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Purpose of Documentation The present manual informs about:

- specifications, configuration and
- operation of the rho4.1/IPC 40.2

Record of Revisions

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Overview of all manuals

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Safety Instructions

1 Safety Instructions

Please read this manual before you startup the rho4.1/IPC 40.2.
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 IEV 826-09-01 (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/IPC 40.2 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 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>,
- 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

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

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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/IPC 40.2 robot control consist of a powerful industrial-standard PC featuring **additional components**, e.g. UPS, temperature monitoring.

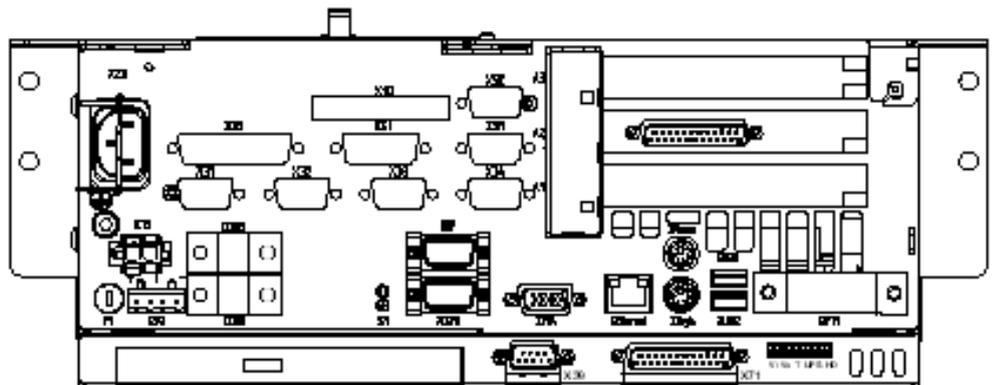
The rho4.1/IPC 40.2 consists of two with each other fix connected parts:

- In the PC-Box, the PC including harddisk and power supply with uninterruptible power supply is built in. Add-on slots for a PCI- and a PCI/ISA-card are available. At a connector block the standard interfaces and some special interfaces are available.
- In a frame component assembled to the PC-Box, the GIGABIT4-interface as well as an alternative to XCOM1 usable V24-interface (X39) is integrated. Also five LED displaying device states and errors and a CD-ROM drive are assembled.

The assembly is compact and service friendly, it is featured by:

- **high fail-safe** (e.g. impact and vibration securely supported hard disk, uninterruptible power supply (UPS) and
- **simple maintenance**

The system is supplied with installed Microsoft Windows XP Professional and appropriate Bosch Rexroth application software (refer to section 9.2).



☞ **Only PCI-Rho-Cards with the following release index can be used:**

- PCI_RHO_SERCOS Index \geq 207
- PCI_RHO_SERCOS2 Index \geq 104
- PCI_RHO_CAN Index \geq 107
- PCI_RHO_CAN_2 Index \geq 104

System Overview

External Control panel

The following control panels can be connected to the rho4.1/IPC 40.2:

- VDP 16.2 12" Display
- VDP 40.2 15" Display
- VDP 60.1 12" Display

The control panels VDP 16.2 and VDP 40.2 are available with a keypad or a Touchscreen. The VDP 60.1 is only available with a keypad.

System Overview

2.1 Specifications

PC feature	rho4.1/IPC 40.2
Intel PentiumIII processor	933 MHz
RAM	512 MB
Hard Disk	> 10 GB IDE (spring cushioned, with Auto-park function)
CD-ROM drive	24 X (or higher)
Free expansion slots	1 x PCI / 1 x PCI/ISA
Power supply	85–264 VAC (at 50/60 Hz) or 24 VDC
Power consumption	approx. 200 W
UPS (uninterruptible power supply)	Via external rechargeable battery
Temperature monitoring	with advance warning and controlled shutdown sequence
5 LEDs	Display of essential operating statuses
Standard interfaces	3x RS-232, 1x RS-422 (COM1 as RS-422), 1x parallel, PS/2 keyboard, PS/2 mouse, XVGA, 2x USB (Type A)
Enhanced interfaces	Ethernet, GIGABIT4 transmission incl. touch screen signals
Real-time interfaces	3x V24/20 mA, PHG connection, 2x CAN-Bus, incremental encoder (optional)
Dimensions	Housing: 364 x 130.2* x 214 mm *plus 10 mm for the screw of the harddisk cover
Protection category	PC-Box: IP 00
Operating system	Microsoft Windows XP Professional

 **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.**

System Overview

2.2 Expansion slots

Two slots are provided for expansion cards:

- 1 PCI bus slot
- 1 PCI/ISA bus combination slot

Expansion slot 2 is occupied by the PCI_rho card. Busmaster cards must be inserted in slot 1 (1st slot from the bottom).



CAUTION

Damage to PC or application software through unauthorized expansion cards.

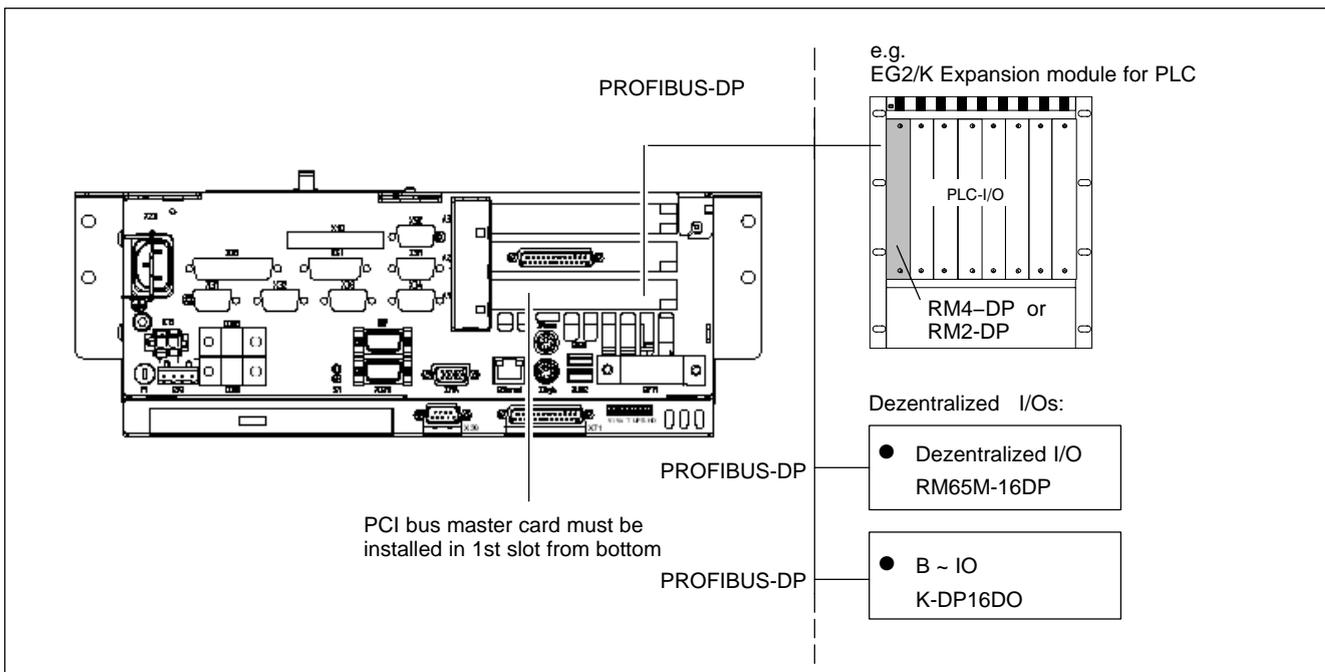
Use only approved expansion cards, and have them installed by a specialist.

2.2.1 PCI busmaster 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



System Overview

Installation of expansion cards see section 8.3

2.3 Rechargeable battery pack

The rho4.1/IPC 40.2 is equipped with an external rechargeable battery pack.

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 (**Uninterruptible Power Supply UPS**). 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 (see section 8.2).

System Overview

2.4 Operating conditions

The rho4.1/IPC 40.2 control is designed for continuous operation (24 hours/day).

Unless stated otherwise in specific sections, these specifications apply:

Temperatures

Storage temperature:

- -20 °C to +60 °C

durability

- +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

2.5 Standards compatibility

The rho4.1/IPC 40.2 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/IPC 40.2 comply with the requirements for the CE mark of conformity. However, installing additional expansion cards will require a supplementary CE approval.**

System Overview

2.6 Wear parts

Wear parts, which are not liable to warranty

- CMOS-battery: 5–7 years
- Rechargeable battery pack: The number of executed load cycles of the battery pack and so its durability depend on the ambient temperature of the battery pack.
Ambient temperature is defined as the temperature, in which the control or battery pack is situated, e.g. the inside temperature of the switch cabinet.

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

Durability rechargeable battery pack

If you don't know the exactly thermal conditions, Bosch Rexroth advises a preventive change of the battery pack every 1,5 years.

- Hard disk: The hard disk is a electromechanic component, which wears out during operating time. It was developed for a durability of 60 month under consideration of the details of the manufacturer:

Hours of operation / month		Max. 333
Switch On-/Off cycles		Min. 10 and max. 150
Operating conditions	Temperature	40°C
	Relative humidity	30 %
	Altitude	< 500 m
Storage conditions	Accesses	30 % of hours of operation
	Temperature	< 30°C
	Relative humidity	< 70 %
	Period	< 3 Month

Typical operation- and storage conditions of the hard disk

The operation outside of these typical conditions is valid, but the durability of the hard disk may be decreased. But the specified ambient conditions of the complete device (see section 2.4) must be kept absolute.

System Overview

- Fans are also mechanical components, which are liable to wear out and the durability in particular is temperature-sensitive. For the built in fan in the PC-box, the manufacturer specifies the following durability:

Ambient temperature	Durability
+ 40 °C	70 000 hours
+ 70 °C	35 000 hours

Durability of the fan

System Overview

2.7 Compatibility check

All Bosch Rexroth controls and drives are developed and tested according to the actual state-of-the-art.

But it is impossible to watch the continuous further development of all materials our controls and drives may encounter with (e.g. lubricant at machine tools). Reactions with the material used by us cannot be excluded in each case.

On this account, you have to make a compatibility check before using our devices between new lubricants, cleaning supplies etc. and our case/device materials.

System Overview

Notes:

Security Functions

3 Security Functions

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

3.1 Temperature monitoring function

The ambient air in the PC environment must not exceed +45 °C (see section 2.4). 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 red **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 Rexroth application software meets this requirement.

The above described temperature monitoring function can be disabled by means of the program UPS_{NT} for Windows.

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 rho4.1/IPC 40.2.

Security Functions

3.2 Uninterruptible Power Supply (UPS)

In the event 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.

The battery-operation are activated, when a power interruption > 20 ms arises.

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.



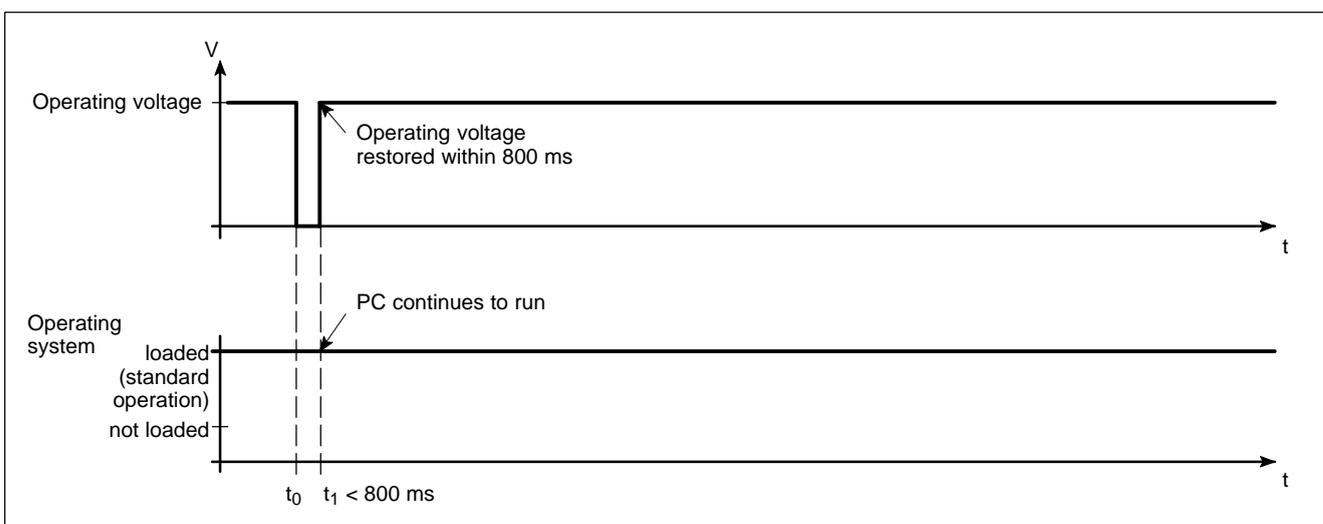
DANGER

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.

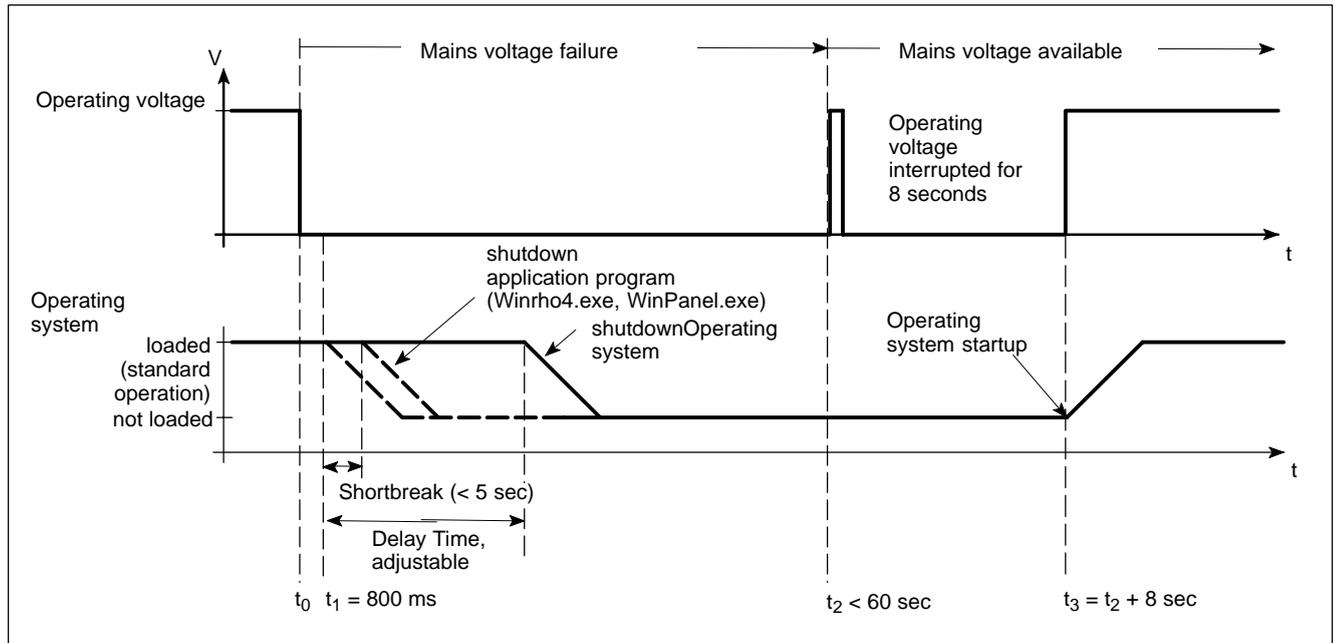


Security Functions

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.

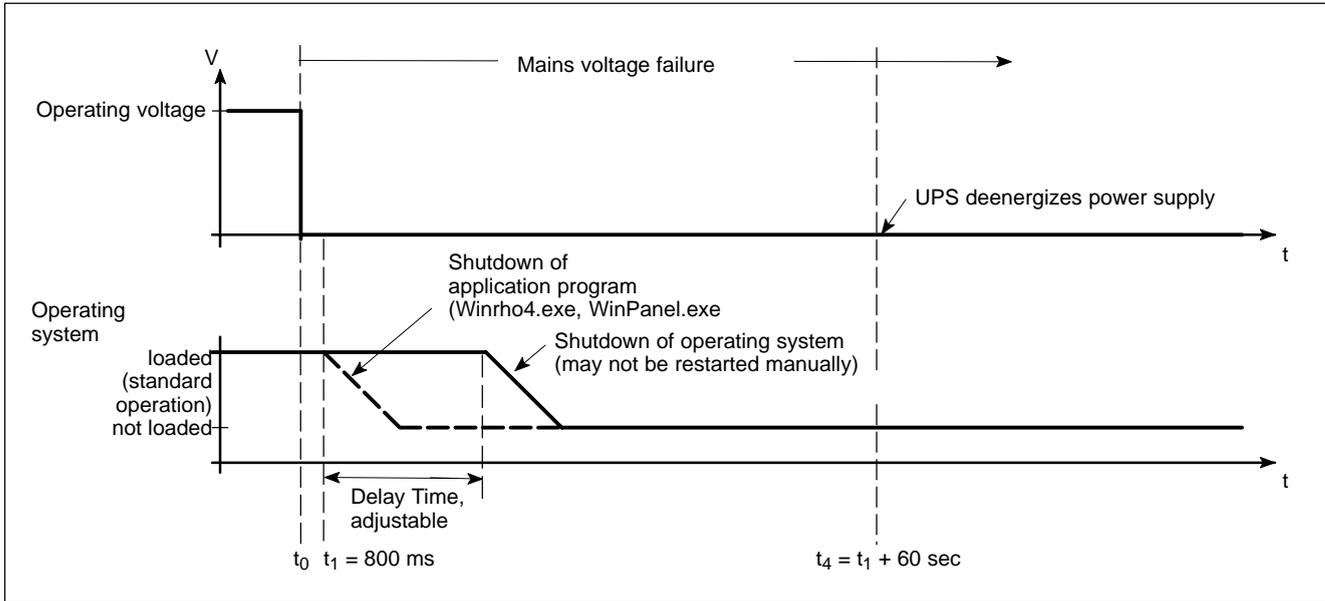
- If the mains power is restored within a 5-second interval (short break), the UPS will remain inactive (only with appropriate settings).
- If the mains power is restored within the next 60 seconds, the UPS will interrupt the operating voltage for another 8 seconds (up to t_3), and then again restart 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 page 3-9 for the procedure required to adjust the Delay Time of the UPS_{NT} supplementary software.

