

# Rexroth Rho 4.1 Rexroth Rho 4.1/IPC300 Connectivity manual

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Edition 06

## Project planning



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Rexroth Rho 4.1/IPC300  
Connectivity manual

**Type of Documentation** Project planning

**Document Typecode** DOK-RHO\*4\*-RHO\*IP\*ANBE-PR06-EN-P

**Purpose of Documentation** The present manual informs about:

- specifications, configuration and
- operation of rho4.1 and rho4.1/IPC300

**Record of Revisions**

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## Overview of all manuals

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# 1 Safety Instructions

Please read this manual before you startup the rho4.  
Store this manual in a place to which all users have access at any time.

## 1.1 Intended use


This instruction manual presents a comprehensive set of instructions and information required for the standard operation of the described products. The described products are used for the purpose of operating with a robot control rho4.

The products described

- have been developed, manufactured, tested and documented in compliance with the safety standards. These products normally pose no danger to persons or property if they are used in accordance with the handling stipulations and safety notes prescribed for their configuration, mounting, and proper operation.
- comply with the requirements of
  - the EMC Directives (89/336/EEC, 93/68/EEC and 93/44/EEC)
  - the Low-Voltage Directive (73/23/EEC)
  - the harmonized standards EN 50081-2 and EN 50082-2
- are designed for operation in industrial environments, i.e.
  - no direct connection to public low-voltage power supply,
  - connection to the medium- or high-voltage system via a transformer.

The following applies for application within a personal residence, in business areas, on retail premises or in a small-industry setting:

- Installation in a control cabinet or housing with high shield attenuation.
- Cables that exit the screened area must be provided with filtering or screening measures.
- The user will be required to obtain a single operating license issued by the appropriate national authority or approval body. In Germany, this is the Federal Institute for Posts and Telecommunications, and/or its local branch offices.

 **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.**

The faultless, safe functioning of the product requires proper transport, storage, erection and installation as well as careful operation.

## Safety Instructions

## 1.2 Qualified personnel

The requirements as to qualified personnel depend on the qualification profiles described by ZVEI (central association of the electrical industry) and VDMA (association of German machine and plant builders) in:

**Weiterbildung in der Automatisierungstechnik**

**edited by: ZVEI and VDMA**

**MaschinenbauVerlag**

**Postfach 71 08 64**

**D-60498 Frankfurt.**

The present manual is designed for RC technicians. They need special knowledge on handling and programming robots.

Interventions in the hardware and software of our products, unless described otherwise in this manual, are reserved to specialized Rexroth personnel.

Tampering with the hardware or software, ignoring warning signs attached to the components, or non-compliance with the warning notes given in this manual may result in serious bodily injury or damage to property.

Only electrotechnicians as recognized under IEC 60947-1 (modified) who are familiar with the contents of this manual may install and service the products described.

Such personnel are

- those who, being well trained and experienced in their field and familiar with the relevant norms, are able to analyze the jobs being carried out and recognize any hazards which may have arisen.
- those who have acquired the same amount of expert knowledge through years of experience that would normally be acquired through formal technical training.

With regard to the foregoing, please note our comprehensive range of training courses. Please visit our website at

<http://www.boschrexroth.com>

for the latest information concerning training courses, teachware and training systems. Personal information is available from our Didactic Center Erbach,

Telephone: (+49) (0) 60 62 78-600.

## Safety Instructions

**1.3 Safety markings on products**

Warning of dangerous electrical voltage!



Warning of danger caused by batteries!



Electrostatically sensitive components!



Warning of hazardous light emissions  
(optical fiber cable emissions)!



Disconnect mains power before opening!



Lug for connecting PE conductor only!



Functional earthing or low-noise earth only!



Connection of shield conductor only

Safety Instructions

## 1.4 Safety instructions in this manual



### **DANGEROUS ELECTRICAL VOLTAGE**

This symbol is used to warn of a **dangerous electrical voltage**. The failure to observe the instructions in this manual in whole or in part may result in **personal injury**.

---



### **DANGER**

This symbol is used wherever insufficient or lacking compliance with instructions may result in **personal injury**.

---



### **CAUTION**

This symbol is used wherever insufficient or lacking compliance with instructions may result in **damage to equipment or data files**.

---

☞ This symbol is used to draw the user's attention to special circumstances.

★ This symbol is used if user activities are required.

## Safety Instructions

**1.5 Safety instructions for the described product****DANGER**

**Danger of life through inadequate EMERGENCY-STOP devices! EMERGENCY-STOP devices must be active and within reach in all system modes. Releasing an EMERGENCY-STOP device must not result in an uncontrolled restart of the system! First check the EMERGENCY-STOP circuit, then switch the system on!**

---

**DANGER**

**Danger for persons and equipment!  
Test every new program before starting up a system!**

---

**DANGER**

**Retrofits or modifications may adversely affect the safety of the products described!  
The consequences may include severe injury, damage to equipment, or environmental hazards. Possible retrofits or modifications to the system using third-party equipment therefore have to be approved by Rexroth.**

---

**DANGER**

**Do not look directly into the LEDs in the optical fiber connection. Due to their high output, this may result in eye injuries. When the inverter is switched on, do not look into the LED or the open end of a short connected lead.**

---

**DANGEROUS ELECTRICAL VOLTAGE**

**Unless described otherwise, maintenance works must be performed on inactive systems! The system must be protected against unauthorized or accidental reclosing.**

**Measuring or test activities on the live system are reserved to qualified electrical personnel!**

---

Safety Instructions



**CAUTION**

**Danger to the module!**

**Do not insert or remove the module while the controller is switched ON! This may destroy the module. Prior to inserting or removing the module, switch OFF or remove the power supply module of the controller, external power supply and signal voltage!**

---



**CAUTION**

**use only spare parts approved by Rexroth!**

---



**CAUTION**

**Danger to the module!**

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

---

The following protective measures must be observed for modules and components sensitive to electrostatic discharge (ESD)!

- Personnel responsible for storage, transport, and handling must have training in ESD protection.
- ESD-sensitive components must be stored and transported in the prescribed protective packaging.
- ESD-sensitive components may only be handled at special ESD-workplaces.
- Personnel, working surfaces, as well as all equipment and tools which may come into contact with ESD-sensitive components must have the same potential (e.g. by grounding).
- Wear an approved grounding bracelet. The grounding bracelet must be connected with the working surface through a cable with an integrated 1 MΩ resistor.
- ESD-sensitive components may by no means come into contact with chargeable objects, including most plastic materials.
- When ESD-sensitive components are installed in or removed from equipment, the equipment must be de-energized.



## Safety Instructions

## 1.6 Documentation, software release and trademarks

### Documentation

The present manual provides information about specifications, configuration and operation of the rho4.1 and rho4.1/IPC300 robot control.

Overview of available documentation	Part no.	
	German	English
Rho 4.0 Connectivity Manual	1070 072 364	1070 072 365
Rho 4.0 System description	1070 072 366	1070 072 367
Rho 4.1/IPC 40.2 Connectivity Manual	R911308219	R911308220
Rho 4.1/BT155, Rho 4.1/BT155T, Rho 4.1/BT205 Connectivity manual	1070 072 362	1070 072 363
Rho 4.1, Rho 4.1/IPC300 Connectivity manual	1070 072 360	1070 072 361
Control panels BF2xxT/BF3xxT, connection	1070 073 814	1070 073 824
Rho 4.1 System description	1070 072 434	1070 072 185
ROPS4/Online	1070 072 423	1070 072 180
BAPS plus	1070 072 422	1070 072 187
BAPS3 Short description	1070 072 412	1070 072 177
BAPS3 Programming manual	1070 072 413	1070 072 178
Control functions	1070 072 420	1070 072 179
Signal descriptions	1070 072 415	1070 072 182
Status messages and warnings	1070 072 417	1070 072 181
Machine parameters	1070 072 414	1070 072 175
PHG2000	1070 072 421	1070 072 183
DDE-Server 4	1070 072 433	1070 072 184
DLL-Library	1070 072 418	1070 072 176
Rho 4 available documentation on CD ROM	1070 086 145	1070 086 145

 **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>

## Safety Instructions

### Release

 **This manual refers to the following versions:**

**Hardware version: rho4**

**Software release: ROPS4**

### Trademarks

All trademarks of software installed on Rexroth products upon delivery are the property of the respective manufacturer.

Upon delivery, all installed software is copyright-protected. The software may only be reproduced with the approval of Rexroth or in accordance with the license agreement of the respective manufacturer.

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

MOBY® is a registered trademark of Siemens AG.

AS-I® is a registered trademark of AS-International Association.

SERCOS interface™ is a registered trademark of Interessengemeinschaft SERCOS interface e.V. (Joint VDW/ZVEI Working Committee).

INTERBUS-S® is a registered trade mark of Phoenix Contact.

DeviceNet® is a registered trade mark (TM) of ODVA (Open DeviceNet Vendor Association, Inc.).

## System Overview

## 2 System Overview

The rho4.1 and rho4.1/IPC300 robot control consist of a powerful industrial-standard PC featuring **additional components** (UPS, temperature monitoring, controlled operating system shutdown, 3 expansion slots for PCI and ISA-standard add-on cards), all of which exceed industrial PC standard requirements.

The compact design and service-friendly construction excels with regard to the following:

- **High degree of failure resistance** (e.g., shock and vibration-proof cushioned hard disk, UPS uninterruptible power supply), and
- **Simplicity of maintenance**

In accordance with requirements, the system is supplied with installed Microsoft Windows 95 or Windows NT 4.0 operating system and appropriate Bosch application software (refer to section 9.3).

### 2.1 Hardware versions

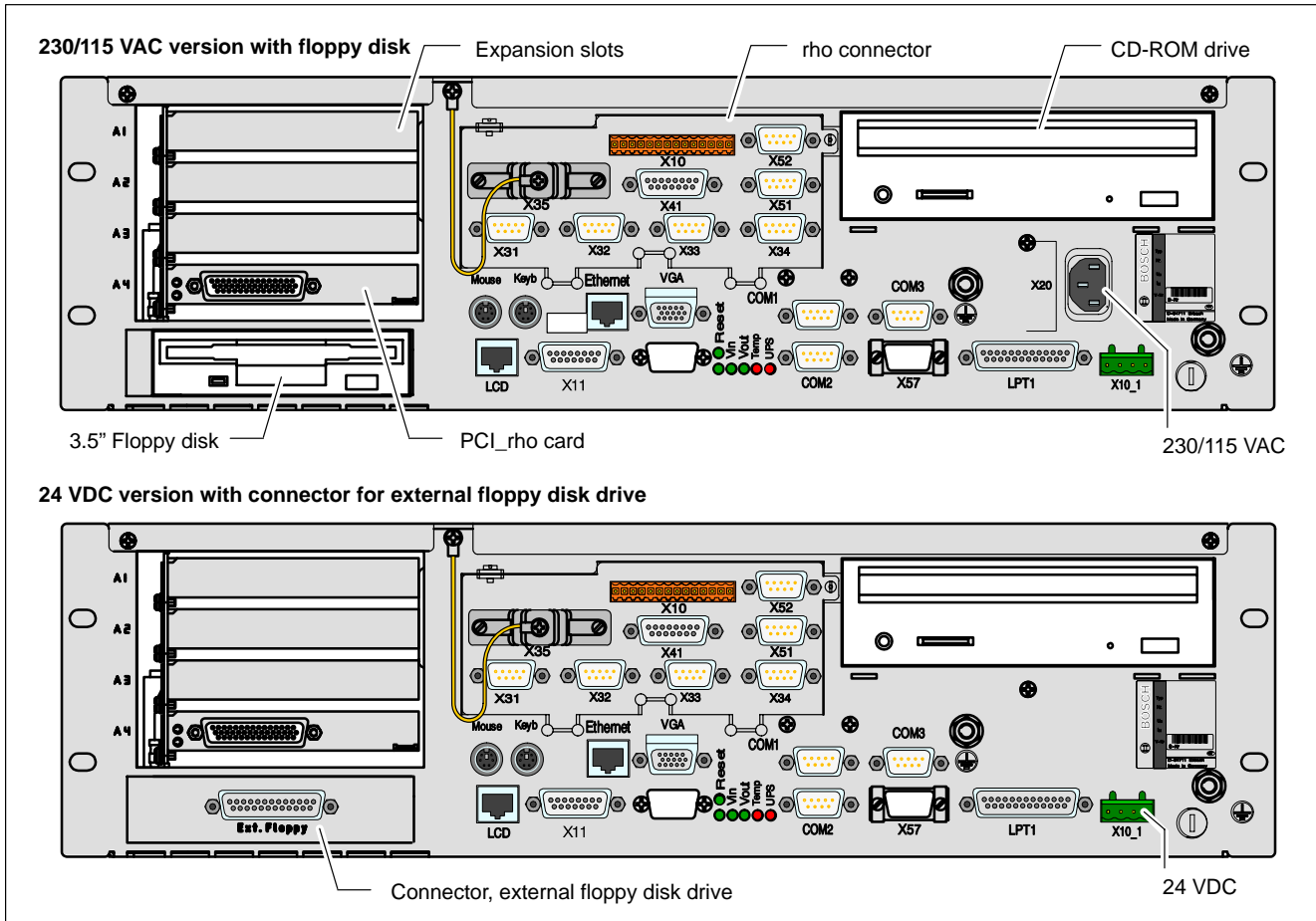
The rho4.1 and rho4.1/IPC300 robot control is available in the following equipment versions:

- 2 Power supply versions: 230/115 VAC and 24 VDC
- Memory capacity versions: 64 MB and 128 MB RAM
- With or without built-in floppy disk drive

 **The 230/115 V<sub>AC</sub> version also features a 24 VDC power input connector (X10\_1) which is non-functional, however.**

System Overview

Different versions (examples)




## System Overview

## 2.2 Specifications

PC feature	rho4.1	rho4.1/IPC300
Intel Pentium processor or compatible CPU (socket 7) with Intel MMX™ technology	$\geq 200$ MHz or $\geq 266$ MHz*	$\geq 266$ MHz, optional 400 MHz Pentium™ III
RAM	min. 64 MB, max. 128 MB	max. 128 MB
Hard Disk	> 5 GB IDE (spring cushioned, with Auto-park function)	
CD-ROM drive	32 X (or higher)	
Floppy disk	High-density 3.5 in./1.44 MB	
Free expansion slots	3 x PCI or 2 x PCI / 1 x ISA	
Power supply (2 versions)	230/115 VAC (at 50/60 Hz) or 24 VDC	
UPS (uninterruptible power supply)	Via internal battery	
Temperature monitoring	with advance warning and controlled shutdown sequence	
4 LEDs	Display of essential operating statuses	
Standard interfaces	4x serial (RS-232), 1x parallel, PS/2 keyboard, PS/2 mouse, VGA	4x serial (RS-232, of which 1x optional RS-485/422), 1x parallel, PS/2 keyboard, PS/2 mouse, VGA
Enhanced interfaces	Ethernet, LVDS video transmission (touch screen signals via COM2), power supply for control panel.	Ethernet, Gigabit video transmission incl. touch screen signals, power supply for control panel.
Real-time interfaces	V24/20 mA, PHG connection, CAN- Bus, incremental encoder, probe	V24/20 mA, PHG connection, CAN- Bus, incremental encoder (optional), probe (optional)
Weight:	Approx. 8 kg	Approx. 8 kg
Dimensions	Housing: 448 x 132 x 256 mm (front panel: 19" x 3U x 256 mm)	Housing: 448 x 132 x 256 mm (front panel: 19" x 3U x 256 mm)
Operating system	Microsoft Windows 95C or Windows NT 4.0	Microsoft Windows NT 4.0

\* Due to processor discontinuation, the rho4.1 is modified to 266 MHz during ongoing production.

 **All specifications are subject to change as a result of technological developments. 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.**

## 2.3 Expansion slots

Three slots are provided for expansion cards:

- 2 PCI bus slots
- 1 PCI- or ISA bus card (combination slot)

Expansion slot 4 is occupied by the PCI\_rho card.



### CAUTION

**Damage to PC or application software through unauthorized expansion cards.**

**Use only approved expansion cards, and have them installed by a specialist.**

---

For more information on installing expansion cards, refer to section 8.3.

## 2.4 Rechargeable battery pack

The rho4.1 and rho4.1/IPC300 are equipped with an internal rechargeable battery pack (2 series-connected, rechargeable 6 V batteries).

In the case of a power failure, the battery pack facilitates a controlled shutdown of the PC operating system, as described in section 3.2 (**UPS function**). Loss of data held in PC RAM is thus prevented.

The battery pack has a limited service life and must be replaced when it fails to hold a full charge.

Refer to section 8.2.3.

## System Overview

## 2.5 Operating conditions

The rho4.1 and rho4.1/IPC300 controllers are designed for continuous operation (24 hours/day).

Unless stated otherwise in specific sections, these specifications apply:

### Temperatures

**Storage temperature:**

- -20 °C to +60 °C

**Ambient temperature**

- +5 °C to +45 °C

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

**CAUTION****Excessive operating temperature!****Do not expose the PC to direct sunlight or other sources of heat radiation!**

---

### Relative humidity

Climate class 3K3, as per EN 60721; condensation not permitted.

### Atmospheric pressure

To DIN 60204, when operating at altitudes up to 2000 m above sea level.

### Protection category

IP00

Control cabinets and installation compartments must conform to IP 54 rating (dust filters upstream of air intake and exhaust):

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

---

## System Overview

### **Vibration resistance, operating**

Frequency range: 10 to 150 Hz  
Amplitude: 0.075 mm at 10 to 57 Hz  
Acceleration: 1 g at 57 to 150 Hz  
to EN 60068-2-6

### **Impact resistance**

15 g as per DIN IEC 68-2-27, no functional impediment.




## System Overview

## 2.6 Standards compatibility

The rho4.1 and rho4.1/IPC300 system components conform to 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 Transformer for 24 V power supply, protective separation
- EN 60 950 Overvoltage category II
- EN 61 131 Requirements with respect to 24 V outputs
- EN 61 131-2 Requirements with respect to 24 V power supply
- EN 418 Machine safety, Emergency-STOP devices
- EN 60 529 Protection categories (incl. housings and installation compartments)
- EN 60 068-2-6 Vibration test
- EN 60 068-2-27 Impact test
- .IS.114 "X-ray Radiation" Directive, as per Official Federal Gazette

 **As shipped from the factory, the rho4.1 and rho4.1/IPC300 comply with the requirements for the CE mark of conformity. However, installing additional expansion cards will require a supplementary CE approval.**

## System Overview

Notes:

## Security Functions

## 3 Security Functions

Each PC is equipped with a temperature monitoring function and an uninterruptible power supply (UPS). The UPS only works in conjunction with a battery pack.

### 3.1 Temperature monitoring function

The ambient air in the PC environment must not exceed +45 °C (see section 2.5). To ensure operational reliability, a temperature monitoring function keeps track of the internal housing temperature.

At internal housing **temperatures exceeding 50 °C**, an overtemperature warning occurs, manifesting itself as follows:

- via the flashing **Temp** LED at the front panel of the housing.
- via a message window displayed by the operating system. This message must also be interpreted by all PC application programs, and particularly by I/O processes. The Bosch application software meets this requirement.

The above described temperature monitoring function can be disabled by means of the following program:

- UPS<sub>plus</sub> for Windows 95
- UPS<sub>NT</sub> for Windows NT 4.0

See also section 3.3.

In the event that internal housing **temperatures exceed 65 °C**, the PC will be subject to a controlled shutdown via the UPS logic circuit (see section 3.2).

**DANGER**

**Inadvertent machine movements.**

**Always ensure that temperatures remain within the noncritical range. In the case of application-sensitive procedures, ensure that machine movements are terminated in a controlled fashion before the temperature monitoring function disables the operator terminal.**

---

## 3.2 Uninterruptible Power Supply (UPS)

In the event of a power failure exceeding 800 ms in duration, or of an internal housing temperature in excess of 65 °C (see section 3.1), the UPS logic integrated in the power supply is activated, initiating a safe operating system shutdown procedure backed by the internal rechargeable battery pack.

Power interruptions of shorter duration are bridged by the battery pack. For the rho4.1/IPC300 running the Windows NT operating system, power interruptions up to 5 seconds in length may be tolerated before the UPS logic circuit activates.

### Please note:

- To allow the rechargeable battery pack to attain its full charge capacity, the device must remain powered up for a minimum of 5 hours subsequent to initial startup. Sufficient UPS protection cannot be ensured during this charging period.
- Frequent On/Off cycling of power tends to cause rapid discharge of the battery pack. You should never cycle the power more often than 4 times in succession. The battery pack must again be fully recharged thereafter.
- The UPS logic function requires hard disk capacity for intermediate data storage. Ensure that the hard disk never fills up completely.



### DANGER

**If there are no batteries in the unit, or if the batteries are defective or discharged, the PC will RESET without warning after a voltage dip in excess of 20 ms! Possible consequences loss of data.**

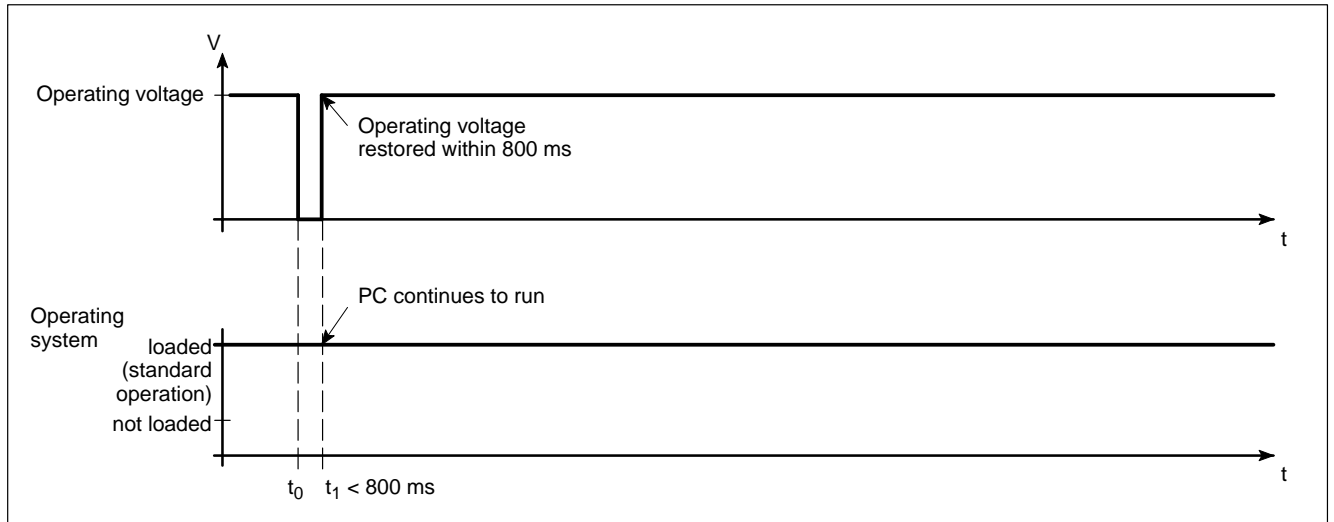
**Observe UPS program messages warning of a discharged battery pack. The relevant test is run during each PC boot phase.**

---

### Power dropouts below 800 ms duration

Voltage drops below 800 ms duration are bridged by the battery pack, and do not trigger the UPS logic circuit.

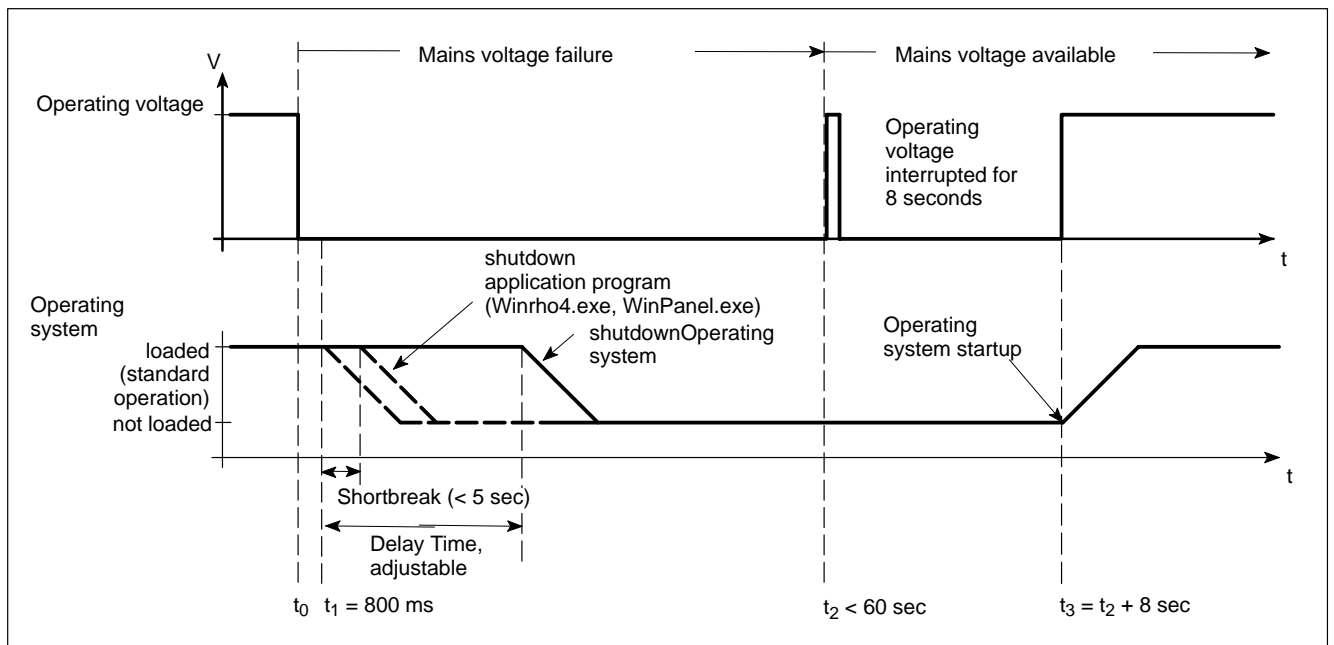
Security Functions



Power losses between 800 ms and 60 sec with shortbreak

In the event of a power loss in excess of 800 ms, the operating system will initiate a safe shutdown of the operating system once a preselected interval (Delay Time) delay time has elapsed.

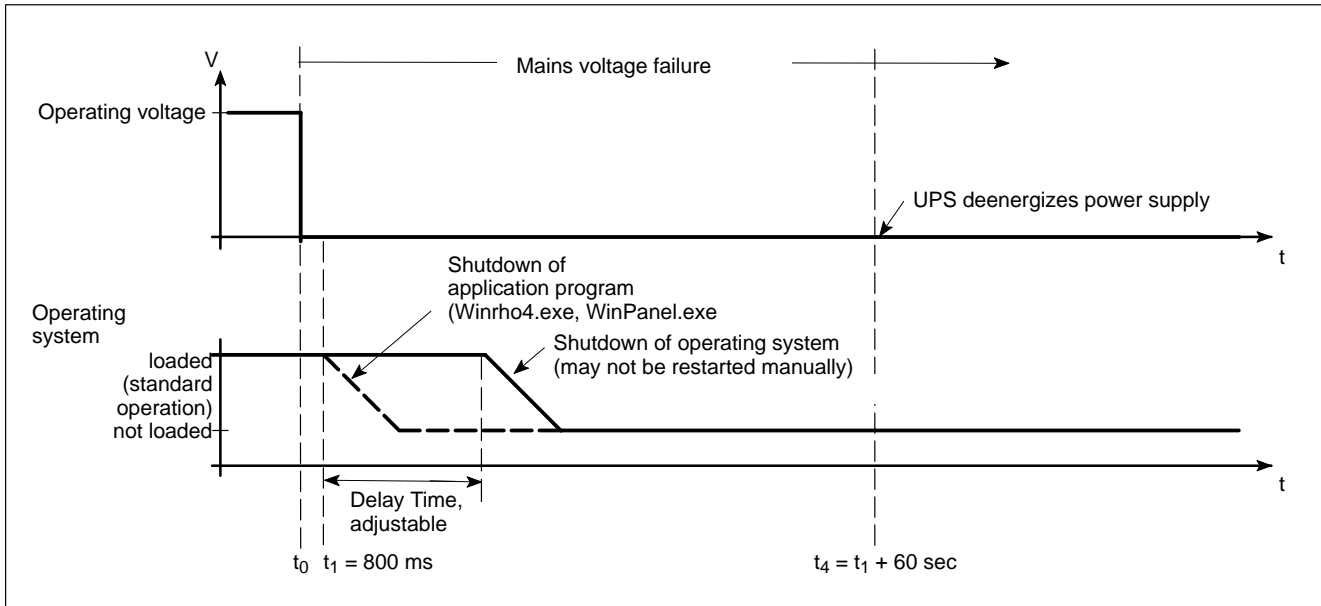
- If the mains power is restored within a 5-second interval (short break), the UPS will remain inactive (**rho4.1/PC300 only** with appropriate settings).
- If the mains power is restored within the next 60 seconds, the UPS will interrupt the operating voltage for another 8 seconds (up to  $t_3$ ), and then again restart the operating system.



