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**Mit Sicherheit
in die Zukunft**

Operating Manual

ProNumeric ProSycon

Controller on IPC hardware
for CNC/PLC (ProNumeric) and PLC (ProSycon)

Operating Manual ProNumeric / Prosycon Version 04/05
Part No. R4.322.2070.0 (322 381 60)



Operating Manual ProNumeric/ProSycon

Previous versions

03/01

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Pichelswerderstraße 3-5
D-13597 Berlin
Germany
Phone ++49.30.33005-330
Fax ++49.30.33005-305
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Document conventions

This manual uses the following signs to indicate a safety-related warning:



Possible injuries or damage to the equipment if relevant safety precautions were not to be taken.



Important information on the handling of the automation system or the respective part in the operating manual.

Object	Example
File names	MANUAL.DOC
Menus / Menu Items	<i>Einfügen / Graphik / Aus Datei [Insert / Graphic / From file]</i>
Paths / Directories	<i>C:\Windows\System</i>
Hyperlinks	<u>http://www.schleicher-electronic.com</u>
Program listings	MaxTsdr_9.6 = 60 MaxTsdr_93.75 = 60
Keys	<Esc> <Enter> (press first key, let go and press next key) <Ctrl+Alt+Del> (press all keys at the same time)



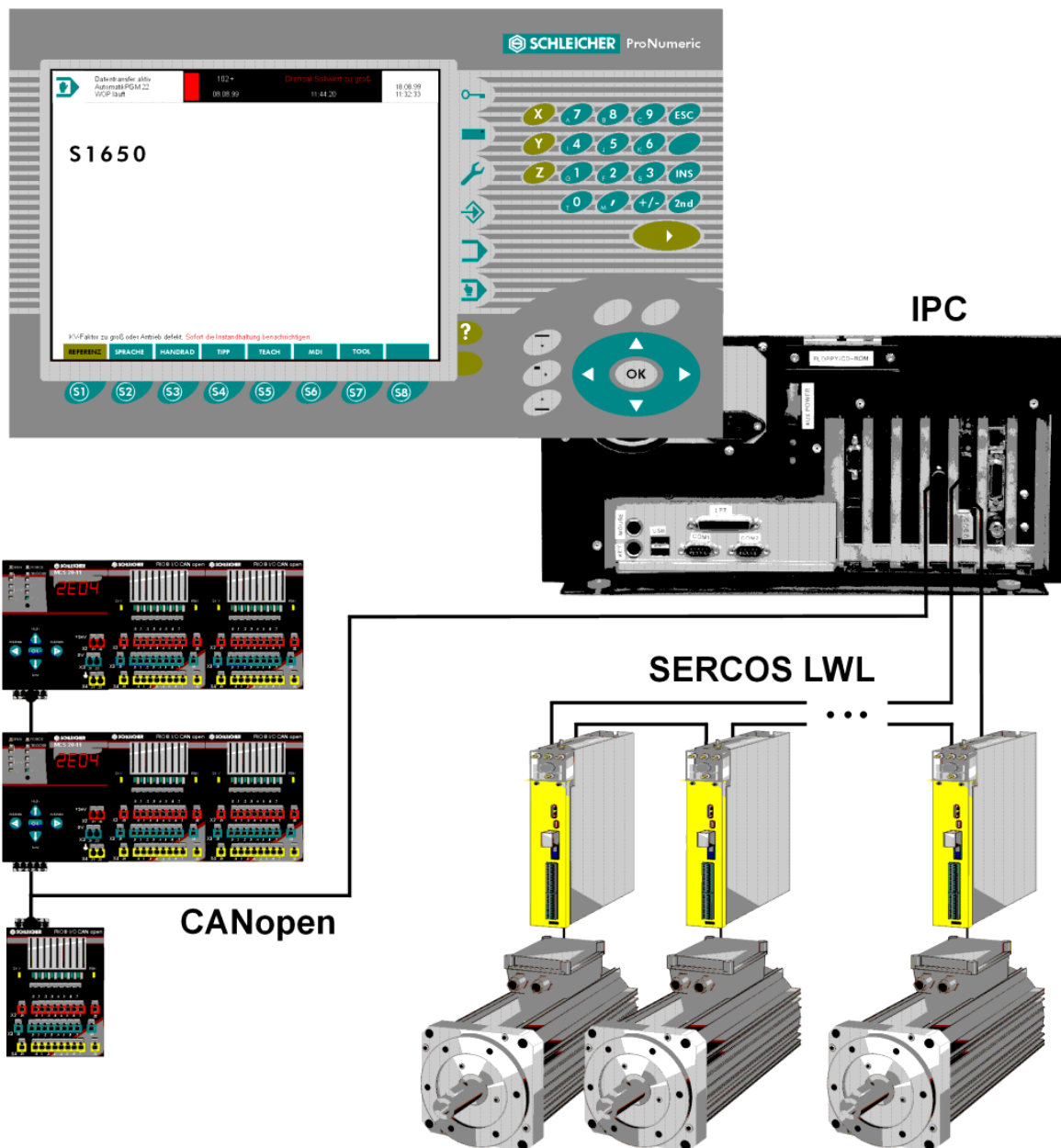
Chapters and text section which valid for both or single ProSycon or ProNumeric are marked with this symbol and specific text.

1 The ProNumeric / ProSycon Solution

ProNumeric = CNC + PLC, ProSycon = PLC

The system solution for CNC/PLC (ProNumeric) and PLC (ProSycon) with three main components:

- A proven industrial PC used as the control hardware
- Standardized CANopen and SERCOS (ProNumeric only) field bus systems for process communication
- Real-time VxWorks® OS which runs beside and independently of the WindowsNT® OS.





1.1 The industrial PC as an automation platform

The idea to use a PC as a platform for automation solutions is enticing. With many different hardware and software components available and continuing improvements of PC processing capabilities PCs could also be used to provide more powerful automation solutions. Thanks to modern information technologies PC solutions can now be used for worldwide communication processes. CNCs receiving their jobs and scheduling maintenance runs via email are now a reality.

In addition, PCs are most widely available and accepted worldwide. PC technology therefore protects your investment to a high degree.

An important aspect when using PCs is that they can operate in real-time, a feature which standard operating systems do not provide. The ProNumeric/ProSycon therefore uses a Real Time Operating System (RTOS).

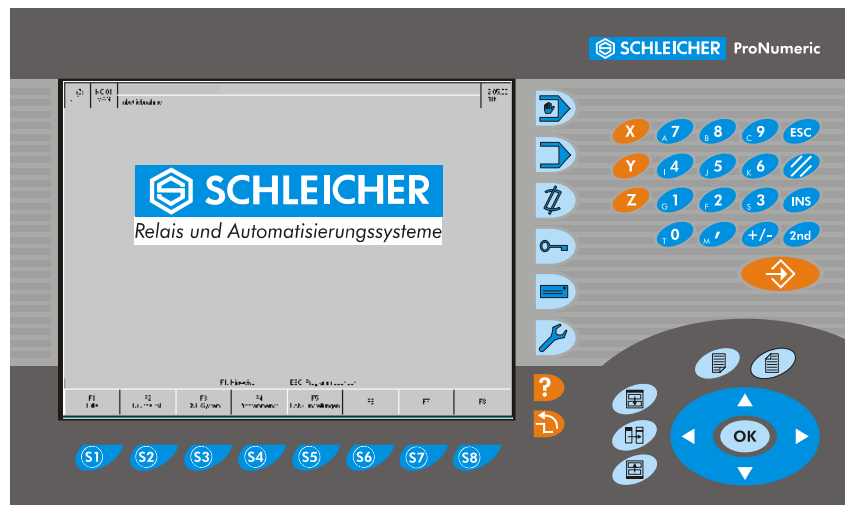
1.2 Real-time capability of ProNumeric / ProSycon

In order to provide real-time capability VxWorks® by Wind River Systems Inc. is used as a second operating system. WindowsNT® is not modified and runs with its original settings. VxWorks® and WindowsNT® communicate exclusively using the standardized TCP/IP protocol.

The advantages here are that the real-time capability is independent of the WindowsNT® version used and that VxWorks® provides an unrestricted real-time capability.

The user will receive the system already fully configured. VxWorks® launches automatically after WindowsNT® has been launched as usual and takes over the control of the PC.

2 The Operator Panel



2.1 Properties

- Built-in device for installation on the machine.
- Connect to any AT computer up to 50 m away.
- Front IP 65
- 12.1" TFT colour display
- Galvanized steel housing
- Connectors for connecting to AT computer:
- Repeater interface (PS/2 keyboard, PS/2 mouse, COM2 as RS 232)
- VGA connection
- Serial COM2 interface as RS 232 from AT computer
- PS/2 keyboard connection
- PS/2 mouse connection
- CE, VDE and UL approvals



