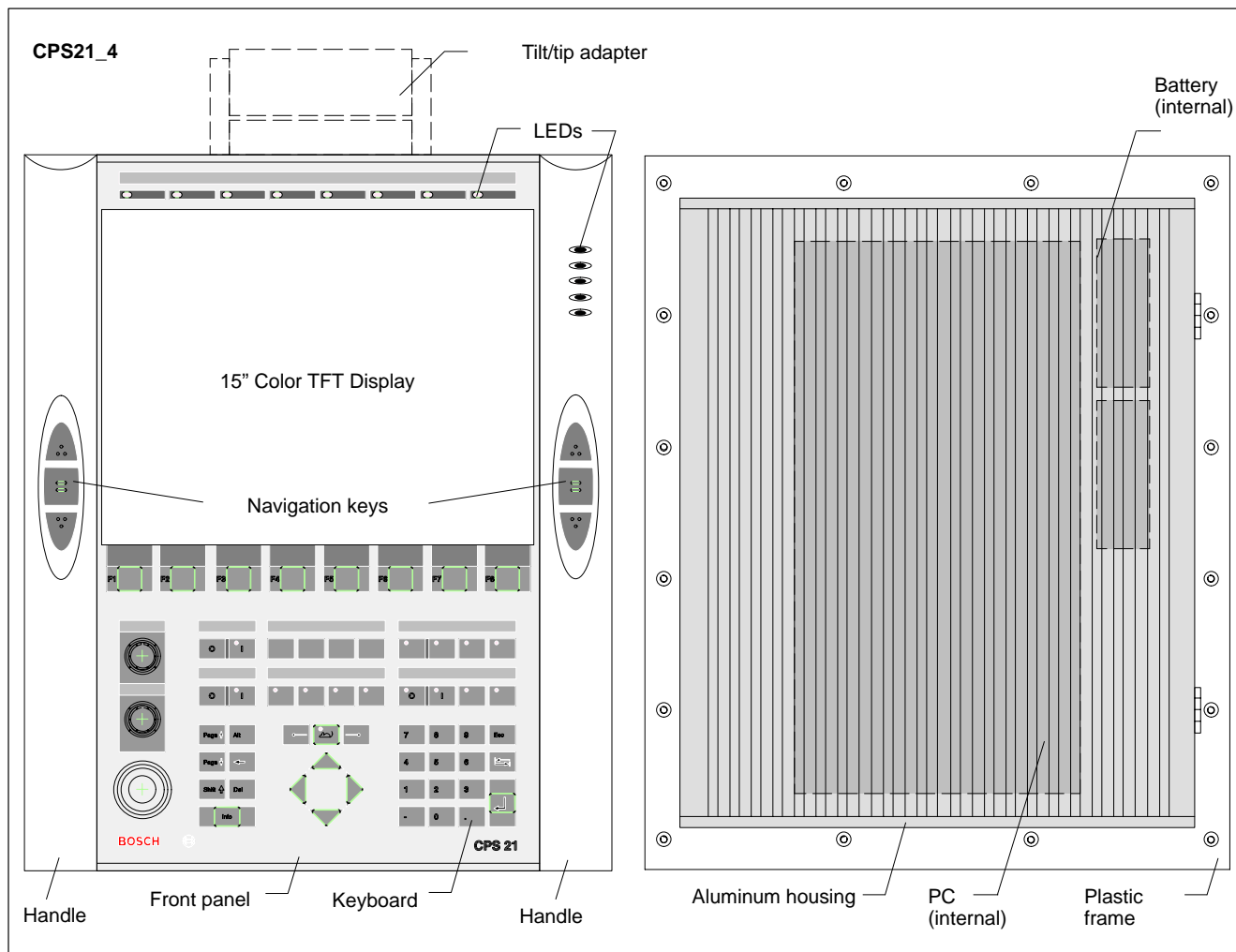Cable type: Screened, min. cross-section 0.14 mm^2
Transmission rate: up to 1 Mbit/s
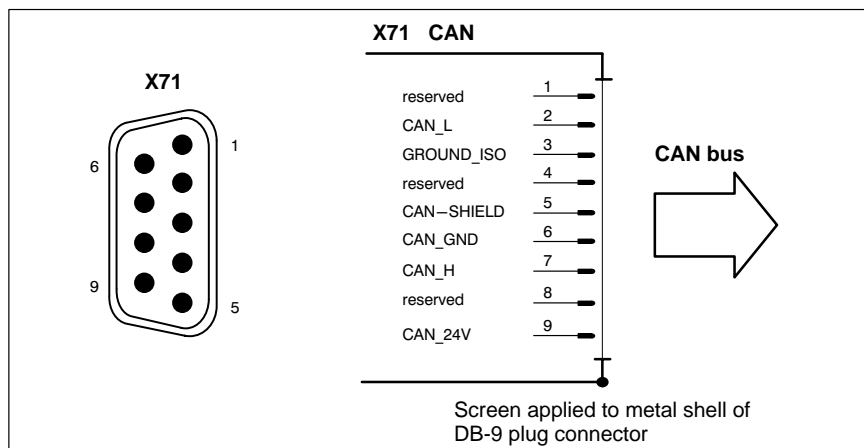
X72   This interface is not used.

X71 **Interbus S "PCI_BM-IBS"**

Female DB-9

Type : InterBus-S Remote (as per EN 50178)
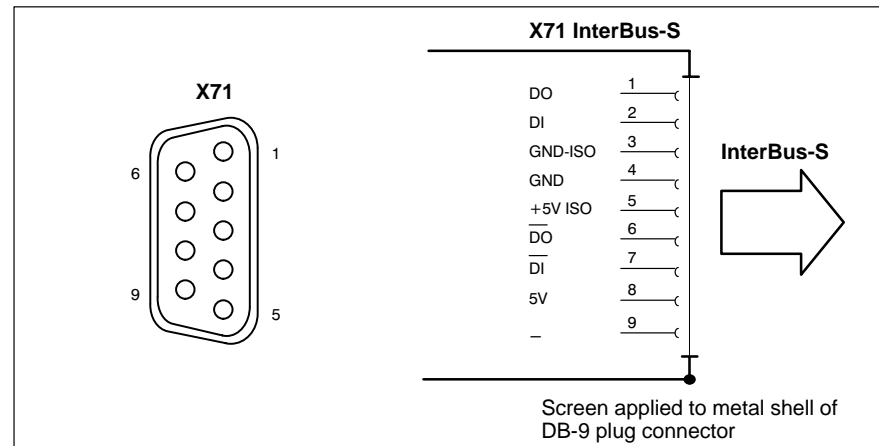
☞ **Please comply with the installation instructions and recommendations of Phoenix-Contact, e.g. IBS SIG Part 1 UM or the IBS SYS INST UM installation manual.**

X72 This interface is not used.

X71   PROFIBUS DP "PCI_BM-DP"

Female DB-9

Max. cable length depending on baud rate (as per DIN EN 19245 Part 3):		
	500 kbit/s	400 m
	1500 kbit/s	200 m
	3000 kbit/s	100 m
	6000 kbit/s	100 m
	12000 kbit/s	100 m

Cable type: Screened, min. cross-section 0.14 mm^2

X71 PROFIBUS-DP

Meaning		Pin	External PROFIBUS DP node
–	–	1	
–	–	2	
Receiving/Transmitting • data P	File	3	RS-485 signal +
Repeater control signal P	Repeater+	4	TTL signal for repeater control
Data ground	GND ISO	5	ISO-GND
Voltage supply+	+5V ISO	6	Voltage supply for repeater (+5 V 100 mA)
–	–	7	
Receiving/Transmitting• data N	Data–	8	RS-485 signal –
Repeater control signal N	Repeater–	9	GND for repeater P

Screen applied to metal shell of DB-9 plug connector

X72   This interface is not used.

6.14.2 PCI_CAN Card

This interface is a second CAN bus for fast transmission of measured data to the PC.

X71 **CAN bus**

Male DB-9 connector

Type:	CAN-Bus
Cable length:	depending on baud rate max. 25 m with 1 Mbit/s
Cable type:	Screened, min. cross-section 0.14 mm^2
Transmission rate:	up to 1 Mbit/s
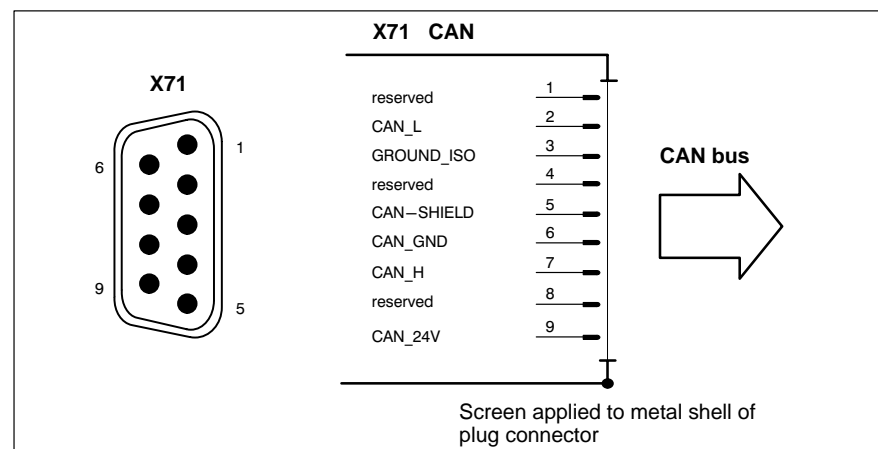
7   Display and Control Elements

The CPS21_3 / CPS21_4 is provided with the following display and control components:

- Display
- Membrane keyboard
- Buttons for START, STOP, and EMERGENCY OFF
- LED displays
- Insertion labels for front panel
- Keyboard controller

CPS21_4

Tilt/tip adapter

LEDs

Battery (internal)

15" Color TFT Display

Navigation keys

P1 P2 P3 P4 P5 P6 P7 P8

BOSCH

CPS 21

Handle

Front panel   Keyboard   Handle

Aluminum housing   PC (internal)   Plastic frame

7.1   Display

The CPS21_3 is equipped with a 13.8" flat color LCD display; the CPS21_4 has a 15" display. The screen is non-reflecting and scratch resistant.