Security Functions

**Power loss in excess of 60 seconds without shortbreak**

After approx. 60 sec., internal UPS functions deenergized the power supply.



☞ Refer to the following pages for the procedure required to adjust the Delay Time: For the UPS<sub>plus</sub> supplementary software, see page 3-6; for UPS<sub>NT</sub> for rho4.1 software, see page 3-10; and for UPS<sub>NT</sub> for rho4.1/IPC300, see page 3-13.

## Security Functions

### 3.3 UPS program

#### 3.3.1 Functionality

The “UPS<sub>plus</sub>” or “UPS<sub>NT</sub>” uninterruptible power supply program controls and monitors the integrated uninterruptible power supply (UPS). The program also checks the function of the rechargeable battery pack, and controls the system temperature monitoring function.

In the case of the rho4.1/IPC300 with Pentium I, 266 MHz, the program also monitors the function of the housing fan.

In the case of the rho4.1/IPC300 mit Pentium III, 400 MHz, the program also monitors fan functions and internal operating voltages.

Depending on the type of IPC and its operating system, one of the following is installed:

- **UPS<sub>plus</sub> for rho4.1** with Windows 95
- **UPS<sub>NT</sub> for rho4.1** with Windows NT
- **UPS<sub>NT</sub> for rho4.1/IPC300** with Windows NT

Communications between program and UPS are handled via the COM4 serial port.

The task of the UPS program is to respond as follows in the event of a power loss:

- By sending a message to all active applications, facilitating their safe shutdown via special application routines.
- By shutting down the operating system after the delay time has elapsed.

Once the UPS power monitoring function has been triggered, aborting the system shutdown routine is no longer possible.

Closing all active applications prevents data loss in the event of a sudden power loss.

In the event that the mains power has not been restored, the UPS will switch off the PC power supply after a maximum of 60 seconds (refer to disconnect conditions in section 3.2).

**CAUTION**

**Loss of data through manual restart!**

**Note that the UPS will switch off the operator terminal in any case. For this reason, once the operating system has been shut down, the “Restart” dialog button must not be selected. In the case of power outages lasting less than 60 seconds, the operating system is restarted automatically.**

 **Parameter values set in the UPS<sub>plus</sub> or UPS<sub>NT</sub> software may not be changed without prior consultation with Bosch.**

## Security Functions

### 3.3.2 Configuring and operating UPS<sub>plus</sub> for Windows 95

- ☞ The UPS<sub>plus</sub> software is already fully configured in the factory shipped rho4.1 controller; the configuration should be changed only after consultation with Bosch.



To start the program for service and control purposes, it can be found on the following path:  
C:\Windows\UPSplus.exe

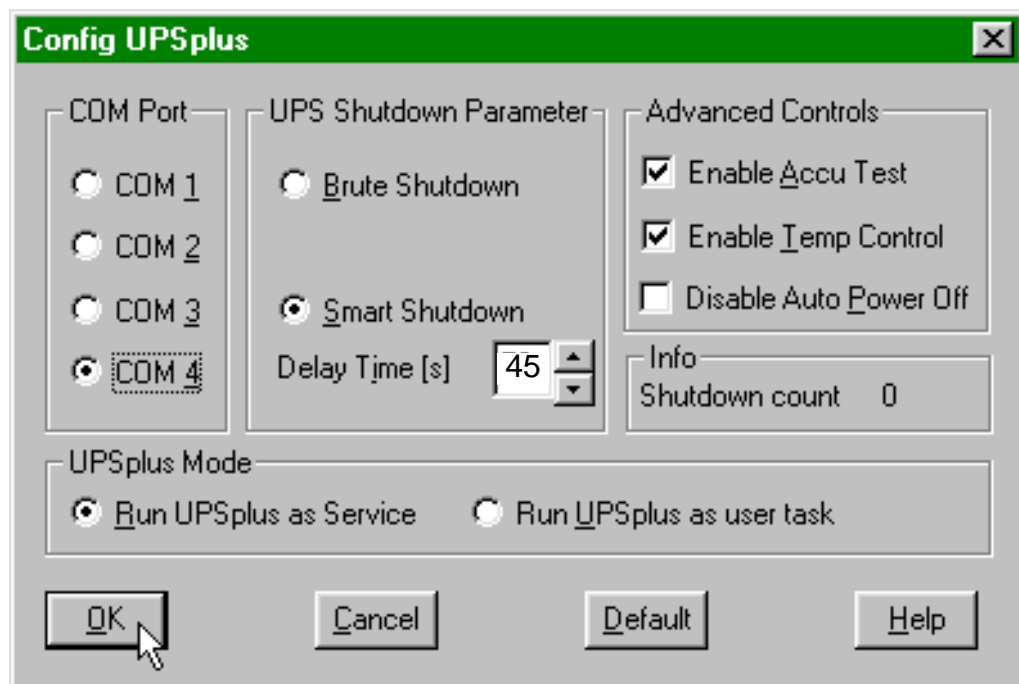
#### Configuration





## Security Functions

This dialog is used to define the starting and run-time behaviour of the UPS Control program. To allow modifications to take effect, the UPS program must be exited and restarted.



### COM Port

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

### UPS Shutdown Parameters

#### Brute Shutdown

Upon receipt of the shutdown signal from the UPS, the shutdown command for the Windows operating system is issued without delay. This causes the immediate termination of all active applications, followed by the shutdown of Windows.

#### Smart Shutdown

Upon receipt of the shutdown signal from the UPS, the preset Delay Time interval starts to elapse.

#### Delay Time

A value of 45 sec must be entered here. During this interval, the rho4.1 application program is exited, and user data saved. Upon expiry of the Delay Time, all application programs will be terminated without security query!

## Security Functions

During the intervening period between the end of the Delay Time and the expiry of the 60 seconds after the shutdown signal, the operating system is shut down (i.e., closing and backing up Windows system files, etc.). If the interval is too short, the shutdown process will be interrupted because the UPS disrupts the mains power. This may cause loss of data in some circumstances.

**CAUTION**

**Upon expiry of the Delay Time, the operating system is shut down without prior security query. Unsecured data belonging to open applications will be lost.**

## Advanced Controls field

**Enable Accu Test**

When this checkbox is checked, the system performs a test of the battery pack during each restart.

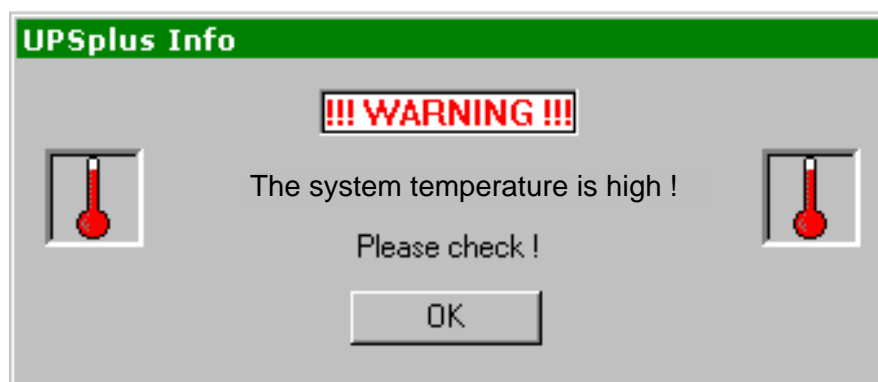
In the case of a faulty battery pack (e.g., defective battery pack, cable break, plug not connected), battery monitoring is disabled. The UPS program continues only with its temperature monitoring function.

If temperature monitoring has not been enabled, the UPS program will be terminated.

In the case of an error, the rho4.1 controller will set the output designated I80.2 UPS\_ACCU\_RCO to "HIGH".

**Enable Temp Control**

When this checkbox is checked, continuous monitoring of the ambient temperature is enabled. Excessive temperatures will produce the following warning message:



## Security Functions

Subsequent to a temperature warning, the UPS control program is again started. During the reactivation interval of approx. 2 seconds, no power monitoring takes place although the battery pack is fully functional. In the case of an error, the rho4.1 controller will set the output designated I80.1 UPS\_TEMP\_RCO to "HIGH".

### Disable Auto Power Off

This option disables both the UPS monitoring function and the shutdown delay for the power supply:

- A power loss will cause the PC to shut down immediately.
- After a normal shutdown, the approx. 60-second wait interval prior to the shutdown of the power supply is omitted.

Although this function reduces the wait times during startups and software installations, it must always be disabled during standard operation!



### CAUTION

#### Loss of data!

**When this checkbox is activated, a safe shutdown will no longer be possible in the event of a power failure. The device switches off instantly!**

## Info field

### Shutdown Count

The value displayed here indicates the number of times the UPS has already shut down the system. After more than 3,000 forced shutdown cycles by the UPS, replacement of the rechargeable battery pack is recommended.

## UPS<sub>plus</sub>-Mode field

There are two operating modes for the **UPS<sub>plus</sub>** program:

### Run UPS<sub>plus</sub> as Service

The program is started as part of the Windows 95 startup, and remains active until Windows 95 is again terminated. This behaviour is not influenced by changing the logged-in user.

The user is unable to stop the program or terminate monitoring. Although he would be able to access the active program via the Setup dialog and change parameter values, these changes would not take effect until Windows 95 has been restarted.

### Run UPS<sub>plus</sub> as User Task

The program is started as part of a user login routine, and is terminated upon logout. The user has full control over all UPS program functions.

## Security Functions

**Default button**

Selecting this button returns all settings to their **default values**.

These are:

- COM port: COM4
- Smart Shutdown, Delay Time: 50 sek (changed to 45 s ex works!)
- Enable Accu Test: enabled
- Enable Temp Control: enabled
- Disable Auto Power Off: disabled
- Run UPS<sub>plus</sub> as Service: enabled

### 3.3.3 Configuring and operating UPS<sub>NT</sub> for Windows NT

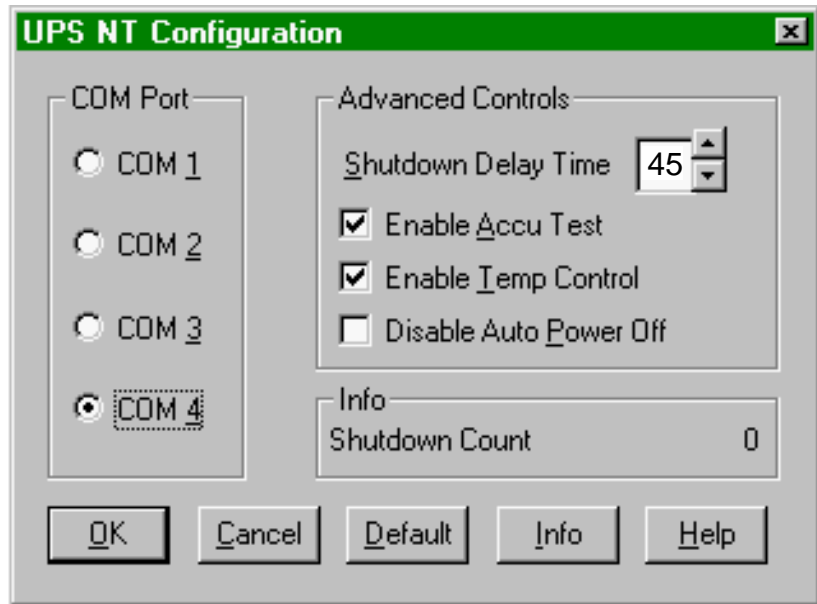
#### Configuration – UPS<sub>NT</sub> for rho4.1

- ☞ **The UPS<sub>NT</sub> software is already fully configured in the factory shipped rho4.1 controller; the configuration should be changed only after consultation with Bosch.**

For service and verification purposes, click **UPS NT Control** in the Control Panel:



## Security Functions



- ☞ **To allow modifications of parameter values to take effect, the UPS program must be exited and restarted. This may be accomplished by restarting the computer.**

**COM Port**

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

**Advanced Controls****Shutdown Delay Time**

A value of 45 sec must be entered here. During this interval, the rho4.1 application program is exited, and user data saved. Upon expiry of the Delay Time, all application programs will be terminated without security query!

During the intervening period between the end of the Delay Time and the expiry of the 60 seconds after the shutdown signal, the operating system is shut down (i.e., closing and backing up Windows system files, etc.). If the interval is too short, the shutdown process will be interrupted because the UPS disrupts the mains power. This may cause loss of data in some circumstances.

**CAUTION**

**Upon expiry of the Delay Time, the operating system is shut down without prior security query. Unsecured data belonging to open applications will be lost.**

## Security Functions

**Enable Accu Test**

When this check box is checked, the system performs a test of the battery pack during each restart.

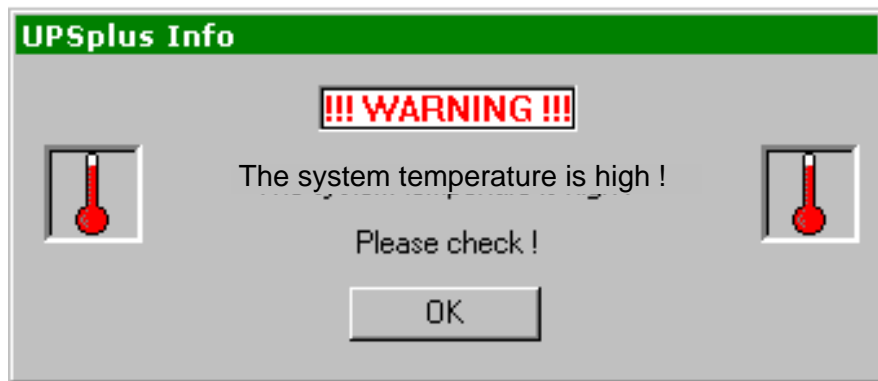
In the case of a faulty battery pack (e.g., defective battery pack, cable break, plug not connected), battery monitoring is disabled. The UPS program continues only with its temperature monitoring function.

If temperature monitoring has not been enabled, the UPS program will be terminated.

In the case of an error, the rho4.1 controller will set the output designated I80.2 UPS\_ACCU\_RCO to "HIGH".

**Enable Temp Control**

When this checkbox is checked, continuous monitoring of the ambient temperature is enabled. Excessive temperatures will produce the following warning message:



Subsequent to a temperature warning, the UPS control program is again started. During the reactivation interval of approx. 2 seconds, no power monitoring takes place although the battery pack is fully functional.

In the case of an error, the rho4.1 controller will set the output designated I80.1 UPS\_TEMP\_RCO to "HIGH".

**Disable Auto Power Off**

This option disables both the UPS monitoring function and the shutdown delay for the power supply:

- A power loss will cause the PC to shut down immediately.
- After a normal shutdown, the approx. 60-second wait interval prior to the shutdown of the power supply is omitted.

## Security Functions

Although this function reduces the wait times during startups and software installations, it must always be disabled during standard operation!

---



### CAUTION

#### Loss of data!

**When this checkbox is activated, a safe shutdown will no longer be possible in the event of a power failure. The device switches off instantly!**

---

## Info

### Shutdown Count

The value displayed here indicates the number of times the UPS has already shut down the system. After more than 3000 forced shutdown cycles by the UPS, replacement of the rechargeable battery pack is recommended.


## Default settings

Selecting this button returns all settings to their **default values**.

These are:

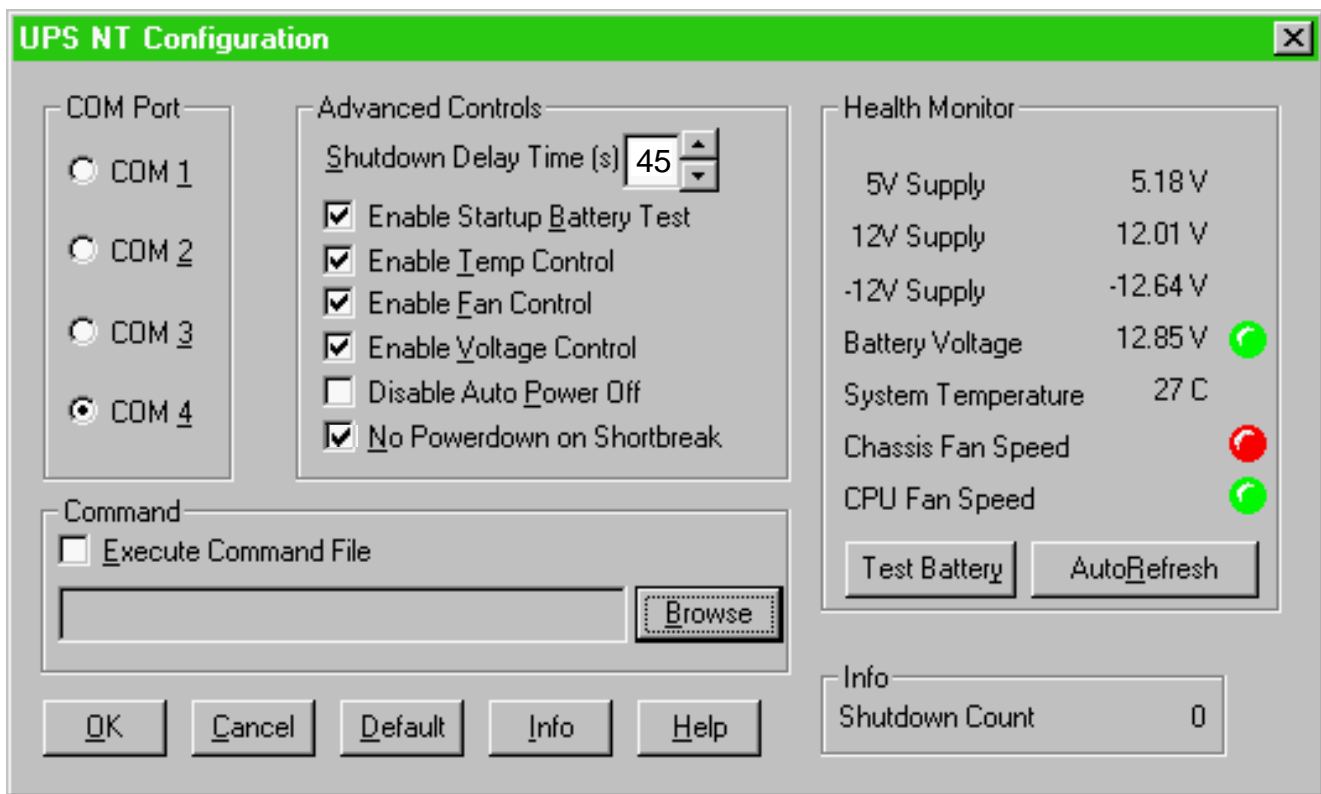
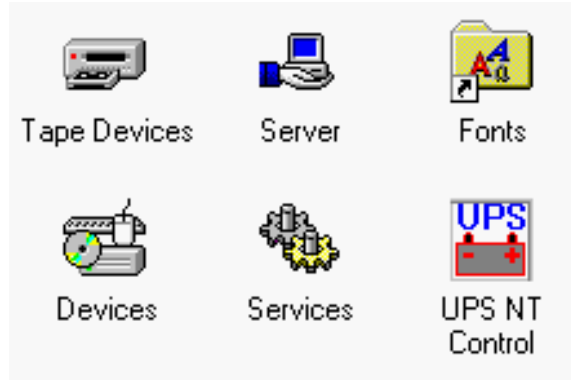
- COM port: COM4
- Shutdown Delay Time: 30 sek (changed to 45 sec ex works!)
- Enable Accu Test: enabled
- Enable Temp Control: enabled
- Disable Auto Power Off: disabled


## Configuration – UPS<sub>NT</sub> for rho4.1/IPC300

 **The UPS<sub>NT</sub> software is already fully configured in the factory shipped rho4.1/IPC300 controller; the configuration should be changed only after consultation with Bosch.**

For service and verification purposes, click **UPS NT Control** in the Control Panel:

Security Functions



 **To allow modifications of parameter values to take effect, the UPS program is stopped and restarted automatically. During this interval of approx. 5 to 10 s, no monitoring takes place.**

**COM Port**

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



## Security Functions

## Advanced Controls

**Shutdown Delay Time**

A value of 45 sec must be entered here. During this interval, the rho4.1 application program is exited, and user data saved. Upon expiry of the Shutdown Delay Time, all application programs will be terminated without security query!

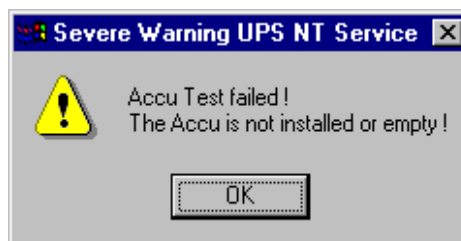
During the intervening period between the end of the Delay Time and the expiry of the 60 seconds after the shutdown signal, the operating system is shut down (i.e., closing and backing up Windows system files, etc.). If the interval is too short, the shutdown process will be interrupted because the UPS disrupts the power to the power supply. This may cause loss of data in some circumstances.

**CAUTION**

**Upon expiry of the Delay Time, the operating system is shut down without prior security query. Unsecured data belonging to open applications will be lost.**

**Enable Startup Battery Test**

When this check box is checked, the system performs a test of the battery pack during each restart. Upon detection of an error, an error dialog is generated, and a message distributed throughout the system. The UPS program continues to operate.



The battery test is automatically repeated after 12 hours:

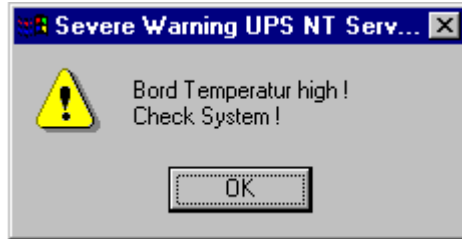
- If no error is found, automatic test repetition in 12-hour intervals ensues.
- When an error occurs:
  - the UPS LED starts to blink
  - an error dialog is generated and a message is distributed system-wide
  - the rho4.1/IPC300 controller sets the output designated I80.2 UPS\_ACCU\_RCO to "HIGH"
  - no further battery test is accomplished.

Error messages from the battery test are also stored in the Windows NT Application Event Log (Programs ► Administrative Tools ► Event log).

## Security Functions

**Enable Temp Control**

When this checkbox is checked, continuous monitoring of the ambient temperature is enabled. Excessive temperatures will produce the following warning message:



The power monitoring function is retained even after a temperature warning.

In the case of an error, the rho4.1 controller will set the output designated I80.1 UPS\_TEMP\_RCO to "HIGH" and the TEMP LED starts to blink.

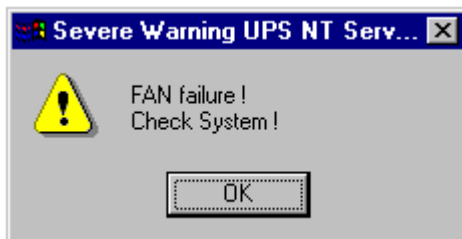
Error messages from the battery test are also stored in the Windows NT Application Event Log (Programs ► Administrative Tools ► Event log).

**Enable Fan Control**

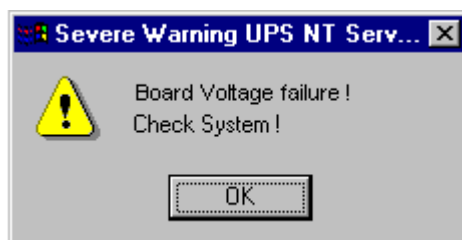
When this checkbox is activated, the following is monitored:

- the housing fan of rho4.1/IPC300 with 266 MHz
- the housing and processor fans of rho4.1/IPC300 with PIII/400 MHz.

In the event of an error, a message is generated and distributed throughout the system. The TEMP LED starts to blink.

**Enable Voltage Control**

When this checkbox is activated, internal supply voltages are monitored. In the event of an error, a message is generated and distributed throughout the system.



## Security Functions

### Disable Auto Power Off

This option disables both the UPS monitoring function and the power-off delay for the power supply:

- A power loss will cause the PC to shut down immediately.
- After a normal shutdown, the approx. 60-second wait interval prior to the shutdown of the power supply is omitted.

Although this function reduces the wait times during startups and software installations, it must always be disabled during standard operation!



#### CAUTION

##### Loss of data!

**When this checkbox is activated, a safe shutdown will no longer be possible in the event of a power failure. The device switches off instantly!**

### No Powerdown on Shortbreak

When this checkbox has been activated, interruptions in the power supply of up to 5 seconds are permitted without affecting ongoing operations. Only in the case of power interruptions lasting in excess of 5 seconds will the UPS logic be started and the safe shutdown of the system initiated.

## Command text box

This dialog box provides for the linking and activation of an executable program (\*.exe; \*.bat) which is to be started and executed after the initialization of the shutdown. This is helpful in situations where applications failing to respond to the systemwide messages must be backed up and terminated. To this end, appropriate housekeeping and termination programs can be entered and activated in this dialog. If there are several programs, or if the programs require transfer parameters, they must be combined in a batch file and then entered.

-  **The entry itself may not contain any invocation parameters, and the declared program itself must not initiate a shutdown!**

## Default settings

Selecting this button returns all settings to their **default values**.

These are:

- COM port: COM4
- Shutdown Delay Time: 30 sec (changed to 45 sec ex works!)
- Enable Startup Battery Test: enabled
- Enable Temp Control: enabled
- Enable Fan Control: enabled

## Security Functions

- Enable Voltage Control: enabled
- Disable Auto Power Off: disabled
- No Powerdown on Shortbreak: enabled
- Execute Command File: disabled

## Health Monitor

This dialog section indicates the current readings for internal voltages, battery voltage, system temperature and fan functions.

The **Battery Voltage** reading is updated only after a battery test. The battery test occurs automatically after a system start, and in 12-hour intervals thereafter; it can also be initiated by pressing the **Test Battery** button.

- The LED illuminates red when the voltage reading of the battery voltage measured under load is low.
- The LED illuminates green when the battery pack is fully functional.

 **Excessive repetitions of the battery test will discharge the battery pack. Never perform more than 5 battery tests within a 24-hour period.**

The following applies to **Fan Speed monitoring**:

- Red LED: Fan at standstill, or fan speed is too low or too high.
- Green LED: Fan is working properly.

Pressing the **StopAutoRefresh** button disables the automatic updating of measured readings, and the legend on the button changes to **Auto-Refresh**.

Pressing the **AutoRefresh** button again enables automatic measurement updating, again changing the legend on the button to **StopAuto-Refresh**.

## Info field

### Shutdown Count

The value displayed here indicates the number of times the UPS has already shut down the system. After more than 3000 forced shutdown cycles by the UPS, replacement of the rechargeable battery pack is recommended.

 **Windows NT stores all important events. The relevant records can be accessed with the use of the following menu sequence: ADMINISTRATIVE TOOLS ► EVENT VIEWER ► LOG ► APPLICATION**

Installation

## 4 Installation

When installing the Bosch rho4.1 or rho4.1/IPC300, refer to the information on standards compatibility and operating conditions in sections 2.6 and 2.5.



### CAUTION

**Conditions hazardous to the product!**

The ambient air must be free of elevated concentrations of acids, alkali, corrosives, salts, metallic vapours, or other electrically conductive pollutants.



### DANGER

The operational reliability of components designed to be installed in housings or control cabinets will be severely impeded if they are used or operated without having first been installed. Therefore, do not use or operate the IPC until it has been installed.

---

### Note

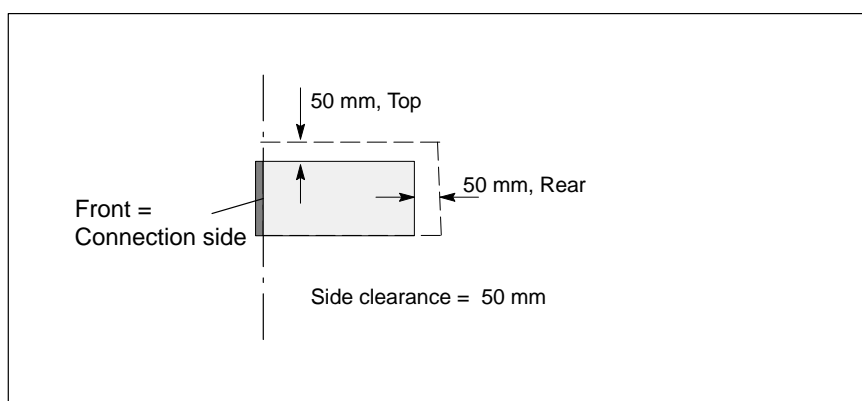
- The use of silicon-based sealing compounds, adhesives and insulating agents is prohibited.
- Ensure that the installation is maintenance-friendly, i.e., that it provides unrestricted access to connections, cables and fuses.
- Precede all installation procedures by writing down the information on equipment 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.