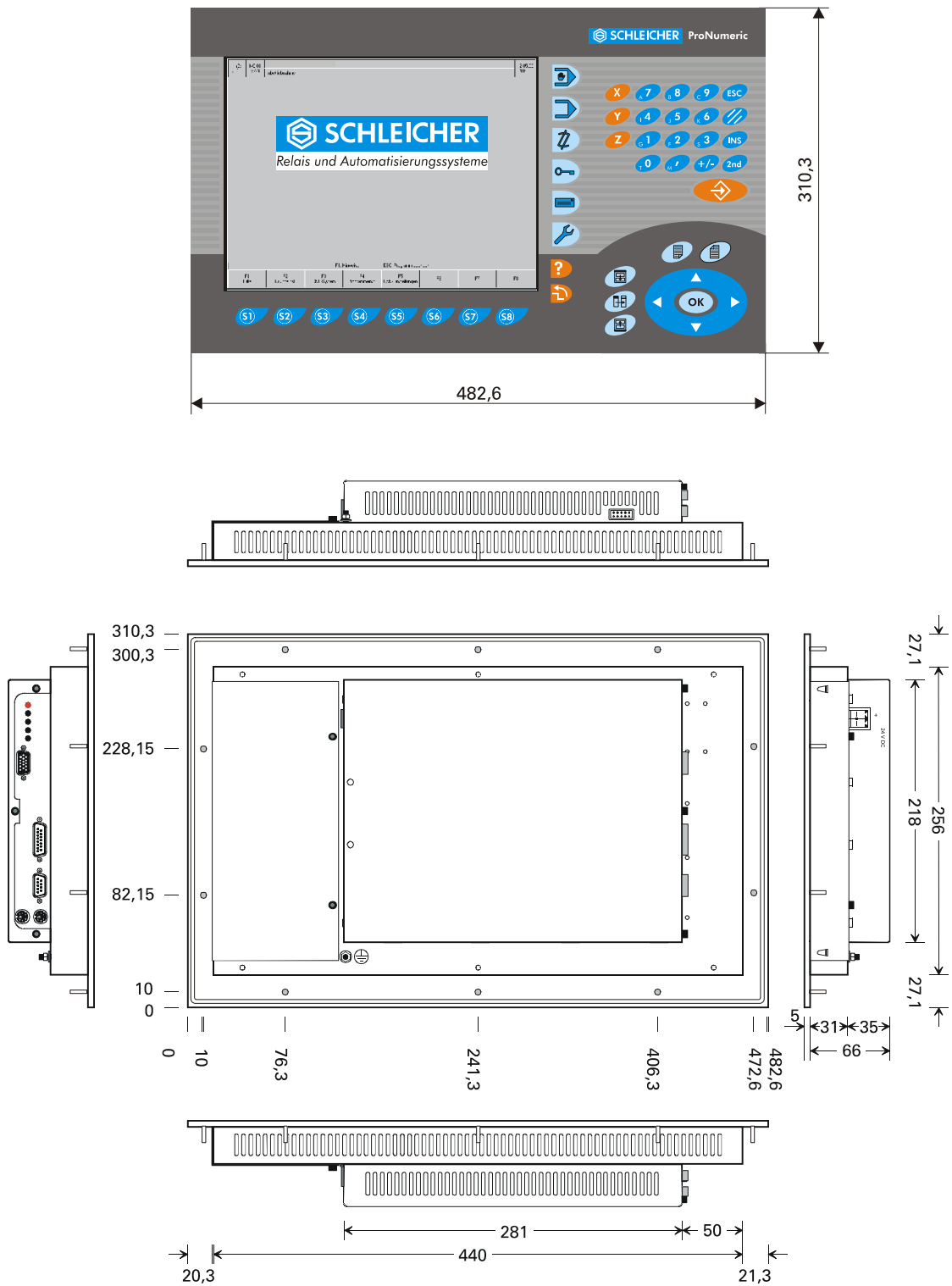
2.2 Technical Data

Front plate	Aluminium carrier board bonded foil
Safety class	IP 65 (front)
Operator panel	Foil keypad
Housing	1 mm galvanized steel
Flat-panel display	12.1" TFT colour display, SVGA (800 x 600)
Interfaces	Connectors for connecting to AT computer: – Repeater interface (PS/2 mouse, PS/2 keyboard, COM2 as RS 232) – VGA connection 1 x serial (COM2) as RS 232 from AT computer 1 x PS/2 mouse 1 x PS/2 keyboard
Supply voltage	24 V DC (19 ... 36 V DC) SELV ^{*)}
Power consumption	Max. 38 W
Weight	
Ambient temperature (operation) – vertical installation	With natural convection: +5 °C to +45 °C
Relative humidity	Max. 50% at +40 °C Max. 90% at +20 °C
Ambient air	Free of corrosive gases
Storage temperature	-20 °C to +60 °C
CE testing for EU conformity:	EMC directive 89/336/EEC
Interference emissions	EN 55011 or EN 55022
Interference immunity to	EN 50082-2



The connected voltage must meet the requirements of EN 60950 for a safety extra-low voltage (SELV).

2.3 Dimensions



General tolerance ISO 2768 K

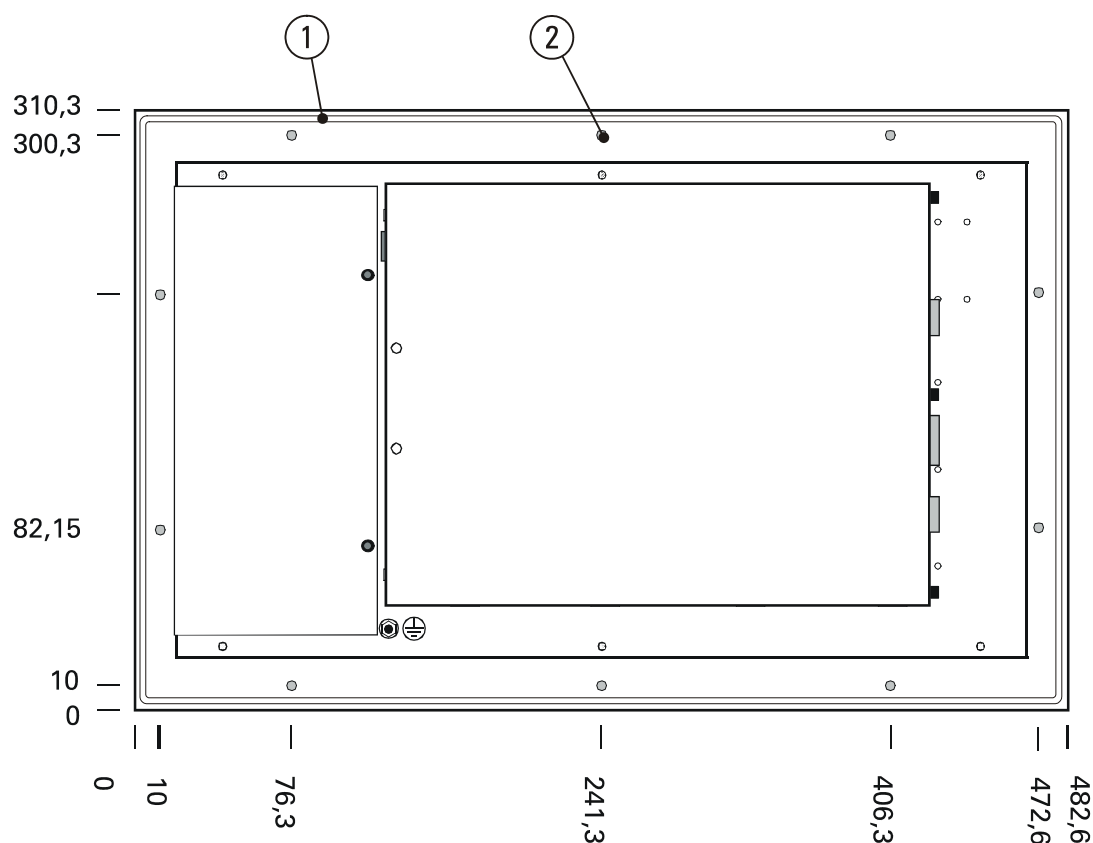


2.4 Attaching and Sealing

The operator panel is suitable for

- Cabinets and racks.
- Front-panels of enclosures and consoles.

1. Front plate for IP65 installation with cellular rubber seal on back.
2. On the back of the front plate there 10 FHS-M5-25 (PEM) threaded bolts for attaching.



IP 65 front protection can only be guaranteed if the panel is installed expertly using the supplied nuts for the M5 bolts and the seal is properly seated.

2.5 Ambient Temperature



The maximum ambient temperature for operation is +45 °C.

Before starting operation:

- Allow device to reach room temperature.
- If condensation occurs the device must not be switched on until it is absolutely dry.

Avoid overheating during operation:

Do not expose the device to direct sunlight

2.6 Ventilation

Ventilation slots on the top and bottom of the cover and tray

- Allow air circulation to cool the device.
- Must be kept open for troublefree operation.

Conditions for Installation

If the device is installed in a console, enclosure or similar, ensure that no heat accumulation occurs, and that the **max. permissible ambient temperature of +45 °C is not exceeded**.

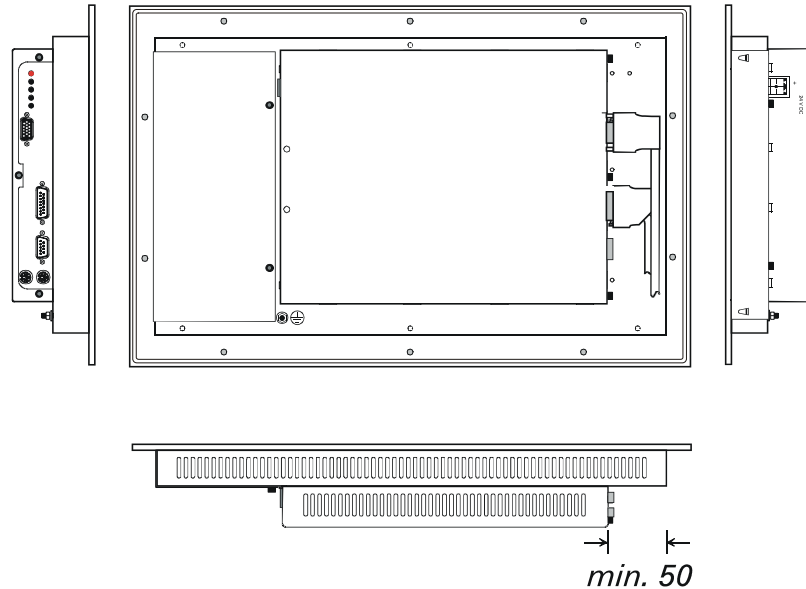
If a closed enclosure is used ensure sufficient ventilation.

The max. permissible ambient temperature for the "device in enclosure" unit depends on the thermal conductivity of the enclosure and on the ventilation. Ensure that the temperature of the air in the enclosure does not exceed +45 °C.



2.7 Spacing for External Connections

The connections are indented so that standard plugs will not protrude beyond the edge of the tray.



When working on the open device please observe the EGB guidelines.

2.8 Electrical Installation



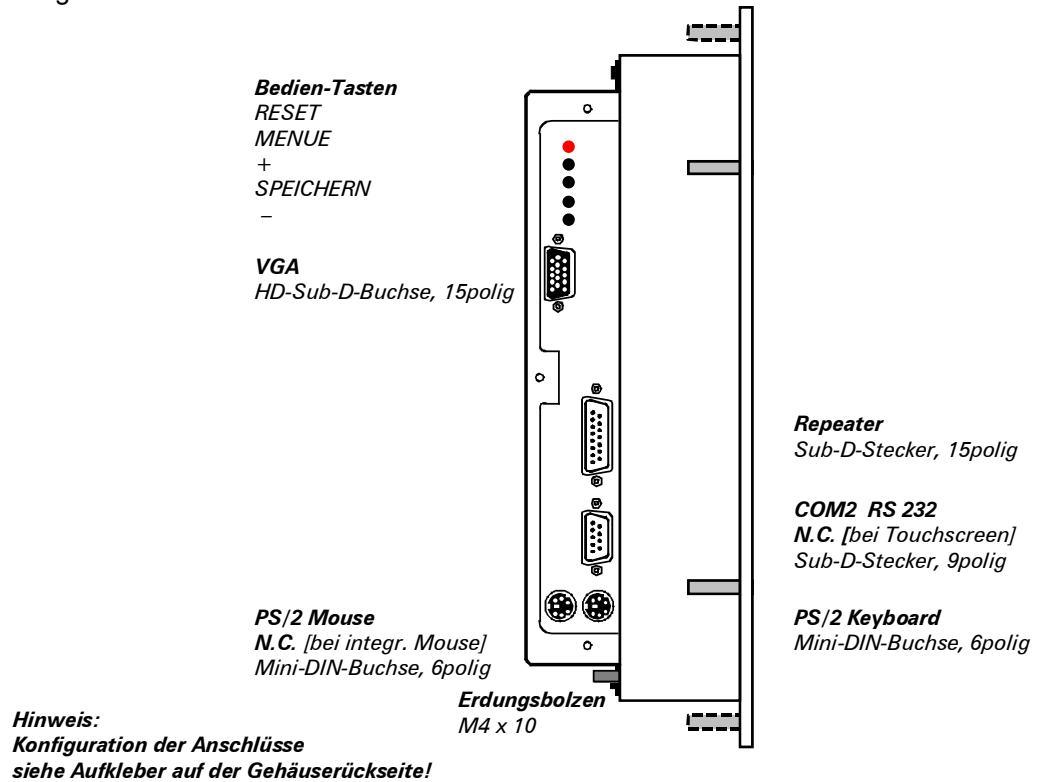
Interference-shielded cables form the basis for interference-free operation.