Brightness and contrast are preset at the factory. Colors can be adapted to the user's requirements via the operating system or by means of the application software.

For maintenance work on the display, the PC can be hinged down if the housing is open. For instructions, please refer to section 8.2.2.

Video Adapter LCD

The integrated video adapter supports VGA-CRT displays (refer to section 6.9) and flat-screen LCDs. Both displays can be operated in parallel.

● Video RAM: 2 MB

☞ **The insertion of a graphics card disables the integrated video adapter.**

For optimal readability the flat display is preset to:

● 1024 x 768 pix-   with 64k colors
  els:

☞ **The 1024 x 768 pixel resolution is preset with every booting up of the CPS21. This applies to the "LCD Video Adapter" and the "CRT Video Adapter".**

7.1.1   Backlight Function

The backlight provides the background illumination for the LCD display. As its service life is limited, only 50% of its original brightness will remain after approx. 15,000 operating hours.
Refer to section 8.2.2 for information about replacing the backlight unit.

To extend the service life of both display and backlight tube, the flat screen display features a timer ("sleep") function for the backlight .
This function "darkens" the display when no keyboard or mouse action has occurred on the CPS21 for a defined period of time. The length of the defined interval can be selected in the PC BIOS and in the Windows Control Panel.

Pressing a key or moving the mouse again activates the backlight, making the display visible once more.

Enabling the "Backlight Off" function

● In the BIOS setup program, go to the "Power Management Setup" menu option. Select the "OnBoard LCD Backlight Timer OFF" submenu, and select a time interval between 28 seconds and 14 minutes.
● Install a screen saver such as "Blank Screen" that will switch the display to a "black signal" in the operating system. Select the "Wait" period after which the screen saver will be activated. The interval selected here is added to the "Backlight Timer OFF" interval that was selected in the BIOS.

7.2   Keyboard

The front panel is provided with a medium resistant membrane keyboard (IP 65). It contains 57 keys (or buttons), 15 of which are provided with an LED. Some keys can be assigned multiple functions.

In addition, 3 buttons are integrated in the front panel:
- START, illuminated
- STOP
- EMERGENCY OFF

7.2.1   Block of Function Keys

The following key blocks belong to those keys whose function can be **programmed** by means of the application program:

- 8 keys arranged horizontally below the display
  (e.g., for the softkey functions customary in industry)
  Description of this key row: F1...F8

- 4 keys F9...F12, arranged horizontally below the F1...F8 function key block
  Description of this key row: provided by the user
                                 (description tags)

- 2 x 3 navigation buttons vertically arranged on the right and left side of the display inside the handlebar.
  Designation: none

Navigation keys

Function keys
F1..F8

Function keys
F9..F12

Navigation keys
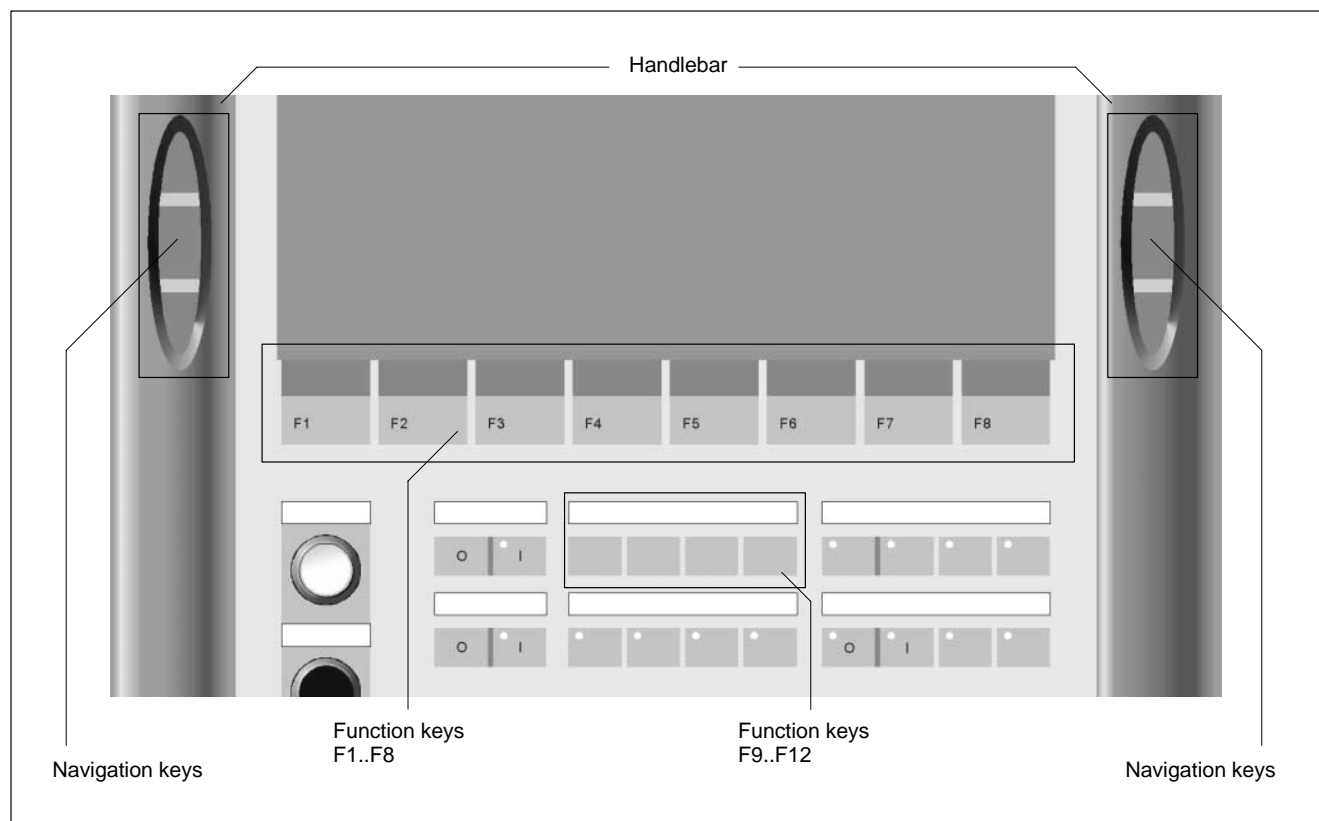
7.2.2 Key Blocks "Control"

The programmable key blocks "Control 1...3" contain 16 keys, 14 of which are provided with an integrated LED.

Keypad "Control 1"

Keypad "Control 2"

Keypad "Control 3"
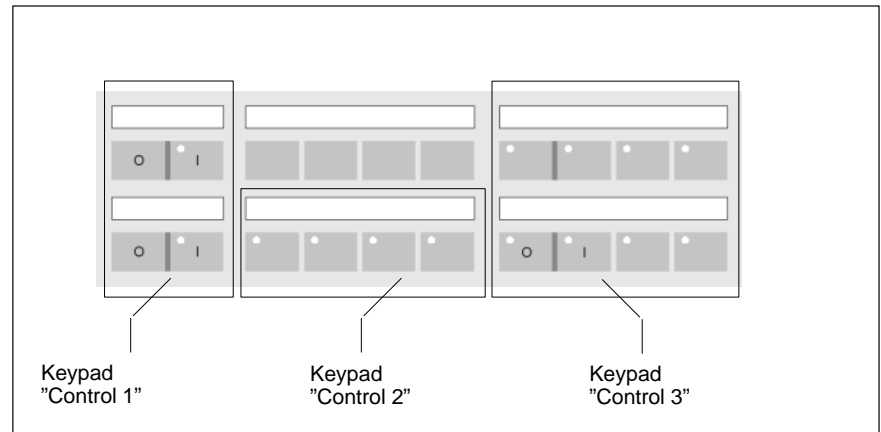
7.2.3 Key Block "Machine"

The key block "Machine" contains the following keys:
- START button (white, illuminated)
- STOP button (black)
- EMERGENCY OFF (red, complying with the requirements of EN 418)

START

STOP

EMERGENCY OFF
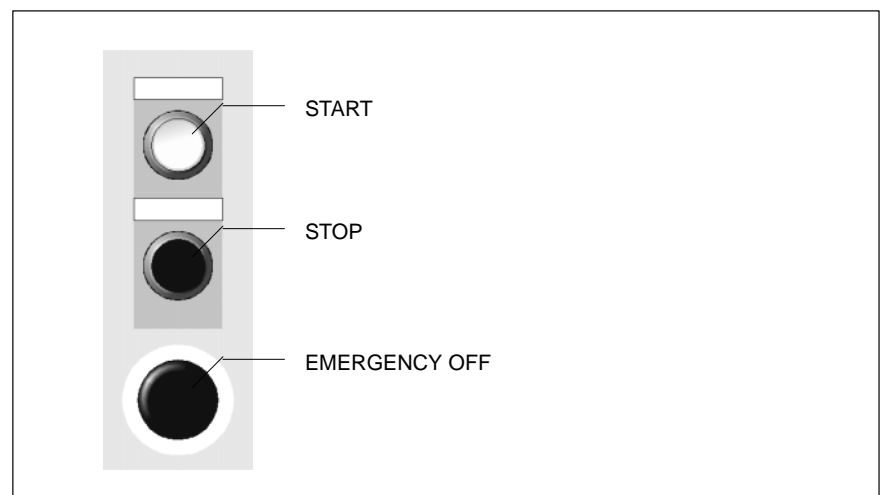
7.2.4 Number, Cursor Control and Special Keys Blocks

Keys may feature fixed (permanent) assignments or allow programming via the application program.