Security Functions

3.3 UPS program

3.3.1 Functionality

The uninterruptible power supply program “UPS_{NT}” controls and monitors the integrated uninterruptible power supply (UPS). Further on, the program offers the following functions:

- Monitoring the system temperature in the housing
- Monitoring the function of the fans
- Check of the charge state if required
- Setting of the Profi Bus address
- Setting of the COM-Interface for the touch screen controller

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

The program consist of two parts, a control panel applet and the actual windows service.

The task of the UPS program is to respond as follows in the event of a power loss within an adjustable time (delay time: max. 60 sec):

- 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 device 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.

Security Functions

At normal operation, the user has no access to the UPS_{NT} program. Operation and configure settings is only possible with special rights (Administrator rights) and after a restart of the operating system.

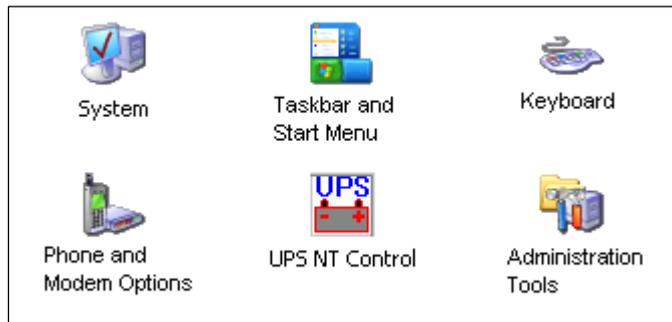
 **Parameter values set in the UPS_{NT} software may not be changed without prior consultation with Bosch Rexroth.**

3.3.2 Operating and configuring UPS_{NT}

Start/Stop

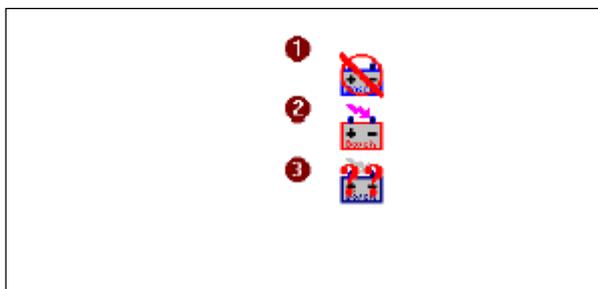
During run-up of Windows XP the UPS_{NT} program is started automatically.

If the service should be stopped, terminated or restarted (e.g. Re-Installation or Update), select Administration Tools -> Services in the Windows XP Control Panel:



Windows XP Control Panel

The actual operating state of the service is displayed in the Windows Task Bar:



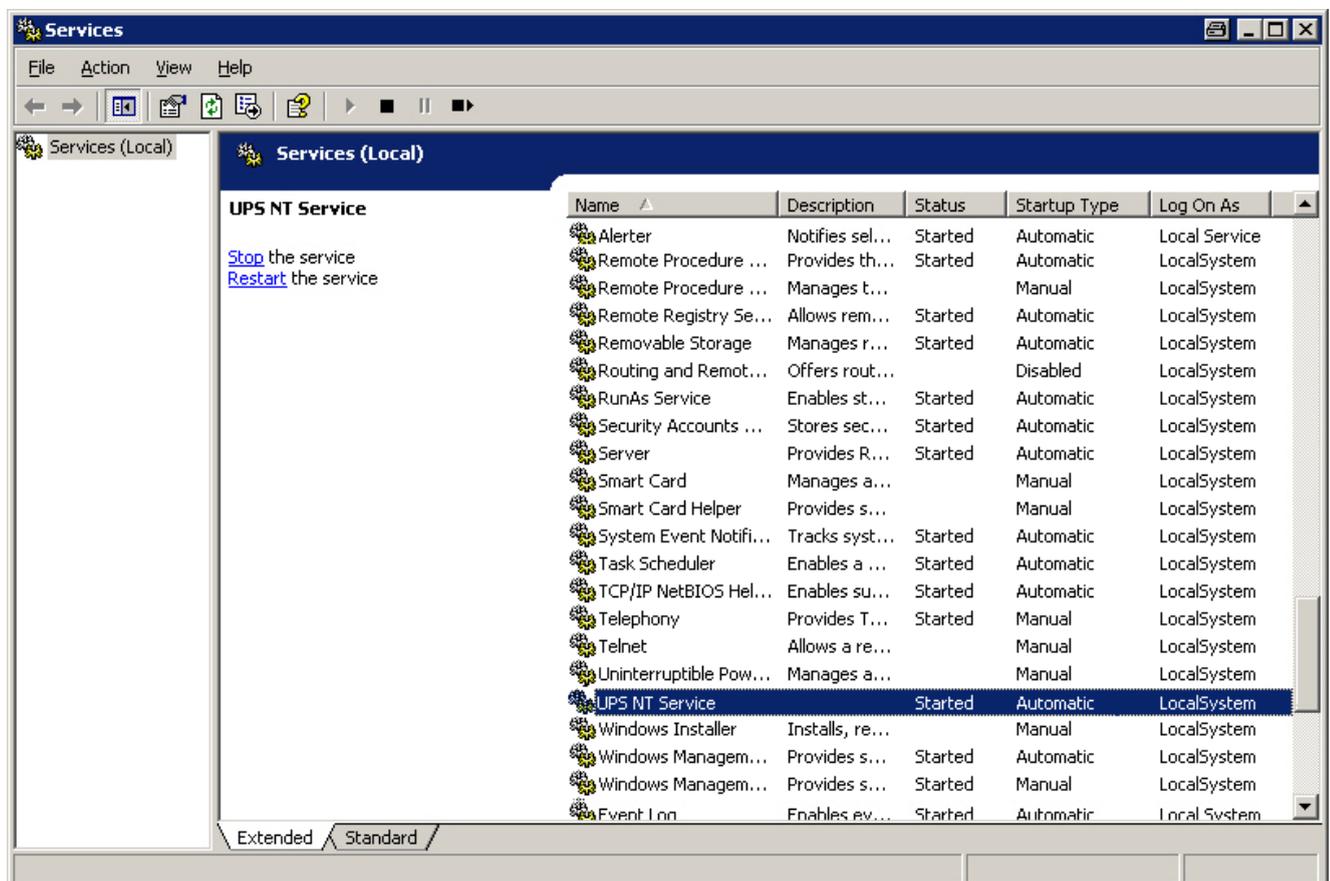
Security Functions

- Legend:
- 1: Service was started, but is not yet ready
 - 2: Service is in operation
 - 3: Service is in operation, but during start errors have been signaled (Battery-, Temperature-, Fan- or Voltage error)

The status of the UPS_{NT} service is displayed in Windows XP under Control Panel → Administration Tools → Services:

- UPS_{NT} stopped: no entry
- UPS_{NT} started: entry “Started” in column “Status”

The marked entry UPS_{NT} Service can be stopped or started by
[“Stop the service”](#)
[“Restart the service”](#)



The window “Services”

Security Functions

Configuration

To configure the UPS_{NT} program, double click the icon **UPS NT Control** in the Control Panel (see page 3–6).

- ☞ **The UPS_{NT} program run always as a Windows service. Changing users has no effect to this attitude. User can not stop the program or monitoring without Administrator rights.**

USV Properties and Maintenance

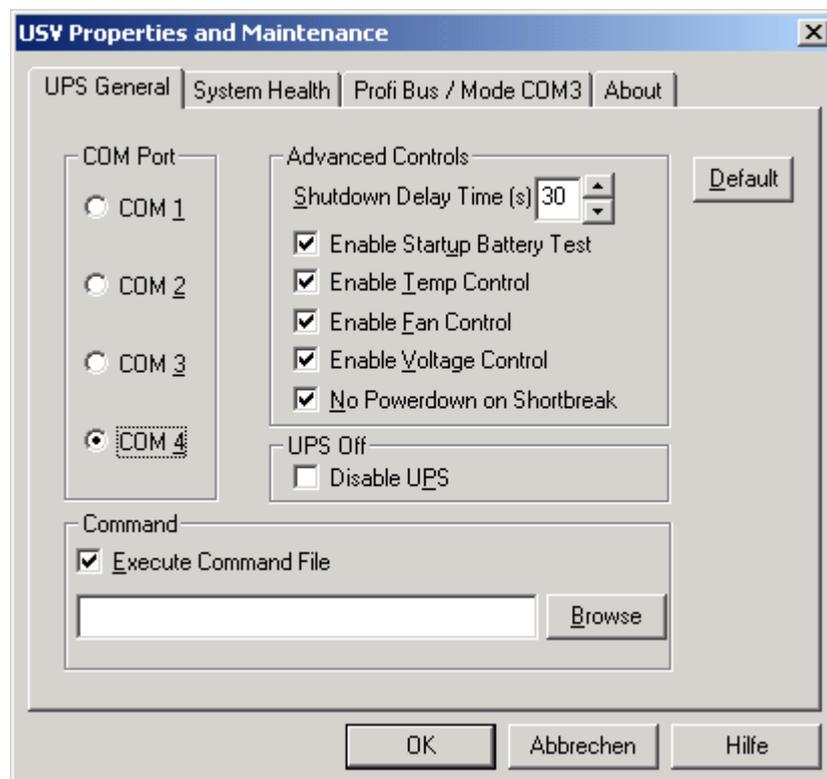
After double clicking the icon **UPS NT Control**, the window **USV Properties and Maintenance** appear.

This window offers the following register entries with more available settings:

- **UPS General**
- **System Health**
- **Profi Bus / Mode COM3**
- **About**

UPS General

After the call, first of all the register UPS General is active, where general settings of the Start- and Runtime attitude can be defined.



The register “UPS General”

Security Functions

- ☞ **After modifications of parameter, the UPS program is stopped and restarted automatically to take effect of the new settings. During this time (5...10 sec) no monitoring take place.**

COM Port: Determines the serial communication interface, where the UPS is connected to. If in the BIOS one or more serial interfaces are disabled, the remaining interfaces are new “numbered” by Windows. This means that in the configuration dialog “COM Port” a new interface must be selected. If no interface is found during start of the service, a corresponding dialog appears and the service is terminated.

- ☞ **The UPS program is connected to the UPS via the COM4 serial port by default settings.**

The block **Advanced Controls** offers the following settings:

Shutdown Delay Time: A value of 45 sec must be entered here. During this interval, the rho4.1/IPC 40.2 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 **Shutdown 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.

Enable Startup Battery Test: When this checkbox is activated, 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 case of an error, the rho4.1/IPC 40.2 controller will set the output designated I80.2 UPS_ACCU_RCO to “HIGH”.

After 12 hours the battery test is automatically performed again:

- If no error appear, the test will be automatically performed every 12 hours.

Security Functions

- In case of an error, a dialog appear and a message is send to all active applications; no further battery test is accomplished.

Enable Temp Control: When this checkbox is activated, continuous monitoring of the ambient temperature is enabled. Excessive temperatures ($> +50^{\circ}\text{C}$) will produce a warning window and the TEMP LED at the housing front starts to blink. In case of an error, the rho4.1/IPC 40.2 controller will set the output designated I80.1 UPS_TEMP_RCO to "HIGH". The temperature warning can be disabled.

At temperatures $> +65^{\circ}\text{C}$ the system is shutdown and cut off by the UPS program.

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

Enable Fan Control: When this checkbox is activated, the housing- and processor-fan is monitored. In the event of an error, a message is generated and send to all active applications. The TEMP LED starts to blink.

Enable Voltage Control: Monitors the internal supply voltages. In the event of an error, a message is generated and send to all active applications.

No Powerdown on Shortbreak: When this checkbox is activated, interruptions in the power supply of up to 5 seconds are permitted without affecting ongoing operations. Only in case of power interruptions lasting in excess of 5 seconds will the UPS logic be started and the safe shutdown of the system initiated.

UPS Off, Disable UPS: 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, the UPS must always be enabled 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!

Security Functions

Command: 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!**

Selecting the button **Default** returns all settings to their **default values**.

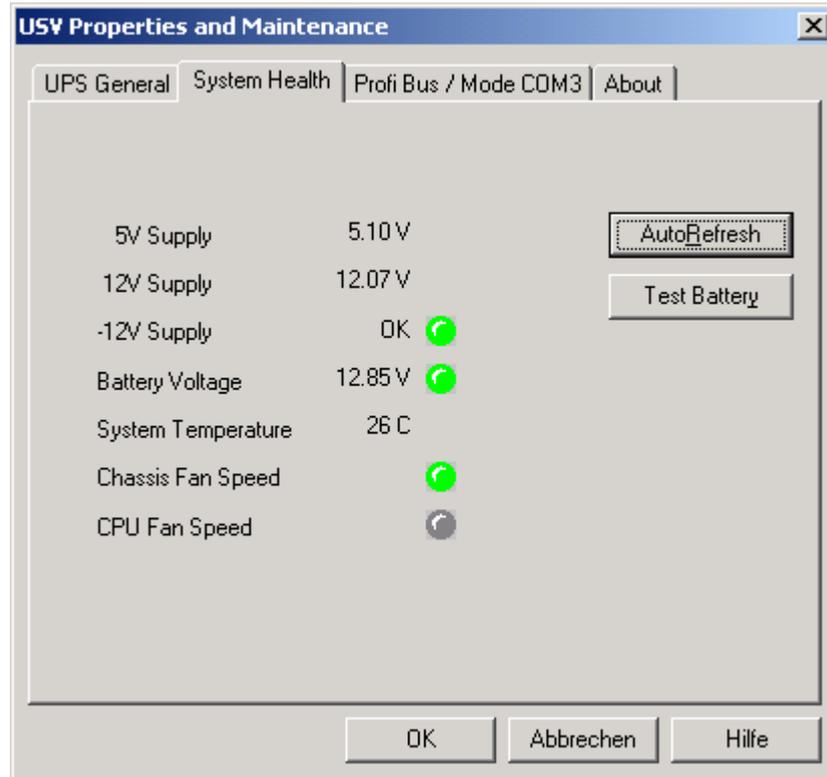
These are:

- COM port: COM4
- Shutdown Delay Time: 30 sec (set to 45 sec ex works!)
- Enable Startup Battery Test: enabled
- Enable Temp Control: enabled
- Enable Fan Control: enabled
- Enable Voltage Control: enabled
- No Powerdown on Shortbreak: enabled
- Disable UPS : disabled
- Execute Command File: disabled

System Health

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

Security Functions



The register "System Health"

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**.

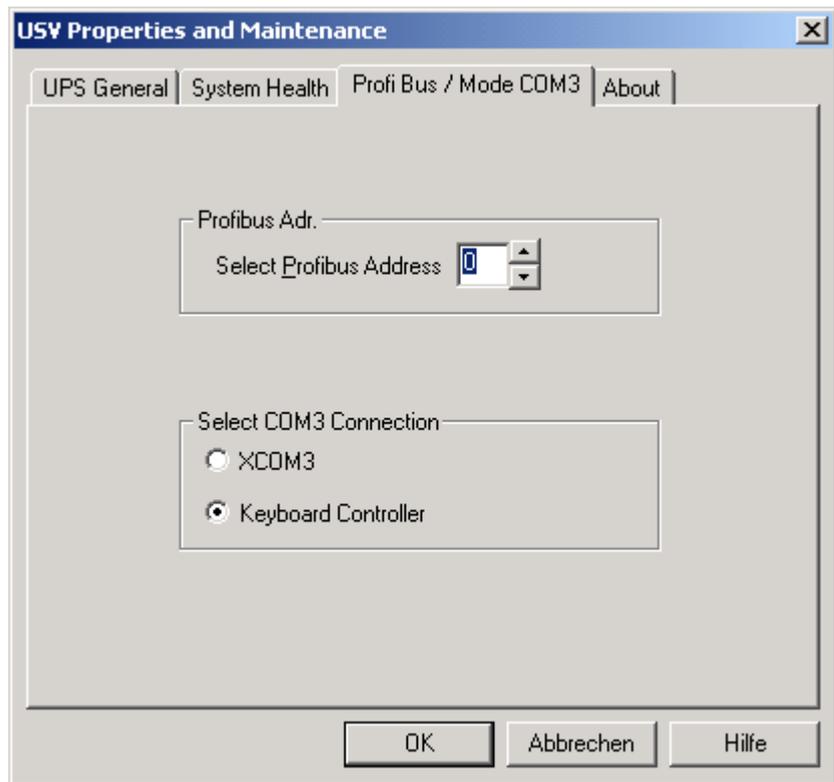
Pressing the **AutoRefresh** button again enables automatic measurement updating, again changing the legend on the button to **StopAuto-Refresh**.