Use only shielded cables for all signal lines. Signal lines must not be installed in the same cable ducts as power cables.

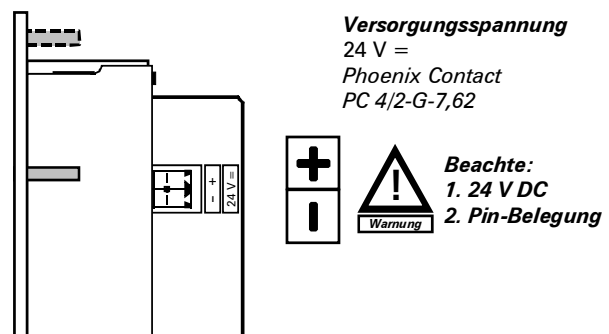
All connectors must be screwed or locked.

2.9 Position of Connections and Interfaces

Left side of housing



Right side of housing



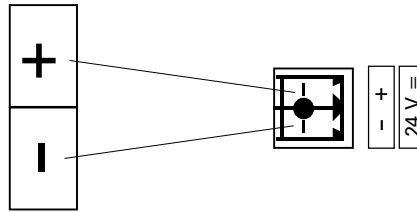
Never connect or disconnect connectors during operation.



2.10 Supply voltage

24 V DC (19...36 V DC) SELV.

Phoenix Contact PC 4/2-G-7,62



Before the voltage supply is connected:

The connected voltage must meet the requirements of EN 60950 for a safety extra-low voltage (SELV).

The voltage must match the permitted input range.

Pay attention to polarity - "+" and "-".

Connect ground point to enclosure ground

There is an M4 x 10 ground stud on the back of the housing tray.
Connect it to enclosure ground.



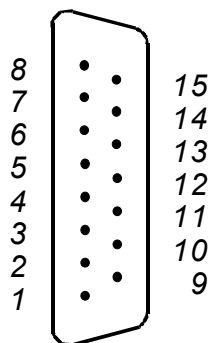
2.11 Periphery Connections

2.11.1 Repeater Interface

15-pin subminiature connector on the left side of the housing, labelled "Repeater".

The operator panel and the computer communicate via this interface. It covers the serial COM2, the keyboard and the mouse.

The operator panel passes all entries that the user makes on the operator panel, e.g. using the foil keypad, an external keyboard, the touchscreen or an external mouse, to the remote computer via this interface.



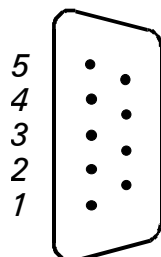
Signal allocation subminiature plug connector, 15-pin

1	COM_DCD	Data Carrier Detect	9	COM_DSR	Data Set Ready
2	COM_RxD	Receive Data	10	COM_RTS	Ready to Send
3	COM_TxD	Transmit Data	11	COM_CTS	Clear to Send
4	COM_DTR	Data Terminal Ready	12	COM_RI	Ring Indicator
5	GND	Ground	13	VCC	
6	GND	Ground	14	KBDAT	Keyboard Data
7	KBCLK	Keyboard Clock	15	MSDAT	Mouse Data
8	MSCLK	Mouse Clock			

2.11.2 Serial Interfaces COM2 [RS 232]

Serial interface on 9-pin subminiature connector as RS 232, labelled "COM2".

RS 232 interface subminiature plug connector, 9-pin

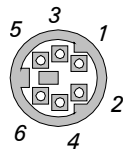
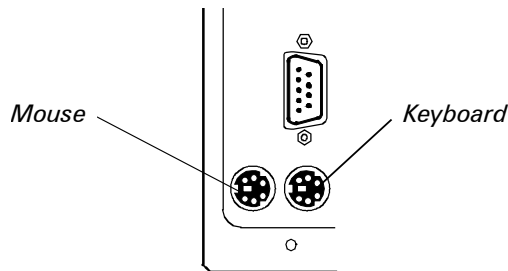


1	DCD	Data Carrier Detect	In
2	RxD	Receive Data	In
3	TxD	Transmit Data	Out
4	DTR	Data Terminal Ready	Out
5	GND	Signal Ground	---
6	DSR	Data Set Ready	In
7	RTS	Request to Send	Out
8	CTS	Clear to Send	In
9	RI	Ring Indicator	In



2.11.3 PS/2 Mouse and PS/2 Keyboard

Two adjacent 6-pin MiniDIN sockets on the left side of the housing for connecting an external mouse and an external MF keyboard:



6-pin MiniDIN socket

Mouse

1	MSDAT	Mouse Data
2	N.C.	
3	GND	Ground
4	VCC	
5	MSCLK	Mouse Clock
6	N.C.	

Keyboard

1	KBDAT	Keyboard Data
2	N.C.	
3	GND	Ground
4	VCC	
5	KBCLK	Keyboard Clock
6	N.C.	



The external mouse and keyboard must bear appropriate EMC certification (CE symbol).

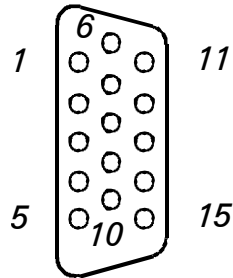
Do not connect or disconnect the mouse or keyboard while the computer is on.

You can use the foil keypad on the front plate in parallel with the external keyboard, but you cannot use two external keyboards at the same time.

2.11.4 VGA Connection

The operator panel receives the VGA signals from the connected computer via this interface.

15-pin HD subminiature "VGA" socket on the left side of the housing.



1	Video signal red	6	Ground red	11	Screen ID bit 0
2	Video signal green	7	Ground green	12	Screen ID bit 1
3	Video signal blue	8	Ground blue	13	Horizontal synchronization
4	Screen ID bit 2	9	N.C. (coded)	14	Vertical synchronization
5	GND (ground)	10	Synchronization ground	15	Screen ID bit 3

2.11.5 Remote Control of Display

You can connect a remote control unit for the display via a 10-pin plug connector on the bottom of the housing. It covers the function of the 5 buttons on the left side of the housing as well as switching the backlight on and off.

10-pin angle-entry plug connector on bottom of housing.

+ button	1	2	OE_LP
SAVE button	3	4	VCC
- button	5	6	GND
MENU button	7	8	Backlight on
N.C.	9	10	RESET button

2.12 Connection Between Operator Panel and PC

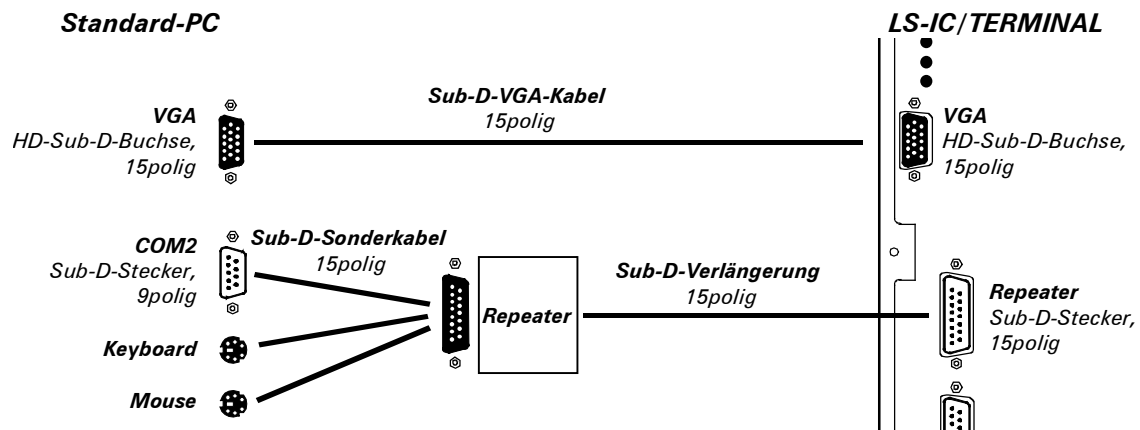
You have to make two connection between the operator panel and the control unit:

1. Graphic connection for display
2. repeater connection for operation on operator panel

The PC connections (COM2, keyboard and mouse) are connected outside the device to a 15-pin subminiature socket using a special cable. This special cable is 3 m long.

If the graphics card has an output driver the operator panel can be up to 50 m from the computer unit – although the display quality will suffer.

If the distance is greater you will have to use the repeater in the housing to amplify the signals and use an extension cable to connect to the operator panel.



2.13 Display

2.13.1 Properties

Colour active matrix LCD TFT (Thin Film Transistor)	
Resolution	SVGA 800 x 600 pixels
Display size	12.1" screen diagonal
Brightness	250 cd/m ²
Colours	262.144
Backlight	Double CCFT (Cold Cathode Fluorescent Tube)
	Service life under ideal conditions: approx. 30,000 hours (not guaranteed by display manufacturer.)

2.13.2 Replacing the Backlight

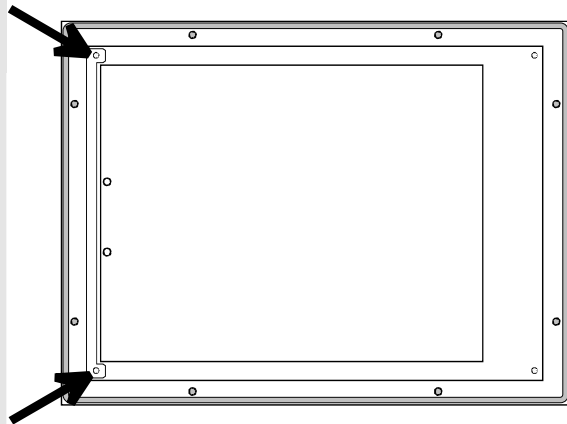
To replace the backlight tubes you have to remove the service cover on the left side of the housing (seen from the back).

You do not have to unscrew the front plate and the housing.

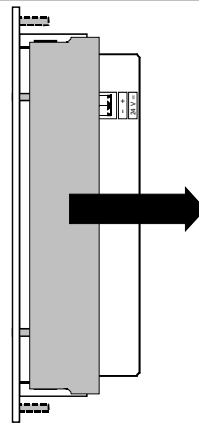
Panel-mounted devices: If there is enough space to the left of the housing (seen from the back) the operator panel can remain in place while you replace the backlight.

Description

Unscrew the two screws on the housing tray.

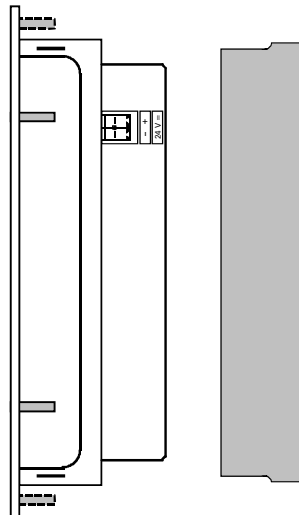


Pull the cover out to the rear.



The backlight tubes are accessible through the opening in the side of the housing tray.

A description of the steps involved in replacing the tubes is provided with the replacement tubes, as they differ according to the display type.