CPS21_3

Special keys — Key mouse

| Page ↑ | Alt | | ← | 🖰 | → | | 7 | 8 | 9 | Esc |

Cursor control block — Number block
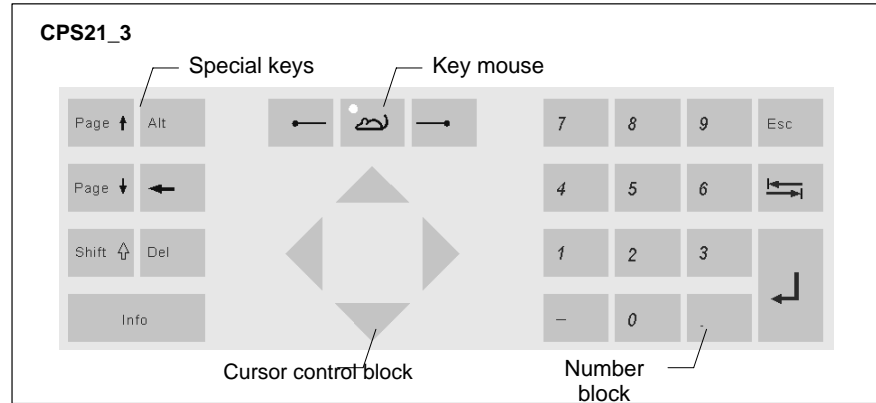
For easy operation, the keys are divided into blocks.

- **Number block** (15 keys)
  - Numbers 0 to 9, –, . ,
    Esc   (Escape)
    ⊢→   (Tabulator)
    ←⏎   (Return)

- **Cursor block and key mouse** (7 keys)
  - Cursor keys: right, left, up, down
  - Key mouse: activate/deactivate mouse, mouse key right and left

- **Special keys** (7 keys)
  - Page up   (to beginning of page)
    Page dn   (to end of page)
    Shift   (capital/small letters)
    Alt   (Alternate)
    ←   (Backspace)
    Del   (Delete)
    Info   (call up information)

7.2.5   Key Mouse

The key mouse is a substitute for an external mouse.

The key mouse is activated (LED on) and deactivated (LED off) with the "mouse" key (key with mouse symbol and LED).

The 4 cursor keys are used to move the mouse cursor upwards, downwards, to the left and to the right, and diagonally in all 4 directions.
The keys "⟶" and "⟵" correspond to the right and left mouse button.
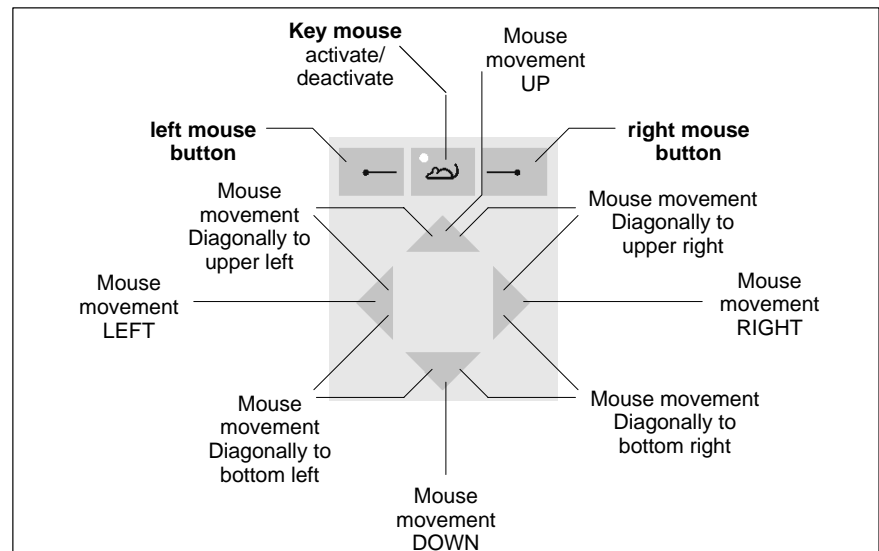
☞ **If the key mouse is active, the cursor keys are not available.**

If an external mouse is connected before start up or after RESET, it is recognized automatically and the key mouse is deactivated. Activating the key mouse is then not possible, even if the external mouse is unplugged. To activate the key mouse, the CPS21 must be rebooted.

☞ **Subsequent connection of an external mouse will not be recognized by the operating system because initialization is only done during "booting".**

7.3   LED Indicators

7.3.1   Hardware Indicators

The PC system is provided with 5 LEDs for indications on hardware. In the case of the CPS21_4 the LEDs are not labeled. The assignments are the same as for the CPS21_3 (see illustration).

5 LED indicators
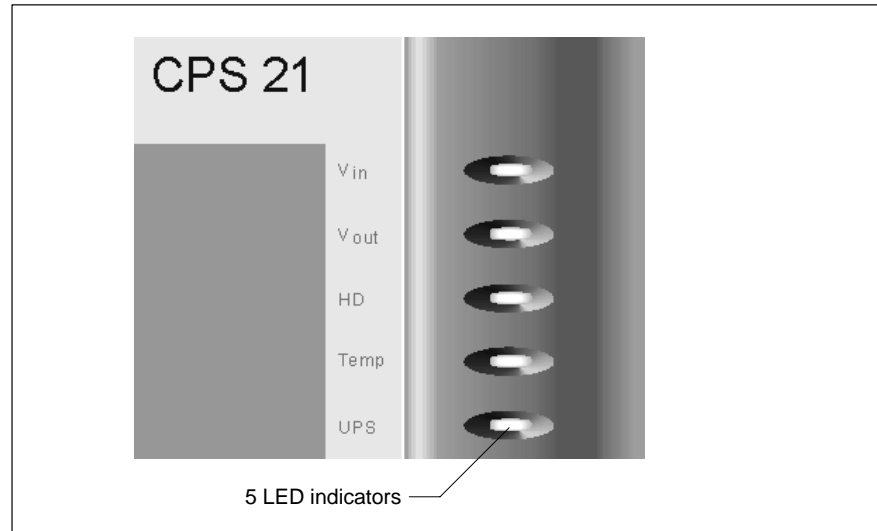
Please take appropiate measures if one of the following LEDs indicates an error or a message:

LED	Display	Meaning	Measures
V_{in}	LED green	Standard operation	–
	LED off	No supply voltage 24 VDC	Check the supply voltage at the power supply unit!
VOut	LED green	Standard operation	–
	LED off	Internal voltage +5V / +12V not available	Check the supply voltage at the power supply unit!
HD	LED yellow	Access to hard disk	–
Temp	LED off	Standard operation	–
	LED flashes red	Internal housing temperature exceeds > 50 °C. Shutdown will occur if temperature continues to rise.	Lower ambient temperature! Check fan of PC!
UPS	LED off	Standard operation	–
	LED red	CPS21 currently running on battery power, i.e. no mains power available!	Restore mains power, initiate a controlled CPS21 restart!
	LED flashes red	Discharged or defective rechargeable battery, or battery not connected.	Check battery! Observe 5 hour recharging time!

In addition, the PC is provided with an LED-equipped RESET button (accessible when housing is open) located on the same side as the interfaces:

Button: Initiates rebooting process of PC.
LED (red):   RESET button is pressed

7.3.2   Customer-Specific Indicators

8 LEDs at the upper rim of the CPS21_3 and CPS21_4 are provided for customer–specific indications.
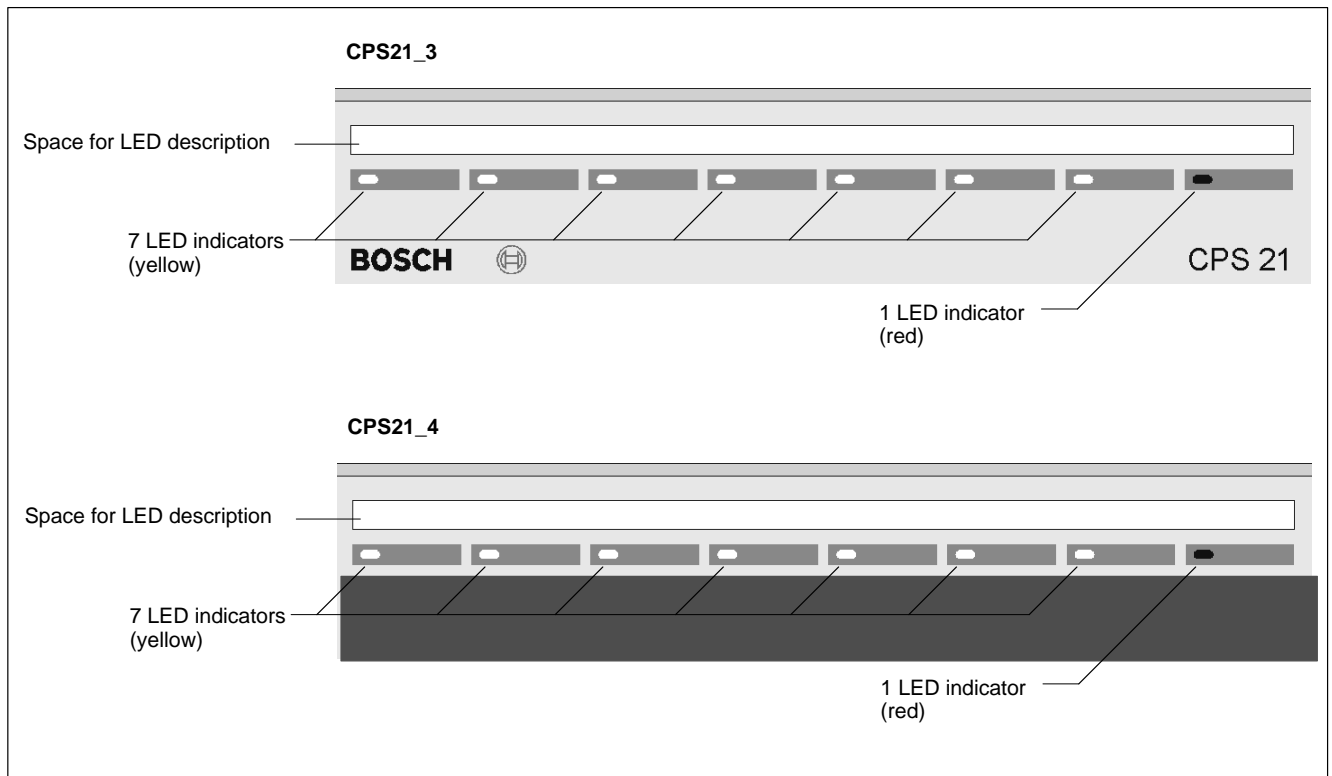
7.4   Front Panel Labeling

Providing for customer-specific terminal legends, individual insertion labels can be pushed in at the edges of the CPS21:

- customer-specific LED indicators (upper edge of front panel)
- programmable key blocks "Control 1..3"
- integrated buttons

The openings for inserting the label (cross-section: 2.5 x 12.0 mm) are located below the handlebars, and are therefore sealed from the outside.

Handlebar (dismounted)

Opening for insertion label in the membrane cross–section: 2.5 x 12.0 mm

6 vertical bores each for fastening handlebars with screws.

Insertion label

Opening for inserting the label

Handlebar (dismounted)

View A – A
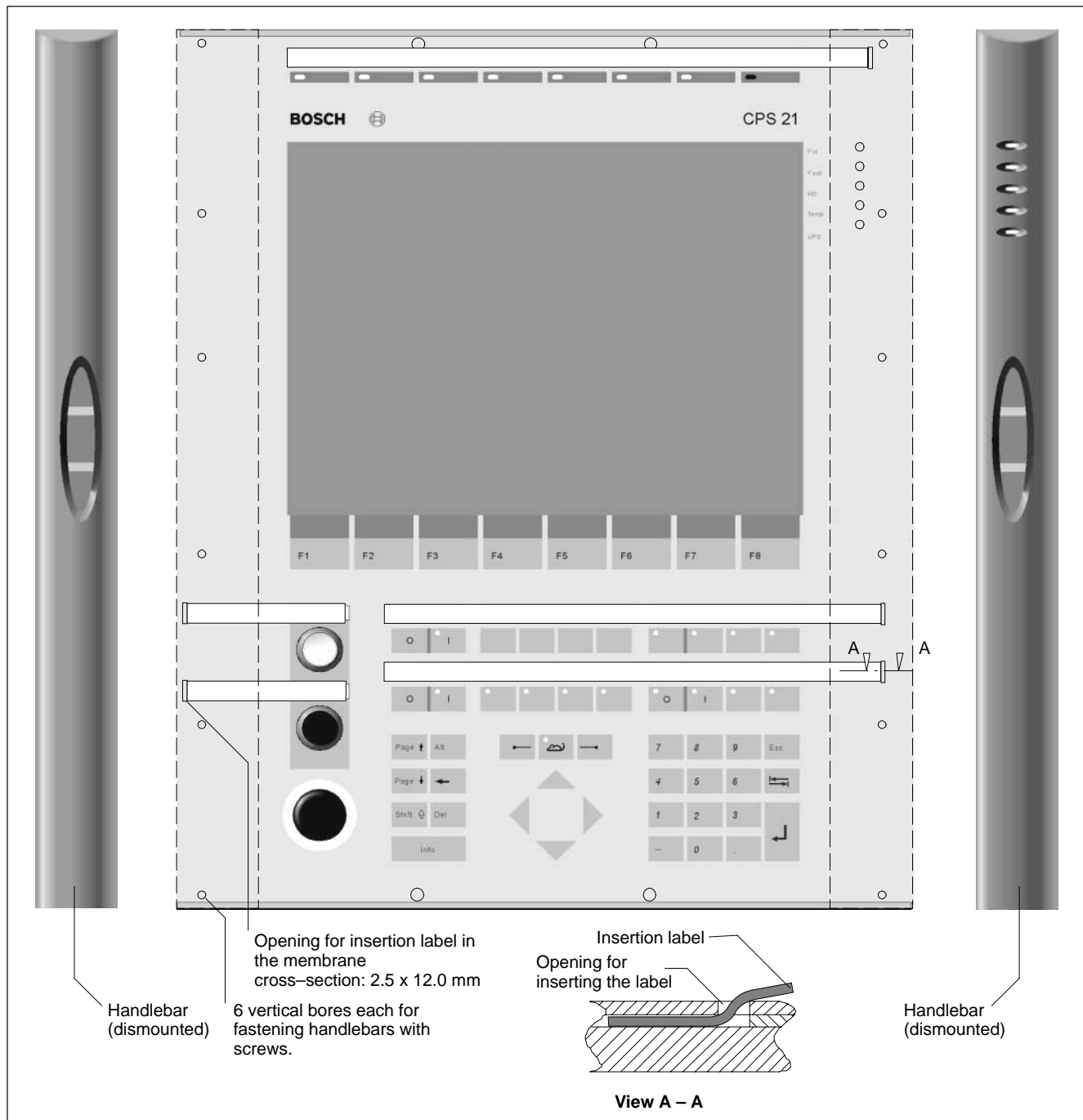
Instructions:

1. The CPS21 must be turned off and completely de-energized.

2. Take the handlebars off the front panel. To do so, unscrew the 12 screws (6 for each handlebar) that are positioned vertically on the rear edge of the plastic frame.

3. Now, insert the labels in the openings especially designed for this.

4. Reassemble the components in the reverse sequence to that described above.

Restart the system. Make sure that the labels can be read easily.

CAUTION
Incorrect labeling may lead to false operation!
Make sure that the descriptions on the labels correspond to the functions of the described keys and LEDs.

Dimensions of the labels

The label is made of plastic or laminated paper. It can also be written on in a normal printer. The height of the readable section is max. 8 mm.
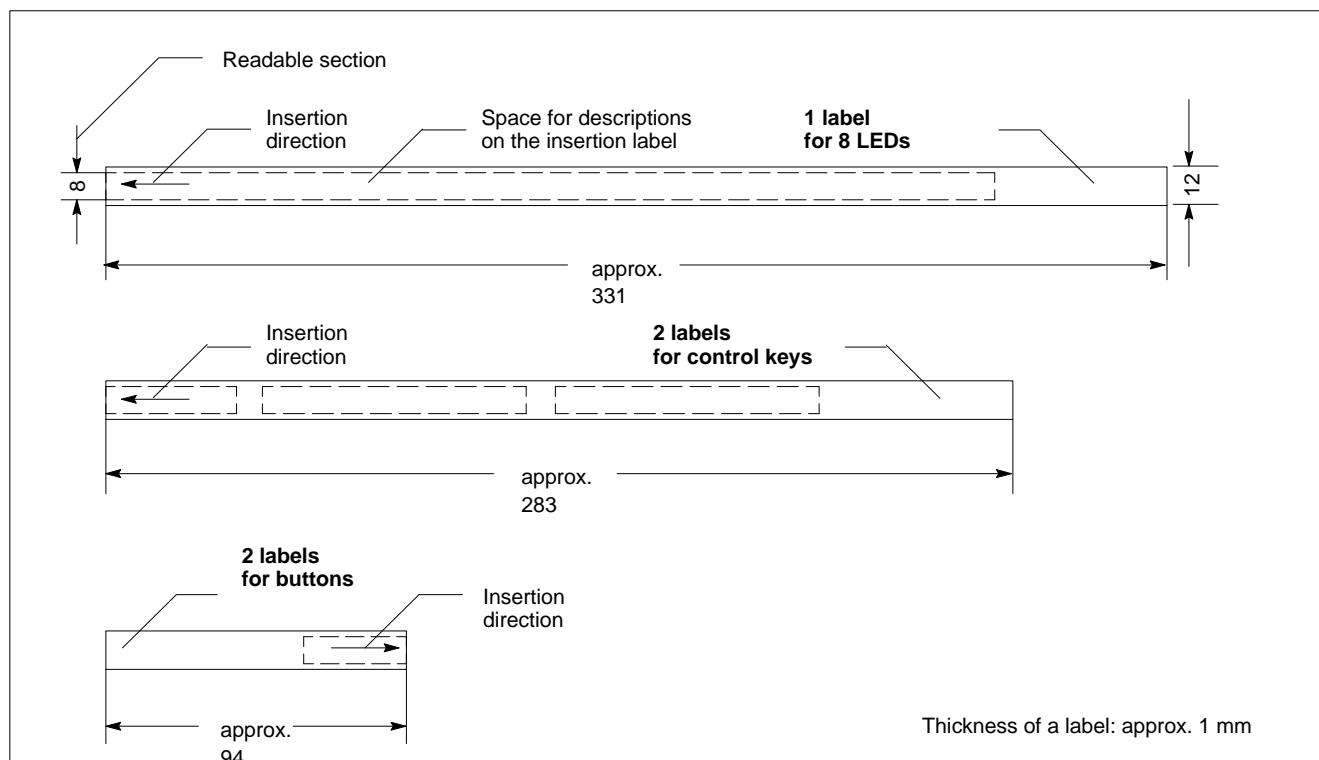
7.5   Keyboard Controller