Security Functions

Profi Bus and other settings

The register **Profi Bus / Mode COM3** is divided in two segments:

- Setting of the Profibus address
- Selection, whether the COM3 interface is available as a serial interface at the XCOM3-connector or whether it is connected internally to the keyboard controller



The register “Profi Bus / Mode COM3”

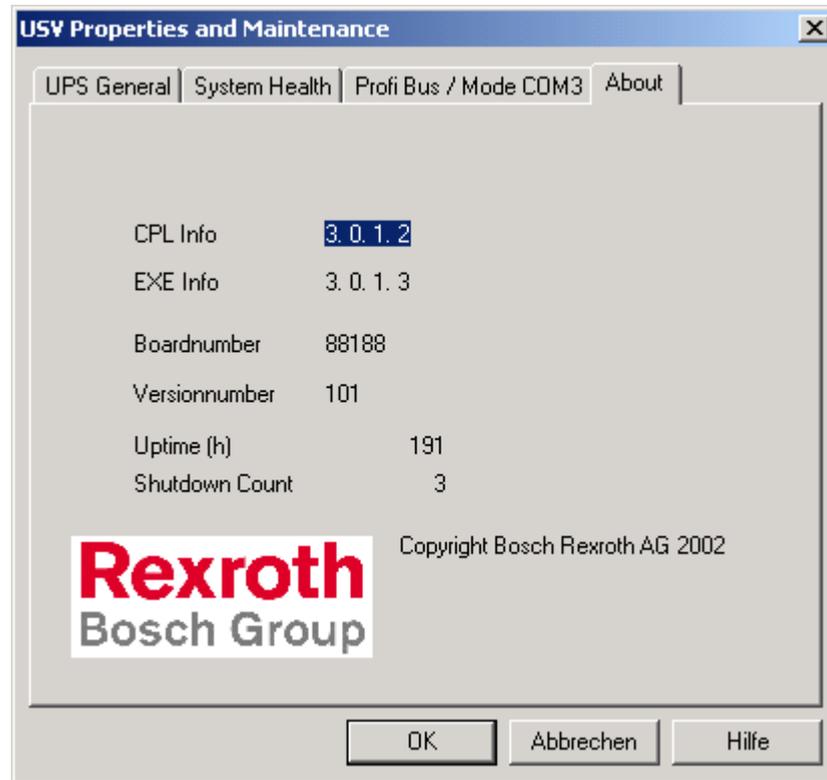
Select COM3 Connection	
XCOM3	COM3 is available at XCOM3-connector
Keyboard Controller	COM3 is internally connected to the keyboard controller to <ul style="list-style-type: none"> – poll the condition of the M-Keys via serial interface or – reload firmware to the keyboard controller

 **To all settings applies: The UPS-Service is stopped. All modifications take only effect after a restart of the PC (supply voltage switched off/on).**

Security Functions

About

The value **Shutdown Count** 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, but not later than the recommended maintenance rate (see section 8.2).



The register "About"

Installation

4 Installation

When installing the rho4.1/IPC 40.2, refer to the information on standards compatibility and operating conditions in sections 2.4 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.

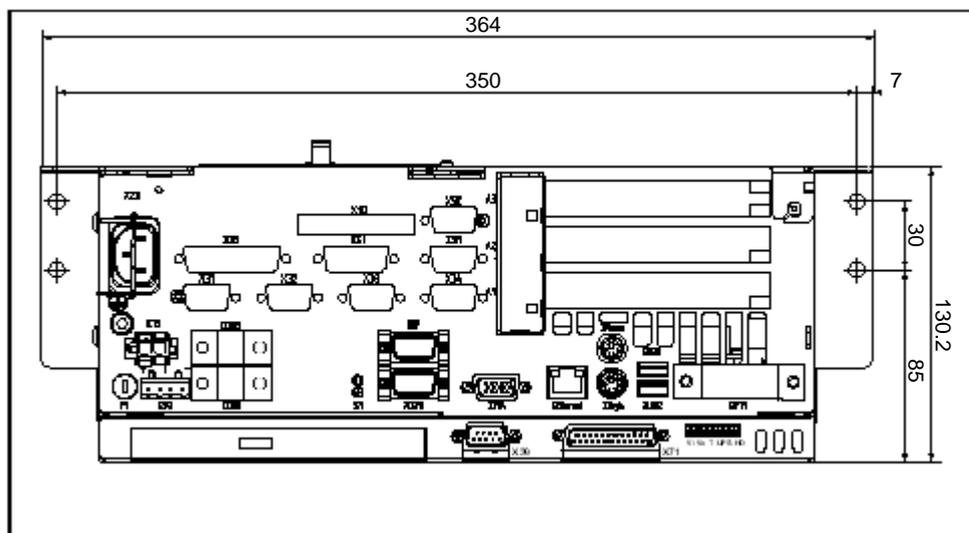
Note

- 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 Dimensioned drawings

The rho4.1/IPC 40.2 may be installed at four mounting holes, e.g. in a switch cabinet. The corresponding dimensions can be taken from the following drawing:



Horizontal installation of the rho4.1/IPC 40.2

The rho4.1/IPC 40.2 may be installed horizontal (electric supply on the left side) or vertical (electric supply on the top).

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 switch 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 switch cabinet. Among these are, for example:

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

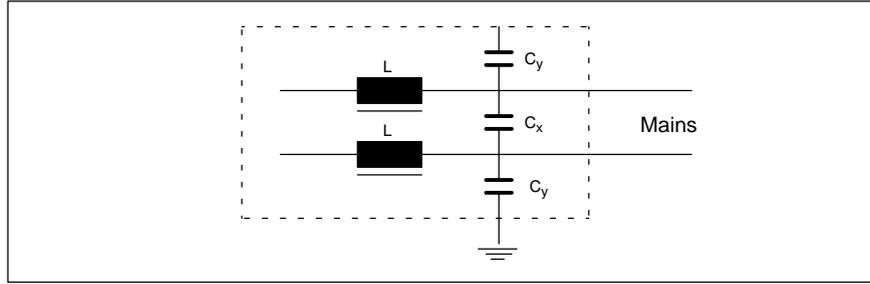
To ensure optimum suppress interference, all of the above components should be taken into consideration because they are most effective when working in combination. In principle, interference suppression should be implemented as follows:

- 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.

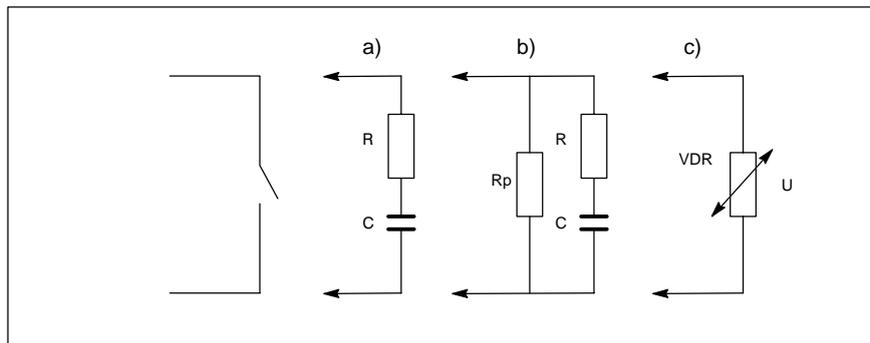
Electrical Connections



Interference suppression examples

Suppression of **contacts**

(Alternating current, direct current, offset DC current)

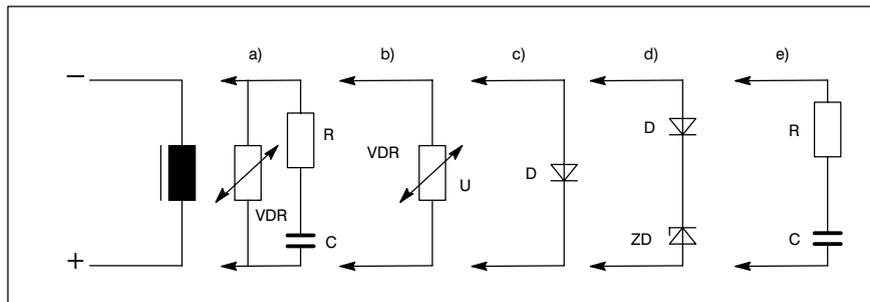


to b) For sensitive contacts, residual current when contact open!

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

Suppression of an **inductive load**

(Motors, solenoid, relay and contactor coils)



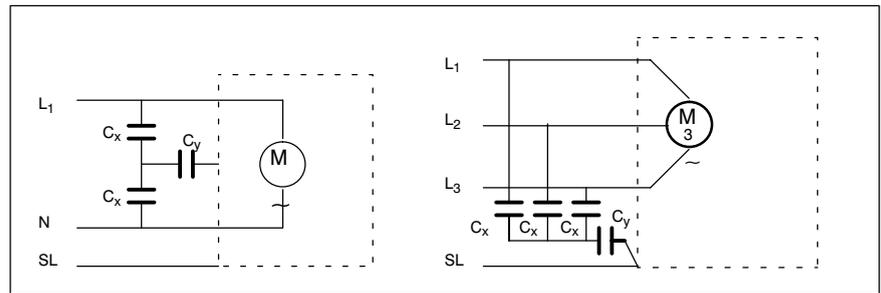
to c) For relay, drop-off delay.

to d) For relay, defined drop-off delay

to e) Must be optimized for inductance!

Electrical Connections

Suppression example – mains input:



Electrical Connections

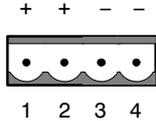
5.3 Operating power**5.3.1 24 VDC power connection****X10 24 VDC power connection**

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 mm² (see following page)

X10		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: $U_{max} = 35 \text{ V}$ (at $t < 100 \text{ ms}$)

Current draw at U_N : max. 5 A

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

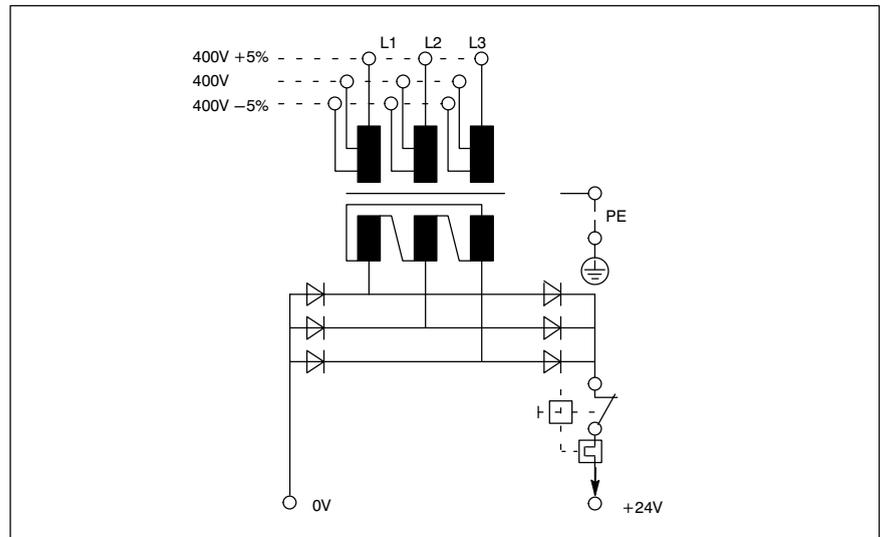
Reverse polarity protection: Via decoupling diode. Polarity reversal will blow input fuse.

**DANGEROUS ELECTRICAL VOLTAGE**

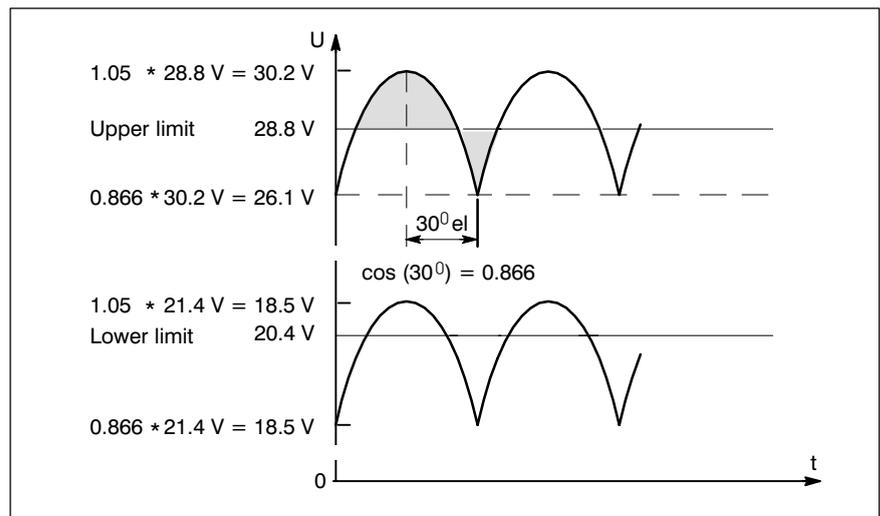
The 24 VDC input voltage must comply with the requirements of "protective separation"!

Electrical Connections

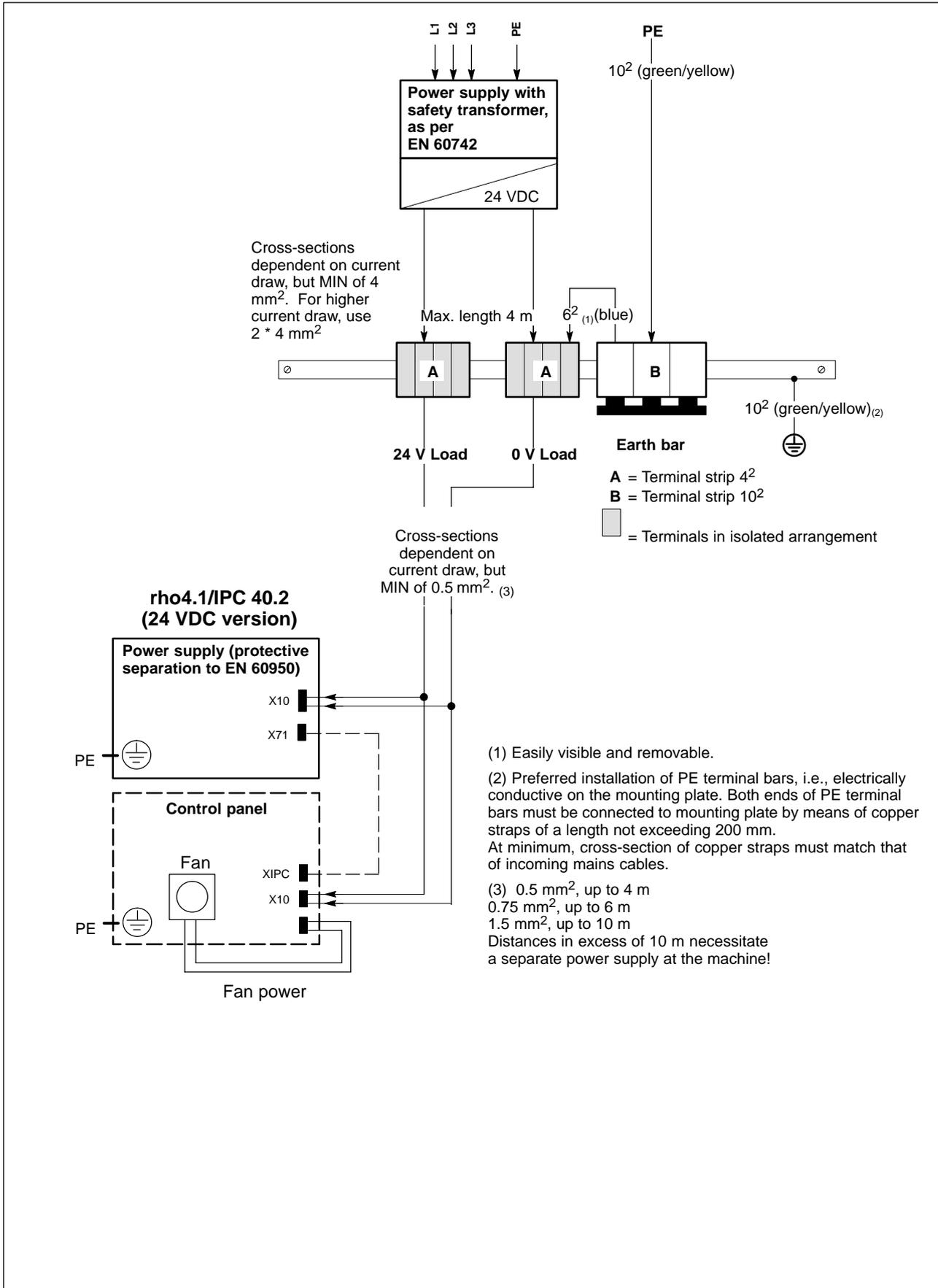
Safety transformer, as per EN 60742:



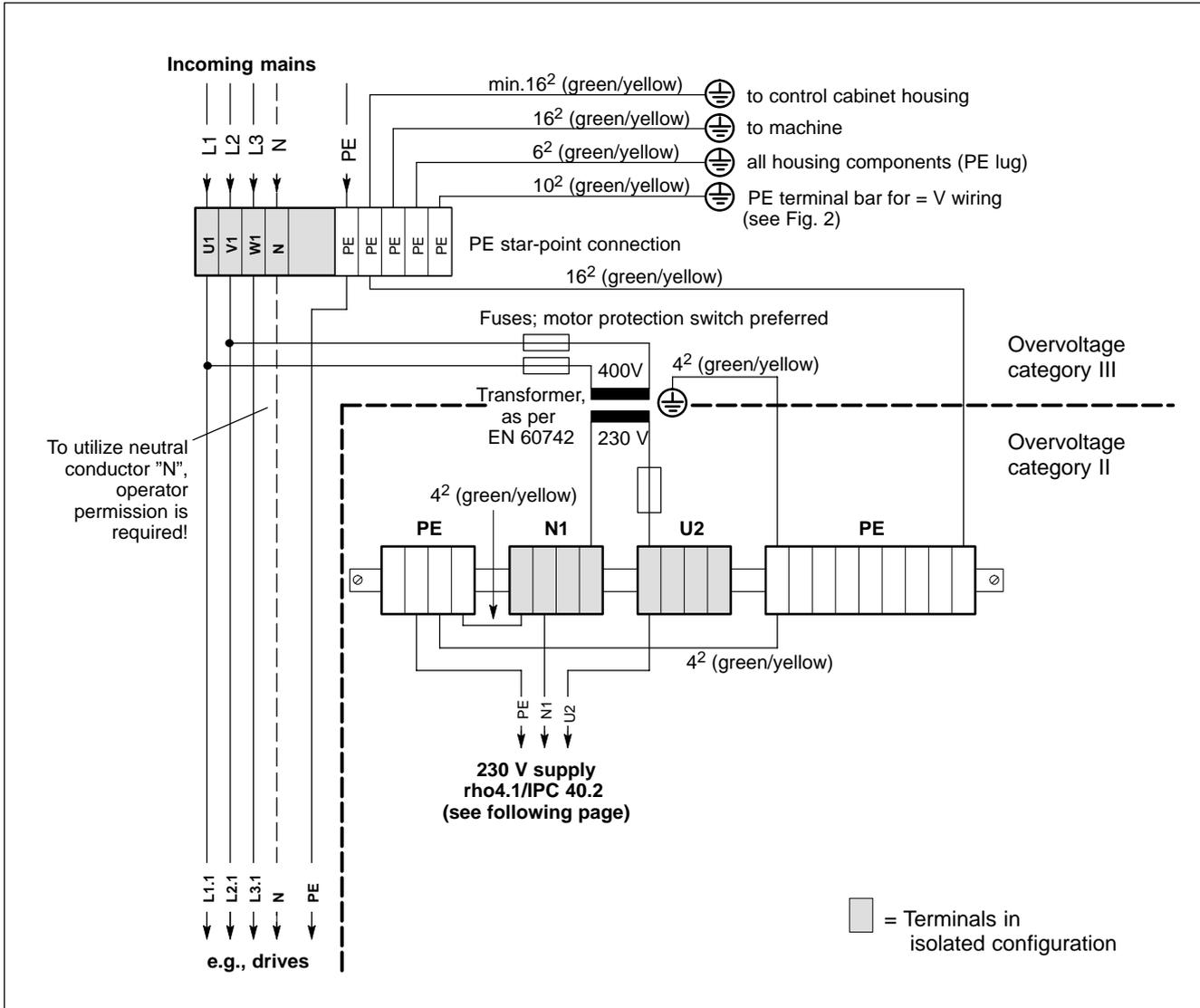
Offset AC components of the type produced by an unregulated rotary current bridge circuit without smoothing, with a ripple factor of 5% (refer to DIN 40110/10.75, section 1.2), are permissible. As an upper voltage limit, this produces a maximum absolute value of 30.2 V and, as a minimum voltage limit,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



Electrical Connections

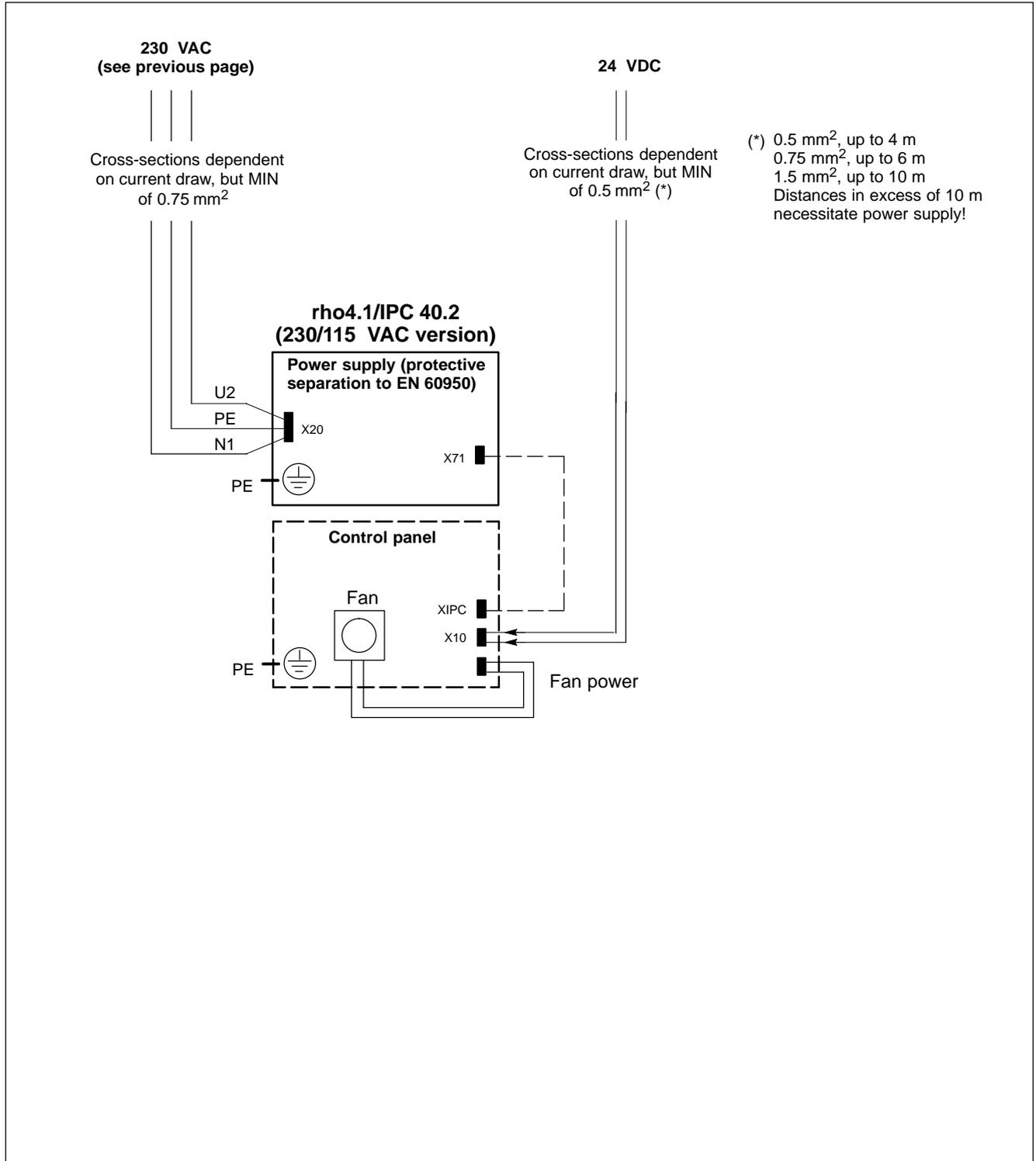


Electrical Connections



Power connection 230 VAC via separation transformer

Electrical Connections



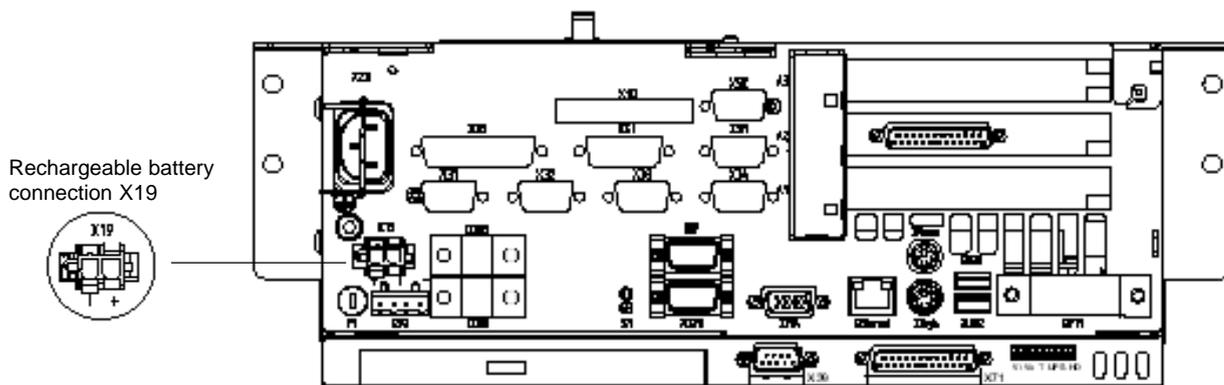
Electrical Connections

5.4 Rechargeable battery connection

X19 Rechargeable battery connection

Connector for an external battery for the integrated UPS:

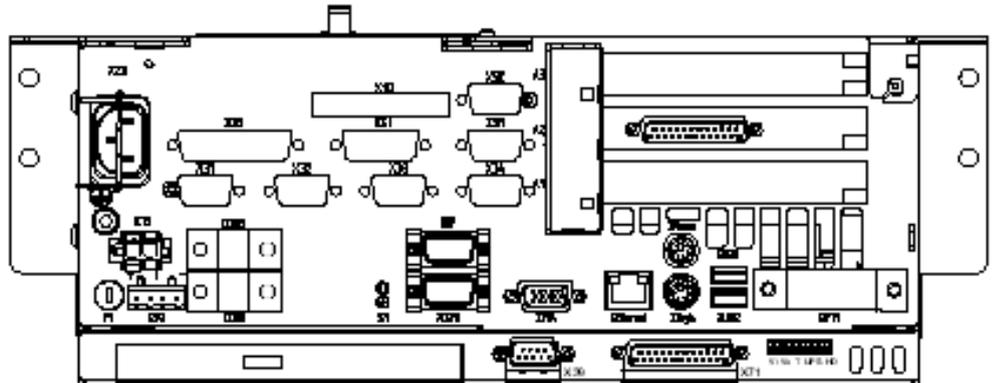
2-pole	
Cable length	max. 3,0 m
Cable type	unscreened, cross-section min. 1,5 mm ²



Interface Ports & Connectors

6 Interface Ports & Connectors

6.1 View to the connector panel



Location of the connectors

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

6.2 Interfaces

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

Panel label	Interface service	Physical connector panel-mounted	Mating connector or cable
XCOM1	Serial port: RS-232, alternate to X39	Male DB-9	Female DB-9
XCOM2	Serial port: RS-232	Male DB-9	Female DB-9
XCOM3	Serial port: RS-232	Male DB-9	Female DB-9
X39	Serial port: RS-422, alternate to XCOM1	Male DB-9	Female DB-9
XLPT1	Parallel port: Supports SPP, EPP, ECP 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
XVGA	VGA connection for ex- ternal CRT monitor	Female VGA HD, 15-pin	Monitor cable with male VGA HD, 15-pin

Interface Ports & Connectors

XKeyb.	PS/2 mini DIN keyboard	Keyboard cable with female mini DIN PS/2	Keyboard cable with male mini DIN PS/2, 6-pin
XMouse	PS/2 mini DIN mouse	Keyboard cable with female mini DIN PS/2	Male mini DIN PS/2, 6-pin
XUSB1	USB-Connection (USB 1.1)	USB female Type A	USB male Type A
XUSB2	USB-Connection (USB 1.1)	USB female Type A	USB male Type A
X10	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
X20	PC power supply: 230/115 VAC operating power, alternate to X10	Socket, male non-heating appliance connector	Power cord with female non-heating appliance connector
X19	Rechargeable battery for uninterruptible power supply	Tyco/AMP MATE-N-LOK, 2-pole	Conductor to the rechargeable battery of the UPS
X71	GIGABIT4-interface (for VDP 16.2, VDP 40.2 or VDP 60.1)	Female DB-25	Male DB-25

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	Incremental encoder connector	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 encoder, measuring probe, serial port, oper. power, PHG, READY signals	Female HD DB-44	Male HD DB-44

 **Mouse and keyboard may be connected only if there is neither mouse nor keyboard connected to an external control panel.**

Interface Ports & Connectors

6.3 XCOM1 through XCOM3, X39 serial PC ports**6.3.1 Pin assignment****XCOM1 Serial port, alternate to X39**

Male DB-9 connector

Type:

RS-232

XCOM1 is also applied to X39 as an RS-422.

Parallel operation is not possible.

Cable length:

Max. 15 m

Cable type:

Screened, min. cross-section 0.14 mm²

Transmission rate:

Max. 115200 bps

Handshake:

Hardware and software handshake (XON, XOFF)

Interrupt (IRQ):

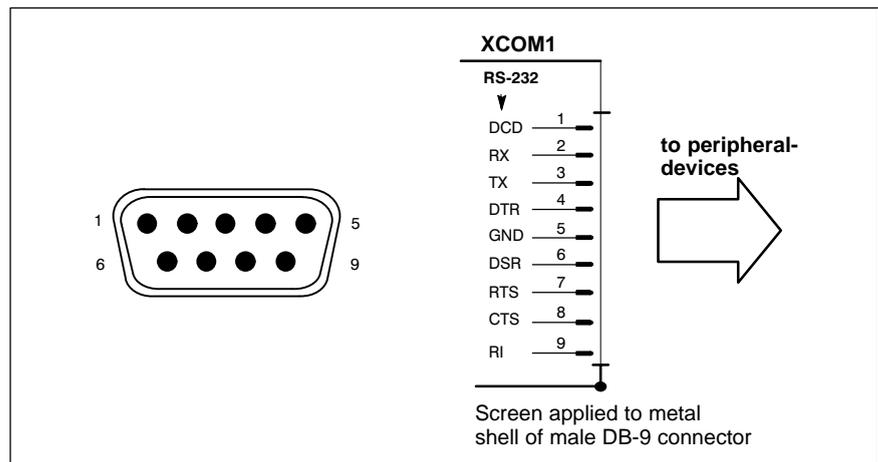
4

I/O address:

3F8H or AUTO (recommended)

BIOS preset:

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.
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

Interface Ports & Connectors

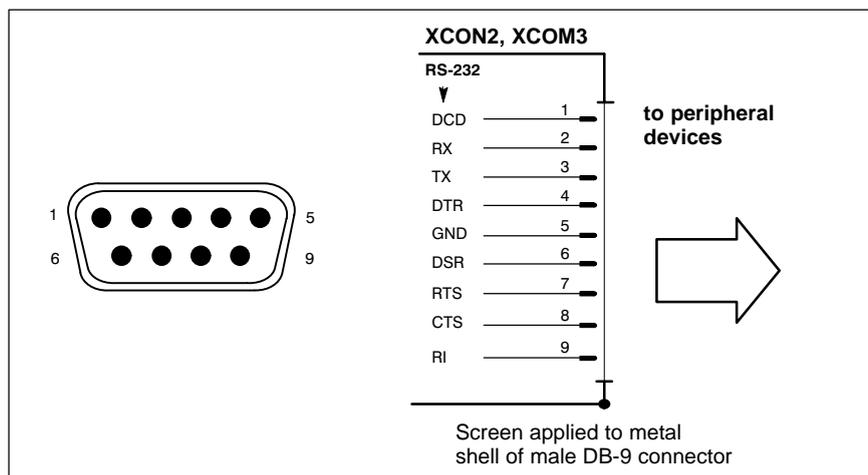
RTS	Request to Send. RCV channel used by the connected peripheral device to signal to the PC that it wishes to transmit data.
CTS	Clear to Send. XMIT channel used by the PC to signal to the connected peripheral device that it is permitted to transmit data.
RI	Ring Indicator. Receive line on which a connected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

XCOM2, XCOM3 Serial ports

Male DB-9 connector
 Type: RS-232
 Cable length: Max. 15 m
 Cable type: Screened, min. cross-section 0.14 mm²
 Transmission rate: Max. 115200 bps
 Handshake: Hardware and software handshake (XON, XOFF)

XCOM2:
 Interrupt (IRQ): 3
 I/O address: 2F8H or AUTO (recommended)
 BIOS preset: Serial Port B: Enabled

XCOM3:
 Interrupt (IRQ): 10
 I/O address: 3E8H
 BIOS preset: Serial Port C: Enabled



Refer to page 6-3 for explanations of pin assignments.