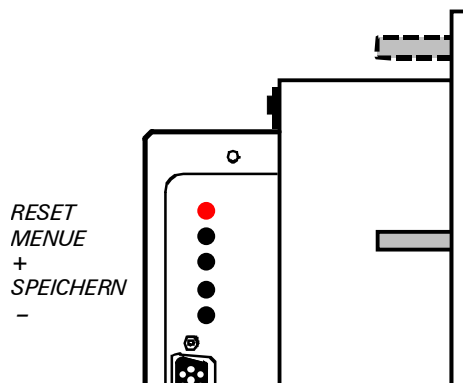


After you have replaced the tubes replace the cover and screw it down.



2.13.3 Display Setting Keys

On the left side of the housing there are five keys for adjusting the display.

The angled buttons are on the VGA/LCD converter card. They protrude through the side of the housing. You can also connect a remote control underneath the housing.



Key functions

	RESET	Reset hardware and software
(red)		Pressing the RESET button resets the hardware and software of the VGA/LCD converter. The set values are read out of the EE-PROM. This means that the last saved values are reactivated.
	MENU	Setting options for the display.
(black)		This key activates the individual setting options for the display: Pixel frequency Colour contrast

		Phase Vertical position Horizontal position Remove (The settings are described in section 2.)
●	+	UP
	(black)	Pressing this button increases the value in any mode.
●	SAVE	Saves the setting
	(black)	Pressing this button saves the current setting in the EE-PROM.
●	-	DOWN
	(black)	Pressing this button decreases the value in any mode.

Default settings

MENU hold RESET press	If you press and hold the MENU button and briefly press the RESET button at the same time the default settings will be read from the E-PROM to the EE-PROM. The display type will not be altered.
--------------------------	--

Setting the display type

If the display type in the memory does not match the connected display or the card is being used for the first time, you will have to set the correct type.

Procedure

Press RESET	Press the RESET button.
Press +	Pressing the "+" button moves up to the next display type in the table
Press RESET	Press the RESET button.
Press -	Pressing the "-" button moves down to the next display type in the table

Type numbers for displays

Manufacturer	Display type	Resolution	Size	Voltage	Type no.
SHARP	LQ104V1DG11	640 x 480	10.4"	5.0 V	0
SHARP	LQ12S41	800 x 600	12.1"	3.3 V	1
SHARP	LQ15X01W	1024 x 768	15.0"	5.0 V	2



The supply voltage for the display must be set correctly.
Jumpers JP1 and JP4 on the VGA/LCD converter card must not be altered.



2.13.4 Adjusting the Display

Default settings

The graphics card in the PC must be set to a refresh rate of 60 Hz and max. 16 million colours.

Setting the screen area

The easiest way to set the screen area is to use Windows 95 / Windows NT

Click on "Start" and then on "Shut down".

The "Shut Down Windows" box appears.

Set the screen area so that there are no vertical shadows.

If Windows is not available carry out the procedure with a grey screen.

The following table summarizes the typical settings:

Display	Graphics	Text mode	SVGA mode	XGA mode
640 x 480	799	899	844	
800 x 600	1000	1000	1055	
1024 x 768	1260	1260	1260	1340

Note:

Display 640 x 480: set at least 790 pixels

Display 800 x 600: set at least 820 pixels

Display 1024 x 768: set at least 1260 pixels

Setting the phase

Phase sets the scan rate for ideal image quality.

You should set the phase range (minimum phase and maximum phase) and a phase value in-between.

Vertical position

Displaces the display vertically.

Horizontal position

Displaces the display horizontally.

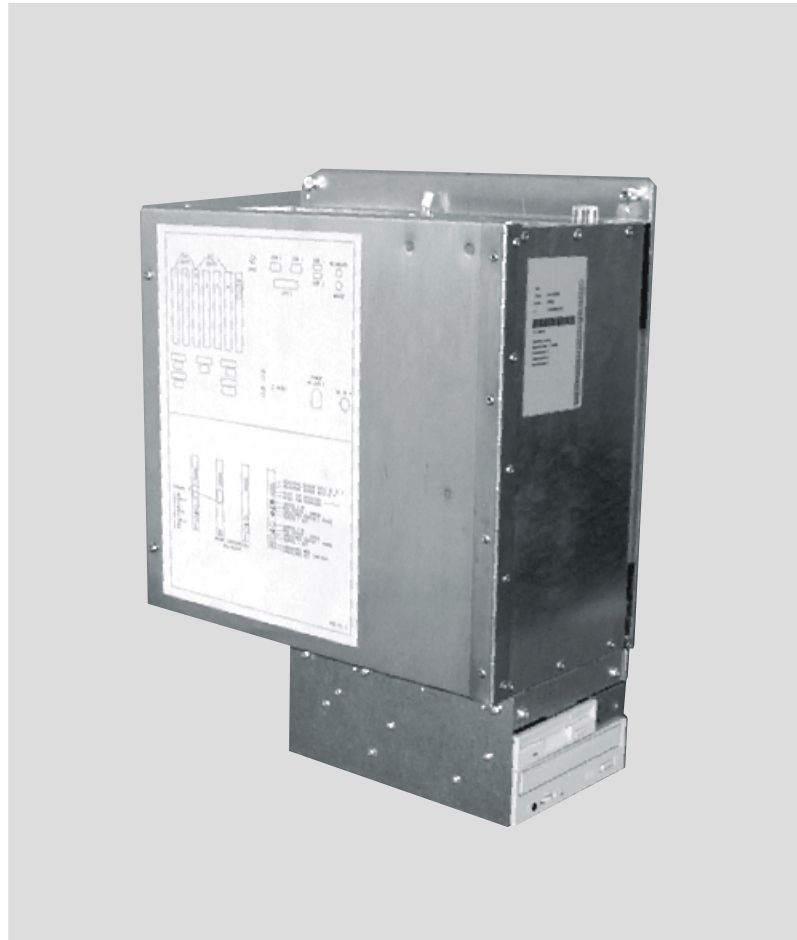
Remove

You can use this function to select the pixel of a character which is to be removed in text mode (720 x 400) when a 640 x 480 display is connected.

3 The PC Box



This chapter describes the PC Box for ProNumeric and ProSycon.



3.1 Features

- Industrial PC for high-performance CNC and PLC
- Celeron CPU 400MHz
- 64MB DIMM RAM
- 128KB L2 Cache
- 2.1GB hard disk
- SERCOS interface for up to 64 NC axes
- CAN field bus interfaces
- Galvanized steel box



Do not touch the inside of the PC Box - apart from when you are installing the power supply cable - as this will invalidate your warranty.



3.2 Technical data

Hardware		
Processor		Celeron
Processor speed		400MHz
Memory		64MB DIMM RAM
Cache		
Chip set		440 BX
Hard disk		2.1GB
Slots		3 ISA slots (if only 3 PCI slots are used, otherwise 2)
		4 PCI slots
		1 AGP slot
Interfaces		2 USB
		2 RS232
	Keyboard	PS/2
	Mouse	PS/2
Power supply		115 / 230V AC
Power consumption		200 W

Climatic conditions		
Ambient operating temperature		0 ... +55°C
Storage temperature		-40 ... +70°C
Relative humidity		15 ... 95%, no condensation
Operating height		0 ... 3000m

Mechanical strength		
Vibration	in operation	500Hz, 0.0001G ² /Hz
Shock	in operation	20G, 11ms
	not in operation	30G

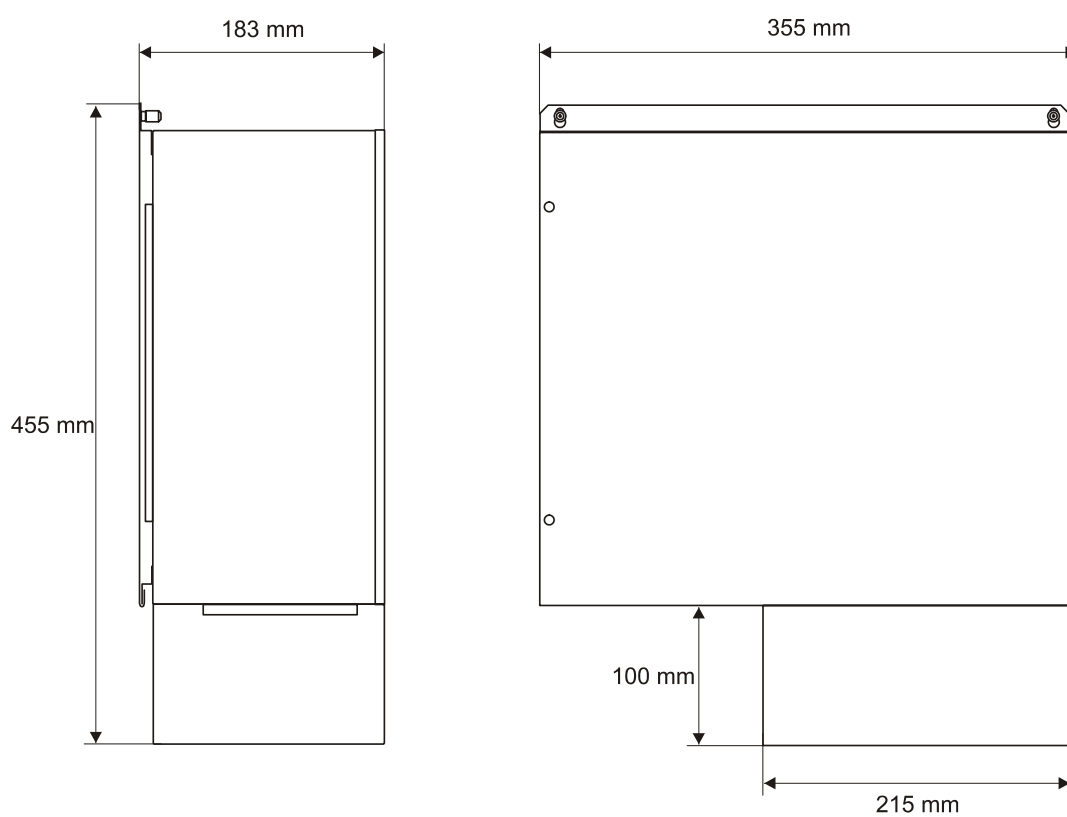
Electrical safety		
Safety class		IP 20 to EN 60529
Clearance/creepage distance		DIN EN 61131-2 and DIN EN 50178 between electrical circuits and objects as well as between electrically isolated circuits in accordance with overload category II, contamination level 2
Test voltage		AC 350V/50Hz

Electromagnetic compatibility		
Electrostatic discharge		EN 61000-4-2: 8KV air discharge, 4KV contact discharge
Electromagnetic fields		EN 50140: field intensity 10V/m, 80 ... 1000MHz
Burst		EN 61000-4-4: 2KV on DC supply lines, 1KV on I/O signal and serial interface lines
Interference emissions		EN 55011: Class A, Group 1