## Installation

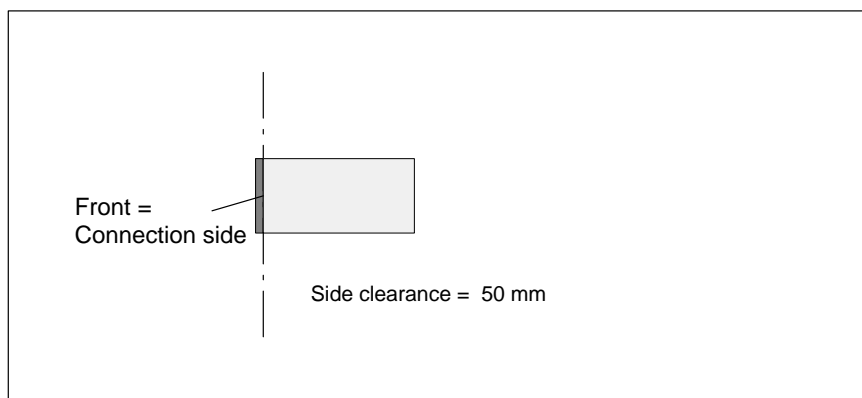
## 4.1 Installed positions and clearances

Housing:	19 in. EISA rack module, protection category IP00 (EN 60529)
Weight:	Approx. 8 kg (without expansion cards)
Installed position:	Horizontal
Installation type:	Installation premises to provide a min. of IP54 rating.

### Clearances – rho4.1



### Clearances – rho4.1/IPC300



☞ **Please note that the integrated CD-ROM drive may be operated in a horizontal position only. Installation in a horizontal position is therefore mandatory.**

- Install the rho4.1/IPC300 in a way ensuring free access to the connection side (front panel).

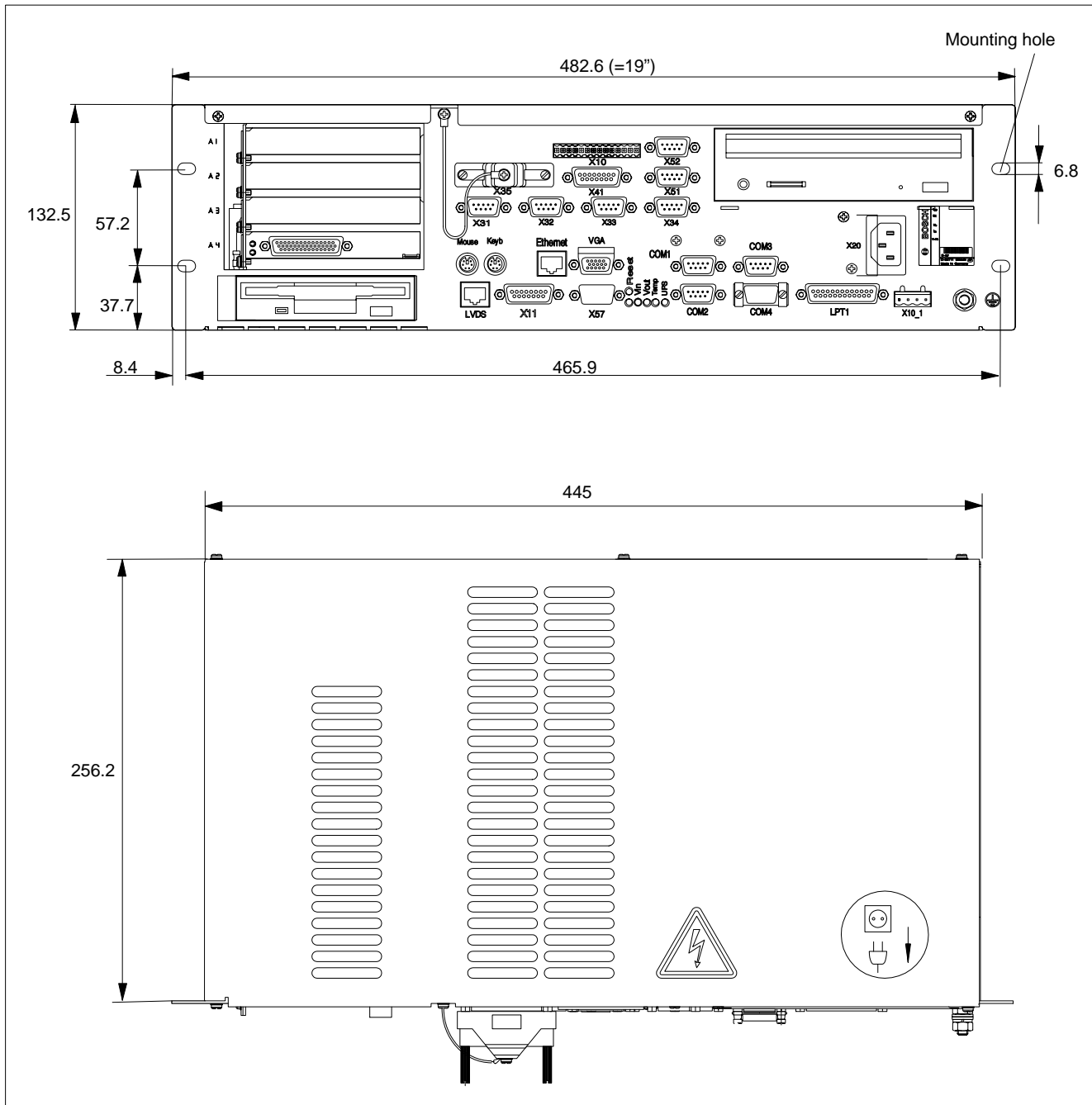
## Installation

- Because it must be possible to verify the operating status of the unit at any time, the LED displays must not be concealed in any way.
- Provide adequate ventilation, and ensure that cables are routed with a minimum clearance of 50 mm (top, bottom and rear).
- When installing connecting cables, allow for sufficiently large loops, providing a strain relief for each cable.
- Maintain suitably large distances from sources of interference.

Installation

4.2 rho4.1 and rho4.1/IPC300 dimensioned drawings

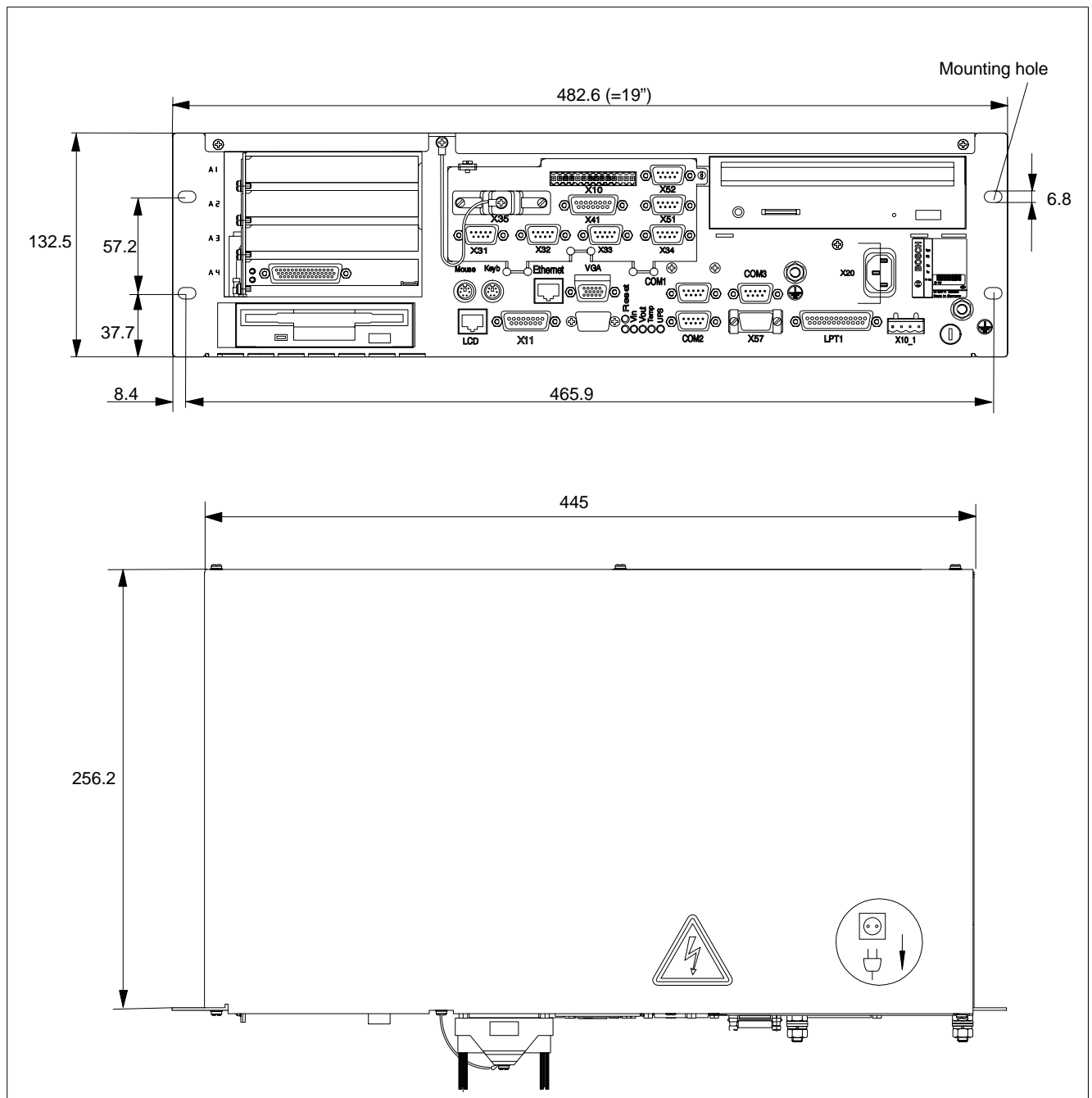
rho4.1





## Installation

## rho4.1/IPC300



### 4.3 Installation

- ★ Build a 19-inch rack 8 mount frame with suitable threaded backups (e.g., captive nuts) matching the 4 mounting eyelets in the front panel of the rho4.1 or rho4.1/IPC300.
- ★ Insert rho4.1 or rho4.1/IPC300 into the mounting frame from the front.
- ★ Using 4 suitable mounting screws, attach the unit to the mounting frame.

Installation

Notes:

## 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 the current state of the art and at the highest level of safety attainable.



### CAUTION

**Risk of damage to system components through 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 functional failures:

- Provide isolated 24 VDC and 0 V terminal bars inside the control cabinet. With regard to cable routing, maintain a minimum distance of 10 cm (4 in.) from all power cables.
- Ensure that machine plant circuits and shutdown sequence are designed to power up control terminals and other industrial-duty components, e.g., CNC and PLC, simultaneously.

## Electrical Connections

## 5.1 Protective Earth (PE) conductor & screening information

---

**DANGER**

**Dangerous conditions, functional failures and equipment damage on machine plant caused by substandard potential equalization or screening properties between system components!**

**Potential equalization currents may 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 electroconductively, on the mounting plate in 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 bands.  
Position 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 cross-sections that are sufficiently dimensioned. 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 interface signal lines via the shielded conductors. Therefore, prior to switching on the IPC for the first time, ensure correct potential equalization between devices that are to be interconnected. Do not forget the interfaces interconnecting devices at different locations (regardless 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 machine plant, 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 on the machine plant caused by substandard EMC measures or line transient interference!**

**Install signal voltage cables at a sufficient distance from high-voltage cables (e.g., motor power cables). If this is not possible, separate metallic cable channels 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:

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

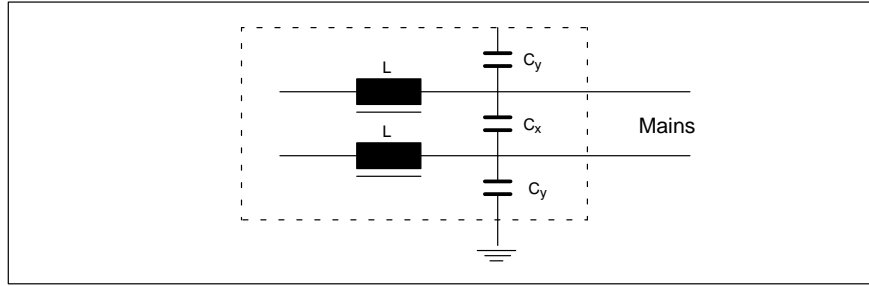
**To ensure optimum suppress interference, all of the above components should be taken into consideration because they are most effective when working in combination. In principle, interference suppression should be implemented as follows:**

- 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.

The following diagram shows a standard interference suppression circuit. Here, the asymmetrical interference voltages are discharged to the housing via  $C_y$ . By contrast,  $C_x$  dampens the symmetrical interference.

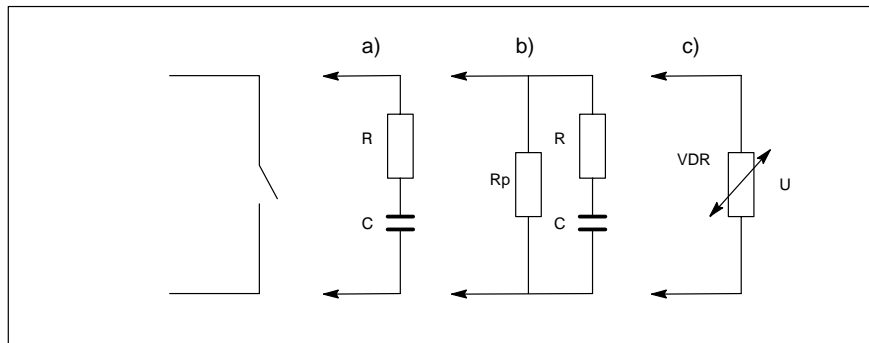
Electrical Connections



Interference suppression examples

Suppression of **contacts**

(Alternating current, direct current, offset DC current)

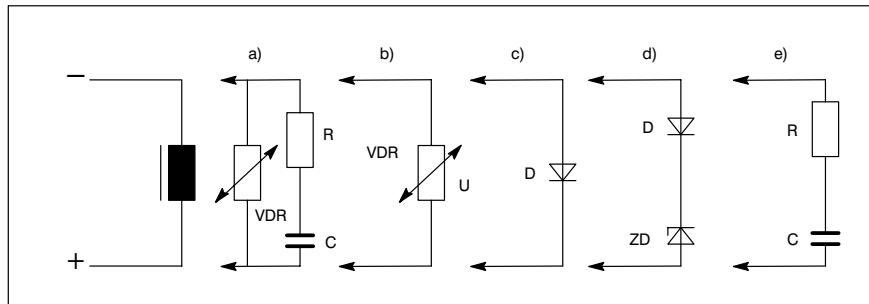


to b) For sensitive contacts, residual current when contact open!

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

Suppression of an **inductive load**

(Motors, solenoid, relay and contactor coils)



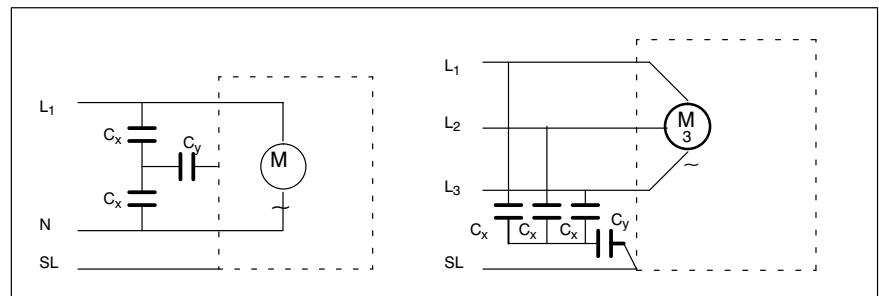
to c) For relay, drop-off delay.

to d) For relay, defined drop-off delay

to e) Must be optimized for inductance!

## Electrical Connections

## Suppression example – mains input:



Electrical Connections

### 5.3 Operating power

#### 5.3.1 24 VDC power connection

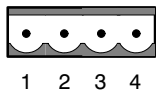
##### X10\_1 24 VDC power connection (when equipped with 24 V power supply)

Alternate to 230/115 VAC power connection. All internally required voltages are provided by a DC/DC converter.

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

Max. conductor cross-section: 1.5 mm<sup>2</sup> (see following page)  
 tion:

X10_1		Pin	Assignment
+	+	1	24V
-	-	2	24V
		3	0V
		4	0V



Rated voltage  $U_N$ : 24 VDC ; +20%, -15%

Residual ripple at  $U_N$ : See diagram below

Interference / surge immunity:  $U_{max} = 35$  V (at  $t < 100$  ms)

Current draw at  $U_N$ : max. 5 A

Input fuse: 6,3 A (5x20) medium time-lag

Reverse polarity protection: Via decoupling diode. Polarity reversal will blow input fuse.



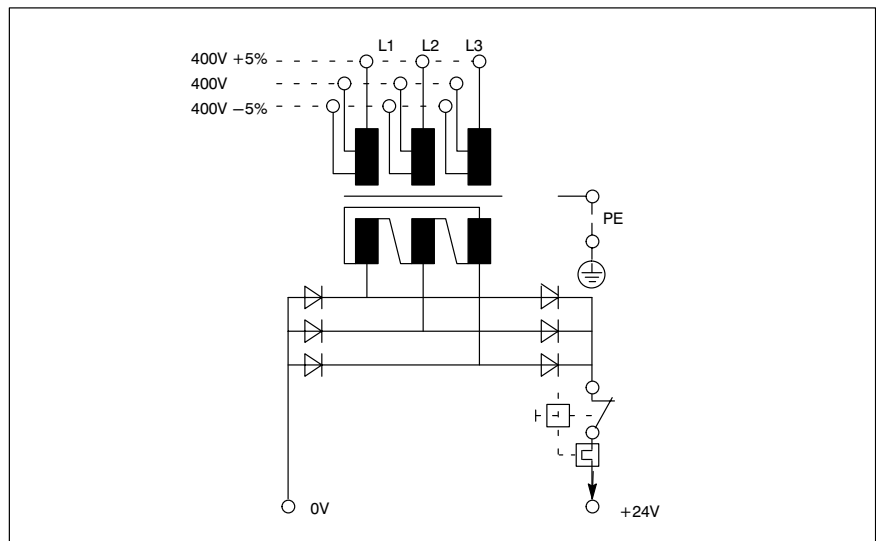
#### DANGEROUS ELECTRICAL VOLTAGE

The 24 VDC input voltage must comply with the requirements of “protective separation”!

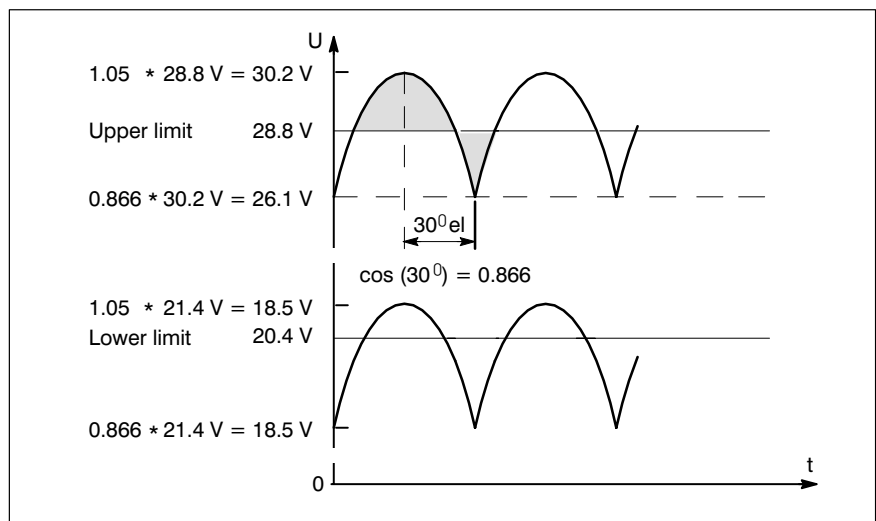


Electrical Connections

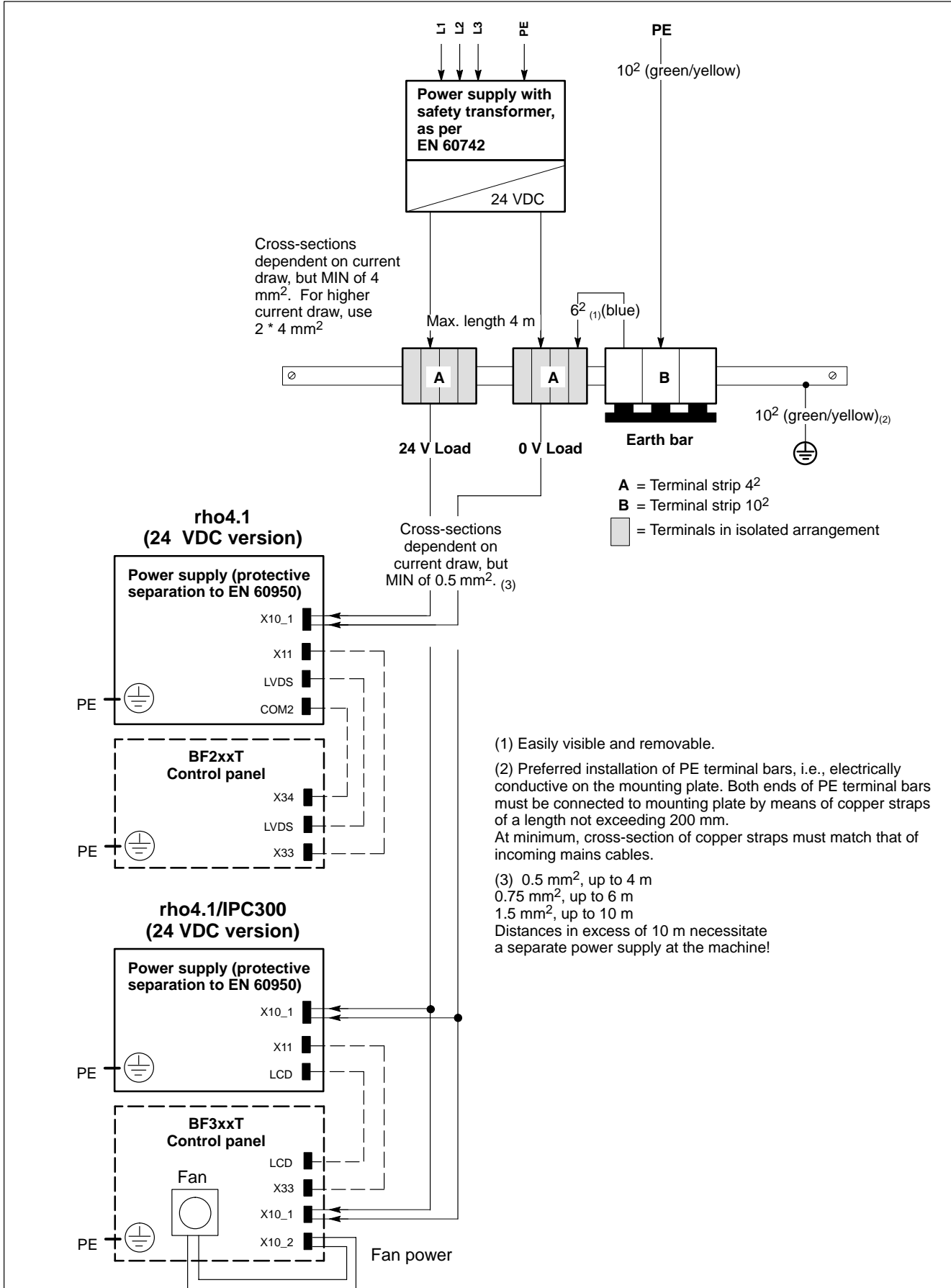
Safety transformer, as per EN 60742:



Offset AC components of the type produced by an unregulated rotary 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, the minimum absolute value of 18.5 V.



Electrical Connections



## Electrical Connections

**5.3.2 230/115 VAC power connection****X20 230/115 VAC power connection (when equipped with AC power supply)**

Alternate to 24 VDC power connection.

All internally required voltages are produced by the integrated power supply.

**CAUTION**

The supply voltage must satisfy the requirements of Overvoltage Category II. Otherwise, the integrated power supply may be destroyed.

Use a separation transformer to generate the 230/115 VAC (refer to next page).

Coupler for non-heating apparatus,  
3-pin

Max. conductor cross-section: 1.5 mm<sup>2</sup>



Rated voltage: 85VAC ... 264VAC;  
Extended-range input

Current draw at  $U_N = 230$  VAC: 0.6 A

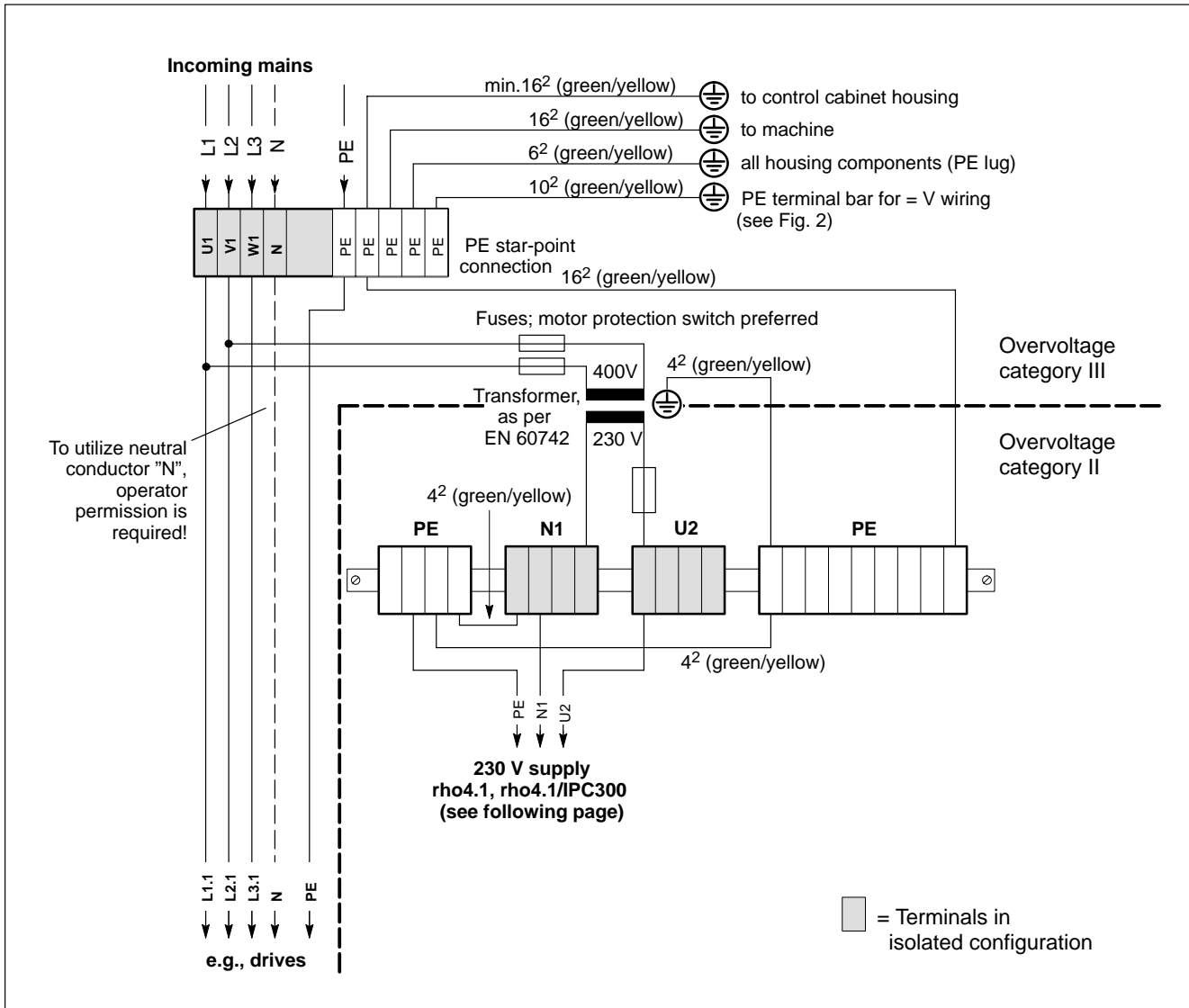
Current draw at  $U_N = 115$  VAC: 1.2 A

Inrush current at 230 VAC: 30 A, cold start, 25 °C

at 115 VAC: 15 A, cold start, 25 °C

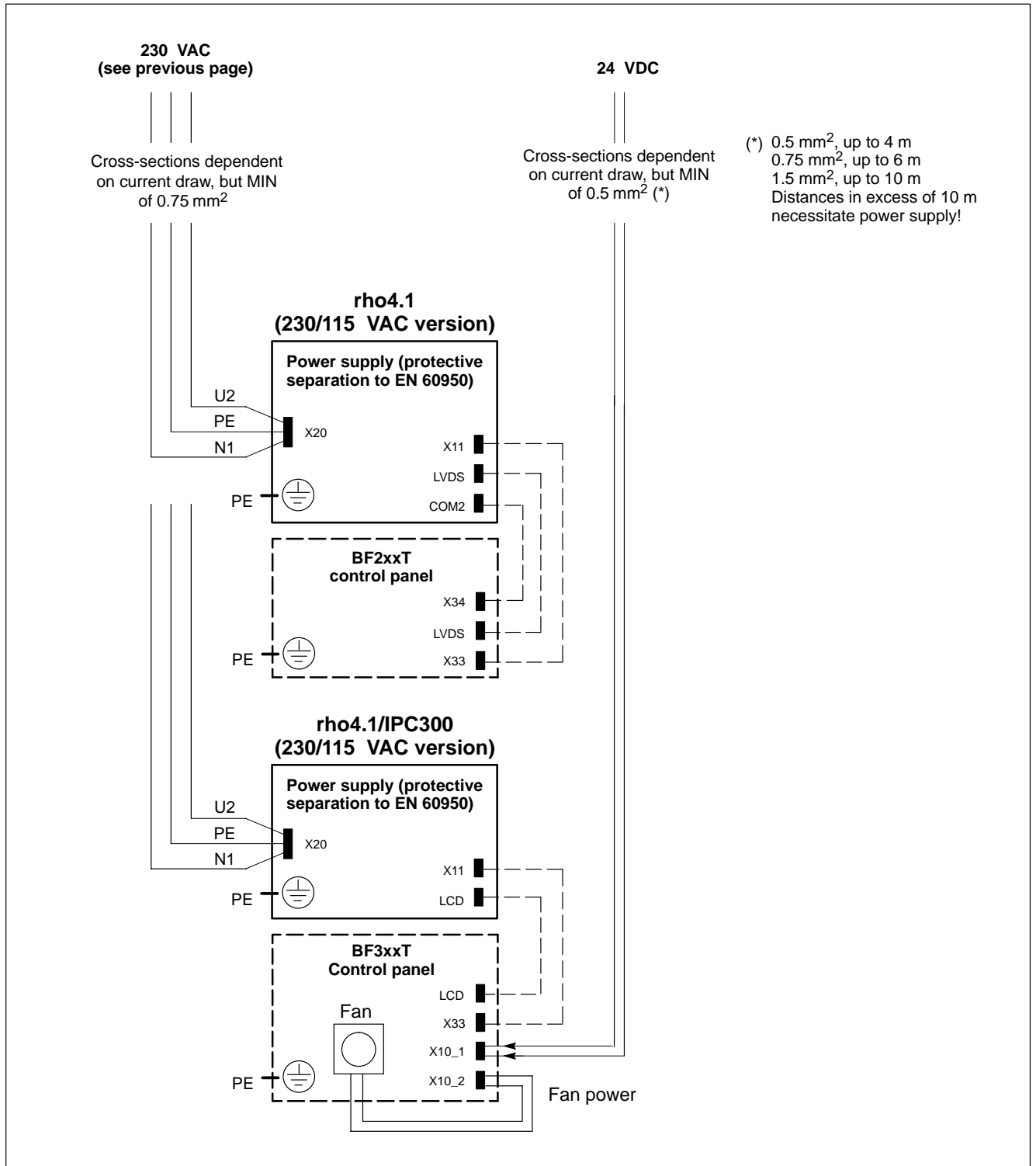
Input fuse: 1,25 A (5x20) medium time-lag

Electrical Connections



Power connection 230 VAC via separation transformer

Electrical Connections



## Electrical Connections

Notes:

## 6 Interface Ports & Connectors


### 6.1 Overview

The following table specifies the installed IPC connector types, as well as their mating connectors.