Interface Ports & Connectors

✎ **Interrupt (IRQ) and I/O-Address must correspond to the BIOS settings.**

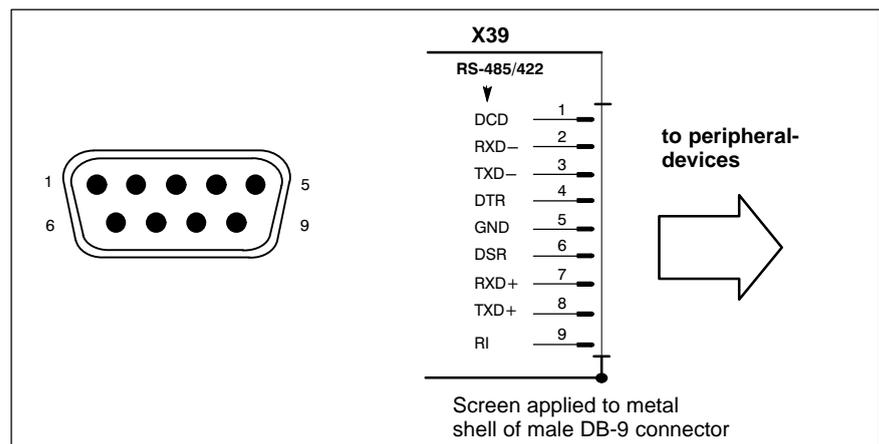
At address conflicts of COM3, e. g. IRQ 10 or 11 has already been occupied by another PC expansion card, you should change the IRQ of the expansion card to one that is still free.

X39 Serial interface as RS-422, alternate to XCOM1

This interface on the rho4.1/IPC 40.2 controller can be used only if the **XCOM1** serial port is **not used**. Parallel operation is not possible.

Male DB-9 connector

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



Configuration for service as an RS-422:

(For more information on pin assignment, see page 6-3)

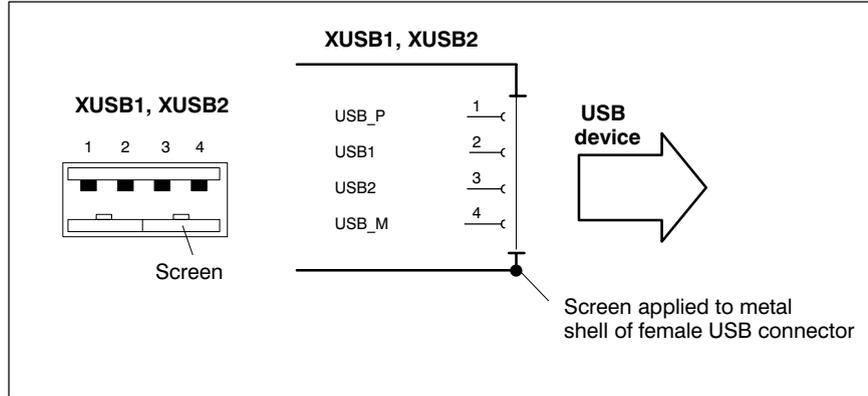
DCD	as for RS-232
RXD-, RXD+	Receive Data. Line on which data is received.
TXD-, TXD+	Transmit Data. Line on which data is transmitted to peripheral.
DTR	as for RS-232
DSR	as for RS-232
GND	as for RS-232
RI	as for RS-232
Screen	as for RS-232

Interface Ports & Connectors

XUSB1, XUSB2 Serial interface (Universal Serial Bus)

The USB interface provides for the connection of up to 128 devices equipped with USB functions. The interface supports only USB 1.1 standard.

USB socket, 4-pin



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

 **Only 500 mA per USB-Connector can be taken of the connected device. If the load exceeds 500 mA, the internal current monitor responds.**

Interface Ports & Connectors

6.4 LPT1 parallel port**XLPT1 Parallel port for printer, etc.**

Female DB-25 connector

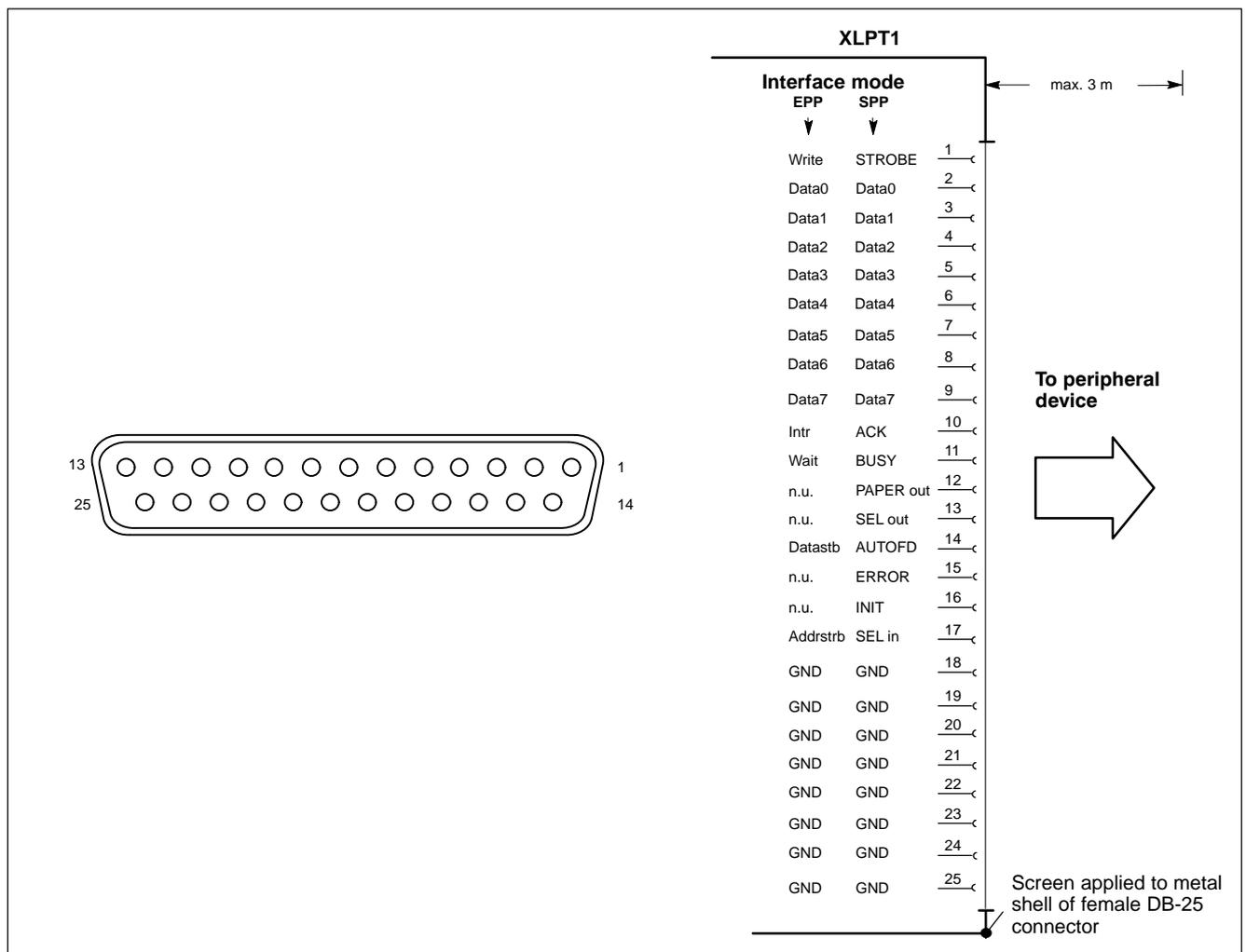
Type: SPP (ex factory), EPP, ECP

Cable length: Max. 3 m

Cable type: Screened, min. cross-section 0.14 mm²

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.

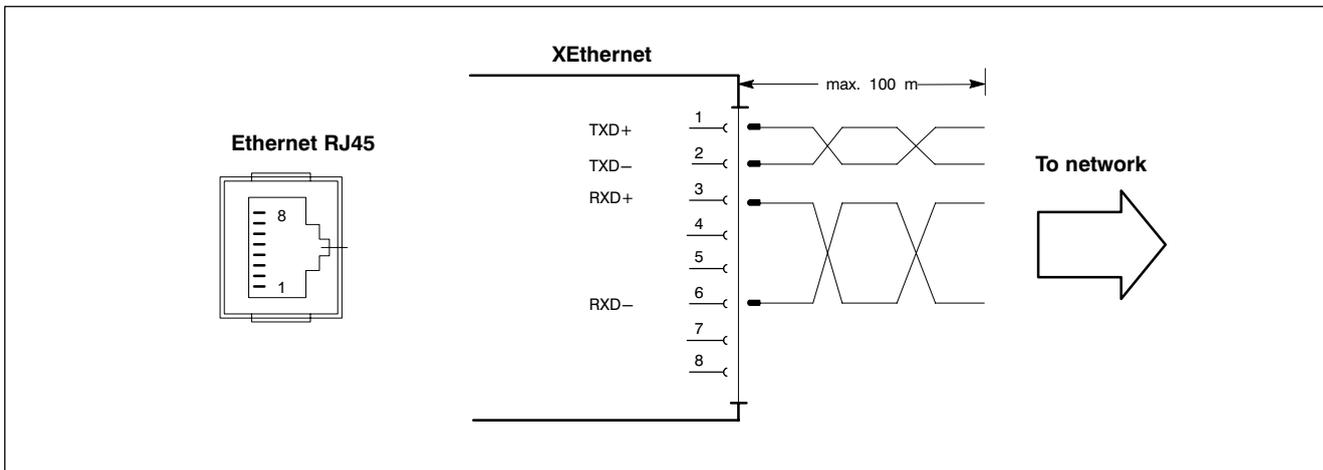
6.5 Ethernet-interface

XEthernet 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:	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):	9



The driver configuration functions for the network connection can be accessed in the task bar or in the “Control Panel” under the “Network Connection” symbol. A dialog box provides selections of data transmission speed, e.g. Auto (recommended), 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

6.6 VGA-Interface

XVGA External monitor port

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

- Video RAM: 8 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.**

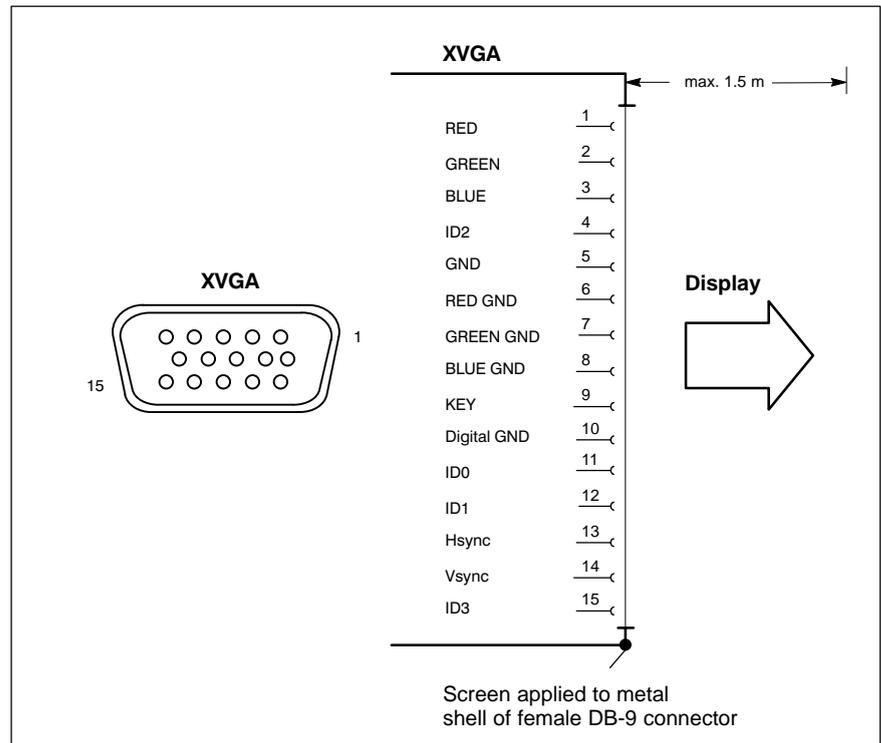
 **When inserting a graphics card, the integrated video adapter must be disabled in the BIOS.**

Female VGA HD, 15-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm²

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



Interface Ports & Connectors

CRT screen resolution

The following standard resolutions are available at a refresh rate of min. 72 Hz:

- VGA mode: 640 x 480 pixels, 72 Hz, 32-bit colours
- SVGA mode: 800 x 600 pixels, 72 Hz, 32-bit colours
- XGA mode: 1024 x 768 pixels, 72 Hz, 32-bit colours
- SXGA: 1280 x 1024 pixels, 72 Hz, 24-bit colours

**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.

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.

Interface Ports & Connectors

6.7 Combined keyboard-/mouse-port

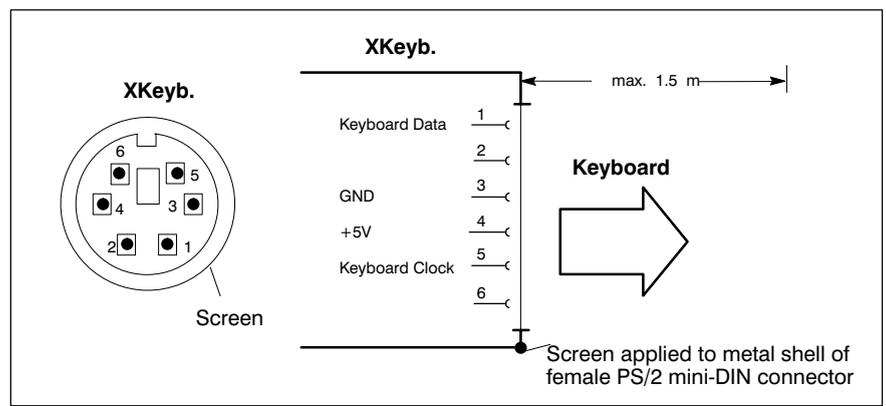
XKeyb. PS/2 Mini-DIN keyboard/mouse port

☞ **Use this keyboard port only if there is no keyboard connected at an external control panel. Otherwise, no faultless operation is guaranteed.**

Female PS/2 mini DIN, 6-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm²



6.8 Mouse port

XMouse PS/2 mouse port

☞ Use this mouse port only if there is no mouse connected to the “Mouse” port at an external control panel. Otherwise, no faultless operation is guaranteed.

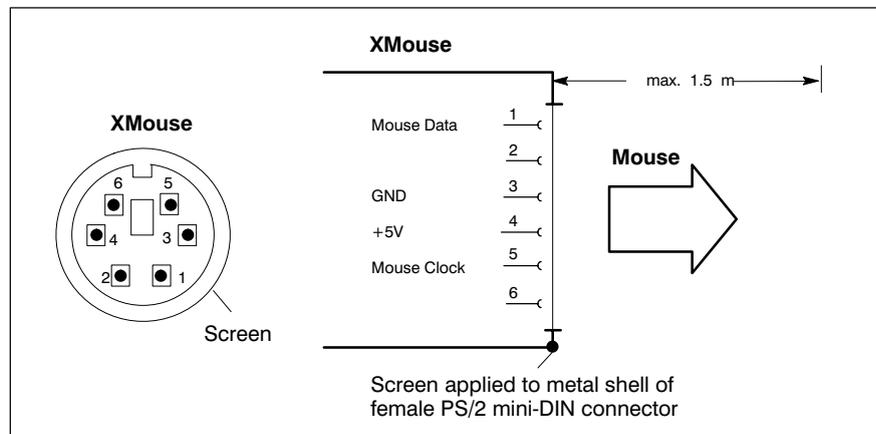
Female PS/2 mini DIN, 6-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm²

BIOS preset: PS/2 Mouse Support: Enabled

PS/2 Mouse: Autodetect



If the P/S2 mouse is not recognized by the system, it must be enabled in the BIOS by switching from Disabled to “Autodetect”. 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 & Connectors

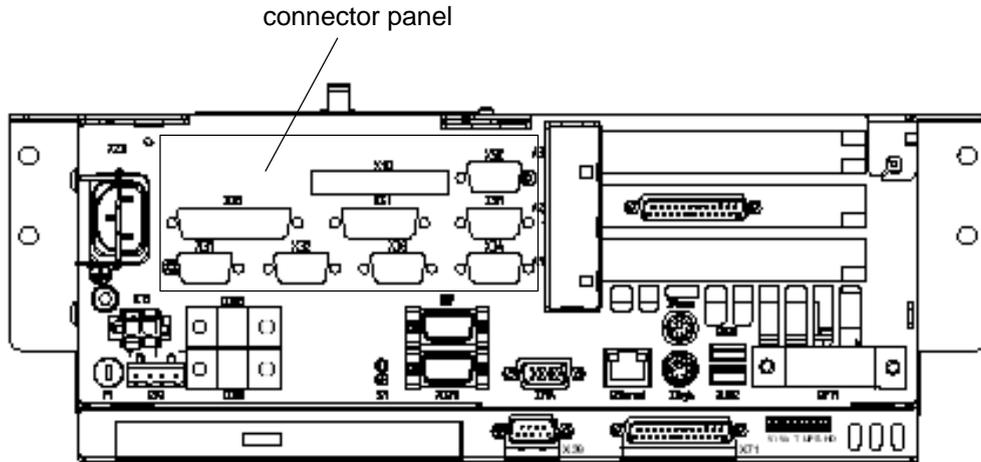
6.9 GIGABIT4 interface

X71 GIGABIT4 interface

The GIGABIT4 interface is available at the female DB-25 connector X71. At this connector the external control panels VDP 16.2, VDP 40.2 or VDP 60.1 are connected to the rho4.1/IPC 40.2 by a pre-converted cable (see section 10 Ordering informations).