Mechanical	
Material of outer box	Galvanized steel
Wall mounting	Yes
Weight	10kg

Conformity	
CE	Yes
CSA	Yes
UL	Yes

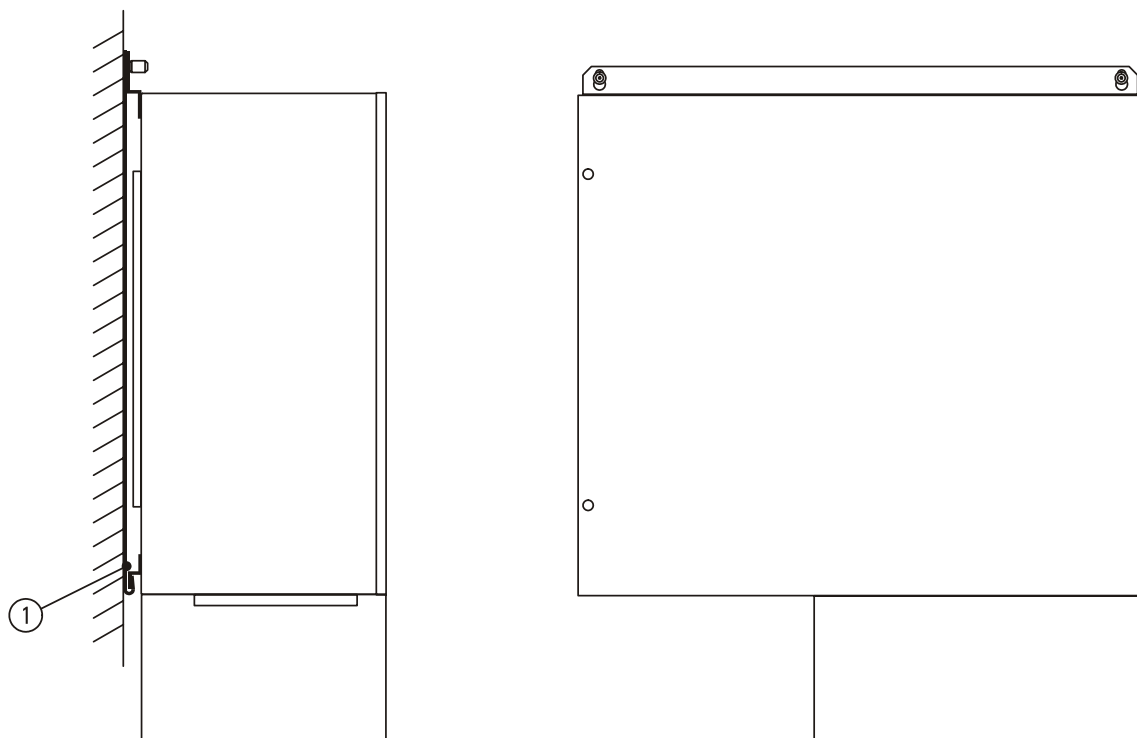
3.3 Dimensions





3.4 Installation position and installation instructions

3.4.1 Installation position



Fit the PC Box to the supplied support (1). Then fit this support to the mounting plate of the cabinet.

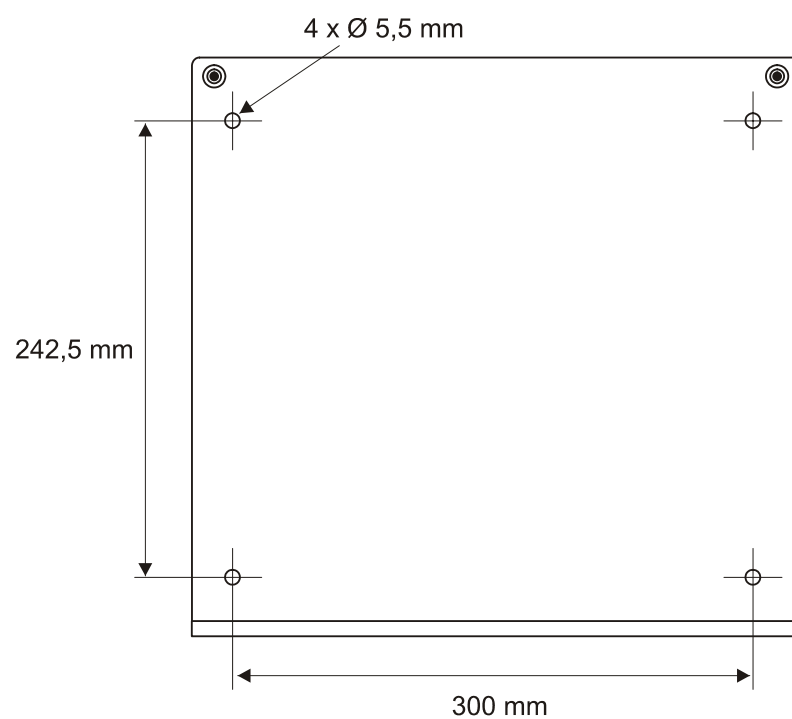
Secure the support using 4 M5 screws to provide a good electrical connection. Use toothed lock washers.



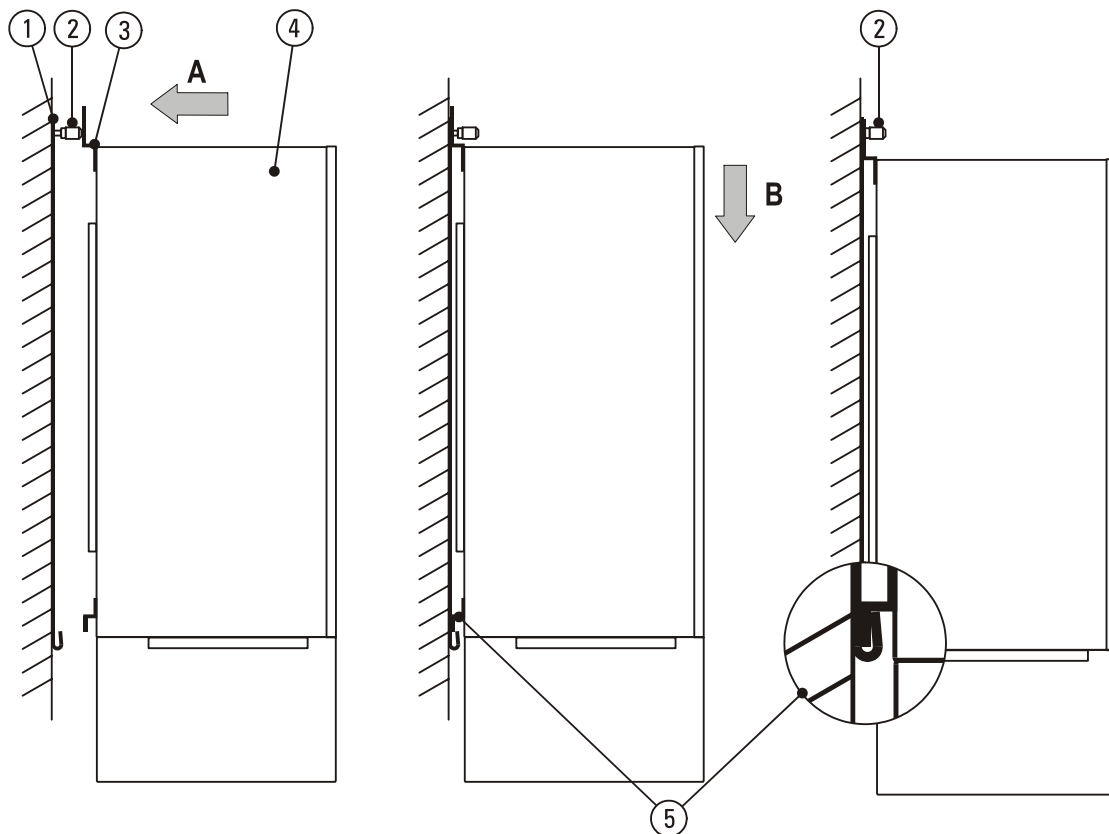
The PC Box must be installed in a vertical position.

The panel with all the ports must point to the top.