Panel label		Interface service	Physical connector panel-mounted	Mating connector or cable
rho4.1	rho4.1/IPC300			
COM1		Serial port: RS-232, rho4.1: free assignment rho4.1/IPC300: alternate to X57	Male DB-9	Female DB-9
COM2		Serial port: RS-232 for touch screen	Male DB-9	Female DB-9
COM3		Serial port: RS-232, free assignment	Male DB-9	Female DB-9
–	X57	Serial port: RS-485/422, alternate to COM1	Male DB-9	Female DB-9
COM4	–	Serial port: RS-232 for UPS logic	Male DB-9	Capped
LPT1		Parallel port: Supports SPP, EPP, ECO mode	Female DB-25	Male DB-25 (e.g., printer cable)
Ethernet		Ethernet 10 Base T network connection	Female RJ45, 8-pin	Male RJ45, 8-conductor, twisted pairs
LVDS	–	for BF2xxT: video transmission	Female RJ45, 8-pin	Male RJ45, 8-conductor, twisted pairs
–	LCD	Gigabit for BF3xxT: Video transmission and RS-422 for touch screen controller (COM2)	Female RJ45, 8-pin	Male RJ45, 8-conductor, twisted pairs, uncrossed, CAT7
VGA		VGA connection for external CRT monitor	Female VGA HD, 15-pin	Monitor cable with male VGA HD, 15-pin
X11		BF2xxT, BF3xxT: operating power, mouse and keyboard	Female DB-15	Male DB-15
Keyb		PS/2 mini DIN keyboard	Keyboard cable with male mini DIN PS/2	Keyboard cable with male mini DIN PS/2, 6-pin
Mouse		PS/2 mini DIN mouse	Keyboard cable with male mini DIN PS/2	Male mini DIN PS/2, 6-pin

## Interface Ports &amp; Connectors

Panel label		Interface service	Physical connector panel-mounted	Mating connector or cable
rho4.1	rho4.1/ IPC300			
X10		24 VDC, PHG operating power, READY contacts, dead-man switch, Emergency-STOP	Male Weidmüller push-lock terminal, MSTB 1.5, 14-pin	Female Weidmüller push-lock terminal, MSTB 1.5, 14-pin
X31		V24_1	Male DB-9	Female DB-9
X32		V24_2	Male DB-9	Female DB-9
X33		V24_3	Male DB-9	Female DB-9
X34		V24_4	Male DB-9	Female DB-9
X35		PHG2000 port	Female DB-25	Male DB-25
X41		Belt device	Female DB-15	Male DB-15
X51		CAN bus 1	Male DB-9	Female DB-9
X52		CAN bus 2	Male DB-9	Female DB-9
SERCOS interface on PCI_rho card		LWL	fibre optical cable	
IF connector on PCI_rho card (external)		Combination port for CAN, incremental en- coder, measuring probe, serial port, oper. power, PHG, READY signals	Female DB-44	Male DB-44
IF connector on PCI_rho card (internal)		Interface for connector panel, PCI rho	Male inline plug, 44-pin	Female inline plug, 44-pin
Ext. Floppy		IDE, for external floppy disk drive	Female DB-25	Male DB-25
Described in section 5.3 of this manual:				
X20		PC power supply: 230/115 VAC operating power, alternate to X10_1	Socket, male non-heating appliance connector	Power cord with female non-heating appliance connector
X10_1		PC power supply: 24 VDC oper. power, alternate to X20	Male Weidmüller push-lock terminal, MSTB 1.5, 4-pin	Female Weidmüller push-lock terminal, MSTB 1.5, 4-pin

 **Mouse and keyboard may be connected only if there is neither mouse nor keyboard connected to the BF2xxT/BF3xxT control panel.**

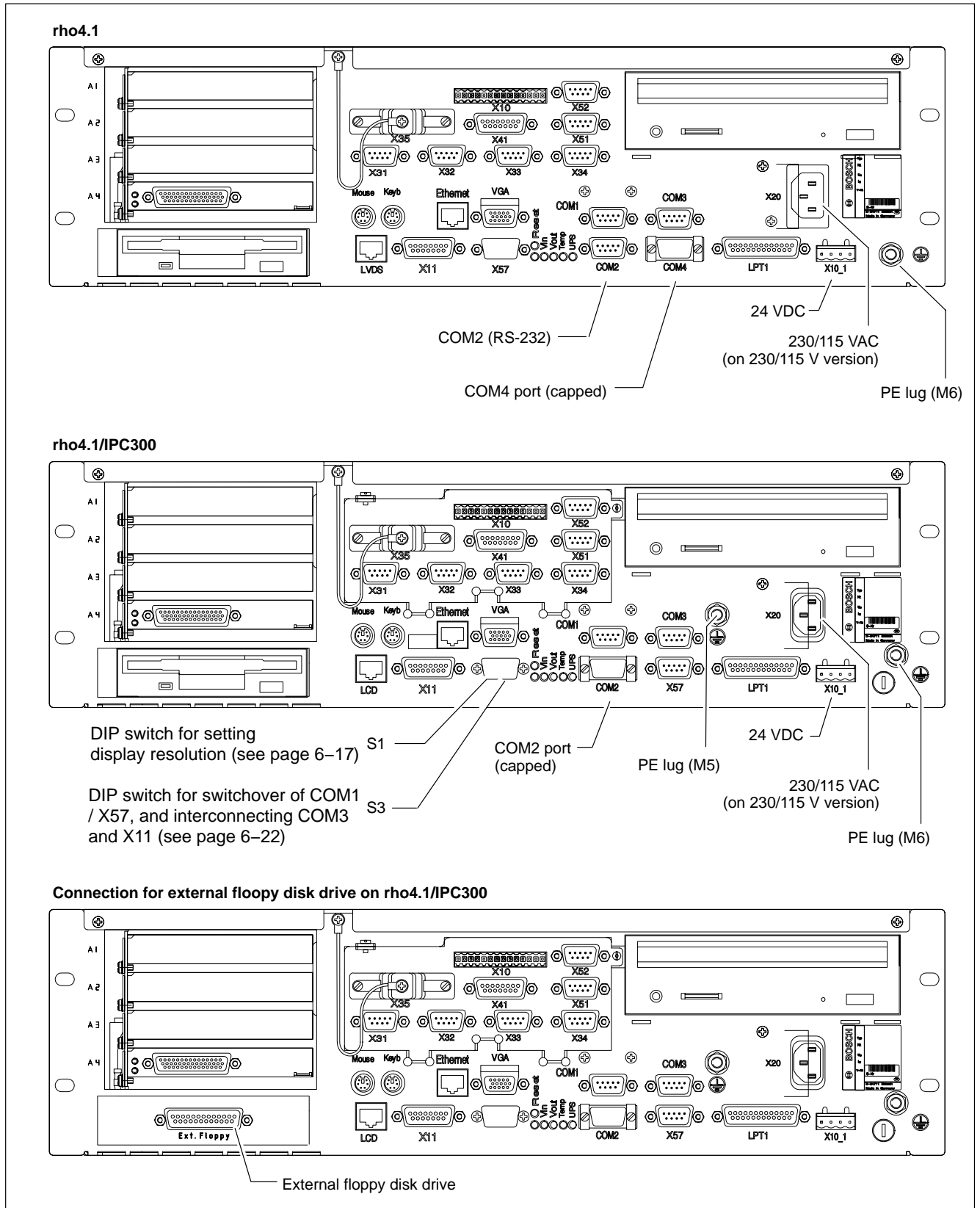
**Port and connector panel layout**

All externally accessed connectors are located on the front panel. All connectors are clearly labelled.

In addition, DIP switches S1 and S3 are externally accessible.



Interface Ports & Connectors



Interface Ports & Connectors

## 6.2 COM1 through COM4 serial PC ports

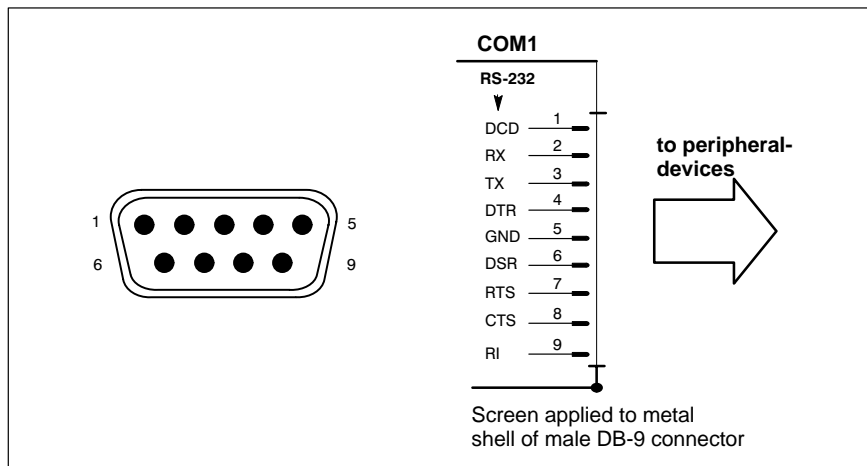
### 6.2.1 Pin assignment



**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**  
 rho4.1/IPC300: alternate to X57

Male DB-9 connector	
Type:	<b>RS-232</b> rho4.1/IPC300: <b>COM1 is also applied to X57 as an RS-422/485. Parallel operation is not possible.</b>
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 115200 bps
Handshake:	Hardware and software handshake (XON, XOFF)
Interrupt (IRQ):	4
I/O address:	3F8H or AUTO (recommended)
BIOS preset:	rho4.1: Onboard Serial Port1: Auto rho4.1/IPC300: Serial Port A: Enabled



**Assignment as an RS-232 serial port**

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.

## Interface Ports &amp; Connectors

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 initialized.
GND	Signal Ground
RTS	Request to Send. RCV channel used by the connected peripheral device to signal to the PC that it 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, assigned to touch screen**

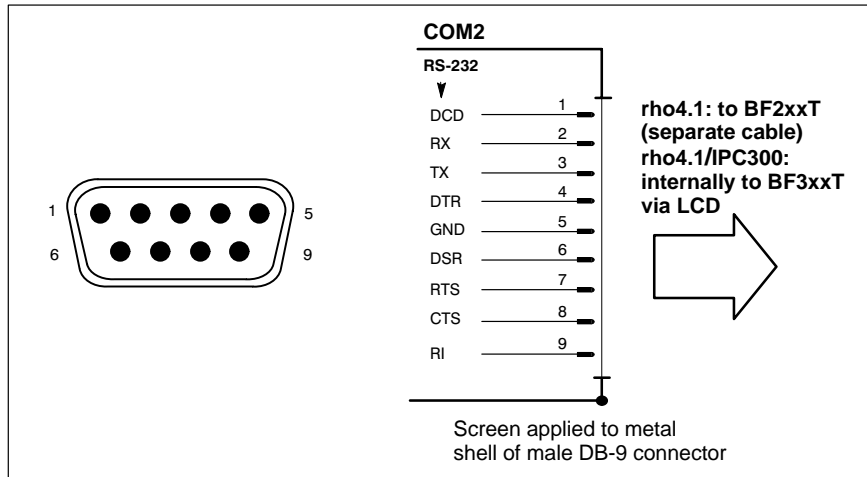
On the rho4.1 controller, the COM2 serial port must be connected to the touch screen of a BF2xxT (for required cable, see section 10.2). On the rho4.1 / IPC300 controller, the COM2 signal is transmitted via the Gigabit cable, making a special cable unnecessary.

In exceptional cases, the rho4.1 may use the COM1 or COM3 serial port for touch screen signals, provided the BIOS settings are modified accordingly.

**Male DB-9 connector**

Type:	RS-232
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 115200 bps
Handshake:	Hardware and software handshake (XON, XOFF)
Interrupt (IRQ):	3
I/O address:	2F8H or AUTO (recommended)
BIOS preset:	rho4.1: Onboard Serial Port2: Auto rho4.1/IPC300: Serial Port B: Enabled

Interface Ports & Connectors



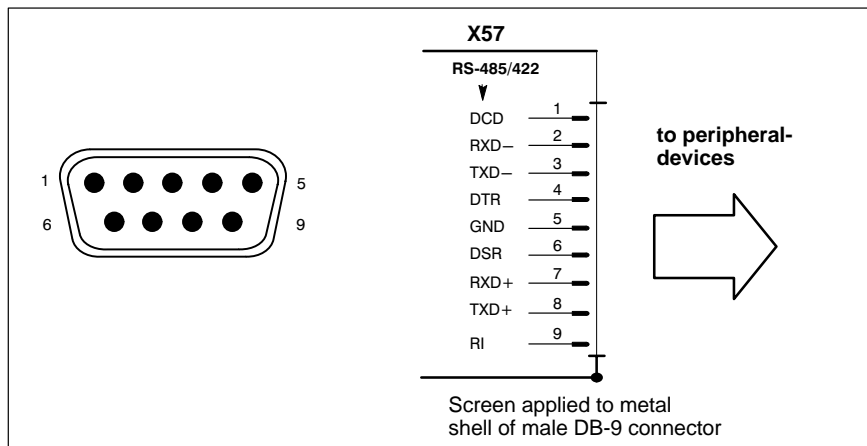
Refer to page 6-4 for explanations of pin assignments.

**X57 Serial interface as RS-485/422, rho4.1/IPC300 only: alternate to COM1**

This interface on the rho4.1 / IPC300 controller can be used only if the **COM1** serial port is **not used**. Parallel operation is not possible.

Male DB-9 connector

- Type: RS-485/422
- Cable length: Max. 15 m
- Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>
- Transmission rate: Max. 115200 bps
- Handshake: Hardware and software handshake (X<sub>ON</sub>, X<sub>OFF</sub>)
- Interrupt (IRQ): 4
- I/O address: 3F8H or AUTO (recommended)
- BIOS preset: Serial Port A: Enabled



## Interface Ports &amp; Connectors

**Configuration for service as an RS-485/422:**

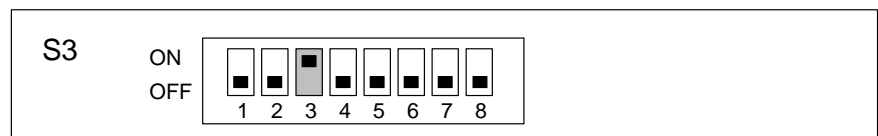
(For more information on pin assignment, see page 6-4)

DCD	as for RS-232
RXD-, RXD+	Receive Data. Line on which data is received.
TXD-, TXD+	Transmit Data. Line on which data is transmitted to peripheral.
DTR	as for RS-232
DSR	as for RS-232
GND	as for RS-232
RI	as for RS-232
Screen	as for RS-232

**Setting**

Using the S3 DIP switch, the X57 interface can be configured for either RS-485 or RS-422 service:

- **X57 = RS-485** Switch segment 3 **"ON"**: TXD is controlled via RTS. Also, for 2-wire operation, TXD+ must be bridged with RXD+, and TXD- with RXD-.
- **X57 = RS-422** Switch segment 3 **"OFF"**: TXD is always enabled.



For the location of the S3 DIP switch, refer to diagram on page 6-2.

**COM3 Serial port, freely assignable**

Male DB-9 connector

Type: **RS-232**

Cable length: Max. 15 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

Transmission rate: Max. 115200 bps

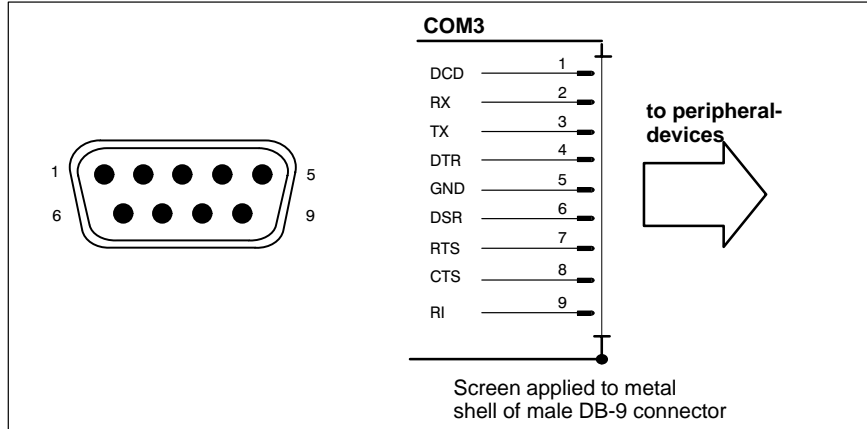
Handshake: Hardware and software handshake (XON, XOFF)

Interrupt (IRQ): 10

I/O address: 3E8H

BIOS preset:	rho4.1:	Onboard Serial Port3: 3E8h
	rho4.1/IPC300:	Serial Port C: Enabled

Interface Ports & Connectors



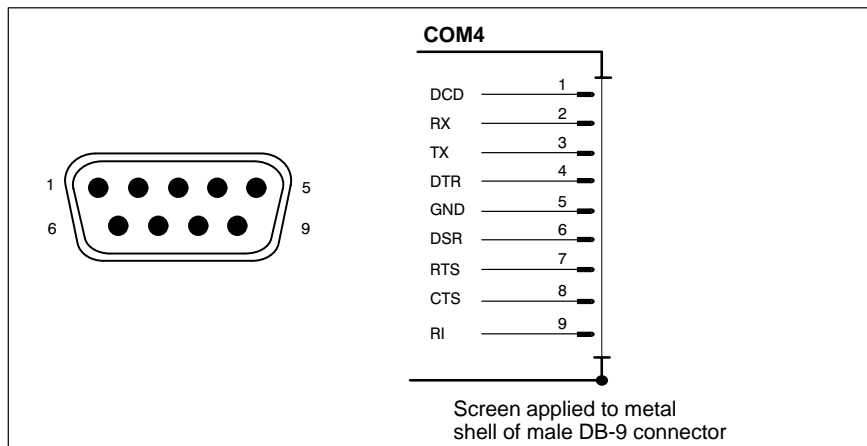
Refer to page 6-4 for explanations on pin assignments.

**COM4 Serial port, configured for UPS logic service**  
(refer to section 3.2)

COM4 is internally assigned to the uninterruptible power supply (UPS).

Male DB-9 connector

Type:	<b>RS-232</b>
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 115200 bps
Handshake:	Hardware and software handshake (XON, XOFF)
Interrupt (IRQ):	11
I/O address:	2E8H (if equipped for free assignment)
BIOS preset:	rho4.1: Onboard Serial Port4: 2E8h rho4.1/IPC300: Serial Port D: Enabled



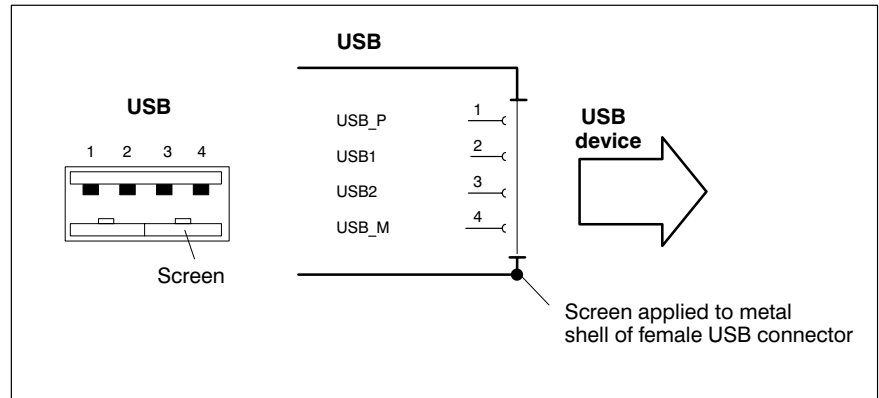
Refer to page 6-4 for explanations on pin assignments.

## Interface Ports &amp; Connectors

**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	Signal
1	USB power supply (max. 500 mA)
2	Data -
3	Data +
4	USB Ground

Interface Ports & Connectors

## 6.2.2 Communication parameter settings

### Control Panel

For information about setting the communication parameters for serial interfaces, refer to the manual supplied with the installed operating system.

Windows 95/NT: Go to **Start** -> **Settings** -> **Control Panel**, etc.

### BIOS

The factory-shipped BIOS settings for COM1 through COM4 have been set to **Present**.



#### CAUTION

Interrupt (IRQ) and I/O address must correspond to BIOS settings.

If addressing conflicts in conjunction with COM3 or COM4 are noted, this may indicate that IRQ 10 or 11 are already in use by other PC expansion cards. If this is the case, the use of alternate IRQs is advised.

---



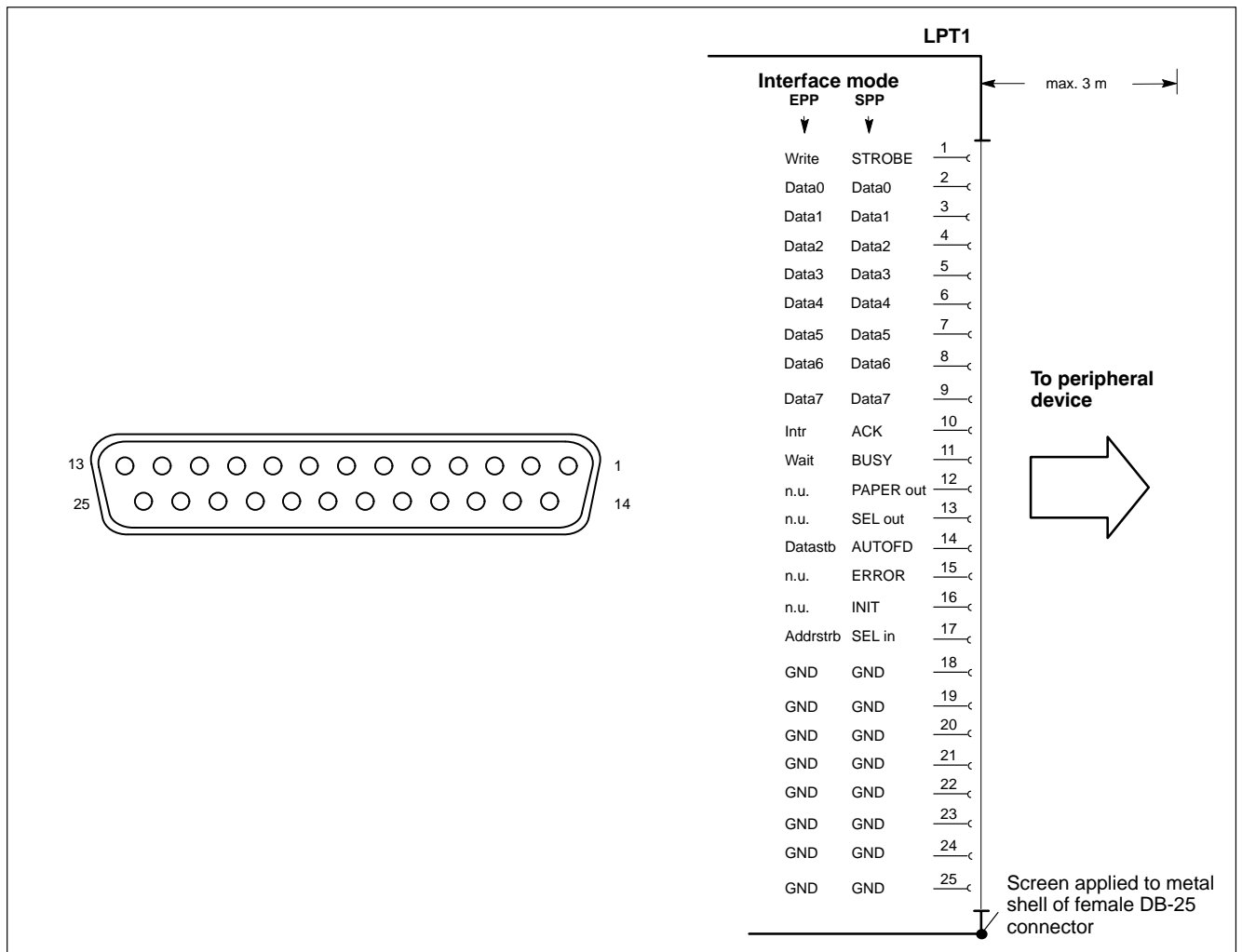
Interface Ports & Connectors

### 6.3 LPT1 parallel port

#### LPT1 Parallel port for printer, scanner, etc.

Female DB-25 connector

Type: SPP (ex factory), EPP, ECP  
 Cable length: Max. 3 m  
 Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>  
 Interrupt (IRQ): 7  
 I/O address: AUTO or **378H** (recommended)



The parallel port normally runs in the default SPP (Standard Parallel Port) mode. Provided that suitable peripheral devices are present, it can also be operated in EPP (Enhanced Parallel Port) or ECP (Extended Capabilities Port) mode. The mode is changed by means of the BIOS settings.