For many industrial applications it is important to determine the key status (pressed / not pressed, key LED ON / OFF) of the front panel keyboard. To this end, a keyboard controller scans the front panel keyboard or an external keyboard, and transfers the key codes, switch settings, etc. to various interfaces.

7.5.1   Scanning Front Panel Keyboard

The current status of the front panel keyboard is transferred:

- to the PC via MF2
- to X28, via an internal connection of 24Vout outputs
- to the PROFIBUS Slave accounts (not used)

The codes of the application program can be further processed over the X28 connection.

Transferring Key Codes to the PC via MF2

The MF2 codes are available in the standard design in the first input byte and are passed on from the controller to the PC (refer to the assignment table on page 7–14).

Transferring Key Codes to the 24 V out outputs

☞ **Bit 1 corresponds to the low-order bit.**

Pressed navigation buttons and cursor/mouse keys are bit-coded by the controller and directly applied to the 24 Vout output.

- Bit1: **CRTL-L** (corresponds to S10)
- Bit2: **CRTL-R** (corresponds to S13)
- Bit3: **CRTL-U,CRTL-D** (corresponds to S09 or S11 or S12 or S14)
- Bit4: **Cursor/Mouse** up or down (corresponds to S46 or S60)
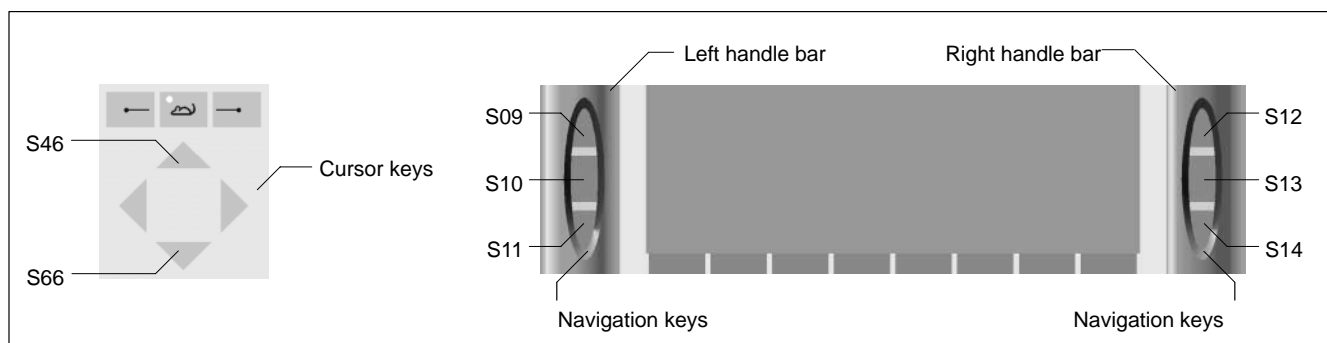
Please also refer to page 7–14 "Code Assignment Table".**.**

Keys, LEDs (descriptions):
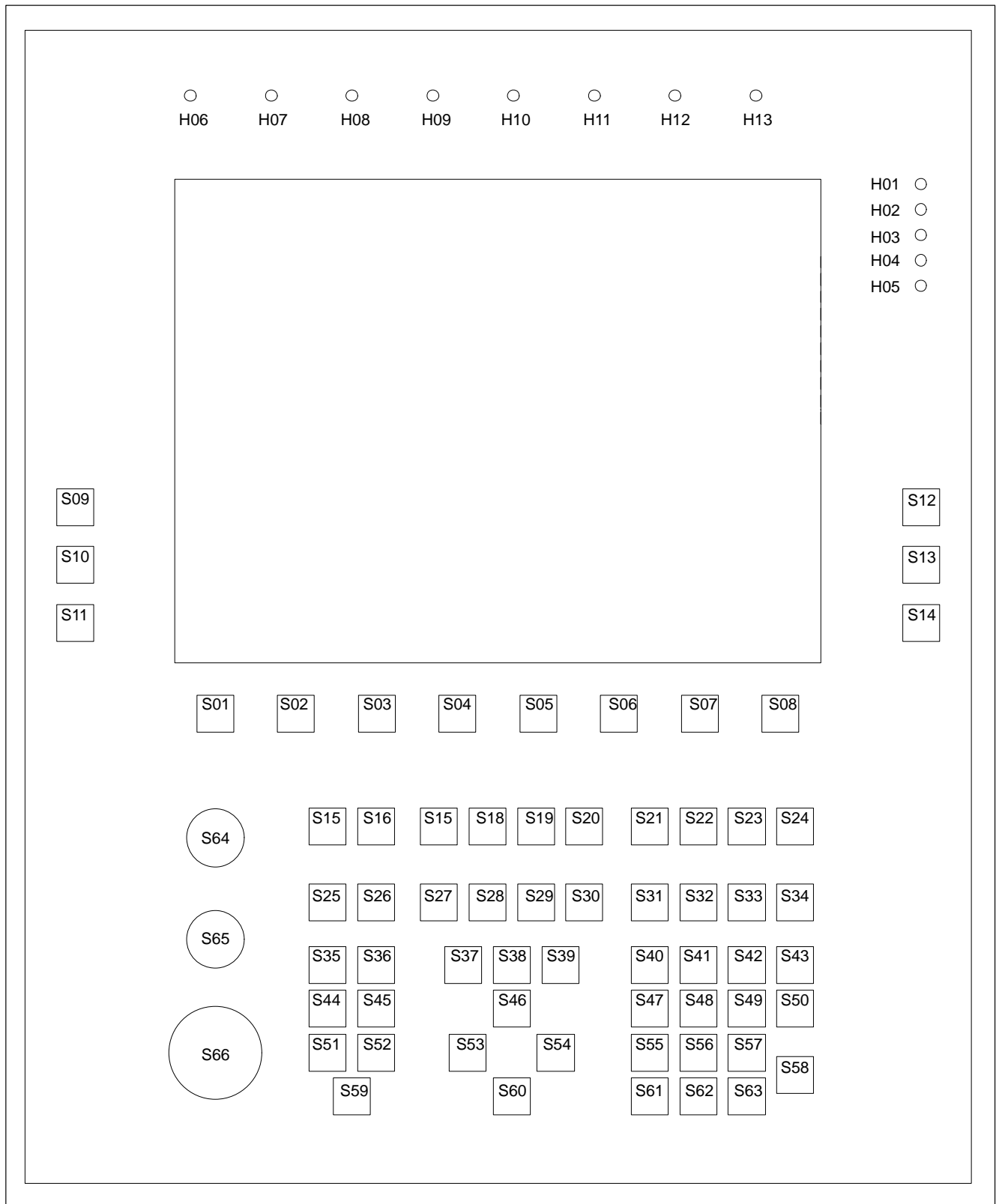
Standard Code Assignment of LEDs and Keys

Key No.	MF2	Mouse	Repeat	COM3	24 Vout	Type of key	LED
S01	F1	–	No	–	–	ST2	–
S02	F2	–	No	–	–	ST2	–
S03	F3	–	No	–	–	ST2	–
S04	F4	–	No	–	–	ST2	–
S05	F5	–	No	–	–	ST2	–
S06	F6	–	No	–	–	ST2	–
S07	F7	–	No	–	–	ST2	–
S08	F8	–	No	–	–	ST2	–
S09	CRTL-U	–	Yes	–	Bit3	ST2	–
S10	CRTL-L	–	Yes	–	Bit1	ST2	–
S11	CRTL-D	–	Yes	–	Bit3	ST2	–
S12	CRTL-U	–	Yes	–	Bit3	ST2	–
S13	CRTL-R	–	Yes	–	Bit2	ST2	–
S14	CRTL-D	–	Yes	–	Bit3	ST2	–
S15	–	–	Yes	Bit1	–	RF15	–
S16	–	–	Yes	Bit2	–	RF15	yellow
S17	F9	–	Yes	–	–	RF15	–
S18	F10	–	Yes	–	–	RF15	–
S19	F11	–	Yes	–	–	RF15	–
S20	F12	–	Yes	–	–	RF15	–
S21	–	–	–	Bit3	–	RF15	yellow
S22	–	–	–	Bit4	–	RF15	yellow
S23	–	–	–	Bit5	–	RF15	yellow
S24	–	–	–	Bit6	–	RF15	yellow
S25	–	–	–	Bit7	–	RF15	yellow
S26	–	–	–	Bit8	–	RF15	yellow
S27	–	–	–	Bit9	–	RF15	yellow
S28	–	–	–	Bit10	–	RF15	yellow
S29	–	–	–	Bit11	–	RF15	yellow
S30	–	–	–	Bit12	–	RF15	yellow
S31	–	–	–	Bit13	–	RF15	yellow
S32	–	–	–	Bit14	–	RF15	yellow
S33	–	–	–	Bit15	–	RF15	yellow
S34	–	–	–	Bit16	–	RF15	yellow
S35	Page up	–	Yes	–	–	RF15	–
S35	Alt	–	Yes	–	–	RF15	–
S37	–	Mouse button left	–	–	–	RF15	–
S38	–	Mouse active	–	Bit32	–	RF15	yellow