3.4.2 Dimensions of the support

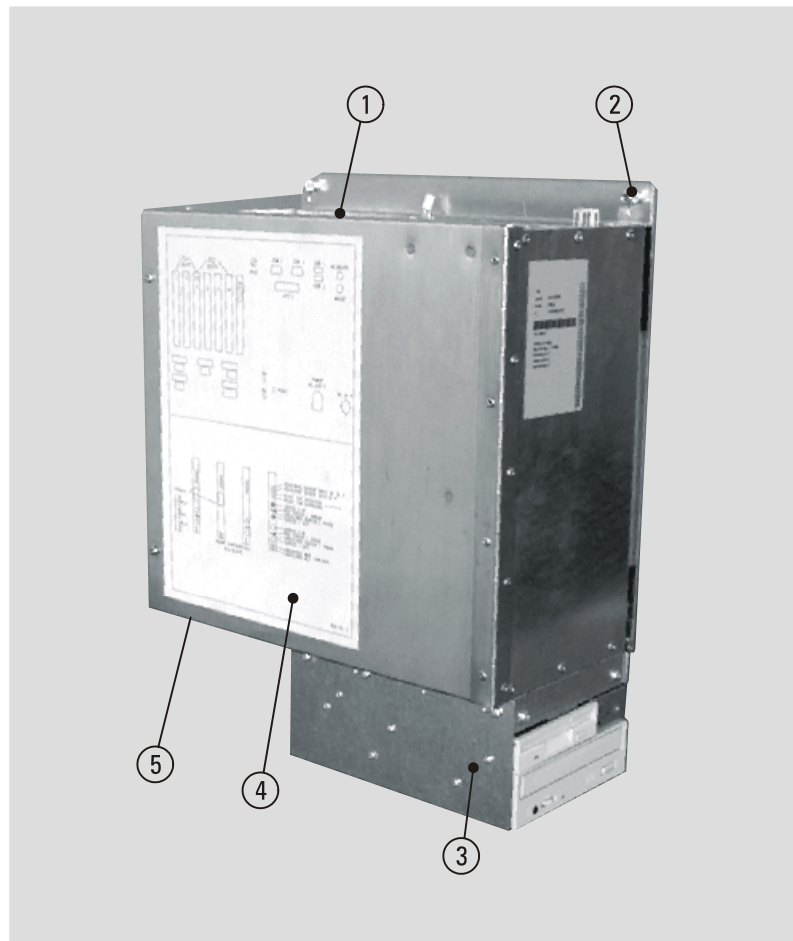


3.4.3 Installation instructions

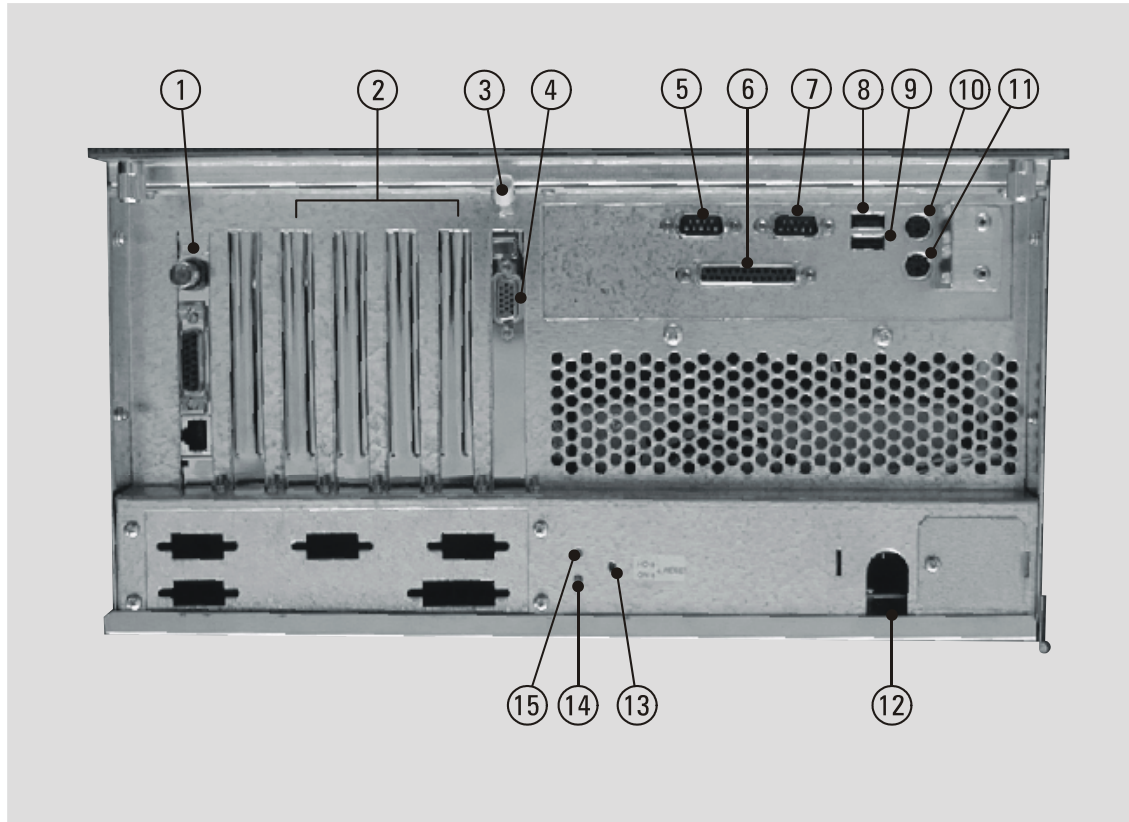


- Unscrew the knurled nuts (2) on the support (1).
- Move the PC Box (4) towards A as shown and position the key holes of the bracket (3) over the upper knurled nut.
- Then move the PC Box down towards B as shown. Make sure that the lower bracket (5) snaps securely into place in the gap of the support.
- Finally, secure the knurled nuts (2).

3.5 Functional elements and ports



Overview	
1	Top (includes all ports and operator panel controls)
2	Support
3	Drives box (can be turned in 90° increments)
4	Door of box
5	Fan including filter (underneath)



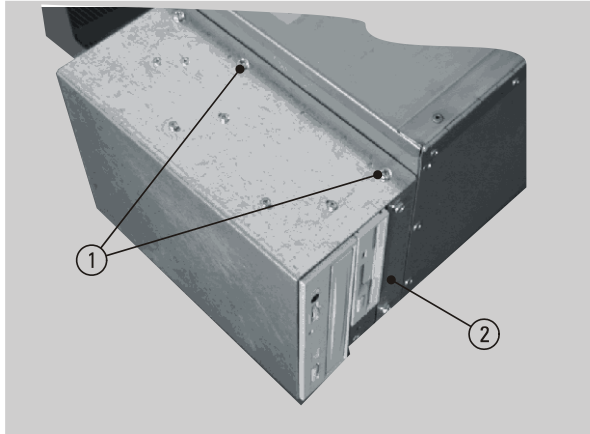
Top	
1	Network adapter
2	Slots for PN-MIC
3	GND
4	Monitor port
5	COM2 port
6	Printer port
7	COM1 port
8	USB1 port (Universal Serial Bus)
9	USB2 port (Universal Serial Bus)
10	PS/2 keyboard port
11	PS/2 mouse port
12	Power supply
13	Reset key
14	LED Power supply
15	LED Hard disk



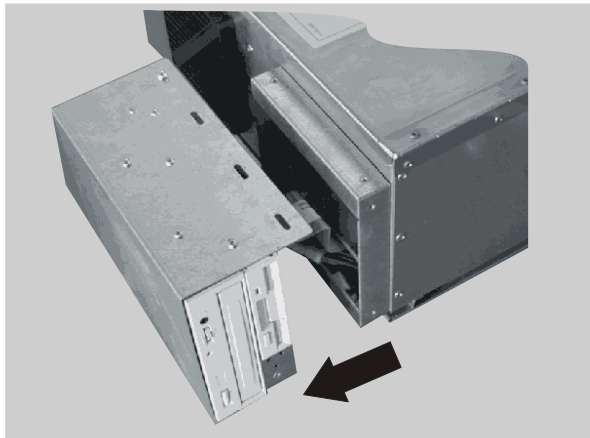
Do not connect or disconnect any peripherals, devices etc. during operation.

3.6 Turning the drives box

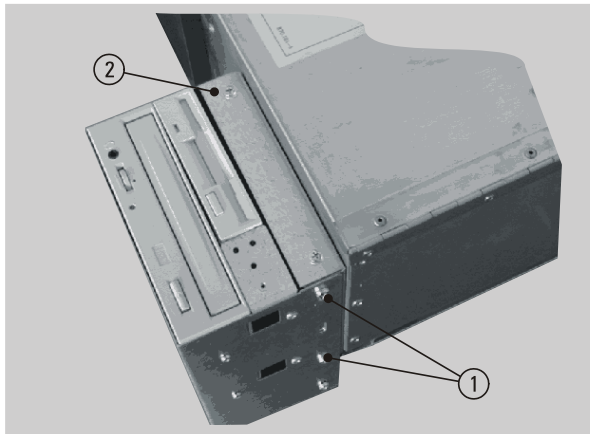
You can turn the drives box in 90° increments.



- Remove the front screws (1) on each side of the box.
- Remove the cover (2).



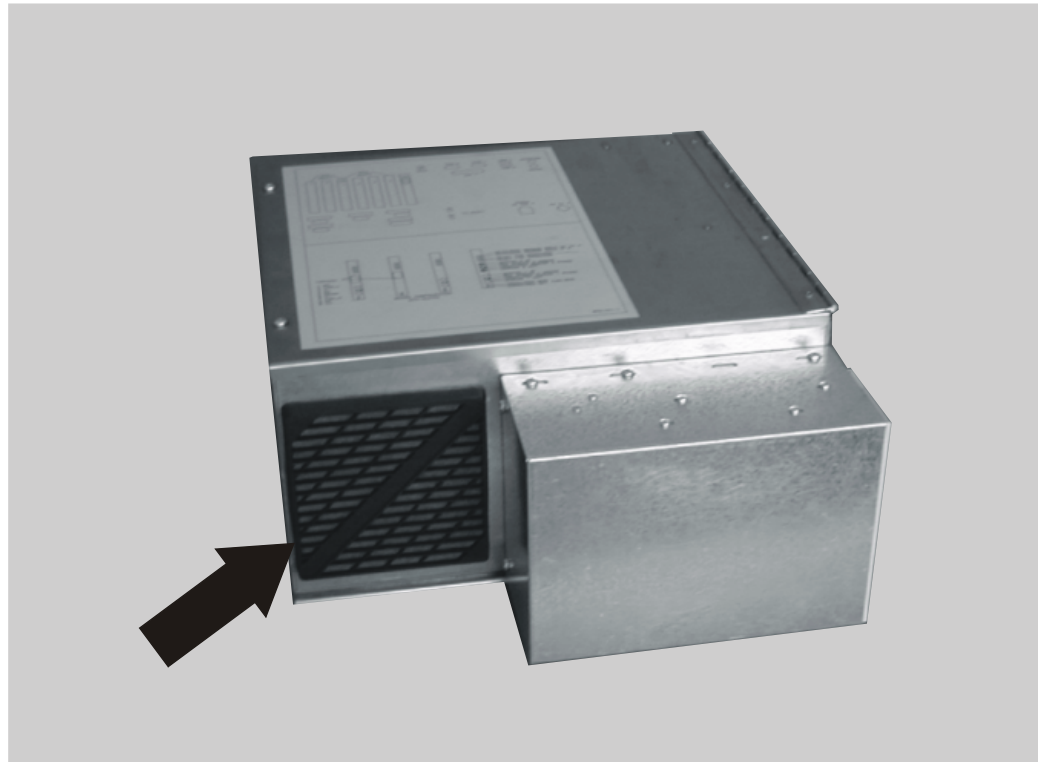
- Remove the box but pay special attention to the cables attached to it. Do not remove the attached cables.
- Turn the box to the desired position and place the cables carefully so that they do not get too twisted.
- Then put the box back in its position.



- Secure the front screws (1) on each side of the box.
- Replace the cover (2).



3.7 Device fan air filter



The cover for the device fan can be found under the PC Box.
Removing the cover provides access to a filter.



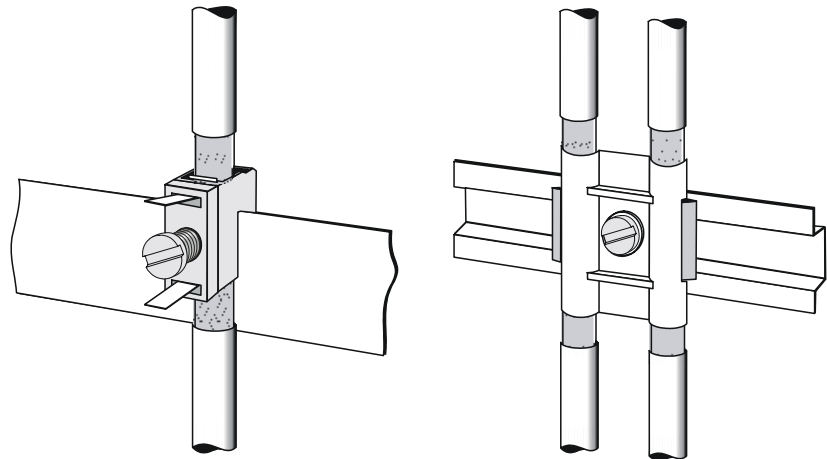
Clean or replace the device fan filter depending on how dirty it is.

Remove the cover to access the filter.

3.8 Electrical installation

3.8.1 Installation guidelines

- The PC Box must be installed in electrical equipment rooms or in earthed and closed metal cases (e.g. enclosures or cabinets).
- The GND at the top of the PC Box must be connected to metal of the cabinet or box using a short cable.
- The data connecting cable between the PC Box and other field bus equipment must be shielded. Both ends of the shield must be connected to the shield or ground wire potential (PE). Ensure that contact is made over a broad surface area and is sufficiently conductive.
- All digital and analog I/O lines must be positioned away from DC/AC conductors > 60V. Analog signal lines must be shielded. The shield must be provided with a large-surface connection to ground in the immediate vicinity of the modules. To secure the shielding, use metal cable clips which surround a large area of the shielding and provide a good contact to GND.





3.8.2 Power supply

Only use the supplied power supply cable.

The power supply is on the integrated power supply. Open the door of the PC Box to access it.