Interface Ports & Connectors

---



**CAUTION**

**Functional failures caused by poor screening!**

**Use only metallic or conductive connector/coupling shells  
providing large-area screen contact.**

---

## Interface Ports &amp; Connectors

## 6.4 Ethernet-interface

### Ethernet network connection

The Ethernet connection allows the PC to communicate on an Ethernet network. 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: rho4.1: Ethernet 10BaseT  
rho4.1/IPC300: Ethernet 10/100BaseTX

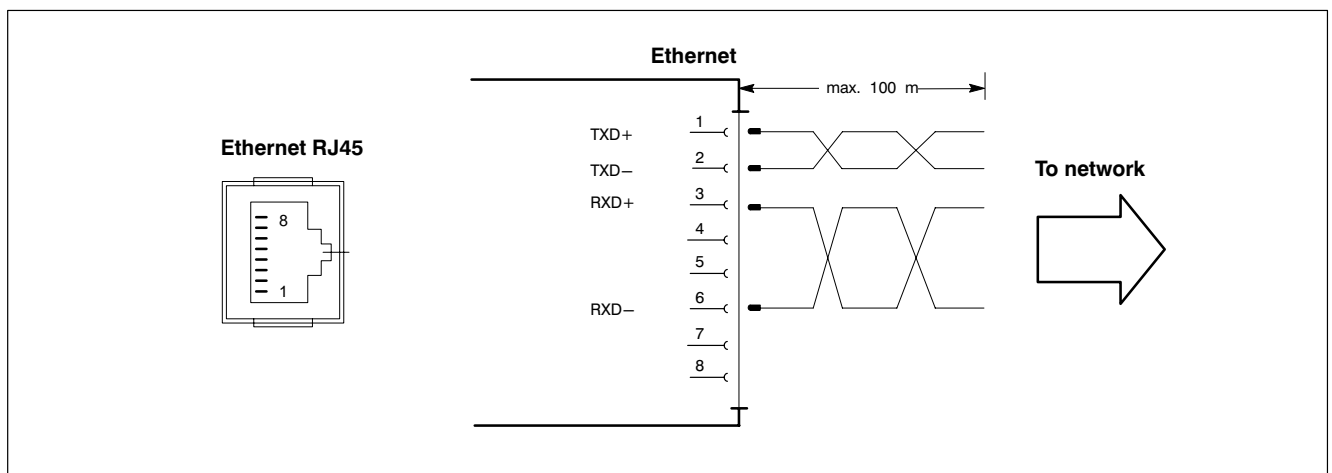
Cable length: Max. 100 m

Cable type: Screened, twisted pair


Transmission rate: 10 Mbit/s and/or 100 Mbit/s

Interrupt (IRQ): 5

I/O address: 340H



The driver configuration functions for the network connection can be accessed in the task bar or in the **Control Panel** under the **Network Card** symbol. A dialog box provides selections of data transmission speed, e.g., 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.**

Interface Ports & Connectors

## 6.5 Video signal interfaces

### 6.5.1 BF2xxT for rho4.1

#### LVDS Video signal transmission

The video signals are transmitted via the LVDS port. The interface is particularly designed for medium-distance transmission paths and interference-free signal transfer. Connection is possible only with the LVDS connector on the BF200T or BF212T control panel.

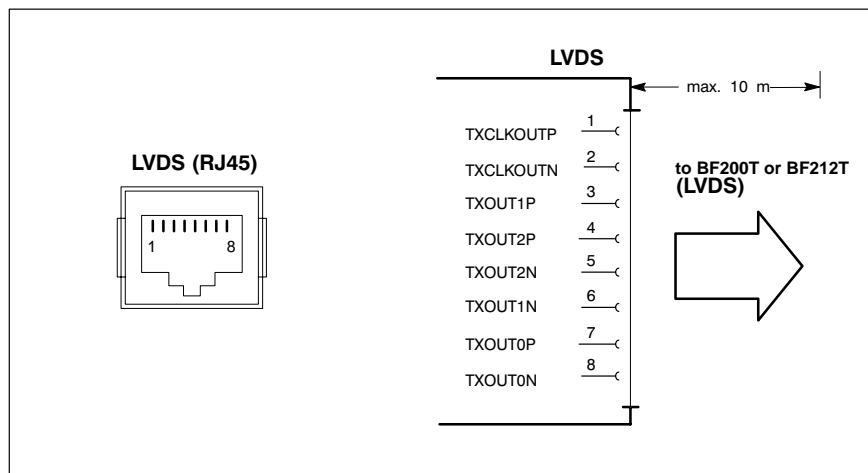
The transmission of controller signals for the touch screen of the BF2xxT control panel to the COM2 port of the rho4.1 is handled by a separate cable.

Female RJ45, 8-pin

Cable length: Max. 10 m

Cable type: Twisted pair, 8-pin, screened

Refer to section 10.2 for a listing of premanufactured connecting cables.



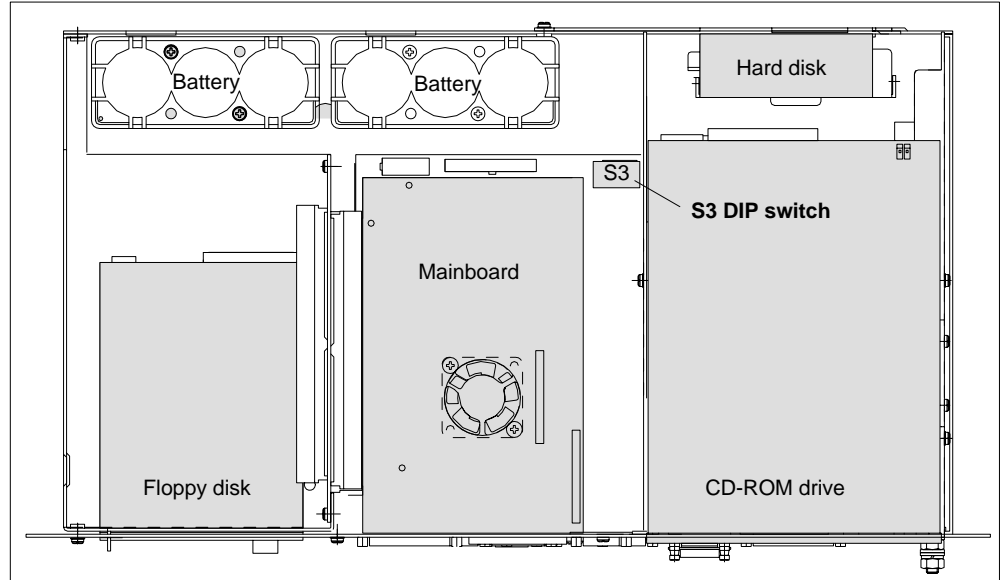
#### Setting screen resolution

The display resolutions must be selected in the connected IPC or rho4 via the S3 DIP switch (see diagram below):

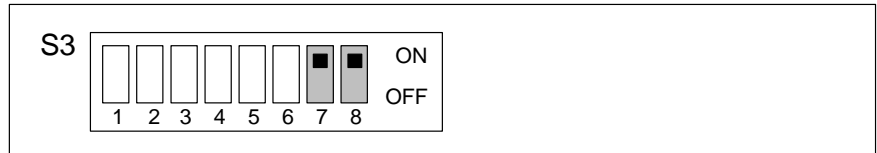
- BF200T (10.4 in. colour display): 640 x 480 pixels, 256000 colours
- BF212T (12.1 in. colour display): 800 x 600 pixels, 256000 colours (factory setting)

To change the factory setting, the housing cover of the rho4.1 is removed (removing 4 mounting screws), and DIP switch segments S3.7 and S3.8 changed to the appropriate settings (refer to diagram below).

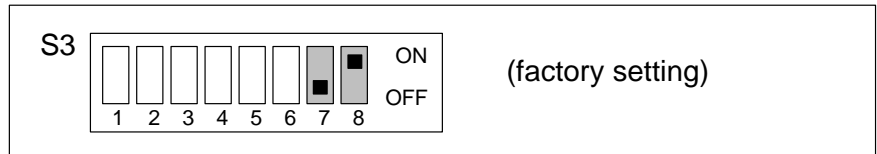
Interface Ports & Connectors



- 640 x 480 pixels      Segments 7, 8 : ON



- 800 x 600 pixels      Segment 7 : OFF  
                                 Segment 8 : ON



Interface Ports & Connectors

6.5.2 BF3xxT for rho4.1/IPC300

**LCD Gigabit interface (video transmission and RS-422 for touch screen controller)**

The Gigabit interface simultaneously handles the transfer of video signals and control communications for the touch screen controller (RS-422). On the rho4.1/IPC300 controller, the controller signals are internally connected to the COM2 port.

The Gigabit interface is particularly designed for extended transmission paths and interference-free signal transfer. Connection is possible only with the Gigabit connector on the BF312T or BF315T control panel.

Female RJ45, 8-pin

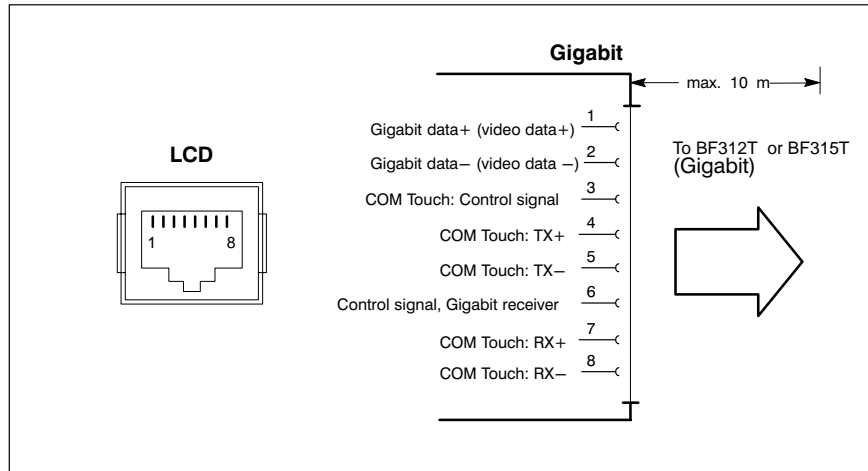
Cable length:

Max. 15 m, max. 75 m with repeater

Cable type:

Twisted pair, 8-pin, screened

Refer to section 10.2 for a listing of premanufactured connecting cables.

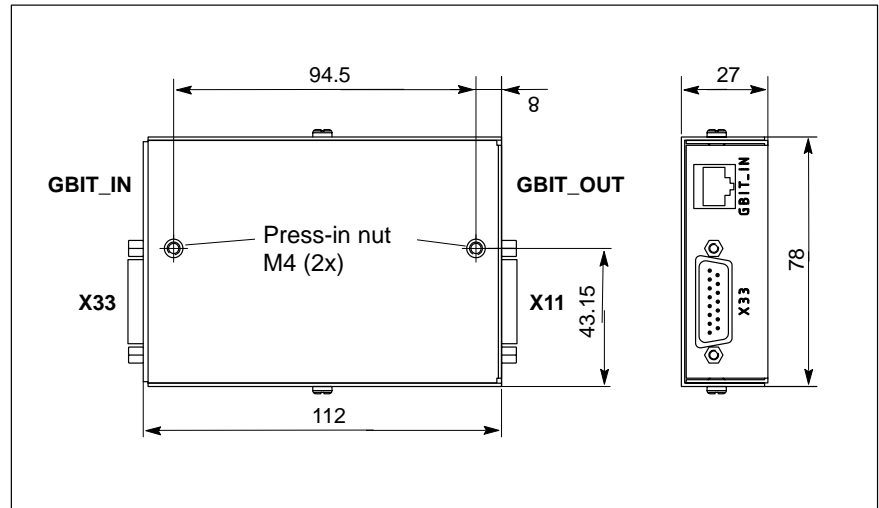


Interface Ports & Connectors

**GBIT repeater**

A Gigabit repeater can be used to extend the required connections between the rho4.1/IPC300 and BF3xxT (LCD and X33) by another 15 metres, to a total of 75 metres with 4 repeaters. Repeater installs via M4 press-in nuts. Using standard mounting clamps, snap-on installation on a standard DIN rail is also possible.

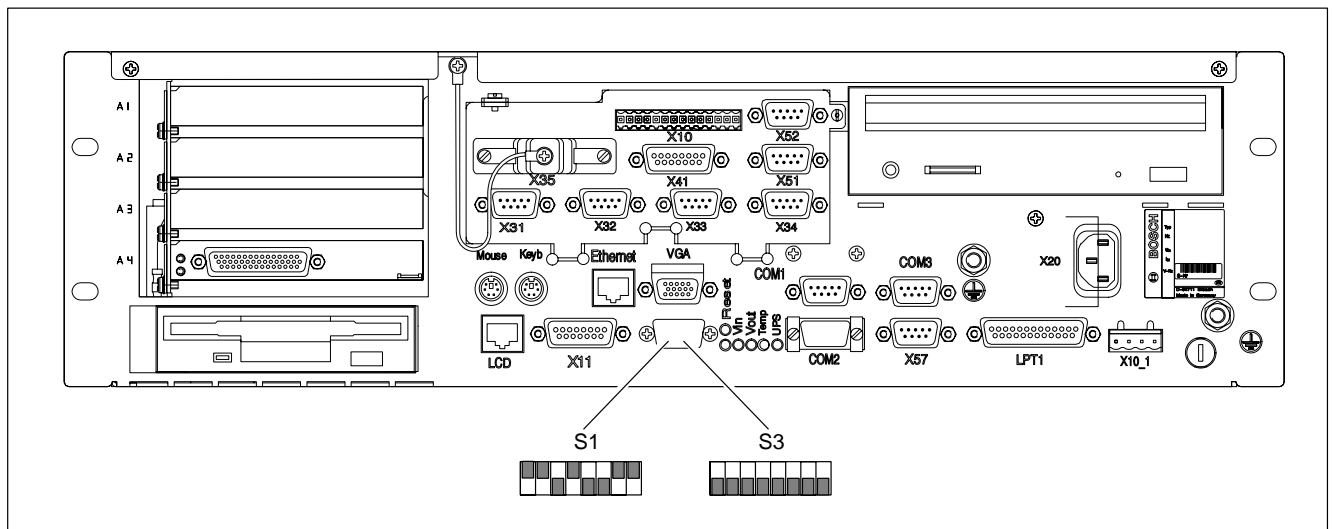
Refer to section 10.2 for ordering information.



**Setting screen resolution**

The display resolution must be selected on the S1 DIP switch (refer to diagram below):

- BF312T (12.1 in. colour display): 800 x 600 pixels
- BF315T (15 in. colour display): 1024 x 768 pixels  
**(factory setting)**



Changes are made on the externally accessible switch segments 1 though 8 of the S1 DIP switch:






## Interface Ports &amp; Connectors

### 6.5.3 External monitor

#### VGA External monitor port

The VGA port accepts an external monitor (CRT) for operation via the built-in video adapter. The external monitor can be operated in parallel with the operator panel.

- Video RAM: 2 MB

 **Note that the external monitor must already be connected at the time the control terminal is booted up. If this is not the case, the VGA port will not be initialized by the BIOS.**

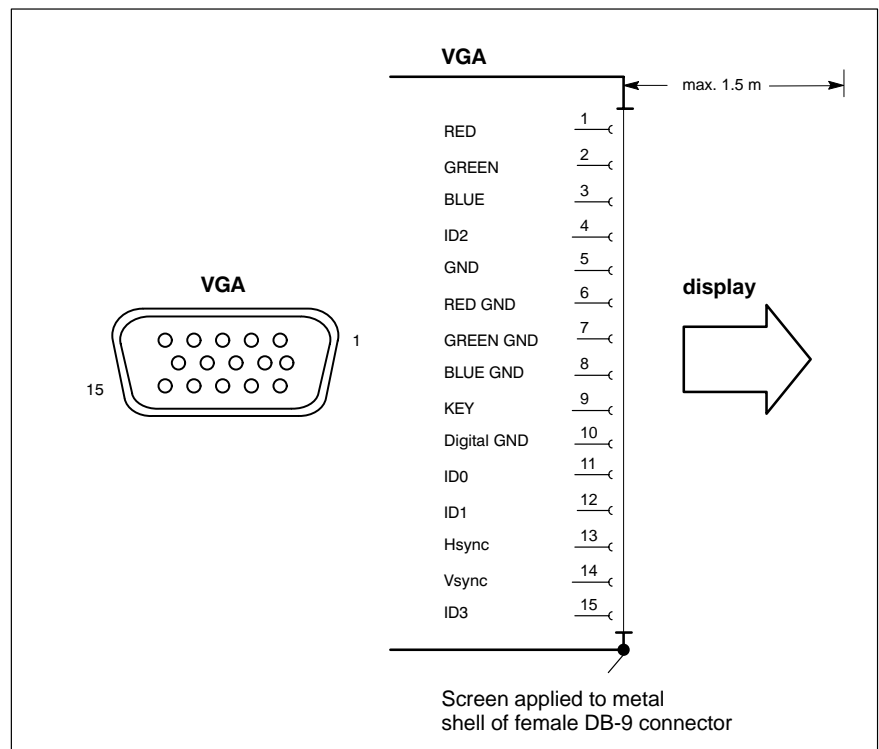
 **Inserting a graphics card will disable the integrated video adapter. On the rho4.1/IPC300, the BIOS settings must also be changed.**

Female VGA HD, 15-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

Max. resolution: **1280 x 1024 pixels, max. 16 million colours**



## Interface Ports &amp; Connectors

## CRT screen resolution

After a system restart, the screen resolution of the VGA port always corresponds to the setting of the LVDS or LCD interface. Refer to page 6-14 (LVDS) or page 6-17 (LCD).

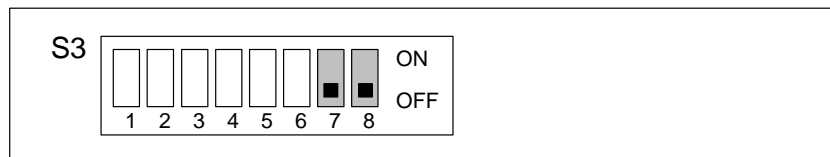
While the rho4.1 or rho4.1/IPC300 controller is running, it is possible to deviate from the above settings by selecting other resolutions and/or colours via the Control Panel of the respective operating system. However, these settings will again be overwritten by any system restart:

- VGA mode: 640 x 480 pixels, 72 Hz, 24-bit colours
- SVGA mode: 800 x 600 pixels, 72 Hz, 24-bit colours
- XGA mode: 1024 x 768 pixels, 72 Hz, 16-bit colours
- SXGA: 1280 x 1024 pixels, 72 Hz, 8-bit colours

If it is desirable to permanently set the VGA connection to a resolution which does not correspond to the range of settings possible on the LVDS or LCD interface, the connection between LVDS/VGA, and LCD/VGA, respectively, must be interrupted:

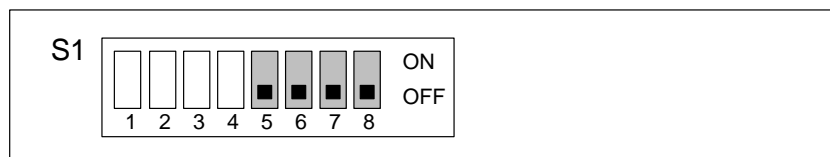
- **rho4.1** via the S3 DIP switch:


VGA resolution	Segment 7 :	OFF
as per BIOS:	Segment 8 :	OFF



- **rho4.1/IPC300** via the S1 DIP switch:

VGA resolution	Segment 5 :	OFF
as per BIOS:	Segment 6 :	OFF
	Segment 7 :	OFF
	Segment 8 :	OFF



 **With these settings, connecting a control panel is no longer possible!**

**CAUTION**

**Setting incorrect resolutions and colours can destroy your monitor!**

**Observe the specifications applying to your CRT or LCD monitor, and adapt the operating system parameters accordingly.**

## Interface Ports & Connectors

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.

## 6.6 X11 power supply connection

### X11 Port for operating voltage, backlight power; mouse signals, and keyboard signals from control panel

The X11 power supply input provides for interference-free operation of the control panel and connected components even over an extended distance.


Up to a distance of 1.5 m, an alternative solution would be to connect mouse and keyboard directly to the PC.

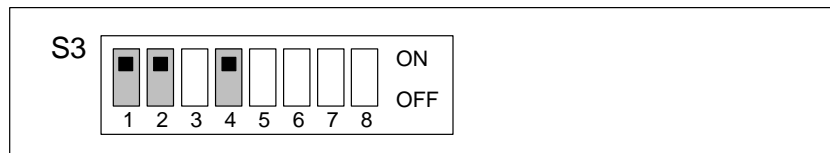
The X11 connection provides the following services:

- Operating power to the control panel
 

rho4.1:	12 VDC
rho4.1/IPC300:	24 VDC
- Power required for backlight source.
- Transmission of mouse and keyboard signals (refer also to sections 6.7 and 6.8)
- Connection between COM3 and control panel as required. The connection is identical for both rho4.1 and rho4.1/IPC300, and is established via the S3 DIP switch.

COM3 interconnected with X11: S3 switch segments 1 and 2: ON

 **rho4.1/IPC300 with PIII/400 MHz only:**  
**To activate the backlight timer function of the BF3xx the switch segment 4 must be set to 4 = ON.**



Female DB-15 connector

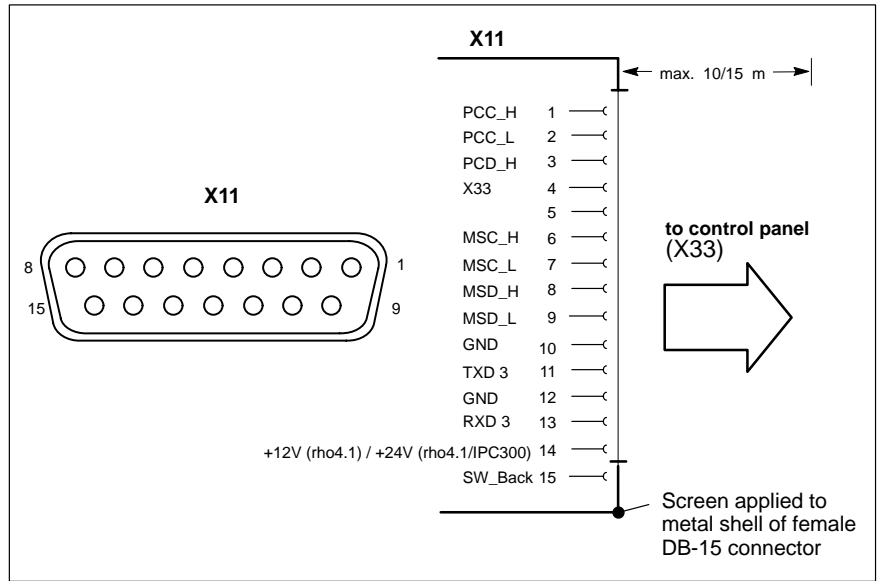
Cable length:
 

rho4.1:	max. 10 m
rho4.1/IPC300:	max. 15 m, extensible to 75 m via repeaters in conjunction with Gigabit interface (see page 6-17)

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

Interface Ports & Connectors

Refer to section 10.2 for a listing of premanufactured connecting cables.



## Interface Ports &amp; Connectors

## 6.7 Keyboard connector

### Keyb PS/2 Mini-DIN keyboard port

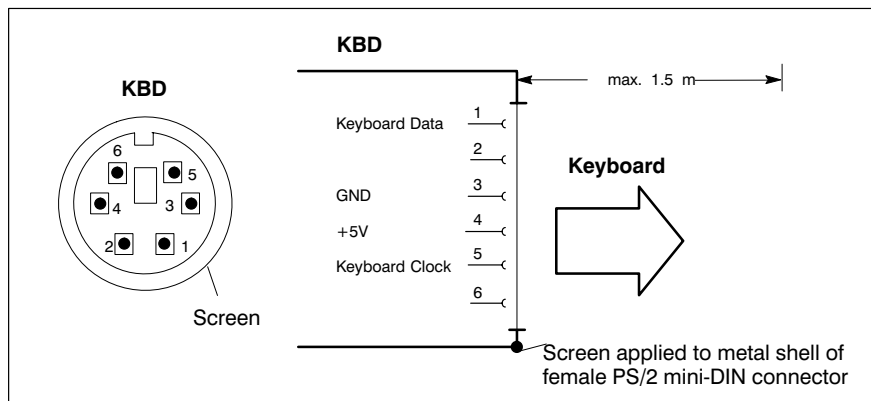
☞ Use this keyboard port only if there is no keyboard connected to the “KBD” port of the control panel. Otherwise, faulty mouse operation may occur.

Female PS/2 mini DIN, 6-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

BIOS preset: System Keyboard: **Present** (rho4.1 only)  
(for “Keyb” or “KBD”)



If the keyboard is not recognized by the system, it must be enabled in the BIOS by switching from **Absent** to **Present** (rho4.1 only).

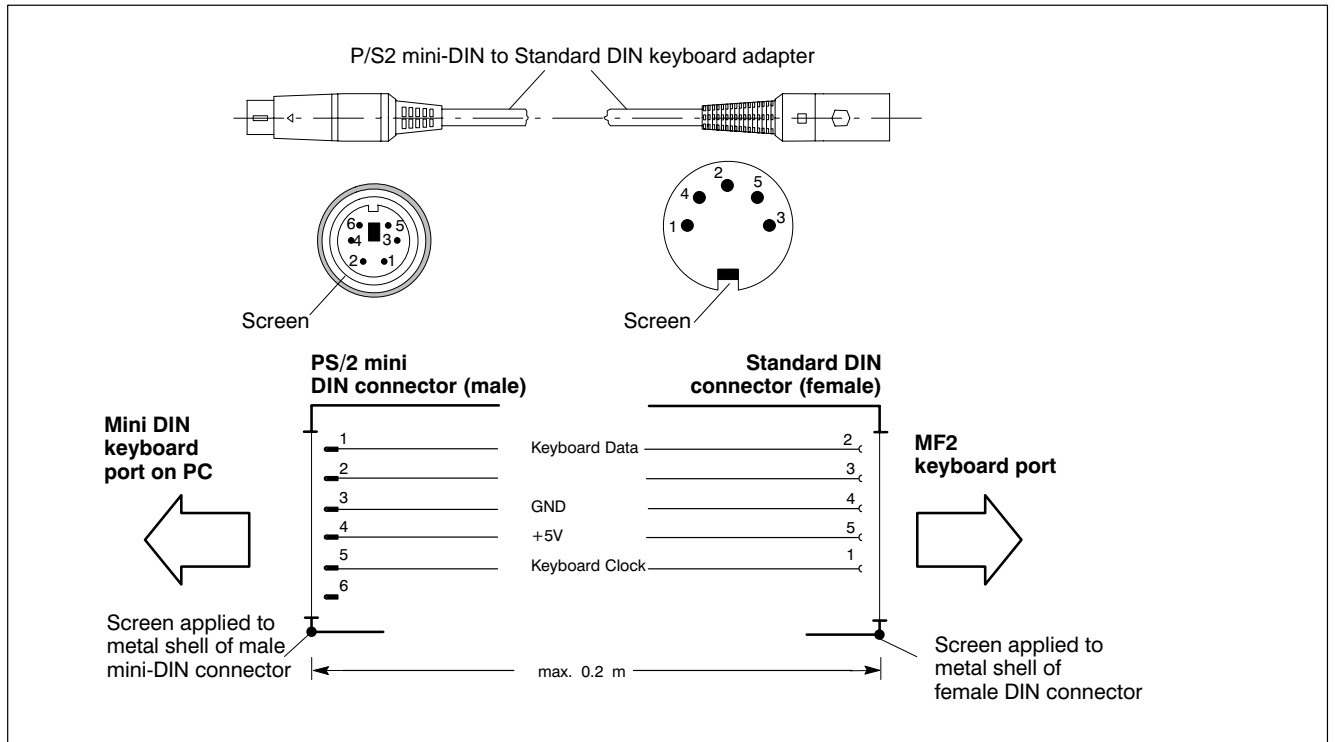
### Keyboard adapter

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 (8 in.) in length, with a DIN connector and a mini DIN coupling on the ends. Pin assignment as per diagram below.

These premanufactured adapters are available from most computer stores.

Interface Ports & Connectors



## 6.8 Mouse port

### Mouse PS/2 mouse port

- ☞ **Use this mouse port only if there is no mouse connected to the “Mouse” port of the control panel. Otherwise, faulty mouse operation may occur.**

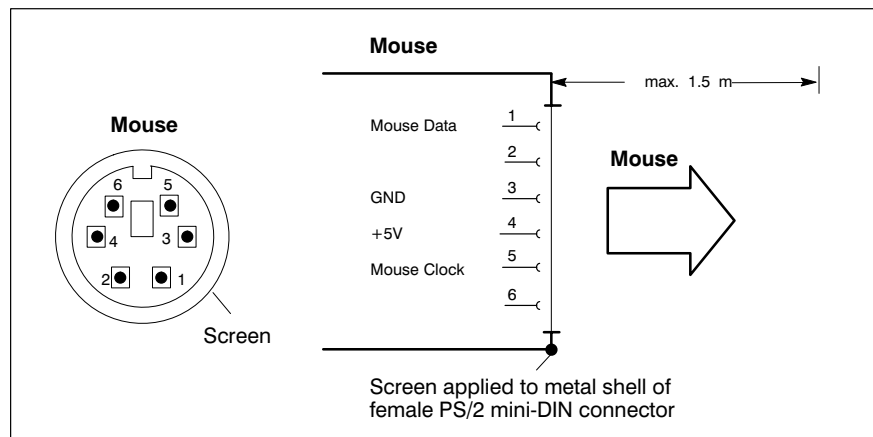
Female PS/2 mini DIN,  
6-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

Interrupt (IRQ): 12

BIOS preset: rho4.1: PS/2 Mouse Support: **Enabled**



If the P/S2 mouse is not recognized by the system, it must be enabled in the BIOS by switching from **Disabled** to **Enabled** (rho4.1 only). The operating system will not recognize the insertion of an external mouse after completed startup because the mouse initialization occurs during the boot phase.

- ☞ **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.



## Interface Ports &amp; Connectors

**6.9 rho4.1 female inline terminal****X10 PCI rho inline terminal**

The X10 connector represents a real-time interface:  
It provides the PHG operating power (24 VDC), connections for READY contacts, Emergency-STOP contacts, and dead-man switch.