Interface Ports & Connectors

6.10 Interfaces at the rho4 connector panel



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.

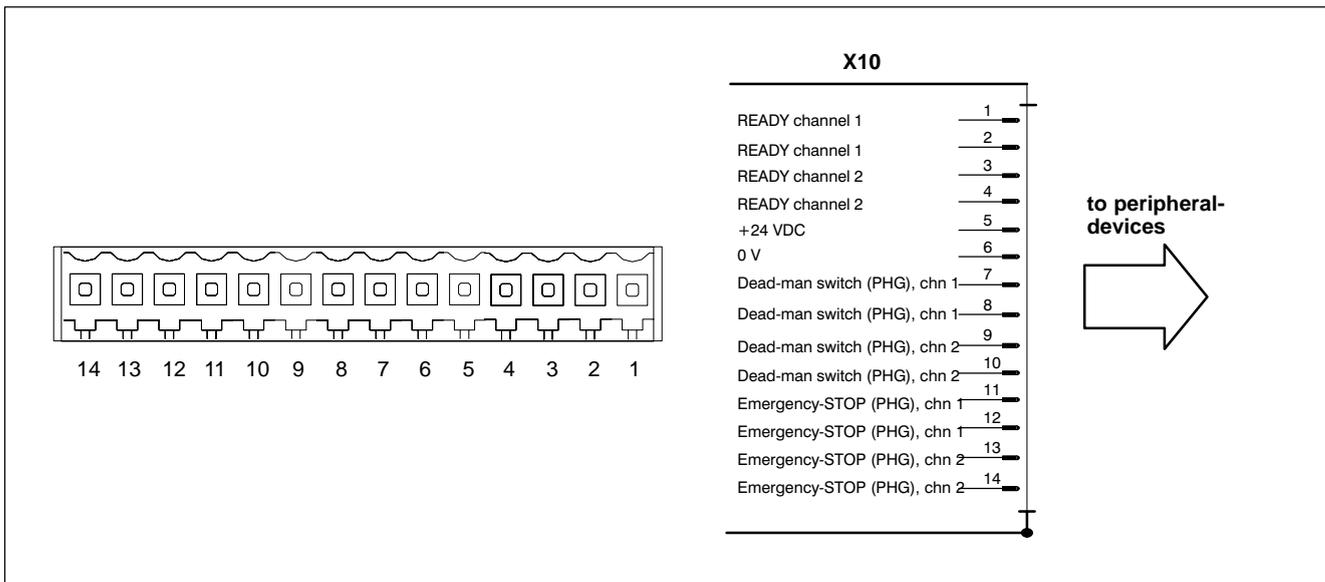
Weidmüller push-lock connector MSTB 1.5,
14-pin

Cable type: Screened, min. cross-section 0.14 mm²

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 section 10.



Interface Ports & Connectors

X31, X32 Ports for serial combination interfaces V24_1 (chn 1), V24_2 (chn 2)

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

Male DB-9 connector

V.24

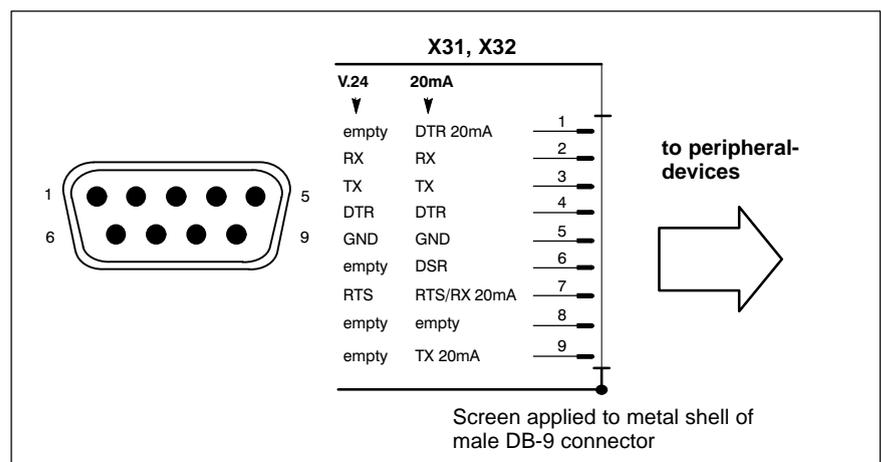
Type:	V.24
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm ²
Data driver:	Short-circuit proof, not electrically isolated
Transmission rate:	Max. 19200 bps
Handshake signals:	DSR, DTR

20 mA

Type:	20 mA active
Cable length:	Max. 100 m
Cable type:	Screened, min. cross-section 0.14 mm ²
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 6–16 for connecting cable.

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



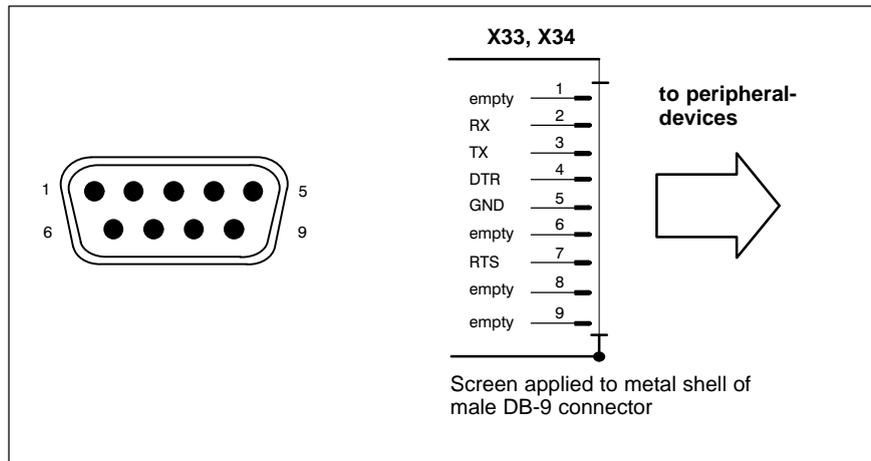
 **The X35 PHG connector and the X31 serial interface port must never be in use, i.e., connected, at the same time.**

Interface Ports & Connectors

X33, X34 Ports for serial interfaces V24_3 (chn 3), V24_4 (chn 4)

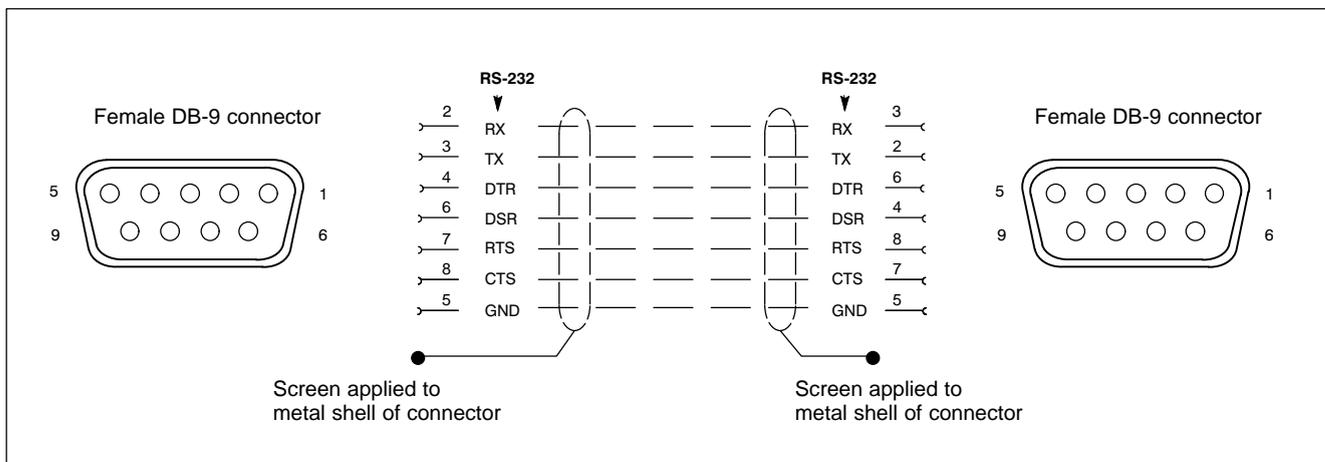
Connectors X33 and X34 represent pure V.24-interfaces. These interfaces facilitate serial data communications in accordance with the V.24 standard.

Male DB-9 connector	
Type:	V.24
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm ²
Data driver:	Short-circuit proof, not electrically isolated
Transmission rate:	Max. 19200 bps
Handshake signals:	None



Connecting cable between X31..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.**

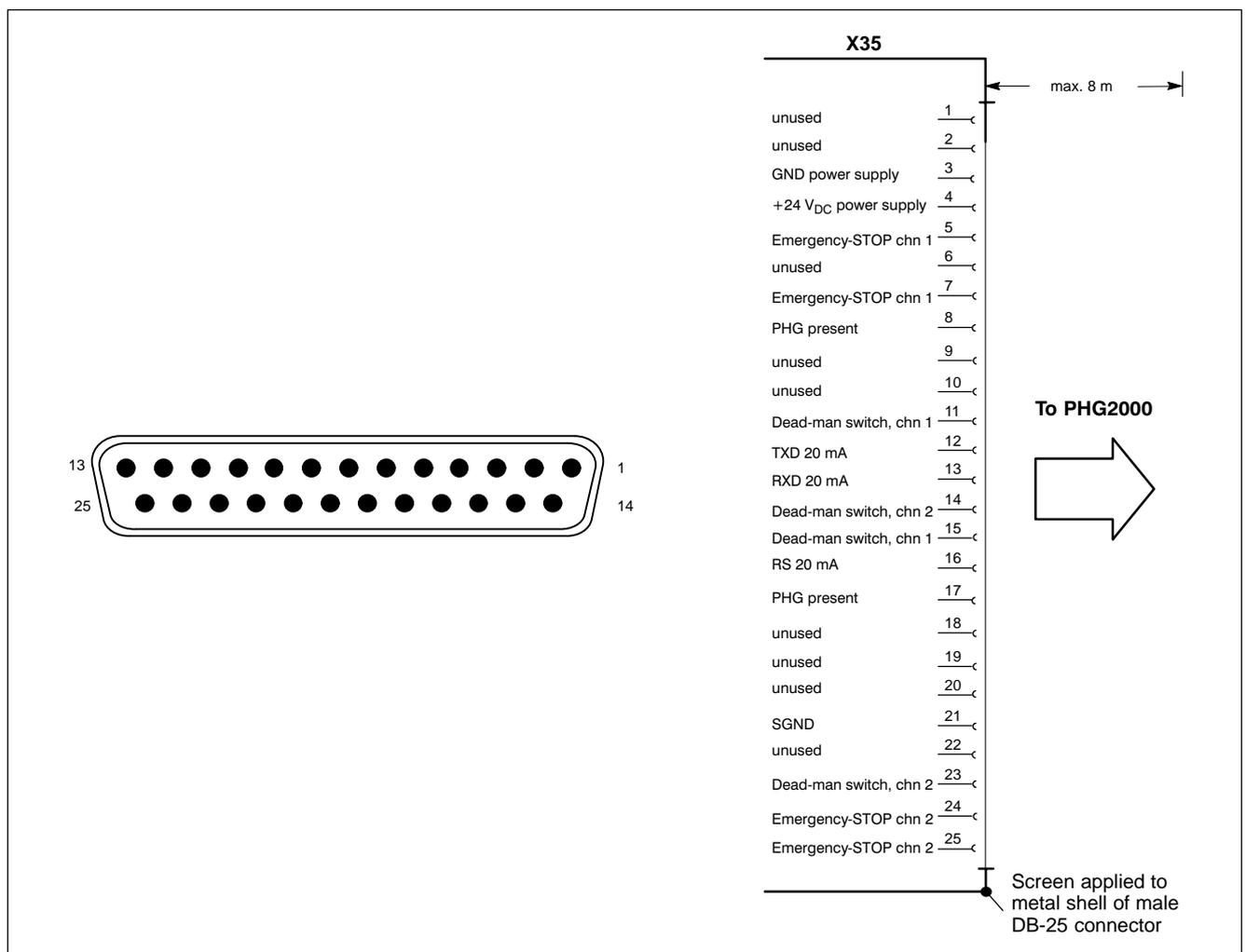
Female DB-25 connector

Type:

Serial 20 mA, plus additional safety functions

Cable type:

Screened, min. cross-section 0.14 mm²

**DANGER**

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

Interface Ports & Connectors

 **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 mm²

Incremental interface

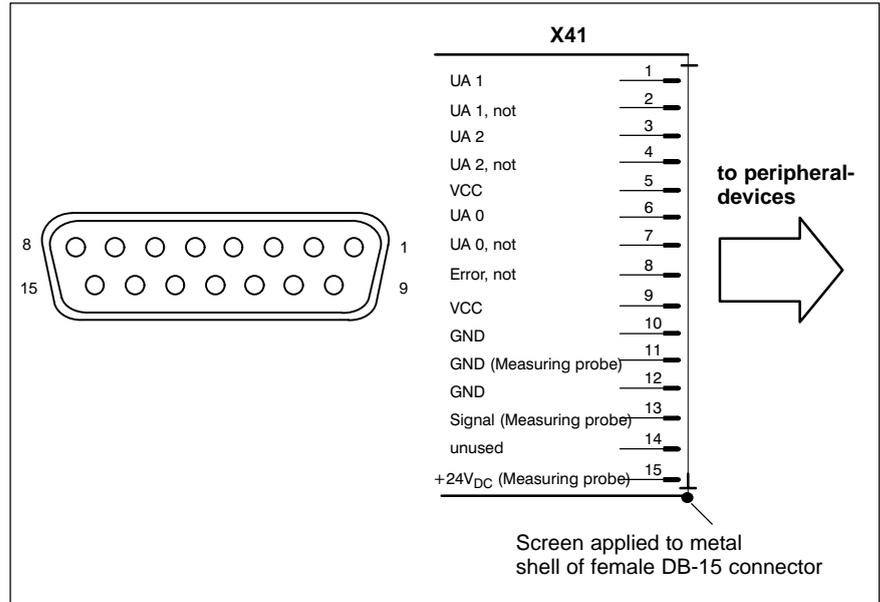
Max. permitted input frequency:	800 kHz
Min. slope interval between active counting pulses:	≥ 250 ns
Input resistance:	120 Ω
Min. voltage differential:	≥ 600 mV
Encoder power supply:	5 V ±5 %, max. 0.35 A, 1.75 W. In case of short-circuit, PC shuts down completely.
Max. permitted current draw, encoder:	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 μs

Interface Ports & Connectors

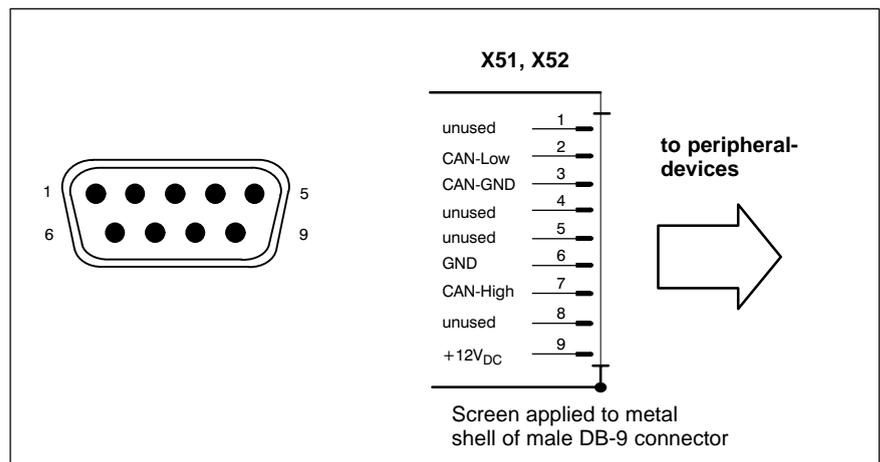


X51, X52 Ports for CAN drives, SR-CAN module, CAN user I/Os

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 ²
Transmission rate:	max. 1 Mbit/s
Data driver:	Short-circuit proof, not electrically isolated
Bus connection:	internal 120 Ω, always connected



Interface Ports & 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 section '10.1 Accessories' or manual 'Indramat Verbindungstechnik LWL-handling', DOK-CONNEX-CABLE*LWL ***AW02-DE-P.