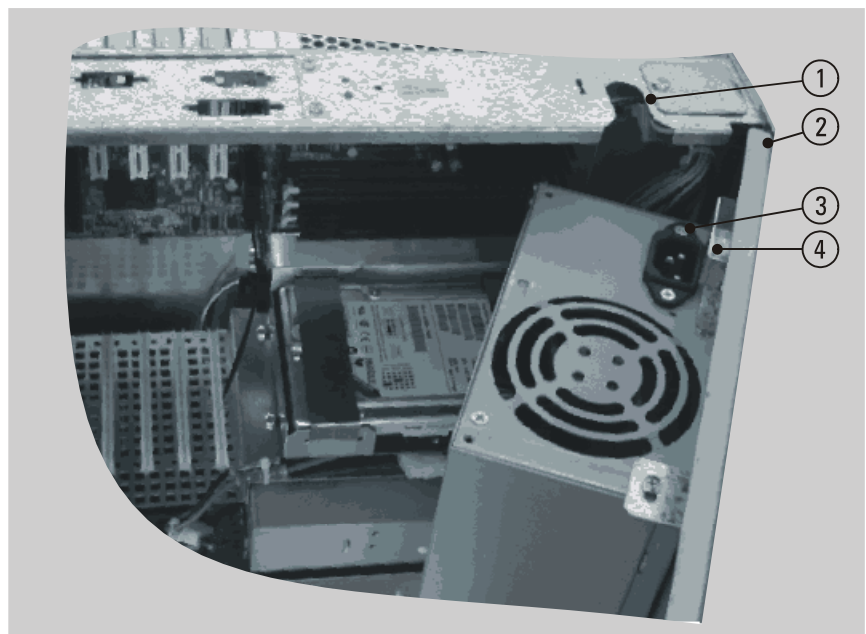
Switch the power supply off before you open the PC Box.



Only connect the power supply cable.

Do not touch anything else inside the PC Box as this will invalidate your warranty.

To open the door unscrew the two screws on the left-hand side of the door.



Power supply

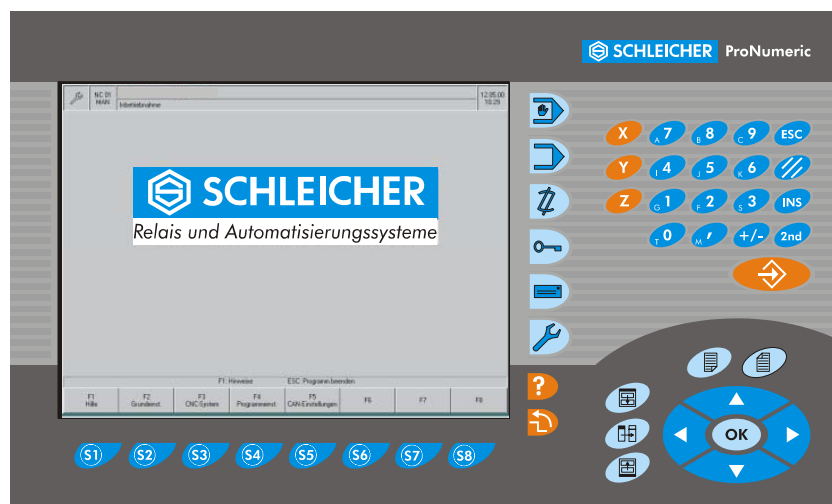
1	Opening in box for power supply cable
2	Door of PC Box (open)
3	Power supply on the integrated power supply
4	Bracket for power supply cable (use cable tie to attach cable)

4 The User Interface









The design of the user interface very closely follows the **HÜMNOS*** Style Guide. The aim is to make the user interface ergonomic, uniform and user-oriented. That brings significant advantages for the user:

- Shorter learning times
- Reduced training costs
- Increased acceptance
- Efficient use of the product
- Increased cost-efficiency of the product

***HÜMNOS** Herstellerübergreifende Module für den nutzerorientierten Einsatz der offenen Steuerungsarchitektur
(manufacturer-independent modules for user-oriented application of open control architecture)



4.1 The Keypad

	Explanation	Corresponding key on PC keyboard
 ... 	Softkeys Keys for initiating context-dependent actions. The associated designation is displayed on the screen.	<F1> to <F8>
Operating keys		
	Manual mode	<Ctrl+F1>
	Automatic mode	<Ctrl+F2>
	Programming	<Ctrl+F3>
	Access authorization	<Ctrl+F4>
	Start external software from hard disk	<Ctrl+F5>
	Startup	<Ctrl+F6>



Entering data		
	Upper case X	<X>
	Upper case Y	<Y>
	Upper case Z	<Z>
	Numeric block with second key assignment To use the second key functions press the "Second" key at the same time	
	Escape This key aborts an action, entry or dialog.	<Esc>
	Delete This key undoes the last change that was made.	
	Insert	<Ins>
	Second To use the second key functions on the numeric block press the "Second" key at the same time	
	Enter Pressing this key confirms an entry or executes a selected function.	<↵>
Navigation and display		
	Help key Calls the help contents	<Ctrl+I>
	Level up key With the level up key you can jump one level up in the dialog tree. You return to the preceding operating or softkey level.	<F12>
	Group select key forwards The group select key moves the selection focus on the screen cyclically from one group to the next.	Tab
	Change window key If more than one window is open you can use the change window key to switch from one window to the next.	ALT + Tab
	Group select key backwards Switch between the individual functions within a window	Shift+Tab
	Page up Key to scroll back through the display.	<PgUp>
	Page down Key to scroll forward through the display.	<PdDn>
	Cursor block Cursor left, right, up, down keys	Cursor block
	Selection key This key selects or deselects a display element.	<Space>

4.2 MFA Display



This section applies to ProNumeric and ProSycon.

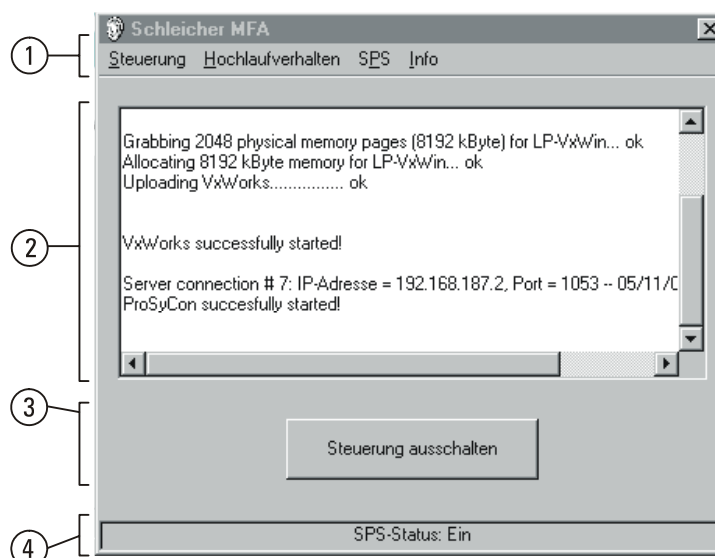
MFA (Multi Function Application) is the basis for operating the controller. With MFA you can set the start behavior and start and stop the controller and the PLC.

4.2.1 Starting the MFA

MFA starts automatically when the controller starts and is entered in the system tray of the taskbar. You can activate it from there by double-clicking on the blue Schleicher logo.



4.2.2 The MFA window



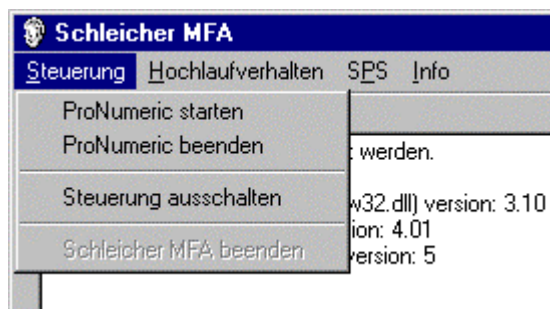
- | | |
|---|---|
| 1 | Menu bar
For explanations see "MFA functions". |
| 2 | Messages
With information on memory, real-time operating system and controller software. |
| 3 | Buttons |
| 4 | Status
Information on PLC status. |



4.2.3 MFA functions

Controller menu

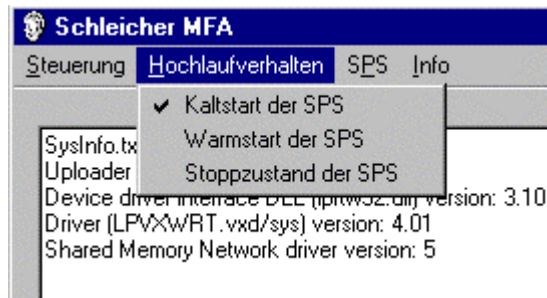
The *Controller* menu is adapted to the type of controller used (ProSyCon or ProNumeric).



The ... *start* / ... *end* menu items start and end the real-time operating system and the controller software.

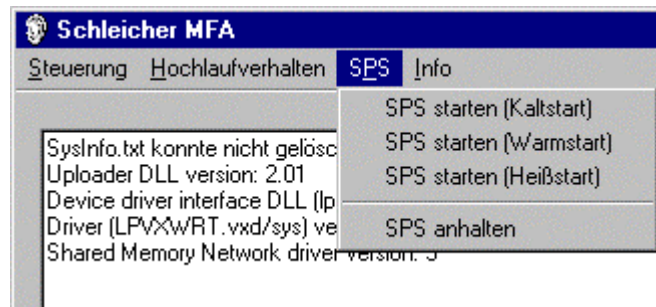
The *Switch off controller* menu item has the same function as the <Switch off controller> button. The controller software, including the PC operating system, is shut down and the controller is switched off.

Startup behaviour menu



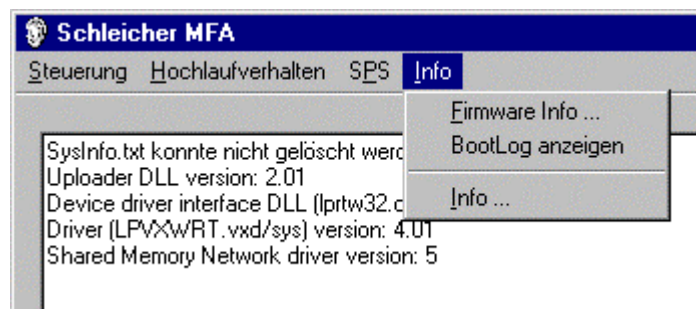
In the *Startup behaviour* menu you can set how the PLC behaves after controller startup. Startup behaviour is described in the "The PLC" section.

PLC menu



In the *PLC* menu item you only start and stop the PLC. Startup behaviour is described in the "The PLC" section.

Info menu



As well as software version information, you can also view the boot log file here (see below).



4.2.4 Display boot log file via MFA

MFA displays the boot log file of the real-time operating system VxWorks®, which is generated on controller startup.



Memory location and name of file: *SCHLEICHER/Os/Log/bootlog.txt*

4.2.5 MFA log file

MFA generates a log file with error messages from the real-time operating system VxWorks®. A new file is generated each day, to restrict the size. The file name is formed from the current date in format year/month/day.

Memory location and name of file (for 14 May 2001):
SCHLEICHER/Os/Log/lb010514.txt

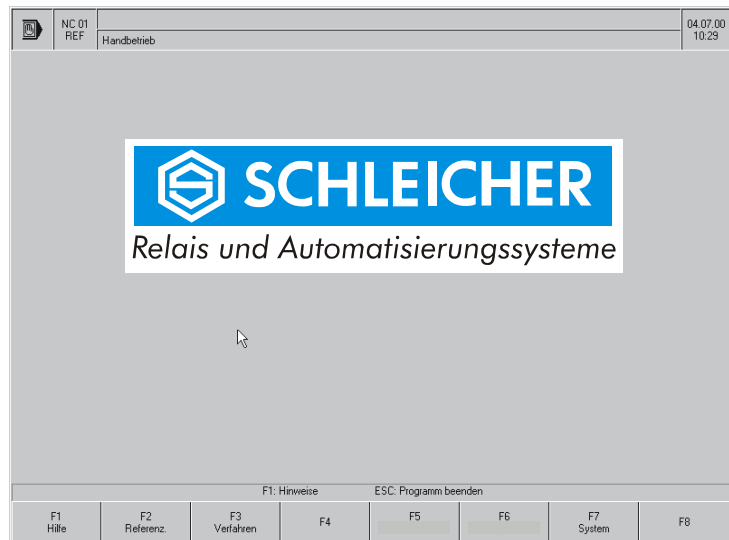


The log files are intended primarily for diagnosis investigations by the controller manufacturer.