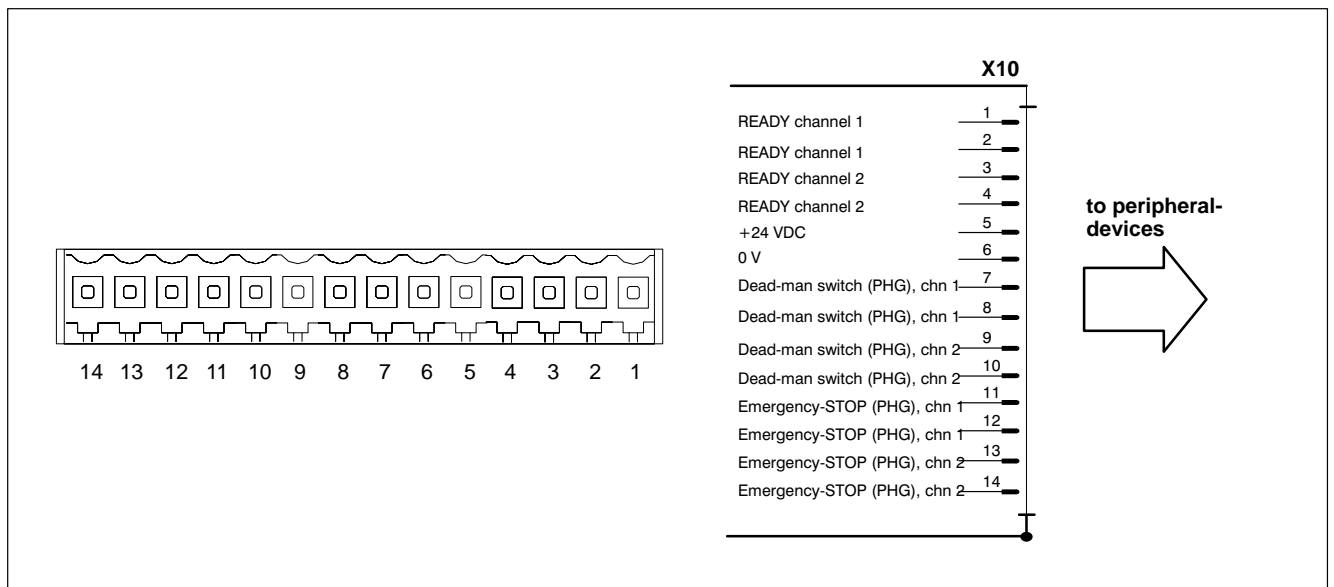
Weidmüller push-lock connector MSTB 1.5,  
14-pin

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

**READY2 Relays:**

Switching load: 32 W max.  
Switching current: 0.8 A max.  
DC switching voltage: 40 V max.  
Watchdog time, analog WD: 50 ms ± 22 %

The male mating connector must be ordered separately, see page 10-1.



Interface Ports & Connectors

**X31, X32 Ports for serial combination interfaces V24\_1 (chn 1), V24\_2 (chn 2)**

Connectors X31 and X32 represent real-time interfaces. The combination interfaces facilitate serial data communications in accordance with the V.24 or 20 mA standard.

Male DB-9 connector

**V.24**

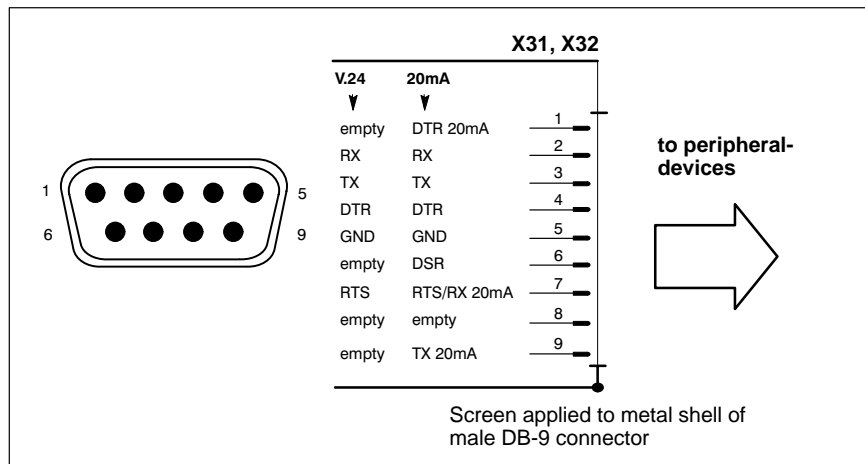
Type:	V.24
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Data driver:	Short-circuit proof, not electrically isolated
Transmission rate:	Max. 19200 bps
Handshake signals:	DSR, DTR


**20 mA**

Type:	20 mA active
Cable length:	Max. 100 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 19200 bps
Data driver:	Short-circuit protected, not electrically isolated
	No-load voltage: 12 V
	Internal resistance: 464 Ω
	Short-circuit current, max.: 26 mA
Receiver:	LOW is recognized through 4.5 mA
	HIGH is recognized from 7.5 mA and up
Handshake signals:	Channel 1 features 20 mA control signal (RTS) for connection of a PHG

Refer to page 6-29 for connecting cable.

 **The switchover from V.24 to 20 mA service is accomplished by bridging Pin 4 and Pin 2 in the connector.**



 **The X35 PHG connector and the X31 serial interface port must never be in use, i.e., connected, at the same time.**

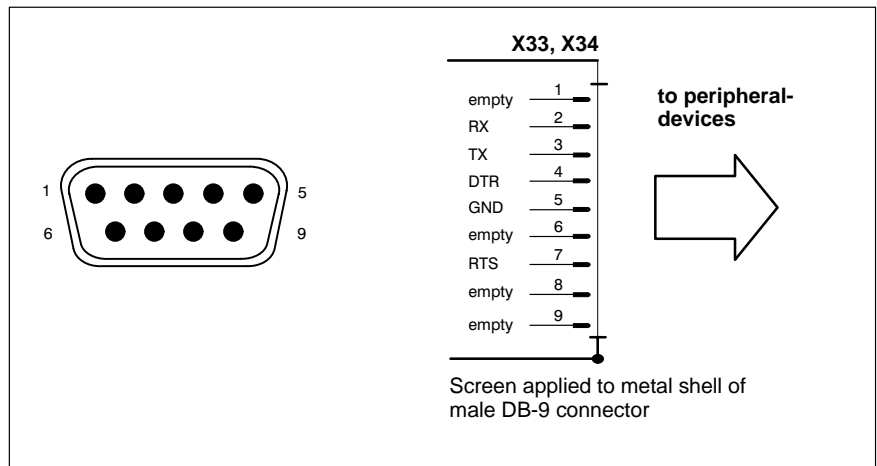
Interface Ports & Connectors

**X33, X34 Ports for serial interfaces V24\_3 (chn 3), V24\_4 (chn 4)**

Connectors X33 and X34 represent real-time interfaces. These interfaces facilitate serial data communications in accordance with the V.24 standard.

Male DB-9 connector

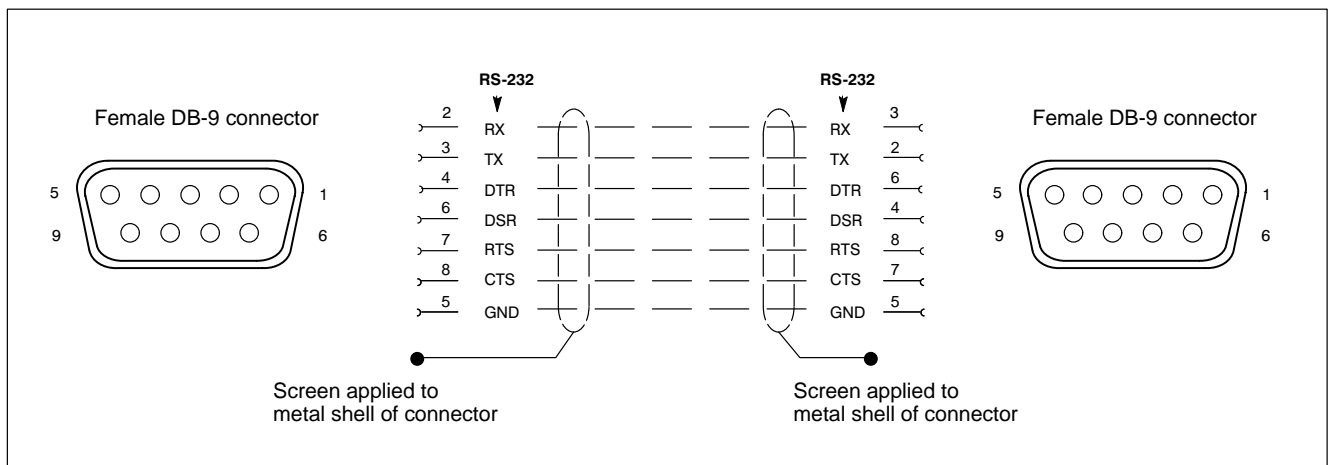
Type:	V.24
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Data driver:	Short-circuit proof, not electrically isolated
Transmission rate:	Max. 19200 bps
Handshake signals:	None



Connecting cable between X31 and X34 connectors and an external PC (e.g., for ROPS4 coupling).

2 x female DB-9 connector

Cable length: max. 20 m, with internal power supply and 350 mA max. current



Interface Ports & Connectors

**X35 PHG2000 connector**

To accommodate the connection of a PHG2000 hand-held programming device. The connector handles serial data transmission, 24 VDC operating power, connection for Emergency-STOP contacts, and dead-man switch.

 **To complete Emergency-STOP circuit, X35 connector is capped with a blind plug as long as a PHG programming device is not connected.**

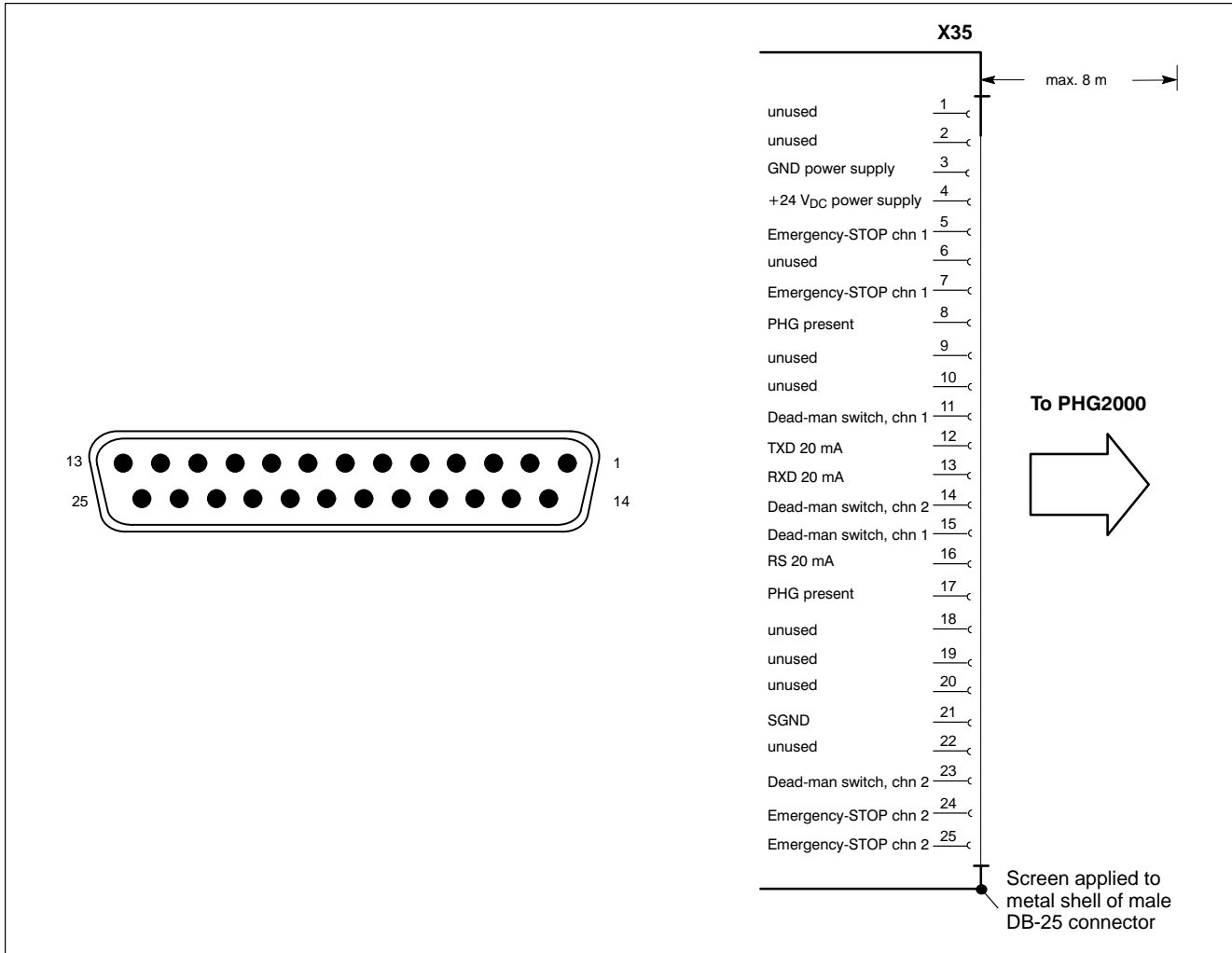
Female DB-25 connector

Type:

Serial 20 mA, plus additional safety functions

Cable type:

Screened, min. cross-section 0.14 mm<sup>2</sup>



**DANGER**

While the PHG is not connected, its Emergency-STOP switch is non-functional. It must therefore be removed from the system!

☞ The X35 PHG connector and the X31 serial interface must never be in use, i.e., connected, at the same time.

### X41 Connector for incremental encoder interface, measuring probe input

The X41 connector provides the following services:

- Incremental encoder interface
- Measuring probe input

Female DB-15 connector

Cable length: Max. 20 m with internal power supply and 350 mA max. External power supply to encoder facilitates longer cable. Possible limitations depend on encoder specifications.

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

#### Incremental interface

Max. permitted input frequency: 800 kHz

Min. slope interval between active counting pulses:  $\geq 250$  ns

Input resistance: 120  $\Omega$

Min. voltage differential:  $\geq 600$  mV

Encoder power supply: 5 V  $\pm 5$  %, max. 0.35 A, 1.75 W. In case of short-circuit, PC shuts down completely.

Max. permitted current draw, encoder: 350 mA

#### Measuring probe input

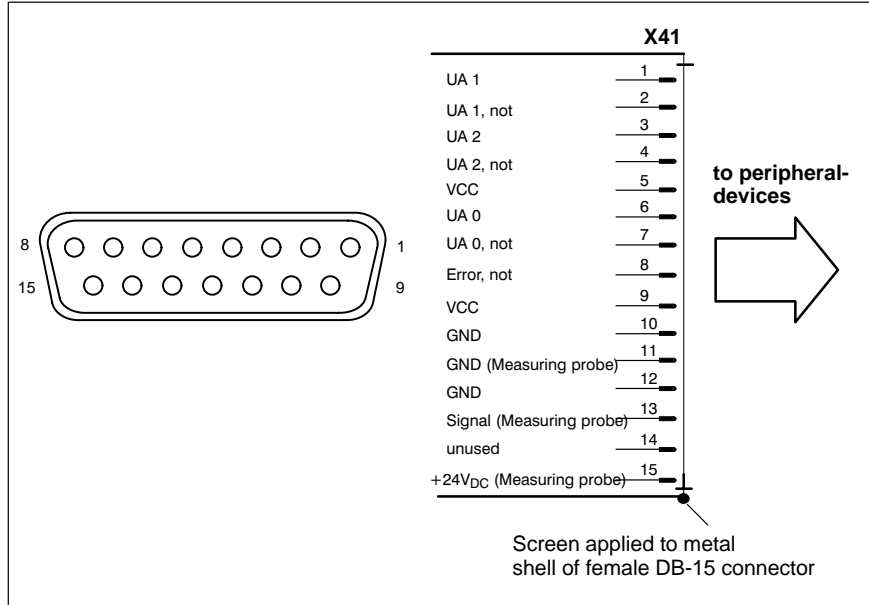
High-speed 24 V meas. probe input, electrically isolated (optocoupler)

Power range 0: -3 V through 5 V, max. 0.5 A

Power range 1: 11 V through 30 V, 4 mA through 30 mA

Switching time (delay): Max. 1.5  $\mu$ s

Interface Ports & Connectors

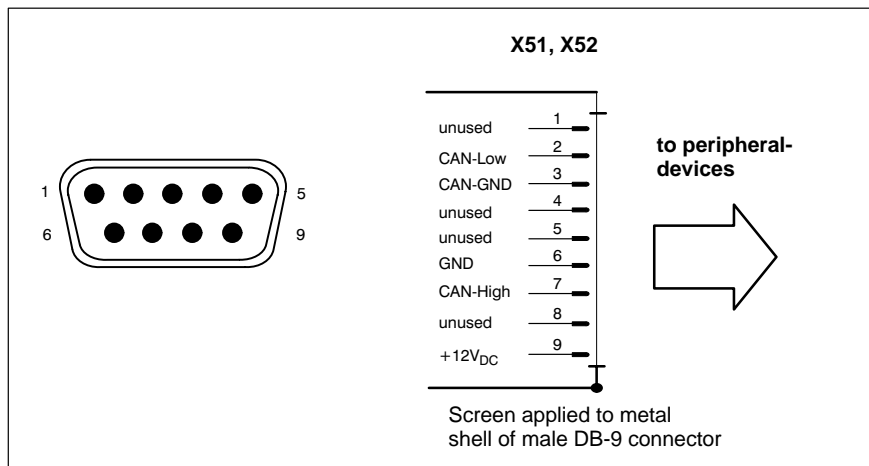


**X51, X52 Ports for CAN drives, SR-CAN module, CAN user I/Os**

The X51 and X52 ports provide real-time interface services.

Male DB-9 connector

Type:	CAN
Cable length:	Max. 25 m at 1 Mbit/s Max. 200 m at 128 kbit/s
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	max. 1 Mbit/s
Data driver:	Short-circuit proof, not electrically isolated
Bus connection:	internal 120 Ω, always connected



## Interface Ports &amp; Connectors

**Utilization of CAN bus interfaces**

The X51 and X52 ports represent two **independent** CAN bus interfaces to connect the following:

- Drives
- Digital output modules
- Digital input modules
- SR-CAN modules
- Interconnections between several rho4 controllers.

**SERCOS interface LWL**

Optional a complete SERCOS channel is available on the PCI\_rho card. The connection to the digital drives is realized by the SERCOS interface. SERCOS is a normed serial fibre optical ring system. The SERCOS interface is designed for a maximum transfer speed of 4 MBaud.

Available fibre optical cables in different lengths, see chapter 10.2 'Order numbers' or manual 'Indramat Verbindungstechnik LWL-handling', DOK-CONNEX-CABLE\*LWL \*\*\*AW02-DE-P.

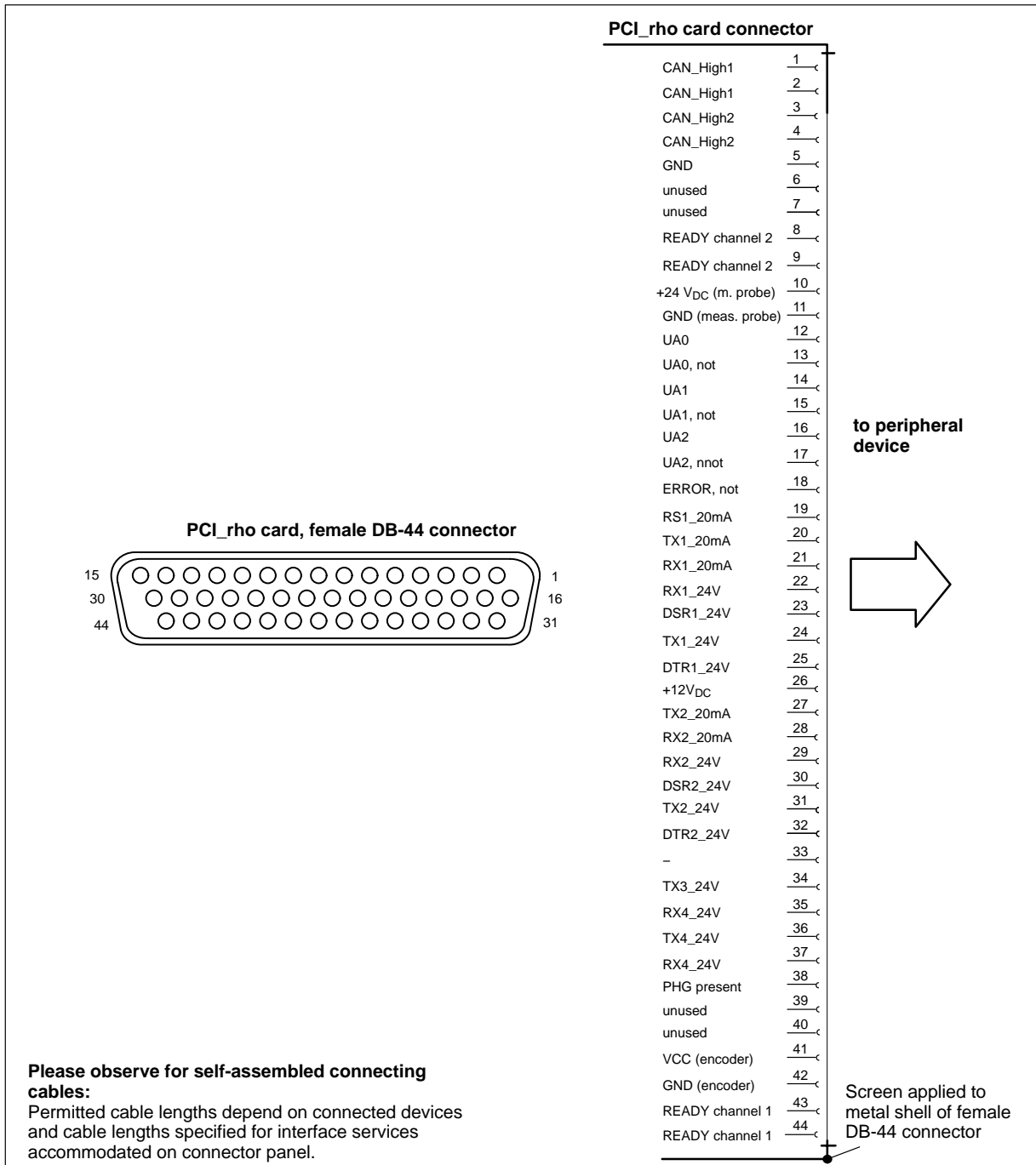
Interface Ports & Connectors

### 6.10 Connections on PCI\_rho card

The interface connections on the connector panel (X10, X31..X34, X35, X41, X51, and X52), are duplicated on the external connector of the PCI\_rho card. The pin assignment of the external connector is identical to that of the internal "AF\_PCI rho" on the PCI\_rho card.

**It is not permitted to operate the interfaces on the connector panel (X10, X31..X34, X35, X41, X51, X52) in parallel with the external interface connector on the PCI\_rho card.**

Female DB-44 connector





Interface Ports & Connectors

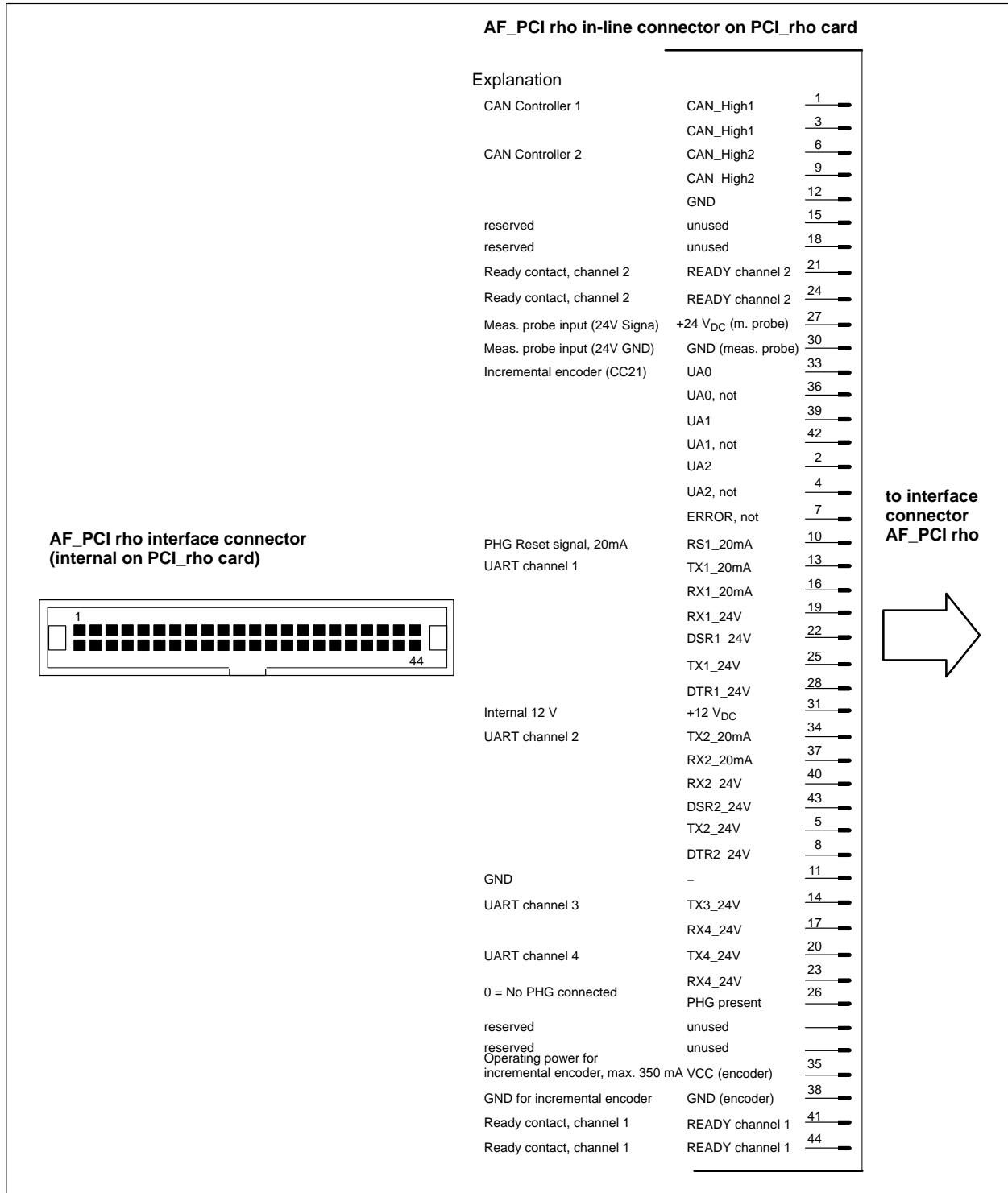
### 6.11 AF\_PCI rho interface connector

The AF\_PCI rho interface connector (X10, X31 thru X34, X35, X41, X51, and X52) on the rho4.1/IPC300 interconnected with the **AF\_PCI rho** (44-pin inline plug connector) on the PCI\_rho card via a ribbon cable.

In-line connector, 44-pin

Cable type:

Ribbon cable, unshielded



Interface Ports & Connectors

## 6.12 External floppy disk drive

The connector labelled “Ext. Floppy” accommodates an external 3.5 in. floppy disk drive for installation in the door of the control cabinet (refer to Accessories in section 10.2).