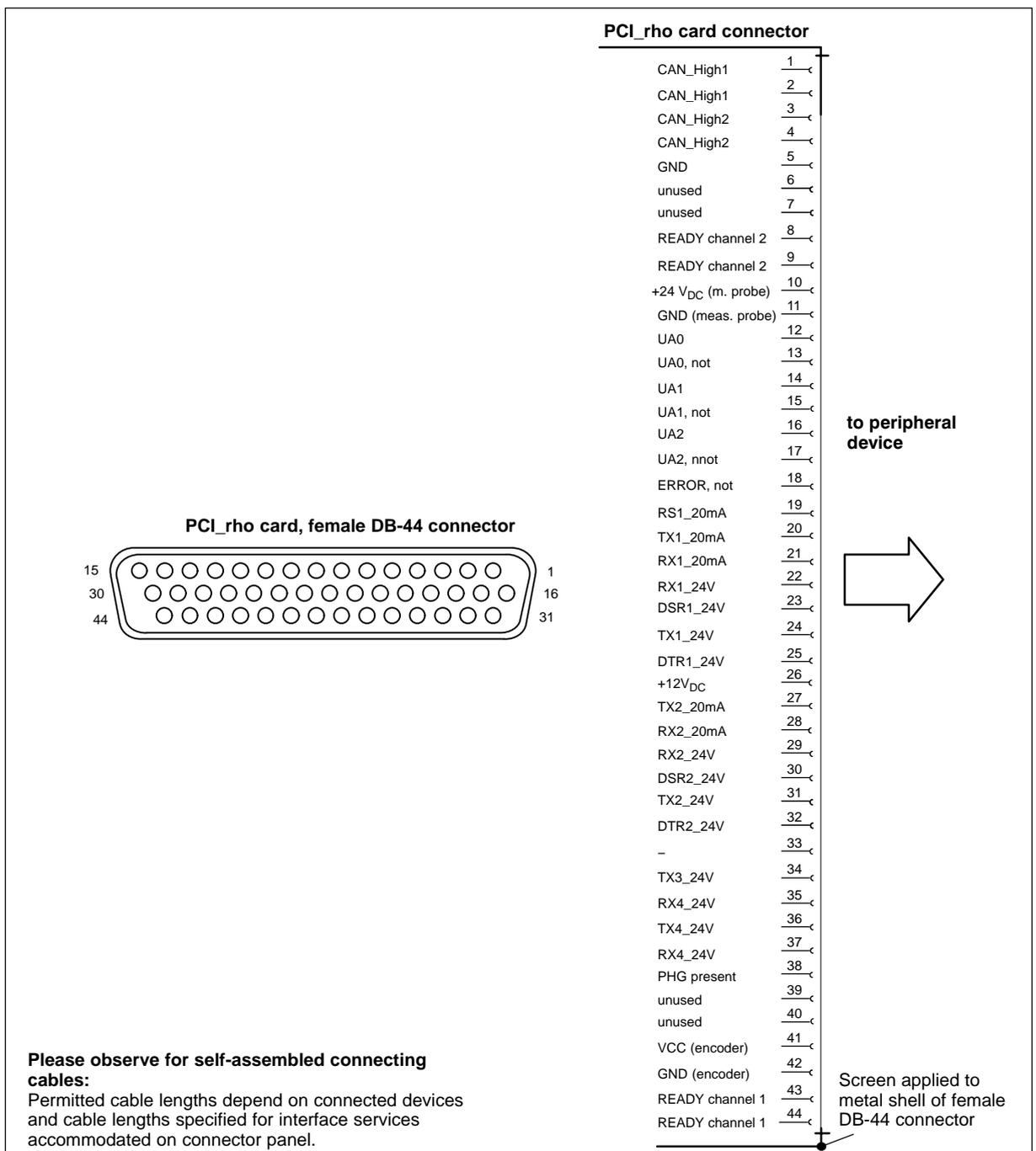
Interface Ports & Connectors

6.11 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

6.12 AF_PCI rho interface connector

The AF_PCI rho interface connector (X10, X31 thru X34, X35, X41, X51, and X52) on the rho4.1/IPC 40.2 is 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:

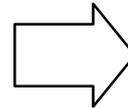
Ribbon cable, unshielded

AF_PCI rho in-line connector on PCI_rho card

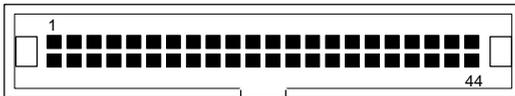
Explanation

CAN Controller 1	CAN_High1	1
	CAN_High1	3
CAN Controller 2	CAN_High2	6
	CAN_High2	9
	CAN_High2	12
	GND	15
reserved	unused	18
reserved	unused	18
Ready contact, channel 2	READY channel 2	21
Ready contact, channel 2	READY channel 2	24
Meas. probe input (24V Signa)	+24 V _{DC} (m. probe)	27
Meas. probe input (24V GND)	GND (meas. probe)	30
Incremental encoder (CC21)	UA0	33
	UA0, not	36
	UA1	39
	UA1, not	42
	UA2	2
	UA2, not	4
	ERROR, not	7
PHG Reset signal, 20mA	RS1_20mA	10
UART channel 1	TX1_20mA	13
	RX1_20mA	16
	RX1_24V	19
	DSR1_24V	22
	TX1_24V	25
	DTR1_24V	28
Internal 12 V	+12 V _{DC}	31
UART channel 2	TX2_20mA	34
	RX2_20mA	37
	RX2_24V	40
	DSR2_24V	43
	TX2_24V	5
	DTR2_24V	8
GND	-	11
UART channel 3	TX3_24V	14
	RX4_24V	17
UART channel 4	TX4_24V	20
	RX4_24V	23
0 = No PHG connected	PHG present	26
reserved	unused	
reserved	unused	
Operating power for incremental encoder, max. 350 mA VCC (encoder)		35
GND for incremental encoder	GND (encoder)	38
Ready contact, channel 1	READY channel 1	41
Ready contact, channel 1	READY channel 1	44

to interface connector AF_PCI rho



AF_PCI rho interface connector (internal on PCI_rho card)



Interface Ports & Connectors

6.13 Expansion Card Interfaces

6.13.1 PCI_BM-xxx Cards

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

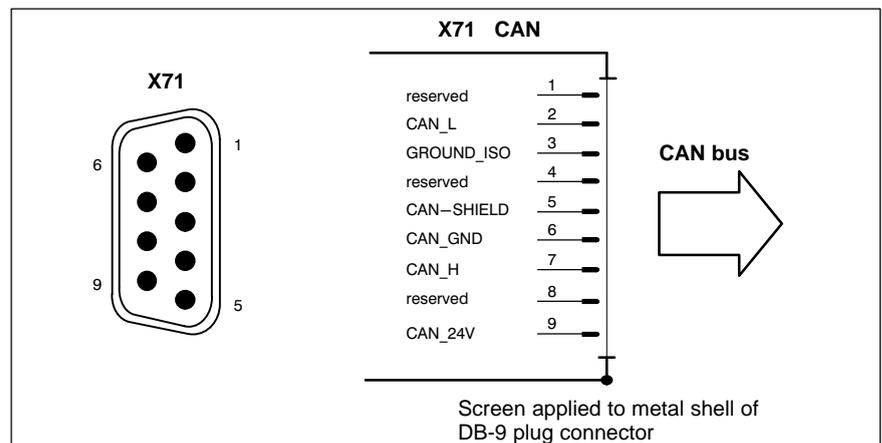
Depending on model, X71 on the busmaster expansion card has been assigned one of the following **bus systems**:

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

X71 CAN-Bus "PCI_BM-CAN"

Male DB-9 connector

Type:	CANopen bus
Cable length:	depending on baud rate max. 25 m with 1 Mbit/s
Cable type:	Screened, min. cross-section 0.14 mm ²
Transmission rate:	up to 1 Mbit/s



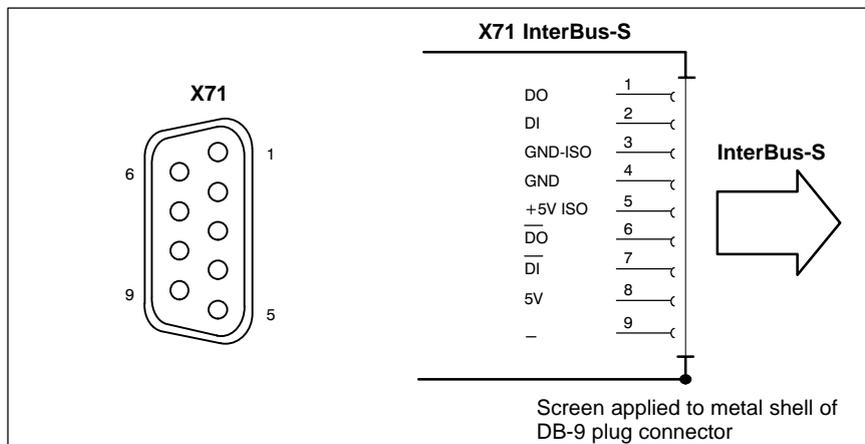
X72 This interface is currently not supported by the rho4.1/ IPC 40.2

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/IPC 40.2

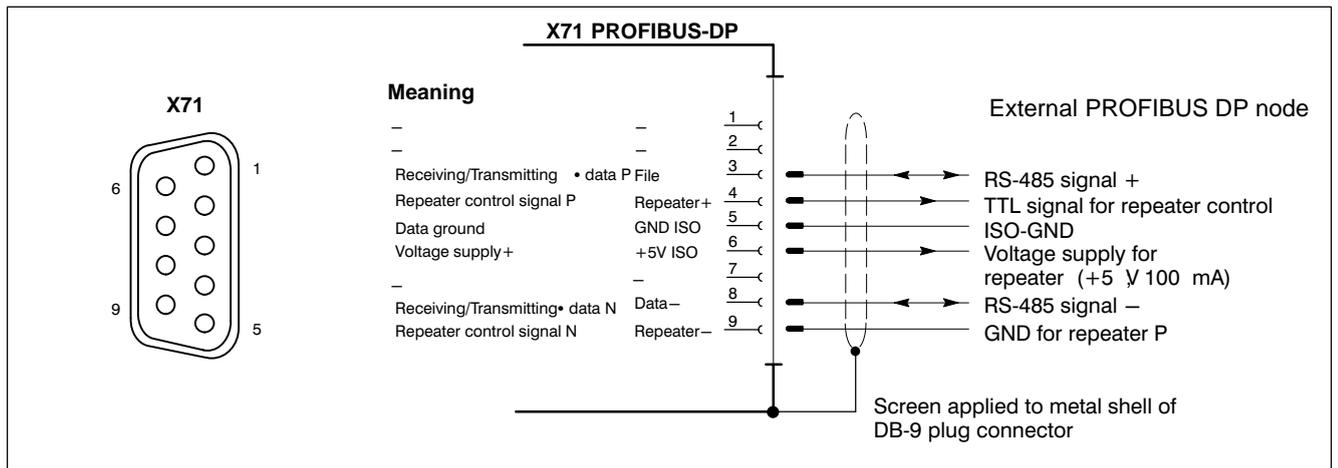
Interface Ports & Connectors

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 mm²



X72 This interface is currently not supported by the rho4.1/IPC 40.2

Interface Ports & Connectors

Notes:

Display- and Operating Components

7 Display- and Operating Components

7.1 Monitor and keyboard

For display and operation of the rho4.1/IPC 40.2 we recommend the especially for industrial uses developed control panels VDP 16.2, VDP 40.2 and VDP 60.1, which are connected via GIGABIT4 interface to the rho4.1/IPC 40.2. These control panels are available with different display sizes. They are equipped with a keypad or touch screen.

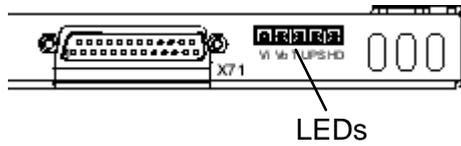
 **A detailed description you find in the corresponding documentation of the control panels.**

To the rho4.1/IPC 40.2 you can also connect a standard monitor (connector XVGA), a PS/2 keyboard (connector XKeyb.) and a PS/2 mouse (connector XMouse).

 **If a VDP is used, the keyboard and mouse could only be connected to this device. The keyboard and mouse ports at the rho4.1/IPC 40.2 are inactive.**

Display- and Operating Components

7.2 Operation- and error display



At the lower right area of the connector panel there are 5 LED for display device conditions and errors. Initiate the following step, if one of the LED display an error or indication.

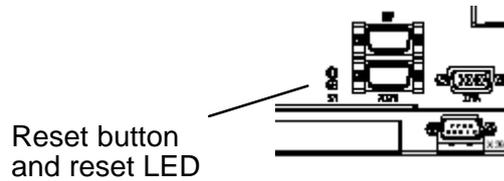
LED	Display	Explanation	Remedial measure
V _i	LED green	Standard operation	–
	LED Off	No 230/115 VAC or 24 VDC power supply	Check mains power input on power supply!
V _o	LED green	Standard operation	–
	LED Off	No internal +5 V power present	–
T	LED Off	Standard operation	–
	LED flashes yellow	Excess temperature	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!
HDD	LED yellow	Lights if a hard disk access is performed	–

LEDs for operation- and error display

Display- and Operating Components

7.3 Reset button

The reset button for actuating a reboot of the PC is located left beside the XCOM2 connector. A red LED above the button lights as long as the button is pressed. This serves for a better control that the button is pressed.



	Button/ Display	Explanation	Remedial measure
RESET	Button	Initiates a reboot	–
	LED red	Reset button is pressed	–

Display- and Operating Components

Notes:

Maintenance and Replacement

8 Maintenance and Replacement

The rho4.1/IPC 40.2 control is 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 fans at least once a year.



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.

- ☞ **For wearing parts the function compatibility is ensured for min. 5 years.**

8.1 Replacing the hard disk

The hard disk mounting frame is accessible by a flap. The hard disk can be replaced inclusive the mounting.



CAUTION

Loss of data!

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



CAUTION

Danger to the module!

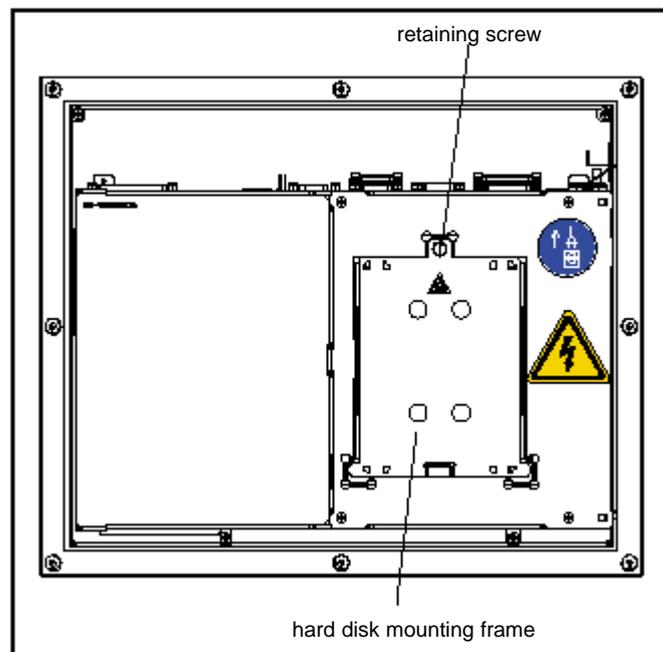
All ESD protection measures must be observed when using the module! Prevent electrostatic discharges!

-  **To safeguard application data, and to avoid the necessity of the time-intensive new installation of operating system and application programs following a hard disk replacement, the hard disk should be backed up at regular intervals.**

Procedure to replace the hard disk:

- ★ Backup all necessary user programs and operating system settings on an external data media or via the network connection.
- ★ Turn off the supply voltage.
- ★ 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). If necessary, remove all connectors as well the rechargeable battery pack cable at connector X19.
- ★ Release the retaining screw of the hard disk mounting frame at the upper side of the rho4.1/IPC 40.2 (see illustration next page). Flap off the mounting frame a little and disconnect the ribbon cable after unlocking the suppressing spring. Now the hard disk mounting frame inclusive hard disk can be extracted.

Maintenance and Replacement



Position of the hard disk mounting frame and retaining screw

- ★ The new hard disk is always delivered mounted in its mounting frame, and is installed in reverse of the sequence described above.
- ☞ **Check if the connections of the ribbon cable at the hard disk and all interface connections are correctly seated. Check if the supply voltage is intact.**
- ★ The new hard disk parameter are recognized by the system automatically. 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.
- ★ Once the operating system was properly installed from the Recovery-CD, the user data and operating system settings for standard operation must be restored.

8.2 Replacing the rechargeable battery pack



CAUTION

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 during system start has failed.
- The total number of charging cycles (see “Shutdown Count” option in the UPS program, page 3–14) exceeds the value in the table below.
- The red **UPS** LED on the front panel is flashing for more than 8 hours (refer to page 2).

A charging cycle is defined by switching the power on/off.