Key No.	MF2	Mouse	Repeat	COM3	24 Vout	Type of key	LED
S39	–	Mouse button right	–	–	–	RF15	–
S40	7	–	Yes	–	–	RF15	–
S41	8	–	Yes	–	–	RF15	–
S42	9	–	Yes	–	–	RF15	–
S43	ESC	–	Yes	–	–	RF15	–
S44	Page down	–	Yes	–	–	RF15	–
S45	Backspace	–	Yes	–	–	RF15	–
S46	Cursor up	Mouse up	Yes	–	Bit4	RF15	–
S47	4	–	Yes	–	–	RF15	–
S48	5	–	Yes	–	–	RF15	–
S49	6	–	Yes	–	–	RF15	–
S50	Tab	–	Yes	–	–	RF15	–
S51	Shift	–	Yes	–	–	RF15	–
S52	Del	–	Yes	–	–	RF15	–
S53	Cursor left	Mouse left	Yes	–	–	RF15	–
S54	Cursor right	Mouse right	Yes	–	–	RF15	–
S55	1	–	Yes	–	–	RF15	–
S56	2	–	Yes	–	–	RF15	–
S57	3	–	Yes	–	–	RF15	–
S58	Enter	–	Yes	–	–	RF15	–
S59	CRTL-I	–	Yes	–	–	RF15	–
S60	Cursor down	Mouse down	Yes	–	Bit4	RF15	–
S61	"–"	–	Yes	–	–	RF15	–
S62	0	–	Yes	–	–	RF15	–
S63	.	–	–	–	–	RF15	–
S64 (START)	–	–	–	–	–	Rafix 16	24 V glow
S65 (STOP)	–	–	–	–	–	Rafix 16	24 V glow
S66 (EMER-GENCY OFF)	–	–	–	–	–	Rafix 16	–

Description of LEDs

Key No.	Description	COM3	Type of LED	LED
H01		–	ST2	yellow
H02		–	ST2	yellow
H03		–	ST2	yellow
H04		–	ST2	yellow
H05		–	ST2	yellow
H06		Bit1	ST2	yellow
H07		Bit2	ST2	yellow
H08		Bit3	ST2	yellow
H09		Bit4	ST2	yellow
H10		Bit5	ST2	yellow
H11		Bit6	ST2	yellow
H12		Bit7	ST2	yellow
H13		Bit8	ST2	red
S16-B		Bit9	RF15 Spot	yellow
S21-B		Bit10	RF15 Spot	yellow
S22-B		Bit11	RF15 Spot	yellow
S23-B		Bit12	RF15 Spot	yellow
S24-B		Bit13	RF15 Spot	yellow
S26-B		Bit14	RF15 Spot	yellow
S27-B		Bit15	RF15 Spot	yellow
S28-B		Bit16	RF15 Spot	yellow
S29-B		Bit17	RF15 Spot	yellow
S30-B		Bit18	RF15 Spot	yellow
S31-B		Bit19	RF15 Spot	yellow
S32-B		Bit20	RF15 Spot	yellow
S33-B		Bit21	RF15 Spot	yellow
S34-B		Bit22	RF15 Spot	yellow
S38-B	Mouse active/inactive	Bit23	RF15 Spot	yellow

Communication with the PC is done via COM3 with special telegrams. The PC sends a lamp telegram to the keyboard controller and receives back a key telegram. All keys that have been pressed since the last lamp telegram are marked on this key telegram.

Lamp Telegram (Receiving telegram)

After receiving the lamp telegram, all coded LEDs switch on.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0 x B1	Data 0	Data 1	Data 2	Data 3

Each byte received must be acknowledged by the keyboard. Only after the acknowledgment, may the next byte be sent. After receiving the fourth byte, the keyboard answers with the key telegram.

Key Telegram (Transmit telegram)

The CPS21 keyboard answers the receipt of the lamp telegram with the key telegram. Keys that have been pressed and released are stored until transmission. Then the flag is deleted.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0 x 0A	Data 0	Data 1	Data 2	Data 3

7.5.2   Exceptions for Simultaneously Pressed Keys

It is possible to press more than one key. Keys that have been pressed are stored until the next lamp telegram.

7.5.3   Customer-defined Assignment of Key Codes

The keycodes can be changed dynamically.

The following keyboard characteristics can be entered as codes:
- Meaning of key (e.g. ”A”, ”3”, ...)
- Position of the key within the keyboard field
- Output of position and meaning of keys to the 24 Vout outputs.

You can receive further information in this regard on request.

DANGER
An incorrect assignment of the key codes can under certain circumstances lead to
- **operating errors in the applications**
- **system crash**
- **failure of the system to start up**

Carefully test the new key assignments for possible erroneous assignment of the keys.

7.5.4   Software download for Keyboard Controller

The COM3 serial port is used to download new key codes into the keyboard controller.

☞ **Customer-specific key codes can be downloaded on request and after arrangement is made by Bosch Erbach.**

Notes:

8   Maintenance and Replacements

The CPS21 is maintenance-free. However, some components are subject to wear and must be replaced, when required.

8.1   Maintenance

Include the following tasks in your maintenance schedule
- Clean the screen with an antistatic cloth or with an alcohol containing window cleanser at least once a week.

CAUTION
Dissolution of sealed key panel surface and display seal through contact with solvents!
Do not use any solvents (e.g., paint thinner)!

- At least once a year check that all plug and socket and terminal connections of the components are correctly seated and not damaged. Check that cables are not broken or crushed. Replace damaged parts immediately.
- Check the screwed connection for suspended installation (connection between tip/tilt adapter and housing cover of CPS21) once per year.
- Make sure that the CPS21 is equipped with a well functioning rechargeable battery pack. Check the charge level of the battery pack regularly!
- Replace the battery pack every 5 years.
- In the event that the unit is in continuous operation, replace the display backlight unit at two-year intervals.

☞ **For spare parts, a functional compatibility is guaranteed for a minimum of 5 years.**
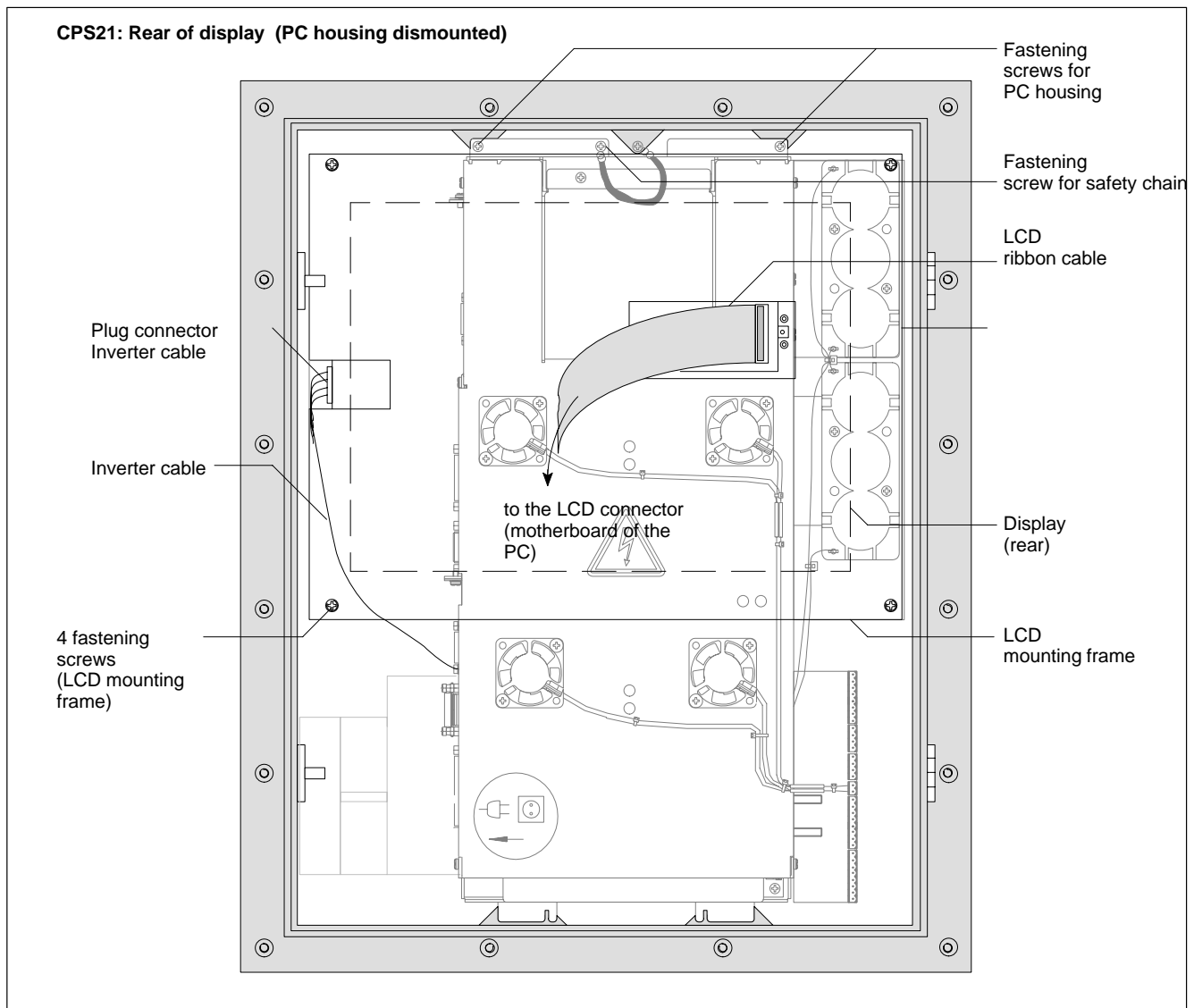
8.2   Replacements

8.2.1   Hard Disk

☞ **CAUTION**
Danger to the module!
All ESD protection measures must be observed when using the module! Prevent electrostatic discharges!