### Ext. Floppy External floppy disk connector

Female DB-25 connector

Type:

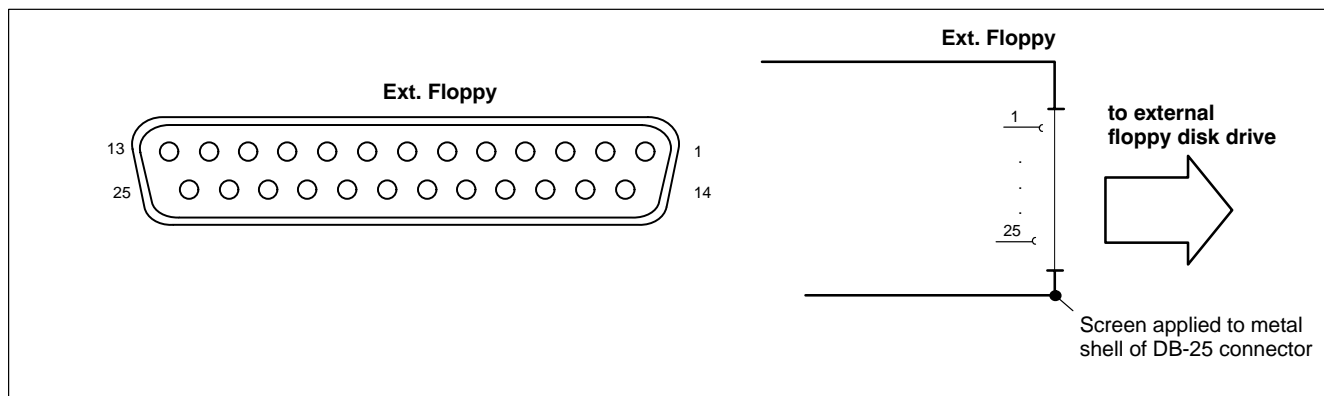
IDE

Cable length:

1 m, integrated in floppy disk drive

Cable type:

Screened, min. cross-section 0.14 mm<sup>2</sup>



## Interface Ports &amp; Connectors

## 6.13 Expansion Card Interfaces

### 6.13.1 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.

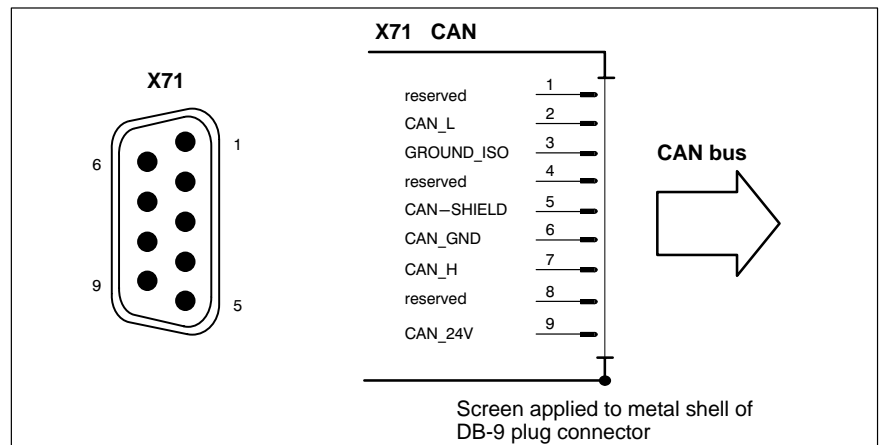
Depending on model, X71 has been assigned one of the following **bus systems**:

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 <sup>2</sup>
Transmission rate:	up to 1 Mbit/s



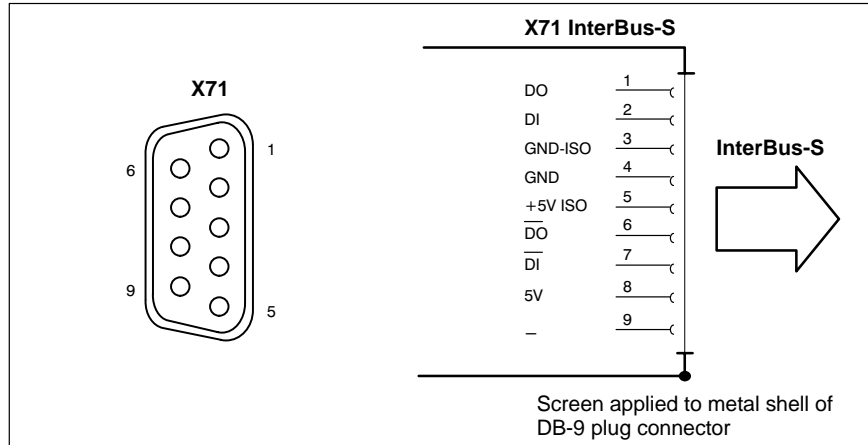
**X72 This interface is currently not supported by the rho4.1**


Interface Ports & Connectors

**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 currently not supported by the rho4.1

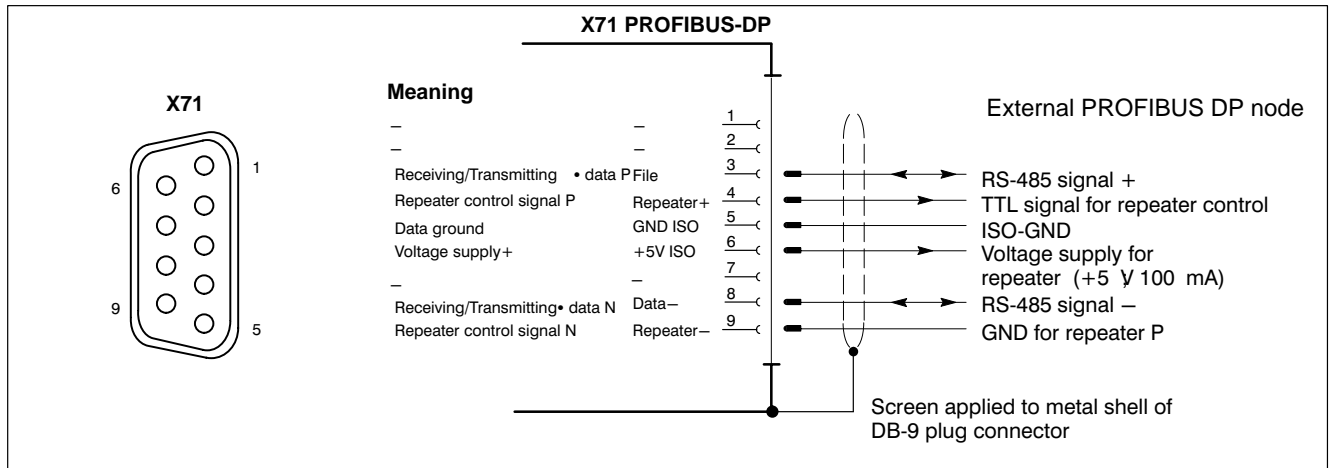
Interface Ports & Connectors

**X71 PROFIBUS DP "PCI\_BM-DP"**

Female DB-9

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

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

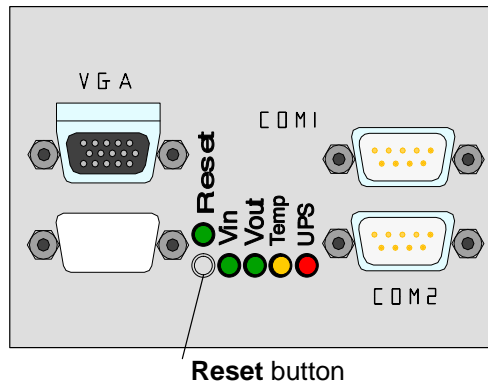


**X72 This interface is currently not supported by the rho4.1**

## Interface Ports & Connectors

Notes:

## 7 LED Display



On the front are a RESET button and 5 LEDs with the following function:

LED	Display	Explanation	Remedial measure
V <sub>in</sub>	LED green	Standard operation	–
	LED Off	No 230/115 VAC or 24 VDC power supply	Check mains power input on power supply!
Vout	LED green	Standard operation	–
	LED Off	No internal +5 V and +12 V power present	Check mains power input on power supply!
Temp	LED Off	Standard operation	–
	LED flashes red	Internal housing temperature exceeds 50 °C; shutoff will occur if temperature continues to rise.	Reduce ambient temperature. Check PC fan for proper operation.
UPS	LED Off	Standard operation.	–
	LED Red	PC in battery backed operation, i.e., no mains power present!	Restore mains power, initiate a controlled restart!
	LED flashes red	Battery pack discharged, defective or not connected	Check battery charge level! Maintain full 5-hour charging time!

	Button/Display	Explanation	Remedial measure
RESET	Button	Initiates a reboot	–
	LED rot	RESET button has been pressed	–

Notes:



## 8 Maintenance and Replacement

The rho4.1 and rho4.1/IPC300 controllers are maintenance-free. However, some components are subject to wear and must be replaced.

### Maintenance schedule

Include the following tasks in your maintenance schedule

- 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 fan and fan filter mats at least once a year. Clogged and contaminated filter mats reduce the air volumes required for proper ventilation and cooling. Therefore, wash dirty filter mats in soapy water or replace with new mats. Allow washed filter mats to dry thoroughly before reinstalling.



#### **DANGER**

**Risk of injury through rotating fan impeller!**

**Keep hands and fingers clear, and do not insert any items into the fan impeller.**

---

- Ensure that the rechargeable batteries are fully functional. Enable automatic testing of the rechargeable battery during each restart by activating the so-called "Accu Test" option of the UPS control program.



#### **CAUTION**

**Loss of data!**

**Back up the data from the hard disk at regular intervals .**

---

- Depending on temperature, vibration and daily operating hours, the service life of the hard disk may last anywhere between 2.5 and 10 years.  
To safeguard application data, and to avoid the necessity of a time-intensive new installation of operating system (OS) and application programs following a hard disk replacement, the functional program and OS data on the hard disk should be backed up at regular intervals with the use of the Bosch-supplied "Backup Package for Industrial PC". This process backs up a hard disk image to a Jaz diskette of the supplied IOMEGA Jaz drive. This image must merely be copied back to the newly installed hard disk.  
For ordering information, refer to section 10.2.

## Maintenance and Replacement

## 8.1 Fuse protection

The rho4.1 and rho4.1/IPC300 controllers are equipped with a replaceable power supply fuse:

- 6.3 A (5x20), medium time-lag for 24 VDC power supply
- 1.25 A (5x20), medium time-lag for 230 VAC power
- In the rho4.1: Accessible after removal of CD-ROM drive (refer to procedures in section 8.2.1).
- In the rho4.1 /IPC300: Externally accessible on front panel.

Order numbers for fuses appear in section 10.3.

 **In the event that the power supply remains faulty after replacing the power supply fuse, this indicates a defect in another 10A fuse. In this case, contact Bosch Service:  
Telephone: +49 (0) 60 62-78-888.**

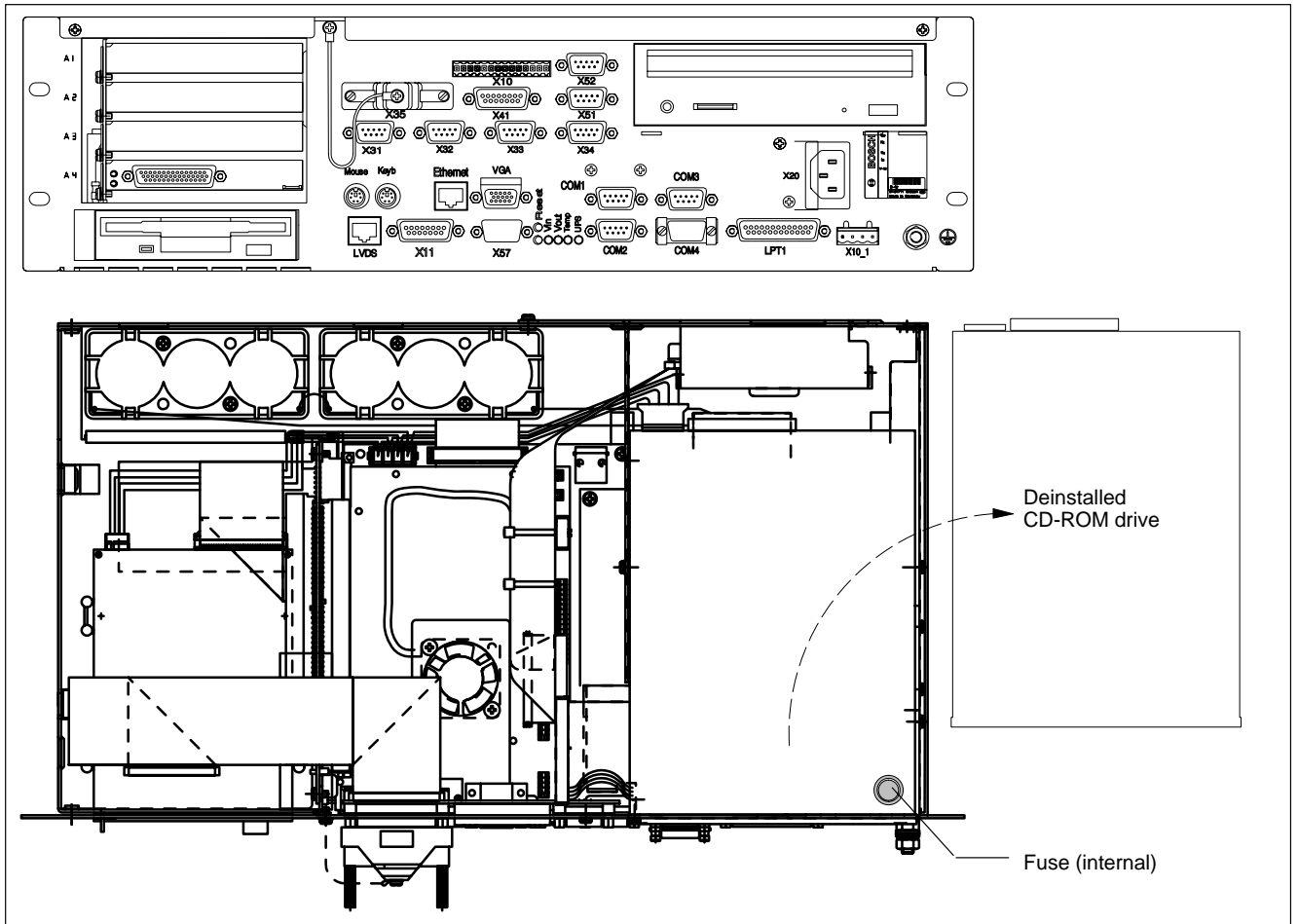
**CAUTION****Loss of data!**

**Service repairs of devices returned by customers do not entail backups of user data. Repaired units are returned with formatted hard disk and newly installed software.**

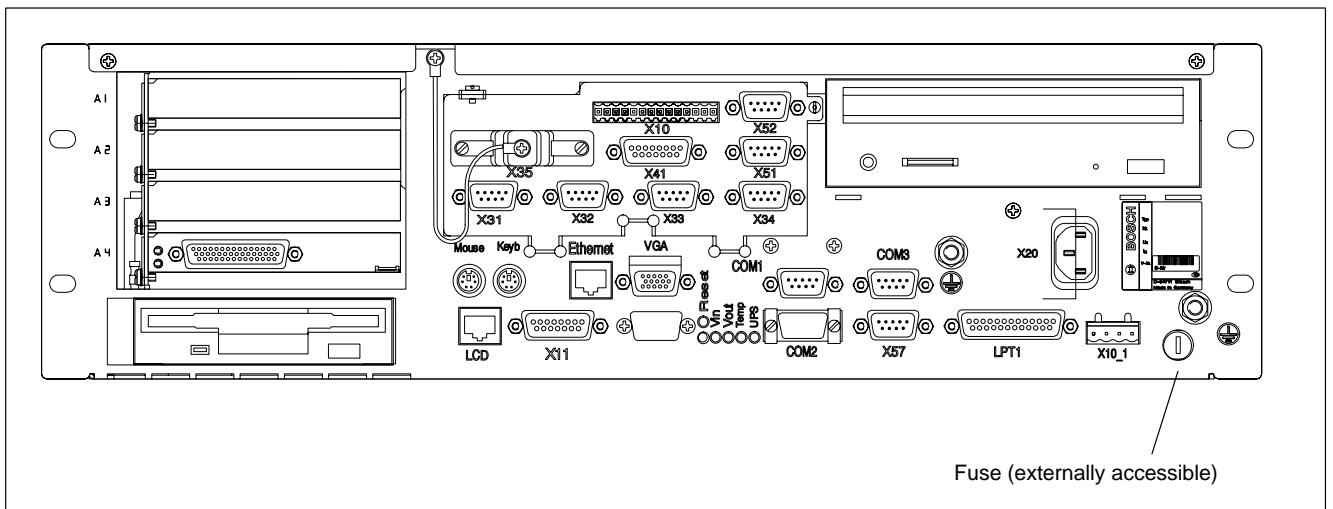
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Maintenance and Replacement

rho4.1



rho4.1/IPC300



## 8.2 Replacing the hard disk

The hard disk is replaced complete with mounting / installation frame.

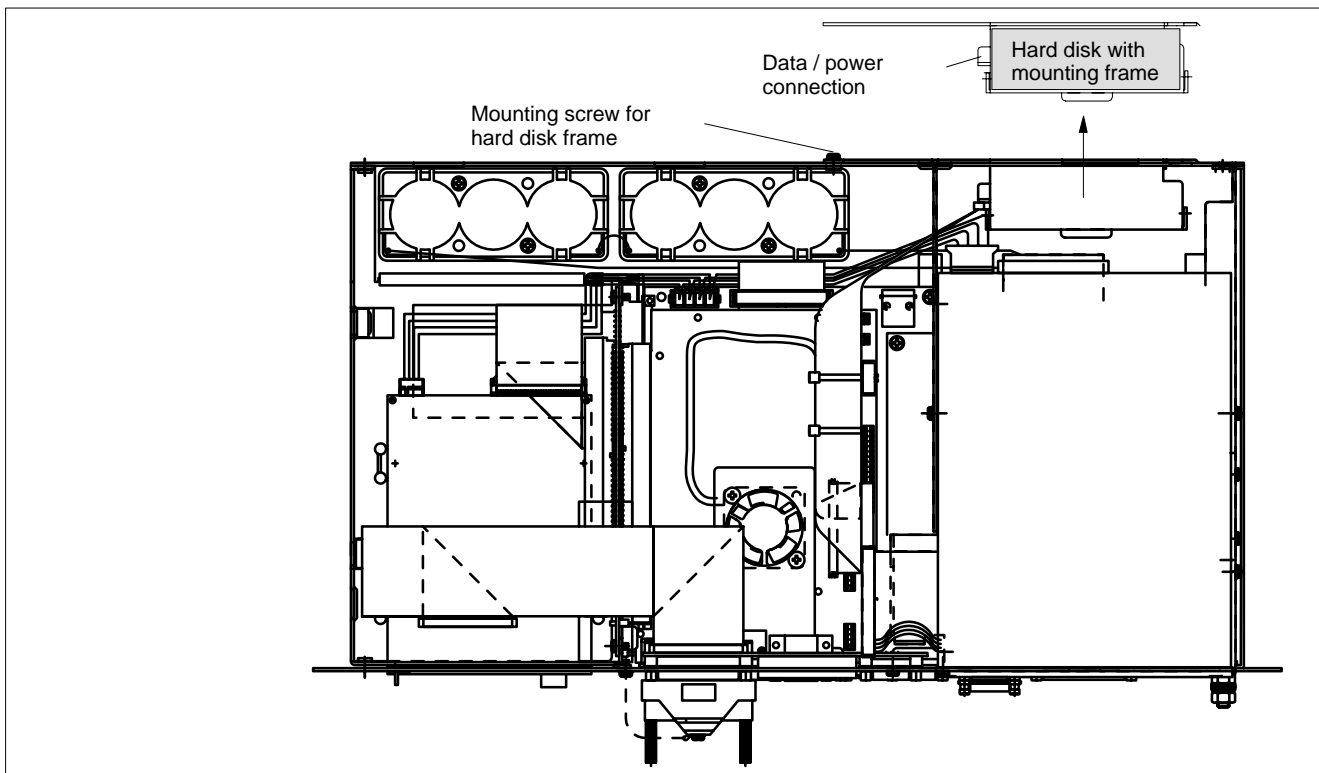


### CAUTION

Loss of data!

Back up all required application data and operating system settings to an external storage medium!

- ☞ To safeguard application data, and to avoid the necessity of the time-intensive new installation of operating system (OS) and application programs following a hard disk replacement, the functional program and OS data on the hard disk should be backed up at regular intervals with the use of the Bosch-supplied "Backup Package for Industrial PC". This process backs up a hard disk image to a Jaz diskette of the supplied IOMEGA Jaz drive. This image must merely be copied back to the newly installed hard disk. For ordering information, refer to section 10.2.



1. Switch off the power to the unit. Unplug all connectors if required.
2. Wait until the power supply performs an automatic shutdown after UPS operation (**UPS** LED on front panel illuminates **red** until UPS shuts down the power supply).
3. Open the housing.

## Maintenance and Replacement

4. The ribbon cable is secured by a spot of hot glue which must be broken (cut) for deinstallation. Disconnect the IDE ribbon cable **from the hard disk**. Unless this cable is defective, disconnecting it from the mainboard will not be required. This ribbon cable also connects the CD-ROM drive at the same time.
5. Remove the retaining screw at the rear of the housing, and remove the frame holding the hard disk.
6. The new hard disk is always installed mounted in its holding frame, and in reverse of the sequence described above.

**Secure the hard disk connector by applying a spot of “hot glue”.**

7. The new hard disk must be declared to the BIOS of the PC. To access the BIOS menu, press the following keys while the system is booting up:
  - On the rho4.1: The <del> key
  - On the rho4.1/IPC300: The <F2> function key.

**rho4.1:** Select the **Auto-Detect Hard Disks** menu option to enable the system to recognize the new hard disk parameters. In the **Standard CMOS Setup** menu, select **PIO Mode 3** for the hard disk. To exit the BIOS, select the **Save Settings and Exit** option. To save all settings, press the <Y> key (indicating YES).

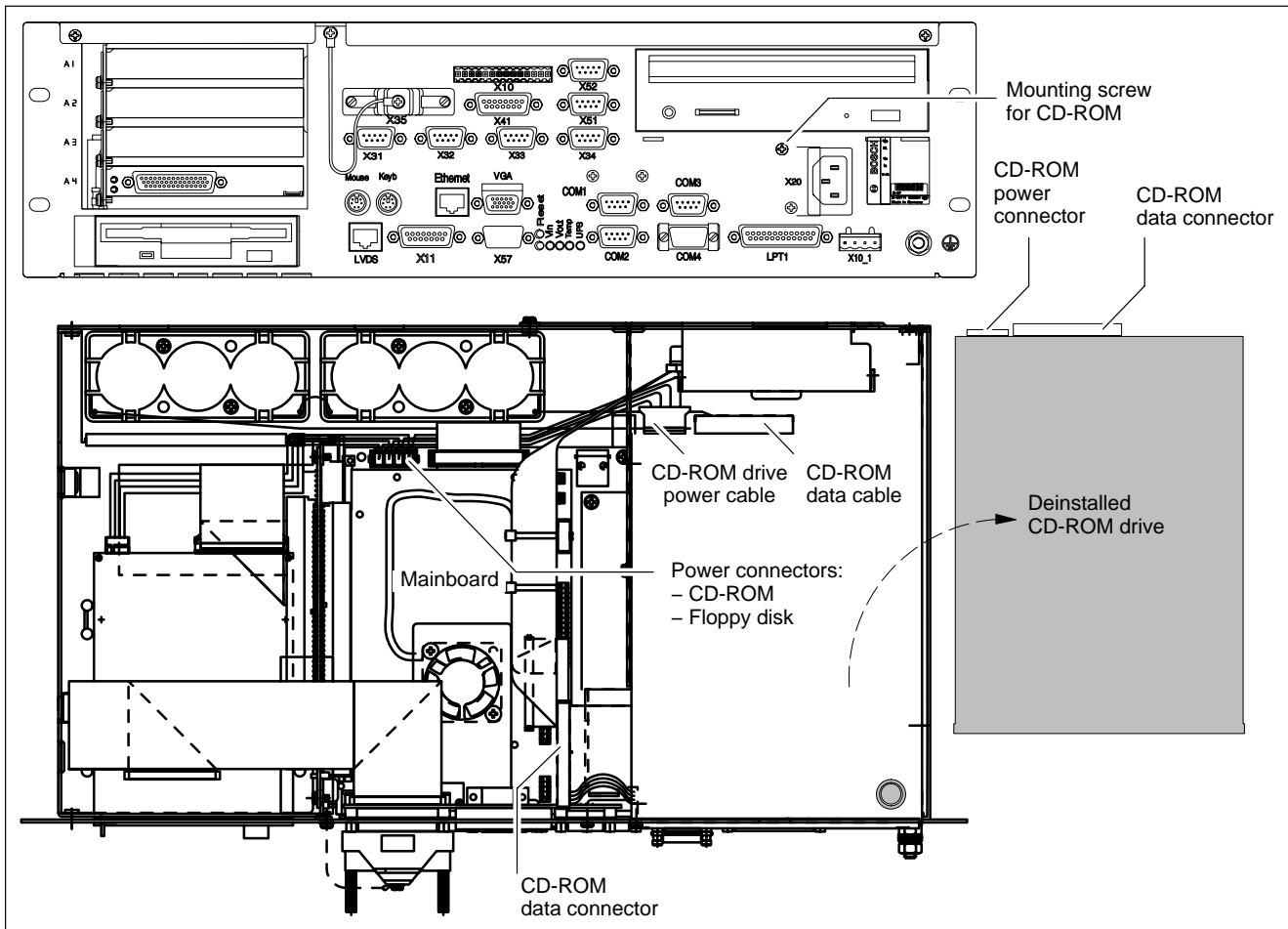
**rho4.1/IPC300:** In the main menu, select **Primary Master**. In the **Type** submenu, select the **AUTO** option to enable the system to recognize the new hard disk parameters automatically. Select **Exit Saving Changes** (saving new parameter settings) to exit the BIOS menu.

Restart the operating system, and again access the BIOS menu. In the **Primary Master** menu, set the den **Type** submenu option to **User**. In the **Transfer Mode** submenu, select **Fast PIO 3**. Select **Exit Saving Changes** (saving new parameter settings) to exit the BIOS menu.

8. In the event that the operating system fails to start, shut off the power to the unit for at least 10 seconds, and restart the system.
9. If the system still does not start up, check for:
  - Proper connection between controller cable and hard disk.
  - Proper seating of all cables and connectors.
  - Presence of operating power.
10. Once the PC has started up properly, the user data and operating system settings for standard operation must be restored.

## Maintenance and Replacement

## 8.2.1 Replacing the CD-ROM drive



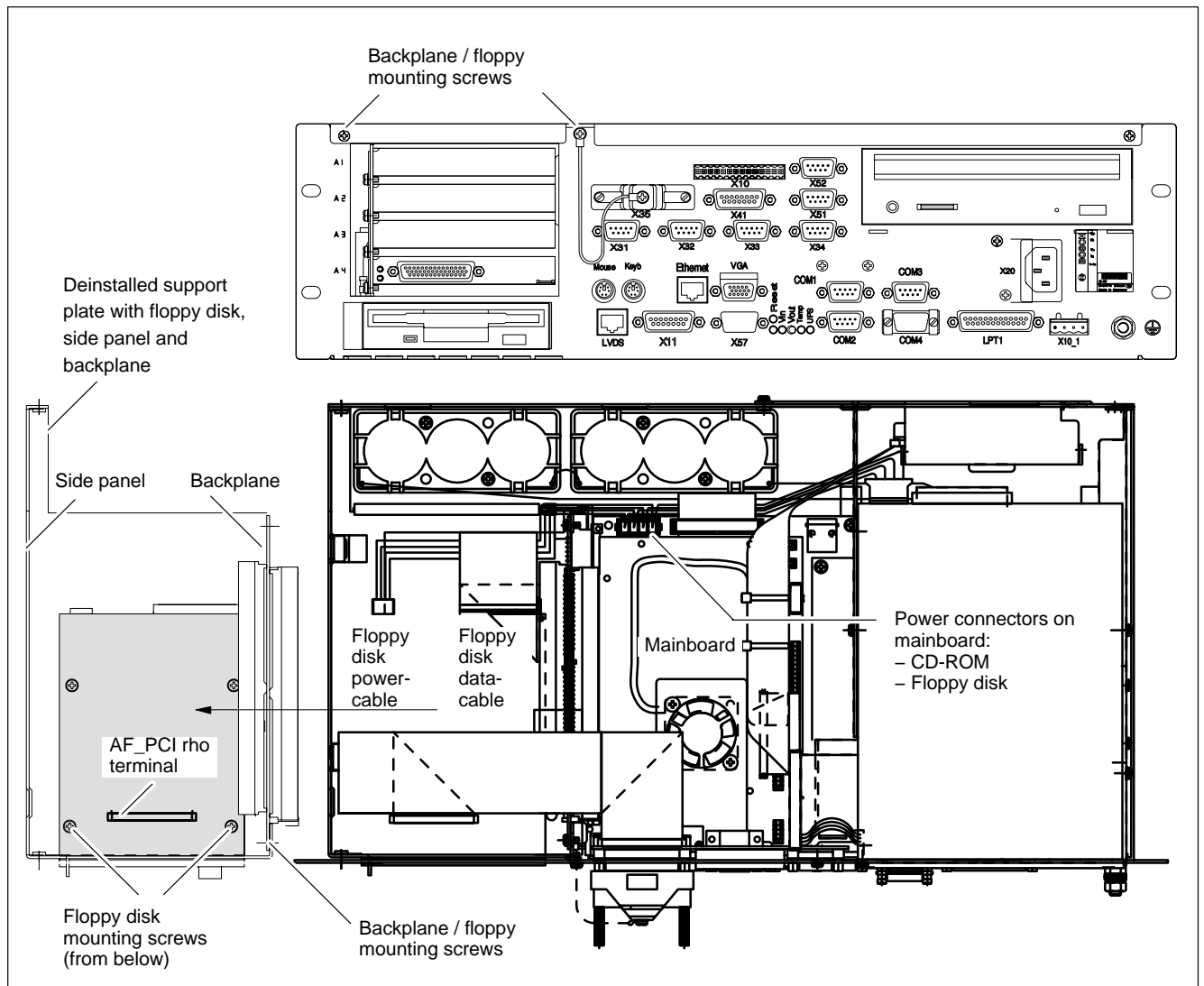
1. Switch off the supply voltage to the unit. Unplug all connectors if required.
2. Wait until the power supply performs an automatic shutdown after UPS operation (**UPS** LED on front panel illuminates **red** until UPS shuts down the power supply).
3. Open the housing.
4. Unplug the female connector together with the controller ribbon cable and the female connector for the power supply from the CD-ROM drive. Unless these cables are defective, disconnecting them from the mainboard will not be required.
5. Loosen and remove the mounting screw on the front panel.
6. Remove the CD-ROM drive including the carrier plate.
7. Loosen and remove the mounting screws and replace the drive.
8. Install in reverse of disassembly sequence described above.
9. Provided the replacement CD-ROM drive is of the same type as the original, it should again be recognised when rebooting the PC. Installing a different type may require new driver software to be installed. In this case, follow the CD-ROM manufacturer's installation instructions and the Microsoft Windows 95 or Windows NT 4.0 installation routine.