A harmful deep discharge of the rechargeable battery pack is prevented as long as the rho4.1/IPC 40.2 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 switch 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

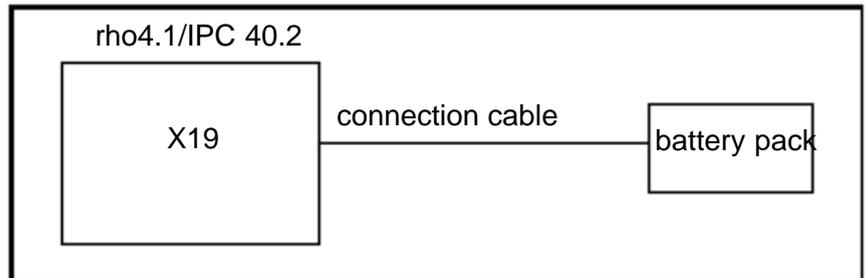
The used battery packs are recyclable, and can be returned to Bosch Rexroth upon replacement. They must not be disposed of in standard residential refuse.

Maintenance and Replacement

X19 External battery pack terminal

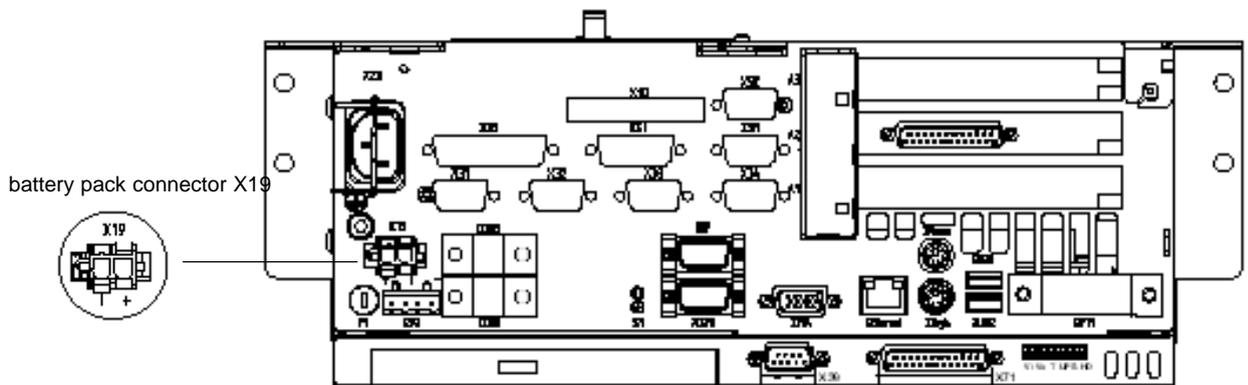
For the rho4.1/IPC 40.2 an external rechargeable battery pack for switch cabinet assembly is available.

For connection pre-converted cables with a length of 1,0 m and 3,0 m are available from Bosch Rexroth.



To connect the external battery pack proceed as follows:

- ★ Mount the battery pack in the switch cabinet
- ★ Switch off the supply voltage of the rho4.1/IPC 40.2. If necessary remove all connectors at the rho4.1/IPC 40.2.
- ★ Plug the 2-pole battery pack connection cable to the terminal X19 at the rho4.1/IPC 40.2. The original cable is polarity reversal secure.

**DANGER**

Polarity reversal of the rechargeable battery packs will result in an F10A (5x20) fuse being triggered on the power supply module.

Maintenance and Replacement

- ✎ **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.**

Testing the new battery pack

- ★ Switch on the supply voltage of the rho4.1/IPC 40.2.
- ★ Pay attention to the LED “UPS” at the front panel:
 - battery pack already charged: UPS-LED **off**
 - battery pack discharged: UPS-LED flashes **red**
- ★ Wait approximate 5 hours until the battery pack is charged and the UPS-LED **expires**.

Maintenance and Replacement

8.3 Expansion cards

The unit provides 1 slot for PCI bus- and 1 Slot for PCI or ISA bus-expansion cards:

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

 **Expansion slot no. 2 is occupied by the PCI_rho card. Busmaster cards must be inserted in slot 1 (1st slot from the bottom).**

**CAUTION**

Damage to PC or expansion cards through electrostatic discharges!

All ESD protection measures must be observed. Prevent electrostatic discharges!

**CAUTION**

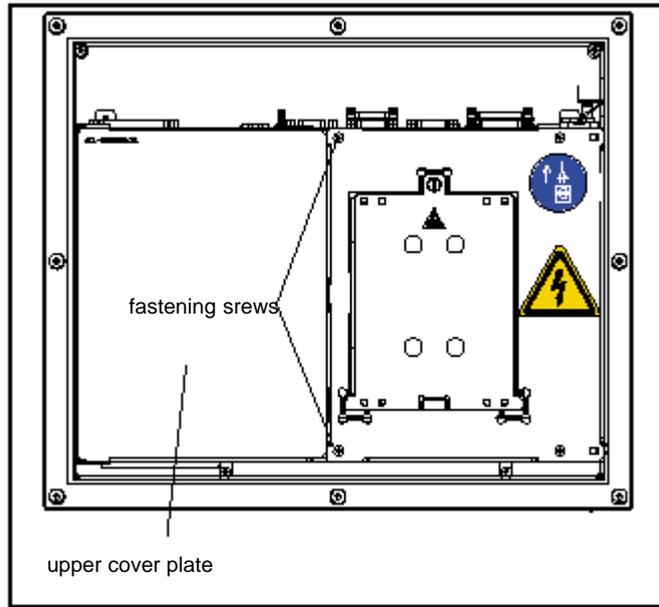
Damage to PC or application software through unauthorized expansion cards.

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

8.3.1 Installing an expansion card

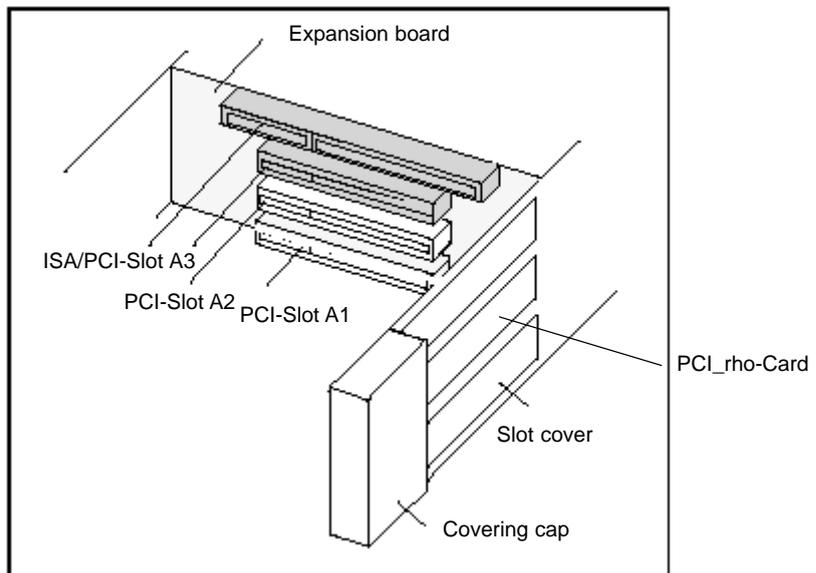
- ★ Switch off the power to the unit. Unplug all connectors if required.
- ★ Wait until the power supply performs an automatic shutdown after UPS operation (**UPS** LED on front panel illuminates **red** until UPS shuts down the power supply).
- ★ Remove the battery pack cable at X19.
- ★ Open the upper cover plate. For that purpose remove only the fastening screws on the side of the expansion card slots; then this part of the cover can be opened.

Maintenance and Replacement



Position of the upper cover plate and fastening screws

- ★ To close the air gap, a covering cap is assembled. Remove this part.
- ★ Remove the mounting screw holding the slot cover.
- ★ Insert the expansion card, and secure it with the mounting screw.



Position of the expansion slots

- ★ Reassemble the covering cap.
- ★ Reassemble the cover plate.

Maintenance and Replacement

- ★ Attach the battery pack cable.

**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!**

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 to try out new configuration settings in both BIOS and operating system.**

8.3.2 Installing an Introc card

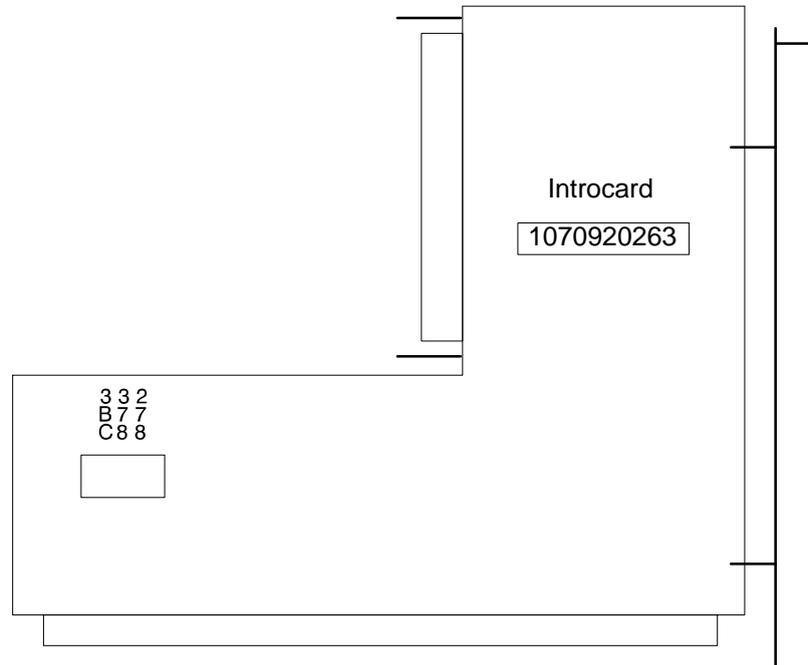
Follow the procedures as described in section 8.3.1. In addition, you will be required to perform the following steps:

- ★ Remove both screws from the Introc card 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 Introc card mounting bracket to unit housing.

Maintenance and Replacement

Selecting address for Introcard

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



Software

9 Software

To facilitate loading of operating- and application-software, a CD-ROM and an Ethernet connection for network access are provided.

The rho4.1/IPC 40.2 control is shipped from the factory preinstalled with different software complements. These include:

- Operating system and drivers
- Utilities
- Application software

9.1 Operating system and utilities

	Software rho4.1/IPC40.2
Operating system	Windows XP Professional
UPS utility program	UPS _{NT}

 **Accessory software (e.g. for ext. control panel) you find in the folder “C:\Support”. All required hardware drivers for the operating system you find in the folder “C:\Drivers”.**

9.2 Arranged user and passwords

In certain circumstances (e.g. activation of a screensaver with password protection) the password of the current user is required. Two user are set up:

- Administrator --> Password: none (press only Enter)
- Rexroth --> Password: 'Rexroth'

The user “Rexroth” is used at the automatic login.

Software

9.3 Application software

The following Bosch Rexroth application software options are available:

Application	rho4.1/IPC 40.2
WinSPS PLC programming software	●
WinDP Field bus parameterization for PROFIBUS-DP	●
WinCan Field bus parameterization for CAN bus	●

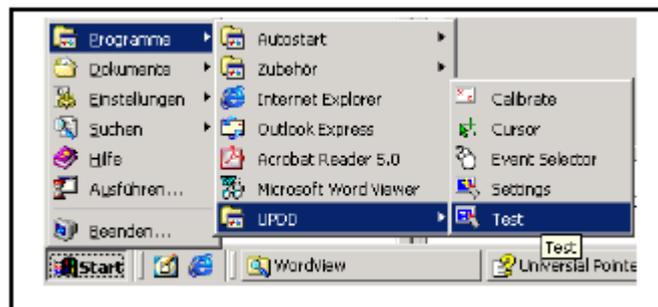
● = provided

9.4 Touch-Screen-Software

The control panels VDP 16.2 as well as VDP 40.2 have a built in touch screen, which allow operation by a touch sensitive surface.

For communication of the touch screen controller with the rho4.1/IPC 40.2 the serial interface XCOM2 is used, therefore this interface is not available at the connector panel in this case.

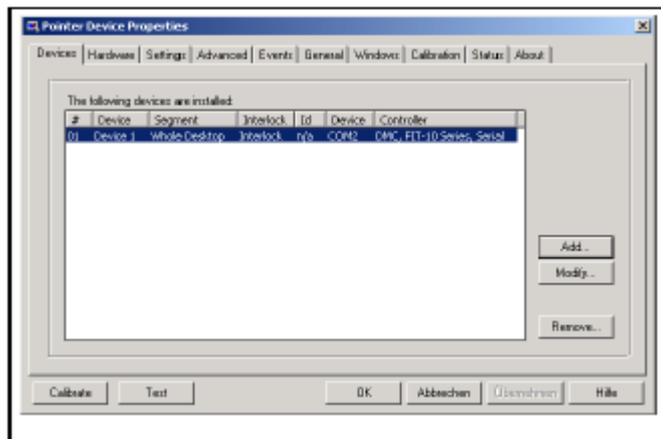
At a rho4.1/IPC 40.2 with an external operating panel the required driver software is installed ex works. Modifications are possible by the application software "Pointer Devices" in the Windows Control Panel. The same setup program can be accessed by "Start -> Programs -> UPDD -> Settings".



UPDD setup programs for the touch screen

Software

After call of the program “Settings”, a dialog window for several settings appear:



Dialog window to adjust the touch screen

For more details select the “Hilfe”-button on the current index card.
If necessary more useful programs are available by “Start -> Programs -> UPDD”.

Of particular interest may be the program “Calibrate”, which allow to calibrate the touch mouse. For that purpose, touch consecutively at a time the center of the four displayed crosses.
To this programs you can get more details by the online help.

Software

Notes:

Ordering Informations

10.2 Accessories

Mains connection

Designation	Order no.	Description
B-AC female connector NETZ 230V	1070 912881	Mains connector 230 V, right-angled, for user assembly
BKS-U-N-NTZKAB-IPCRHO-002,5-P	1070 048937	Mains cable 230 V, with female right-angled connector, length 2,5 m

Battery pack and cable

Designation	Order no.	Description
SUP-E01-BTV 16/40	1070 170041	External battery pack BTV 16/40/60
IKL0265/003,0	1070 170040	Connection cable for external battery pack BTV 16/40/60, length 3,0 m
IKL0264/001,0	1070 170156	Connection cable for external battery pack BTV 16/40/60, length 1,0 m

Connector for X10 (rho4 connector panel)

Designation	Order no.	Description
Female connector X10	1070 916 914	Power supply and real-time interface for PHG2000, 14-pin

USB-Stick 64 MB

Designation	Order no.	Description
Flashdisk USB 64 MB	1070 922 511	USB-Stick (e.g. for data backup)

Ordering Informations

Connection cable for VDP 16.2, VDP 40.2 und VDP 60.1 (GIGABIT4-Interface)

Designation	Order no.	Description
BKS-U-H-G4****-IPCVDP-001,0-P	R911307684	Connection cable IPC-VDP, high-flex, 1 m
BKS-U-H-G4****-IPCVDP-005,0-P	R911306043	Connection cable IPC-VDP, high-flex, 5 m
BKS-U-H-G4****-IPCVDP-010,0-P	R911306046	Connection cable IPC-VDP, high-flex, 10 m
BKS-U-N-G4****-IPCVDP-020,0-P	R911306047	Connection cable IPC-VDP, high-flex, 20 m
BKS-U-H-G4****-IPCVDP-030,0-P	R911306048	Connection cable IPC-VDP, high-flex, 30 m

Ethernet cable for connection to program unit

Designation	Order no.	Description
Ethernet cable	1070 919 187	10BaseT, crossed lines, 0,15 m
Ethernet cable	1070 919 188	10BaseT, crossed lines, 2,5 m
Ethernet cable	1070 919 257	10BaseT, crossed lines, 5 m
Ethernet cable	1070 918 795	10BaseT, crossed lines, 10 m
Ethernet cable	1070 918 797	10BaseT, crossed lines, 25 m

Ethernet cable for connection via switch

Designation	Order no.	Description
Ethernet cable	1070 918 793	10BaseT, non-crossed lines, 2,5 m
Ethernet cable	1070 919 258	10BaseT, non-crossed lines, 5 m
Ethernet cable	1070 921 384	10BaseT, non-crossed lines, 10 m
Ethernet cable	1070 918 796	10BaseT, non-crossed lines, 25 m

Premanufactured fibre optic cable with strain relieve

Designation	Order no.	Description
Fibre optic cable	1070 917 885	male connectors on both sides, 2 m
Fibre optic cable	1070 917 887	male connectors on both sides, 5 m
Fibre optic cable	1070 918 956	male connectors on both sides, 10 m

Ordering Informations

Premanufactured fibre optic cable without strain relieve

Designation	Order no.	Description
Fibre optic cable	1070 917 886	male connectors on both sides, 0,23 m
Fibre optic cable	1070 917 884	male connectors on both sides, 0,33 m
Fibre optic cable	on request	male connectors on both sides, 0,43 m

Programming units and accessories

Designation	Order no.	Description
PHG2000	1070 918 443	Cable length 8 m
PHG2000EL	1070 919 860	Cable length 8 m
Extension cable in meter	1070 919 062	Min. 20 m to max. 60 m
Project engineering cable	1070 918 830	Connection PHG ↔ PC, 5 m

PCI busmaster cards

Designation	Order no.	Description
PCI_BM-DP	1070 078 905	PROFIBUS-DP
PCI_BM-CAN	1070 080 381	CANrho, CANopen
PCI_BM-IBS	1070 080 379	InterBus-S

Appendix

A Appendix

A.1 Abbreviations

Abbreviation	Meaning
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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