☞ **In the event that no external data source (CD-ROM or floppy disk drive) is connected to the CPS21, the new hard disk to be installed must contain a pre-installed operating system.**
In any case, in order to reduce installation time, it is recommended to have a fully configured operating system pre-installed on the hard disk!

1. Back up all essential application data and system operating configurations to an external data carrier or by using the network connection!

2. Turn off the supply voltage. If necessary, unplug all cables.

3. Wait until the power supply unit shuts down automatically after UPS operation (the UPS-LED on the front of the CPS21 is red until the UPS shuts down the power supply unit).

4. Open the aluminum housing with a 5 mm double-bit key and swing the front panel and its frame to the side.
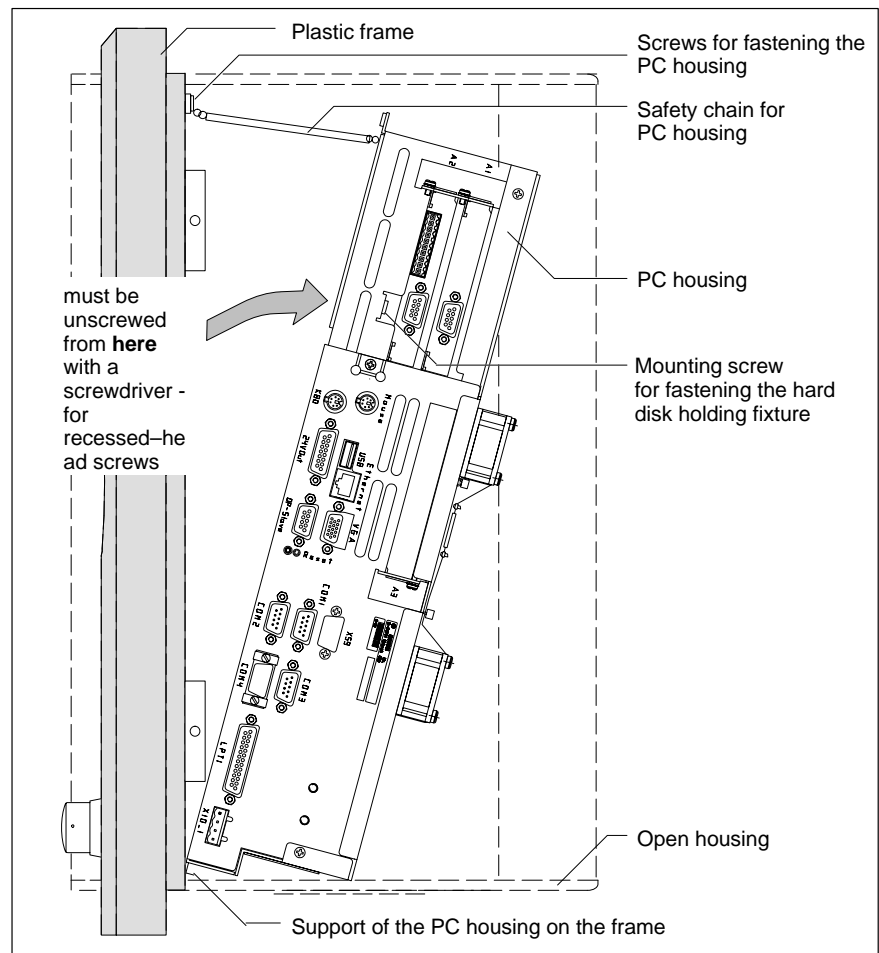
5. The PC is fastened to the upper edge of the plastic frame with 2 screws, and secured with a safety chain against falling off the frame.
    Unscrew the two fastening screws and pull the PC down as far as the safety chain permits.

6. The hard disk can now be seen on the side of the PC that is facing the display. Unplug the ribbon cable for data/power connection **from the hard disk**. At both sides, the ribbon cable is secured by a dab of bonding adhesive, which must be cut open prior to de-installation. Only in case of a damaged cable must it be unplugged from the motherboard as well (see illustration on page 8–4).

7. Next to the hard disk, there is a **fastening screw** that fixes the hard disk holding fixture. Unscrew it and move the carrying structure at its bottom part (close to the fastening screw) a little bit downwards. By this movement, the holding fixture is released from the clamping joint on the other side of the PC housing. Now you can take off the holding fixture from the side (see illustration on page 8–4).

8. Unscrew the hard disk from its suspension and replace it with the new hard disk. Fasten the new hard disk.

9. Reassemble the components in the reverse sequence to that described above.

☞ **Once the plug connector has been reinstalled, the ribbon cable must again be secured with a dab of "hot glue" at both sides.**

☞ **When remounting the hard disk, make sure that cables, especially those between display and PC housing, are not flattened or squeezed.**

Testing the new component:

10. If the new hard disk is of the same type as the old one, recognizing the disk by BIOS is not necessary. Proceed to 12.

11. When booting the system, press the <Del> key to access the BIOS menu of the PC. Select the "**Primary Master**" menu command in order to enable the system to detect and identify the hard disk parameters. In the "**Transfer Mode**" submenu item set "Fast PIO 3" for the hard disk. To exit BIOS, press F10 (**"Save Settings and Exit"**; saves the hard disk parameters).
    To do so, press the <Z> key if you have a keyboard with a German layout (Z = Y for Yes).

12. If the operating system fails to start up, interrupt the power supply again for min.10 seconds, and then restart the operating system.

13. If the system still fails to boot, check the connections for the following:
    ● Positive connection of hard disk controller cable
    ● Proper seating of all cables and connectors.
    ● Functioning power supply

14. Once the PC has started properly completed its boot process, the user data and operating system configuration must again be restored for normal operation.

Removing the Hard Disk

View: PC pulled down, side facing display

Clamping joints for fastening the hard disk holding fixture

Holding fixture for hard disk

PC holding fixture

Hard Disk

Controller ribbon cable

Mounting screw for fastening the hard disk holding fixture

PC housing

First pull fixture down, then turn it outwards

Controller ribbon cable disconnected from hard disk
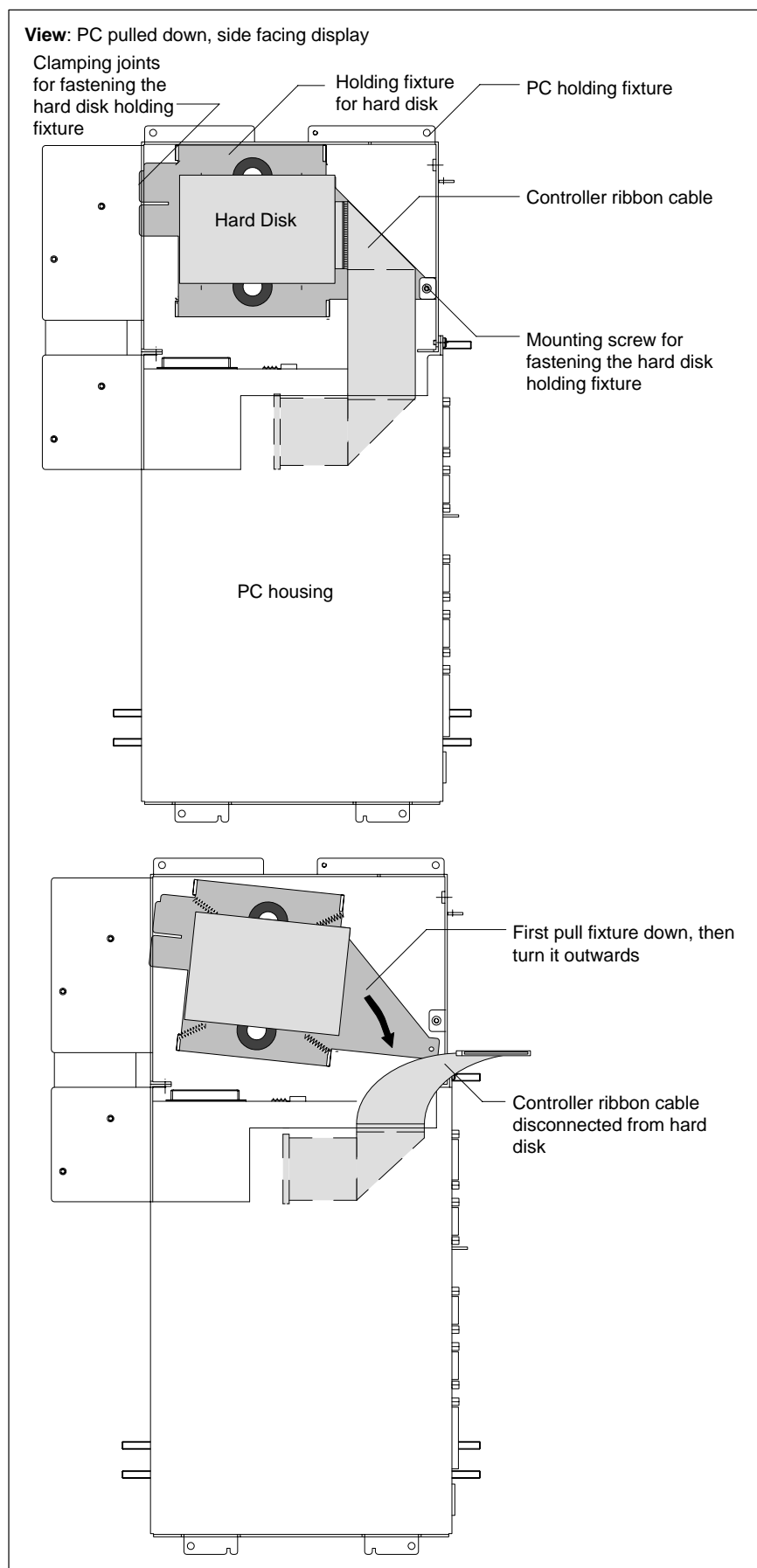
8.2.2   Display and Backlight/Inverter