## Maintenance and Replacement

10. If the CD-ROM drive still cannot be accessed, check for:

- Proper connection between controller cable and CD-ROM drive.
- Proper seating of all interface cables and connectors.
- Presence of operating power.

## 8.2.2 Replacing the 3.5 inch floppy disk drive



1. Switch off the supply voltage to the unit. Unplug all connectors if required.
2. Wait until the power supply performs an automatic shutdown after UPS operation (**UPS LED** on front panel illuminates **red** until UPS shuts down the power supply).
3. Open the housing.
4. Remove all expansion cards and all cables connected to these cards.

## Maintenance and Replacement

5. Unplug the female connector together with the controller ribbon cable (data cable) and the female connector for the power supply from the floppy disk drive. Unless these cables are defective, disconnecting them from the mainboard will not be required.
6. Loosen and remove the two mounting screws on the front panel. Loosen and remove the four backplane mounting screws. Extract the floppy disk drive, side wall, backplane and bracket as a unit from the housing in a sideways direction. Because the mainboard is inserted in one of the slots on the backplane, the backplane must be tugged gently to release this mechanical connection.
7. Loosen the 4 mounting screws on the underside of the floppy disk holder, and insert a new drive.
8. Install in reverse of disassembly sequence described above.
9. In the event that you have installed a different type of floppy disk drive (e.g., 3.5 in. HD 2.88 MB), this must be declared to the PC BIOS. To access the BIOS menu, press the following keys while the system is booting up:
  - On the rho4.1: The <del> key
  - On the rho4.1/IPC300: The <F2> function key.

**rho4.1:** Go to the **Standard SETUP** menu, and select the new floppy disk type. To exit the BIOS, select **Save Settings and Exit** (saving all parameter settings).

Confirm the function by pressing <Y> (indicating YES).

**rho4.1/IPC300:** Go to the **Main Menu**, and select the **Diskette 1** menu option. Select the new floppy disk type. To exit the BIOS, select **Exit Saving Changes** (saving all parameter settings).

10. If the floppy disk drive cannot be accessed, check for:
  - Proper connection between controller cable and floppy disk drive.
  - Proper seating of all cables and connectors.
  - Presence of operating power.



## Maintenance and Replacement

## 8.2.3 Replacing the rechargeable battery pack

**WARNING**

Before replacing the battery, back up important data. If there is a voltage dip while the battery is being replaced, data in the RAM will be lost.

The battery pack must be replaced when

- The battery test has failed.
- The total number of charging cycles exceeds 3000 (refer to the Shut-down Count option in UPS program, sections 3.3.2 and 3.3.3).
- The red **UPS** LED on the front panel is flashing for more than 8 hours (refer to page 7-1).

A charging cycle is defined by the manner in which the power supply is backed up by the battery pack subsequent to Power-OFF:

- rho4.1: always after Power-OFF
- rho4.1/IPC300: after Power-OFF only in cases where a controlled shutdown of software is still required.

A harmful deep discharge of the rechargeable battery pack is prevented as long as the rho4.1 or rho4.1/IPC300 is connected to mains power.

The number of charging cycles of the battery pack and thus its lifetime depends on the ambient temperature of the battery pack.

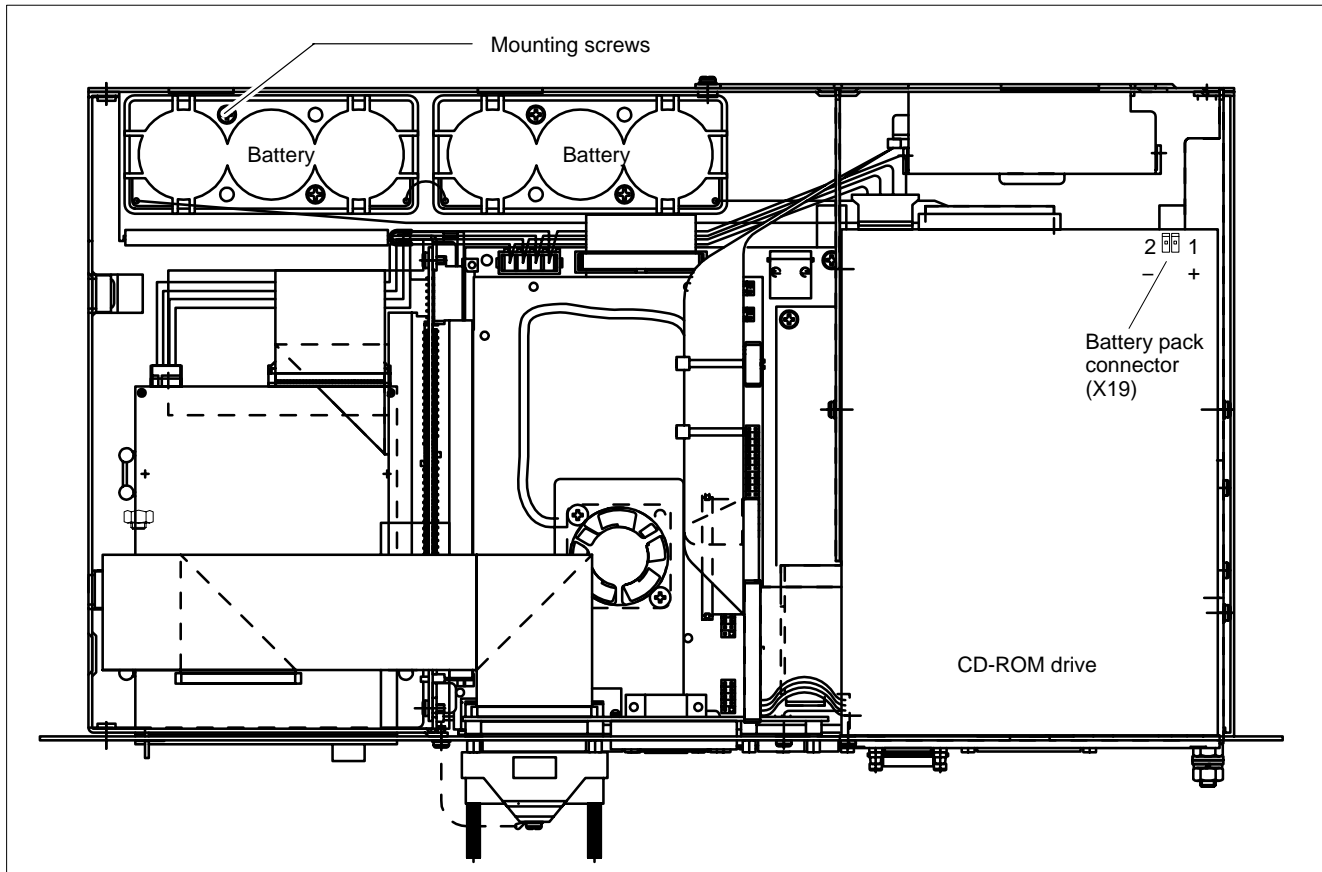
The ambient temperature is defined as temperature, in which the Battery Pack is used, e.g. the internal temperature of the PC or the internal temperature of the control cabinet.

See the following table for approximate values:

Ambient temperature	Charging cycles	Maintenance period
+ 25 °C	4000 cycles	6 years
+ 35 °C	2000 cycles	3 years
+ 45 °C	1000 cycles	1,5 years

 **The used battery packs are recyclable, and can be returned to Rexroth upon replacement. They must not be disposed of in standard residential refuse.**

Maintenance and Replacement



**X19 Battery terminal**

DC power terminal for battery pack. The connection may be removed only for the purpose of replacing the battery pack.

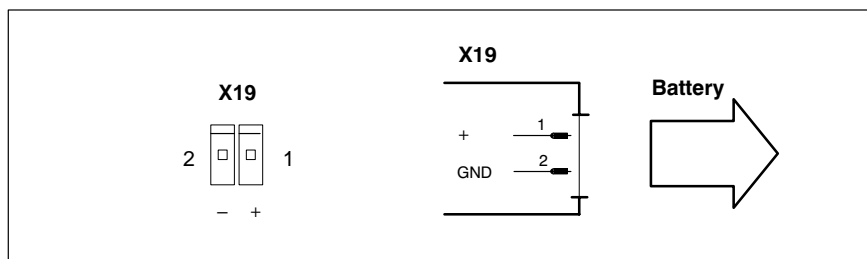
Terminal strip, 2-pin

Cable length:

Max. 0.5 m

Cable type:

unscreened, min. cross-section 1.5 mm<sup>2</sup>



## Maintenance and Replacement

**Replacing the batteries**


1. Replace batteries only while the PC is shut down, and with power plug disconnected. This applies to both 230/115 VAC and 24 VDC power plugs.
2. Open the housing cover.
3. Remove the male connector with the two-conductor cable from the X19 battery terminal beneath the CD-ROM drive.
4. The battery pack can be replaced when the 4 mounting screws have been removed.
5. Reconnect the male connector with the two-conductor cable with the X19 battery terminal. Ensure correct polarity of the batteries.

**DANGER**

**Polarity reversal of the rechargeable battery packs will result in an F10A (5x20) fuse being triggered on the power supply module. The UPS operating cycle will then no longer be possible.**

---

6. Close the housing cover.
7. Restore power to the system.  
Observe the **UPS LED** on the front panel.
  - Batteries already charged: **UPS LED OFF**
  - Batteries discharged: **UPS LED flashes red**Allow approx. 5 hours to pass until the battery pack has been recharged and the **UPS LED extinguishes**.

 **During the charging phase the discharged battery pack does not provide sufficient UPS protection enabling safe and controlled PC shutdown. Therefore, install fully charged batteries if at all possible.**

## 8.3 Expansion cards

The unit provides 3 slots for PCI bus and ISA bus expansion cards :

- 2 PCI bus slots (max. length 180 mm)
- 1 combination slot (PCI or ISA bus) (max. length 180 mm)

Expansion slot no. 4 is occupied by the PCI\_rho card.

---



### CAUTION

**Damage to PC or application software through unauthorized expansion cards.**

**Use only approved expansion cards, and have them installed by a specialist.**

---

### 8.3.1 Installing an expansion card

1. Switch off the power to the unit. Unplug all connectors if required.
  2. Wait until the power supply performs an automatic shutdown after UPS operation (**UPS** LED on front panel illuminates **red** until UPS shuts down the power supply).
  3. Open the housing.
  4. Remove the mounting screw holding the slot cover.
  5. Insert the expansion card, and secure it with the mounting screw.
- 



### CAUTION

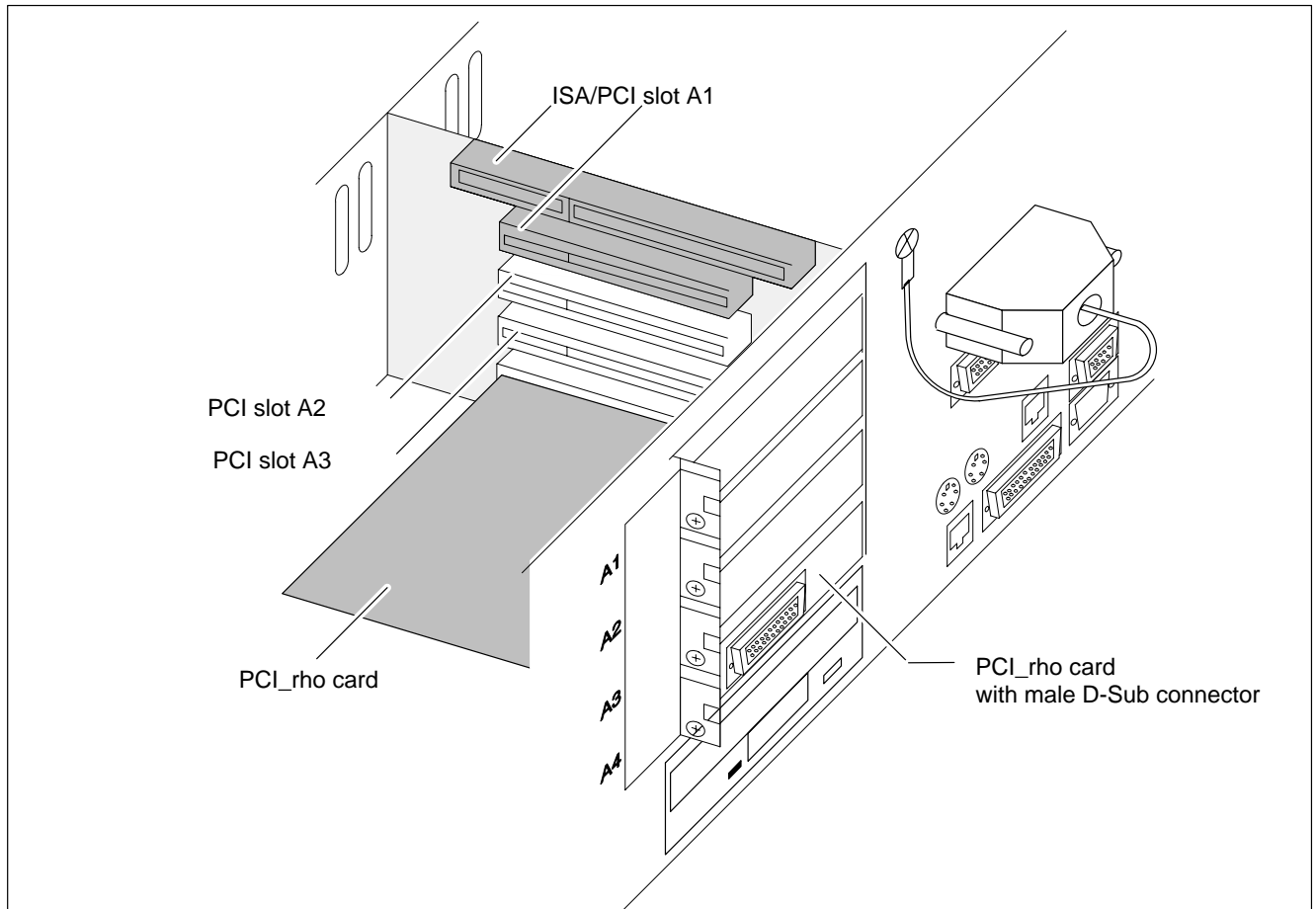
**Destruction of expansion card or main board**

**The ISA/PCI combination slot must never be populated with an ISA card and PCI card at the same time!**

---

## Maintenance and Replacement

## Expansion slot layout inside housing



If the card is Plug-and-Play (PnP) compatible, it is automatically recognized and integrated in the system, provided this creates no hardware conflicts (IRQ, etc.) with other expansion cards or connected devices.

In the event that subsequent to a system reboot the functions based on the newly added card are not available, there may be several reasons for this:

- The card is not properly seated in the PCI or ISA slot contacts.
- The software driver for the card is **not installed or its installation is faulty**.
- IRQ (interrupt) conflict with other PC hardware components.
- The software for the card has not been installed.

**CAUTION**

**Destruction of main board or ISA cards through address conflicts (IRQ, memory access, I/O address)!**

**Observe the information provided by the card manufacturer. You may have try out new configuration settings in both BIOS and operating system.**

## Maintenance and Replacement

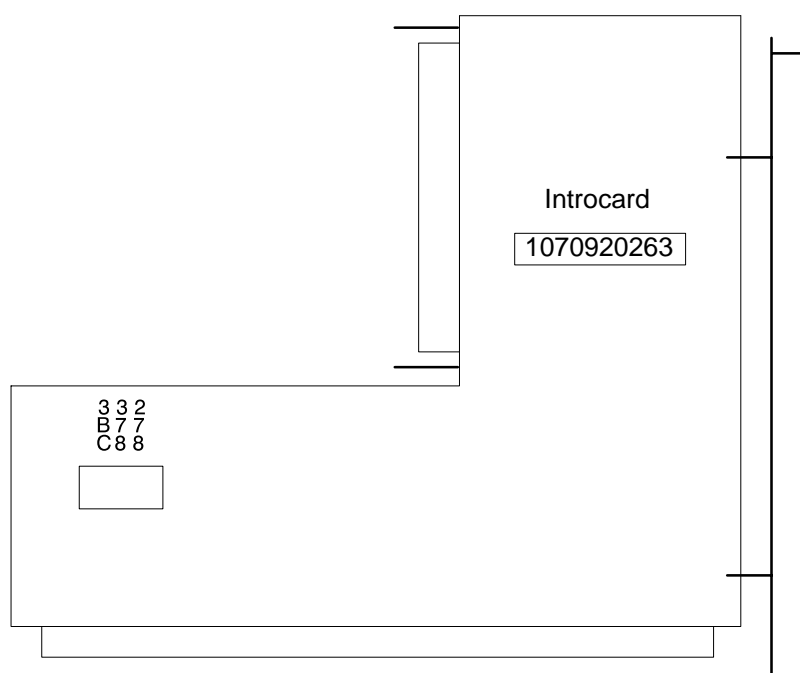
## 8.3.2 Installing an Introcard

Follow the procedures as described in section 8.3.1. In addition, you will be required to perform the following steps:

- ★ Remove both screws from the Introcard mounting bracket.
- ★ Insert card into uppermost expansion slot (ISA slot).
- ★ Align mounting bracket and expansion card so that the card is properly seated in the ISA slot.
- ★ With card inserted and securely pressed home, carefully replace and tighten screws of mounting bracket.
- ★ Using screws, attach Introcard mounting bracket to unit housing.

### Selecting address for Introcard

- ★ The preferred position for the address jumper on the Introcard is address 278 (LPT2).



Software

## 9 Software

To facilitate loading and backing up of operating and application software, a CD-ROM drive, 3.5 in. floppy disk drive, and an Ethernet connection for network access are provided.

Please refer to the documentation of the particular operating system for restoring backup files.

Depending on their intended application, the rho4.1 and rho4.1/IPC300 controllers are shipped from the factory preinstalled with different PC platformware and software complements. These include:

- BIOS
- Operating system
- Utilities
- Application software

### 9.1 BIOS software

The IPC requires the BIOS software for its initial boot process to enable it to find and start an operating system that provides a more user-friendly and comfortable platform for running the application software.

The PCs are equipped with the following licensed BIOS software:

- rho4.1 (200 MHz): AMIBIOS ver. LEU1R129 (or higher) by American Megatrends Inc.
- rho4.1 (266 MHz): PhoenixBIOS by Phoenix Technologies Ltd.
- rho4.1/IPC300: PhoenixBIOS by Phoenix Technologies Ltd.

### 9.2 Operating system and utilities

	Software	
	rho4.1	rho4.1/IPC300
Operating system	Windows 95C or Microsoft Windows NT4.0	Microsoft Windows NT4.0
UPS utility program	UPS <sub>plus</sub> (for Windows 95) or UPS <sub>NT</sub> (for Windows NT)	UPS <sub>NTC4</sub>

Software

### 9.3 Application software

The following Bosch application software options are available:

Application	rho4.1	rho4.1/IPC300
WinSPS PLC programming software	●	●
WinDP Field bus parameterization for PROFIBUS-DP	●	●
WinCan Field bus parameterization for CAN bus	●	●

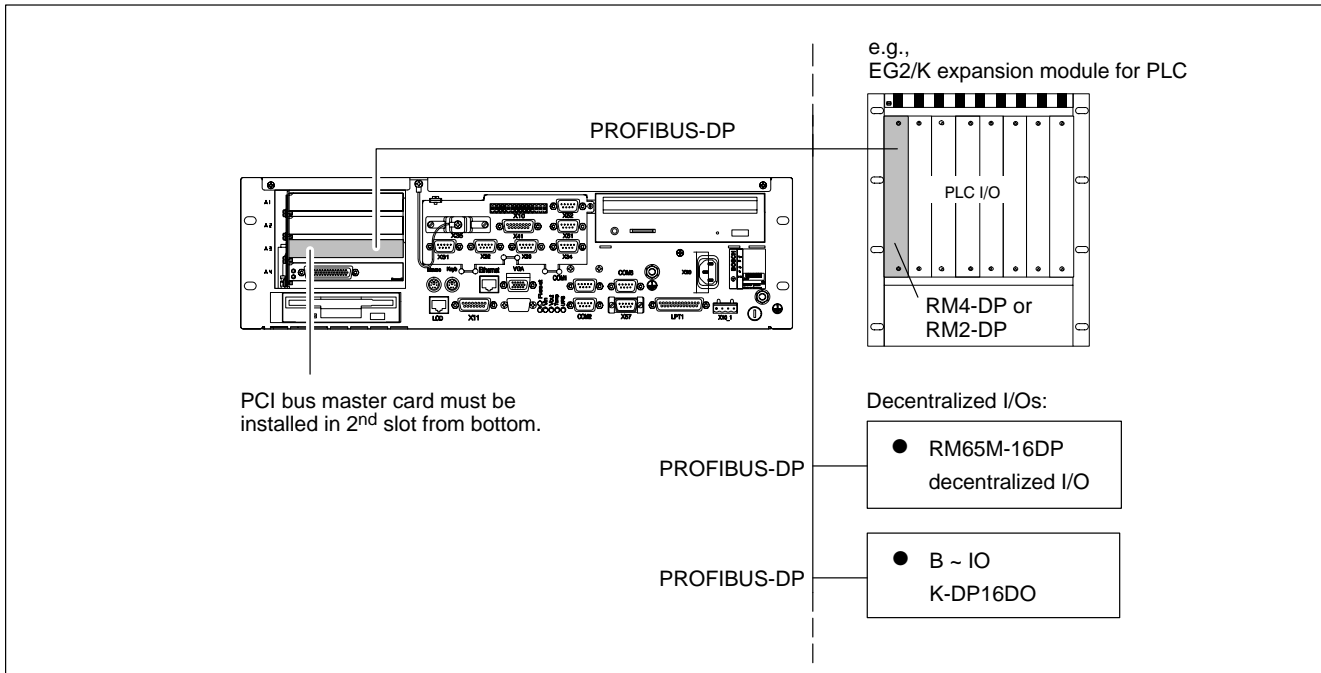
● = provided

#### 9.3.1 PCI bus master expansion cards

Following Busmaster-expansion cards are available:

- for PROFIBUS-DP: PCI\_BM-DP
- for CANrho or CANopen: PCI\_BM-CAN
- for Interbus-S: PCI\_BM-IBS

**Example: PROFIBUS-DP**





Order numbers

## 10 Order numbers

### 10.1 rho4.1, rho4.1/IPC300

For order numbers of the versions of basic unit, operating system, rho4.1 real-time board and additional software functions, refer to the "rho3, rho4 Price List".

### 10.2 Accessories

Designation		Order no.
230 V mains cable	length 2,5 m, with female right-angle connector for non-heating appliances	1070 048 937
Female connector for non-heating appliances	right-angled, for user assembly	1070 912 881
Female connector X10	Power supply and real-time interface for PHG2000, 14-pin	1070 916 914
Control panel for rho4.1:	BF 200T, 10.4" touch screen: - without cables - with cables, length 10 m	1070 080 676 1070 081 286
	BF212T, 12.1" touch screen (without cables)	1070 081 212
	Control panel for rho4.1/IPC300:	
	BF 312T, 12.1" touch screen (without cables)	1070 079 484
	BF315T, 15" touch screen with additional control unit (without cables)	1070 083 215
Connecting cables BF2xxT with rho4.1	COM2 (touch screen controller), length 2.5 m	1070 083 117
	5 m	1070 083 116
	10 m	1070 080 771
	LVDS, length 2.5 m	1070 918 793
	5 m	1070 919 258
	10 m	1070 918 794
	LVDS, hi-flex cable length 2.5 m	1070 920 456
	5 m	1070 920 457
	10 m	1070 920 271
	X11 (power supply), length 2.5 m	1070 083 120
5 m	1070 083 119	
10 m	1070 080 744	

Order numbers

Designation		Order no.		
Connecting cables rho4.1/IPC300 with P I to BF312T	LCD, rigid cable length	2,5 m 1070 920 456		
		5 m 1070 921 385		
		10 m 1070 921 384		
		15 m 1070 921 070		
	X11, length	2,5 m 1070 083 120		
		5 m 1070 083 119		
		10 m 1070 080 744		
		15 m 1070 079 383		
		<hr/>		
		Connecting cables rho4.1/IPC300 with P I to BF315T TA	LCD, rigid cable length	2,5 m 1070 920 456
5 m 1070 921 385				
10 m 1070 921 384				
X11, length	2,5 m 1070 083 120			
	5 m 1070 083 119			
	10 m 1070 080 744			
	<hr/>			
Connecting cables rho4.1/IPC300 with P III to – BF315T P3 – BF315T P3 TA – BF315T P3 OTA	LCD, rigid cable length		2,5 m 1070 920 456	
			5 m 1070 921 385	
			10 m 1070 921 384	
	LCD, hi-flex cable length	2,5 m 1070 922 022		
		5 m 1070 922 021		
		10 m 1070 921 891		
	X11, length	2,5 m 1070 083 120		
		5 m 1070 083 119		
		10 m 1070 080 744		
		<hr/>		
	Repeater for rho4.1/IPC300	Cable extension of 15 m, for LCD and X33	1070 079 423	
	Ethernet cable for connection to program- ming unit	crossed lines: 10BaseT, length	0,15 m 1070 919 187	
			2,5 m 1070 919 188	
			5 m 1070 919 257	
10 m 1070 918 795				
25 m 1070 918 797				
non-crossed lines (connection via HUB): 10BaseT, length		2,5 m 1070 918 793		
		5 m 1070 919 258		
		10 m 1070 921 384		
		25 m 1070 918 796		
		<hr/>		
		Programming units	PHG2000 with cable, length 8 m	1070 918 443
			PHG2000EL with cable, length 8 m	1070 919 860

## Order numbers

Designation		Order no.
	Extension cable in meter lengths, min. 20 m to max. total length 60 m	1070 919 062
	Project engineering cable (Connection PHG ↔ PC), 5 m	1070 918 830
PCI bus master	PCI_BM-DP (PROFIBUS-DP)	1070 078 905
	PCI_BM-CAN (CANrho, CANopen)	1070 080 381
	PCI_BM-IBS (InterBus-S)	1070 080 379
Control box	Control box without cable	3842 405 602
	connecting cable, length 1 m	3842 405 555
External floppy disk drive	3,5", for installing in the control cubicle, with connecting cable, length 1 m	1070 079 424
Backup Package for Industrial PC	with 2 GB Iomega "Jaz" drive	1070 084 267
Premanufactured fibre optic cable, male connectors on both sides:		
with strain relieve	2 m	1070 917 885
	5 m	1070 917 887
	10 m	1070 918 956
without strain relieve	23 cm	1070 917 886
	33 cm	1070 917 884
	43 cm	on request

## 10.3 Spare Parts

Designation		Order no.
Fuses	6.3 A (5x20), medium time-lag, for 24 VDC power	1070 900 850
	1.25 A (5x20), medium time-lag, for 230 VAC power	1070 900 839
	10 A (5x20), quick-blow, for battery pack	1070 904 575
Battery pack	1/2 Akku-Pack für USV (always order to pieces))	1070 919 399
	Connecting cable for battery pack	1070 080 517

## Order numbers

Designation		Order no.
5 GByte hard disk with mounting frame	rho4.1	1070 084 208
	rho4.1/IPC300	1070 084 207
CD-ROM drive		1070 919 420
3,5" Floppy disk drive		1070 920 192
RAM modules	rho4.1: 200 MHz: 32 MB	1070 919 081
	64 MB	1070 920 267
	266 MHz: 64 MB	1070 920 827
	128 MB	1070 920 459
	rho4.1/IPC300: 64 MB	1070 920 827
	128 MB	1070 920 459

Appendix

# A Appendix

## A.1 Abbreviations

<b>Abbreviation</b>	<b>Meaning</b>
ASCII	American Standard Code for Information Interchange
BAPS3	Programming language; Bewegungs- und Ablaufprogrammiersprache, Version 3
C:	Hard disk drive C
DDE	Dynamic Data Exchange
DDEML	Dynamic Data Exchange Management Library
EGB	Elektrostatic sensitive components
ESD	Electrostatic discharge
JC	Machine coordinates
MPP	Machine parameter program
PC	Personal Computer
PE	Protective Earth
POS	Actual position
PG	Programming unit
RC	Robot Control
RCO	Robot Control Output
ROPS4	Robot programming system for rho4
TCP/IP	Transmission Control Protocol/Internet Protocol
OC	Original coordinates
WC	World coordinates

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