☞
CAUTION
Danger to the module!
All ESD protection measures must be observed when using the module! Prevent electrostatic discharges!

A fading backlight causes a progressive deterioration of LCD display readability, making a backlight replacement advisable. These components should also be replaced in case of malfunction of the display and inverter.

CPS21: Rear of display (PC housing dismounted)

Fastening screws for PC housing

Fastening screw for safety chain

LCD ribbon cable

Plug connector Inverter cable

Inverter cable

to the LCD connector (motherboard of the PC)

Display (rear)

4 fastening screws (LCD mounting frame)

LCD mounting frame

1. Switch off the supply voltage. If necessary, unplug all cables.

2. Wait until the power supply unit shuts down automatically after UPS operation (the **UPS-LED** on the front of the CPS21 is **red** until the UPS shuts down the power supply unit).

3. Open the aluminum housing with a 5 mm double-bit key and swing the front panel and its frame to the side.

4. Remove the plug from the PC and all PE connections from the PC housing.

5. The PC is fastened to the upper edge of the plastic frame with 2 screws, and secured with a safety chain against falling off the frame. Unscrew the two fastening screws and pull the PC down as far as the safety chain permits.

Replacing the Display/Backlight:

6. Unplug the LCD ribbon cable and the backlight inverter cable from the LCD mounting frame.

7. Unfasten the safety chain of the PC housing. While doing so, hold the PC. Remove the PC by lifting it out of the lower swing bearings of the plastic frame.

8. Unfasten the 4 fastening screws of the LCD mounting frame. Now you can pull out the display and its holding fixture.

9. It is also possible to replace only the two backlights.

10. Reassemble the components in the reverse sequence to that described above.

☞ **When remounting the hard disk, make sure that cables, especially those between display and PC housing, are not flattened or squeezed.**

CAUTION
Use only the same type of displays!
Only insert backlights complying with the display!

Testing the new component:

11. In the event that, after booting the system, the display does not produce an image, check for the following:
   - Positive connection of plug connectors and cables
   - Proper seating and positive contact of backlight unit

8.2.3   Rechargeable Battery Pack

CAUTION
Prior to replacing the battery pack, save all important data because voltage failures which might occur during the process lead to loss of data in the RAM.

The rechargeable battery pack must be replaced in the following cases:

- the battery test during the start of the system has failed
- the number of charging cycles exceeds the value stated below for ambient temperature dependent cycles (see UPS program, page 3–8)
- the red LED "UPS" on the front panel flashes for more than 8 hours (see page 7–8).

A recharge cycle is determined by switching the PC power supply unit on and off.
As long as the control terminal is connected to mains power, a deep discharge of the rechargeable battery pack is prevented.

The number of charging cycles that the rechargeable battery pack can withstand and therefore its useful life, depends on the ambient temperature in which the battery pack is used. Ambient temperature here is defined as the one in which the operating terminal is situated, e.g. the temperature in the control cabinet or in the operating housing.

The following table can be used as a guideline:

Ambient temperature	Charging cycles	Maintenance interval
+ 25 °C	4000 cycles	6 years
+ 35 °C	2000 cycles	3 years
+ 45 °C	1000 cycles	1.5 years

☞ **If there is some uncertainty concerning the temperature conditions of the operating terminal, then we recommend exchanging the battery pack every 1.5 years.**

Battery
pack

Mounting screws

Rear
PC housing

Mounting screws

Battery pack

Carrier board

Battery line (two
conductors) for power
supply

Battery
pack
Connection

X19

Replacing the battery pack

1. Switch off the supply voltage. If necessary, unplug all cables.

2. Wait until the power supply unit shuts down automatically after UPS ope-
   ration (the **UPS-LED** on the front of the CPS21 is **red** until the UPS shuts
   down the power supply unit).

3. Open the aluminum housing with a 5 mm double-bit key and swing the
   front panel and its frame to the side.

4. Open the rear cover of the PC housing.

5. Remove the male connector with the twin-conductor cable from the X19
   battery terminal.

6. Unscrew the battery packs and replace them.

7. Now reconnect the cable of the new batteries.

CAUTION
In case of false polarity, an F10A (5x20) fuse will be tripped on the power supply unit. UPS operation is then impossible.
Therefore, ensure correct polarity of the battery packs when connecting the cable (see illustration above).

---

8. Reassemble the components in the reverse sequence to that described above.

☞ **If the new battery pack has not yet been charged (for 2.5 Ah: approx. 5 hours charging time), the UPS protection against an uncontrolled shutdown of the PC is not sufficient during the charging time. Therefore, use only fully charged batteries if possible.**

Testing the new component:

9. Restart the system.

10. Observe the "UPS" indication on the front panel. If the batteries are already charged, the UPS-LED is **off**. If the batteries are not yet fully charged, the UPS-LED **flashes red**. In this case, please wait for approx. 5 hours until the UPS-LED **goes off** (batteries are charged).

Notes:

9   Spare Parts

Description	Part numbers for			
	CPS21_4 **1070 085 400**	**CPS21_3** **1070 083 279**	**CPS21_2** **1070 081 821**	**CPS21** **1070 080 821**
PC-Box without software (hard disk included)	1070 083 278 (PCI card has to be ordered separately, see next row)	1070 083 278 (PCI card has to be ordered separately, see next row)	1070 081 820 (PCI_BM-CAN, PCI_CAN included)	1070 081 447 (PCI_BM-CAN, PCI_CAN included)
Expansion cards: – PCI_BM-CAN – PCI-CAN – PCI_BM-DP – PCI_BM-IBS – Adapter card for Interbus-configuration software	1070 080 381 1070 080 941 1070 078 905 1070 080 379 1070 083 813		–	
Hard disk in mounting frame without software	1070 081 537			
LCD display (TFT 13.8"), 2 backlights included	–	1070 919 799		
LCD display (TFT 15"), 2 backlights included	1070 920 377	–		
Backlight		1070 920 285		
Front panel with buttons and connection card, without display	1070 921 870	1070 919 675		
Pushbuttons, each consisting of base and button: – button for STOP – button for EMERGENCY-STOP – base for STOP and EMERGENCY-STOP – button START – base for START – lamp for START	1070 920 606 1070 920 612 1070 920 608 1070 920 609 1070 920 610 1070 920 611			
Battery pack	2 x 1070 919 399			
Distribution circuit board – Special board EMERGENCY-STOP / STOP separated	1070 920 894			
Coolkit – External fan kit for increased ambient temperature	1070 920 886			

Notes:

A   Annex

A.1   Abbreviations

BIOS	Basic Input Output System
CD–ROM	Compact Disk-Read Only Memory
COM x	Serial port x
CRT	Monitor with Cathode Ray Tube
DSTN	Passive Matrix display (used in LC displays)
EPP	Enhanced Parallel Port (bidirectional)
ESD	Electro-Static Discharge Abbreviation for all terms relating to electro-static discharge, e.g. ESD protection, ESD hazards, etc.
FD	Floppy Disk
GB	Gigabyte
HD	Hard Disk
ISA	"Industrial Standard Architecture", PC bus system
IDE	Integrated Device Electronics, interface for hard disk, CD–ROM, etc.
KBD	Keyboard
LCD	Liquid Crystal Display (flat–panel display)
LPT	Line Printer Terminal (printer port)
MB	Megabyte
PCI	Peripheral Component Interconnect, PC bus system
PE	Protective Earth
PLC	Programmable Logic Controller
RAM	Random Access Memory
SPP	Standard Parallel Port
Slot	PC slot
TFT	Thin-Film Transistor (active matrix color display, used in LC displays)
UPS	Uninterruptible Power Supply
VGA	Video Graphics Array (graphics standard)

A.2   Index

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