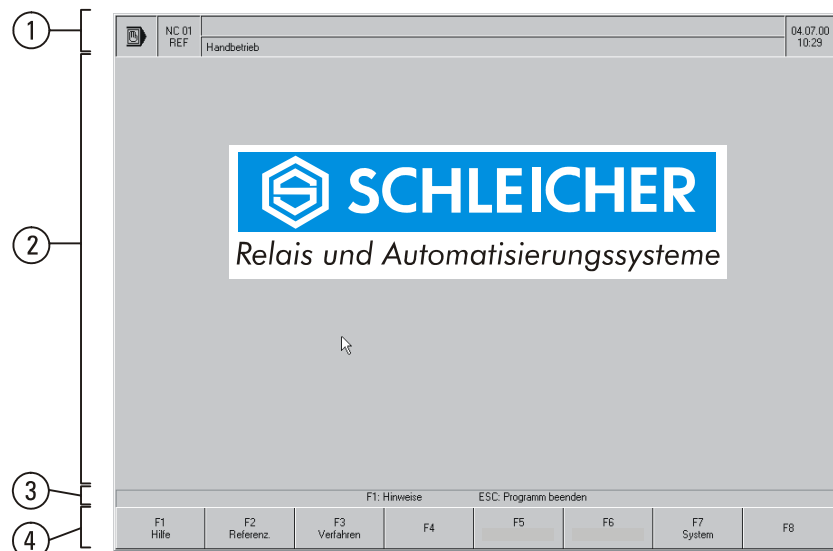
4.3 The Schleicher Dialog Display

The Schleicher dialog provides all the dialogs for operating the CNC and PLC. There are different Schleicher dialogs for ProSycon and ProNumeric, depending on the controller.

The Schleicher dialog is permanently installed on the controller and starts automatically after controller startup.

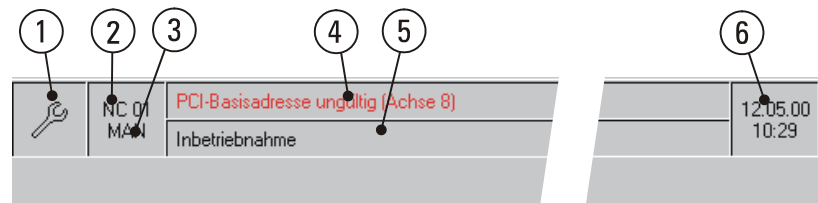


Window structure



1	Status and messages
2	Working area The working area is the area of the screen, a window or a dialog box, where settings can be changed or information displayed.
3	Hints
4	Softkeys The lettering for softkeys S1 to S8 below the display appears in the softkey area.

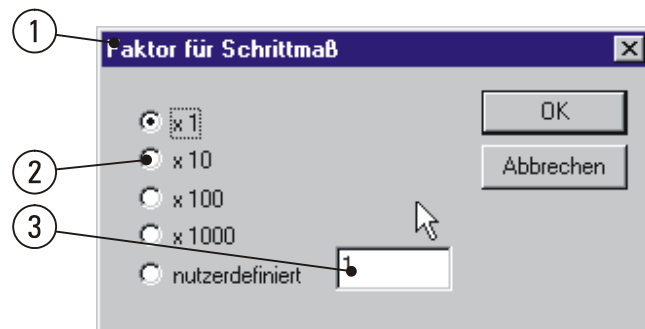
Status and messages



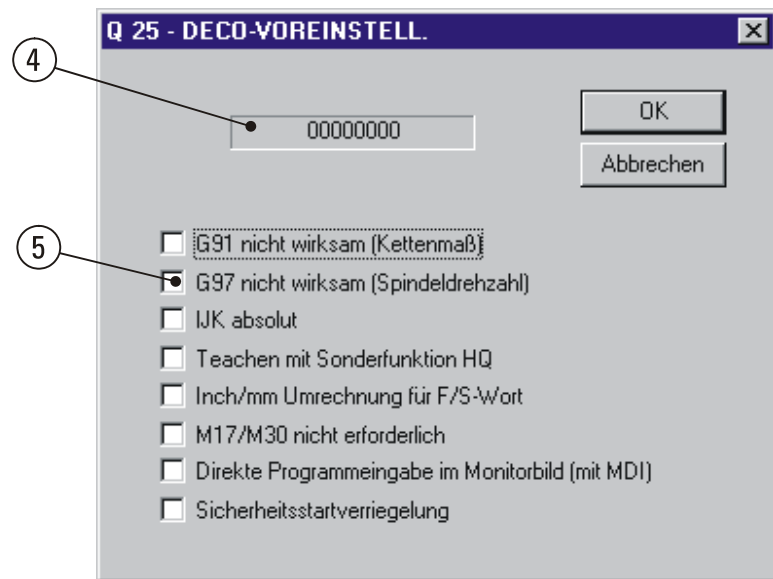
1	Current operating elements Select the operating area with the Operating keys.
2	Selected NC subsystem
3	Current NC mode
4	Error messages
5	Current position in controller menu
6	Date and time

Structure of dialog boxes

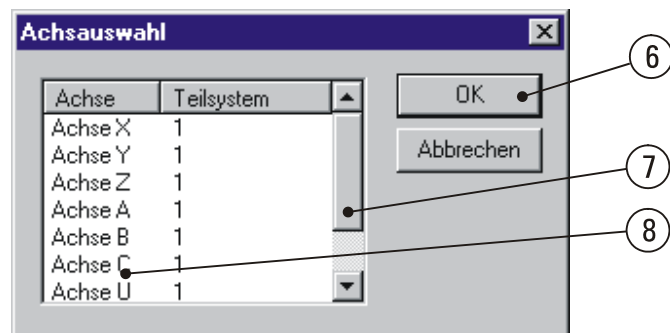
Structure and operation of dialog boxes follows Windows® conventions.



1	Title bar The title bar contains information for the user about the content of the window and possibly about the current activity.
2	Selection list (only one option can be selected)
3	Entry field An entry field is an element for user data entry. When the field is active the values in it can be deleted, changed or left unchanged.





-
- | | |
|---|---|
| 4 | Output field
The output field is for displaying information for the user. The data in it cannot be changed or deleted. |
|---|---|
-
- | | |
|---|--|
| 5 | Selection list (several options can be selected) |
|---|--|
-



-
- | | |
|---|---------------|
| 6 | Action button |
|---|---------------|
-
- | | |
|---|---|
| 7 | Scroll bar
If the window is bigger than the displayed area this is indicated by a scroll bar. The box in the scroll bar shows the current position of the visible area in relation to the whole. You can use the scroll bar to select the part you wish to view. |
|---|---|
-
- | | |
|---|--|
| 8 | Selection list (only one option can be selected) |
|---|--|
-



Display element status

Activated		<p>A display element is activated if it is marked with the illustrated dotted-line frame. You can only edit (entry field) or select an element if it is activated.</p> <p>You can move the focus within the dialog box with the group select keys . Within a group you can move the focus with the cursor keys.</p>
Selected		<p>An active display element can be selected. A selected field is marked as such (e.g. check, colour background).</p> <p>A display element is selected and deselected with the  (space) key.</p>
Disabled		<p>A display element is referred to as disabled if it cannot be activated. This is indicated graphically (reduced contrast).</p>

4.3.1 Schleicher dialog in ProSycon

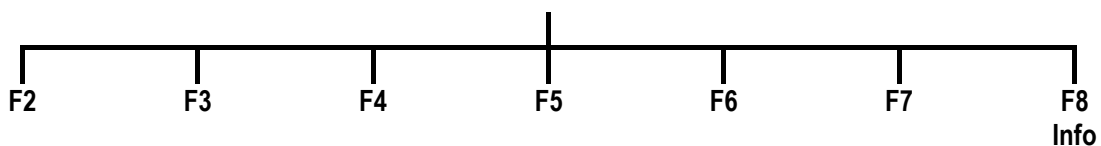


This section applies only to ProSycon.

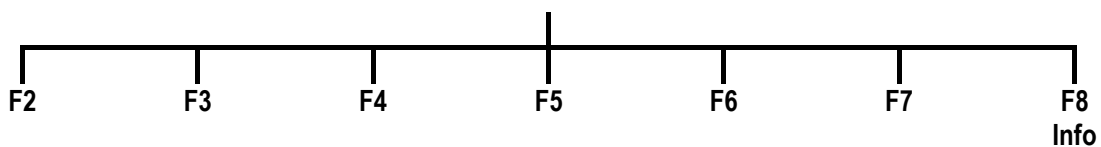
The controller menu and the ProSycon operating elements

The top level of the controller menu is the operating elements. The operating elements are oriented on the important operating activities. Softkey F1 is always for calling help pages. The help page contains further information on the content of the subsequent operating levels.

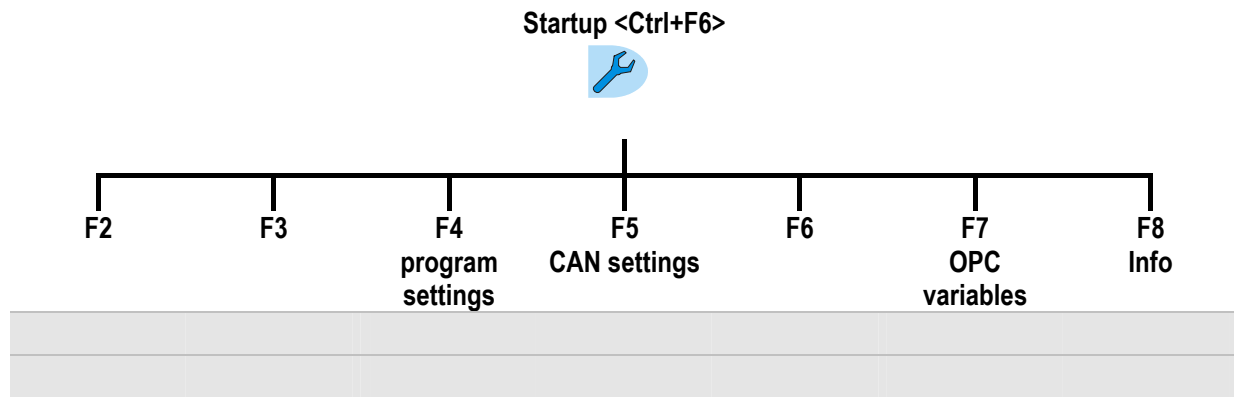
Access authorization <Ctrl+F4>



Start external software <Ctrl+F5>



Start application 1	Start application 2	Start application 3	Start application 4	Start application 5	Start application 6	



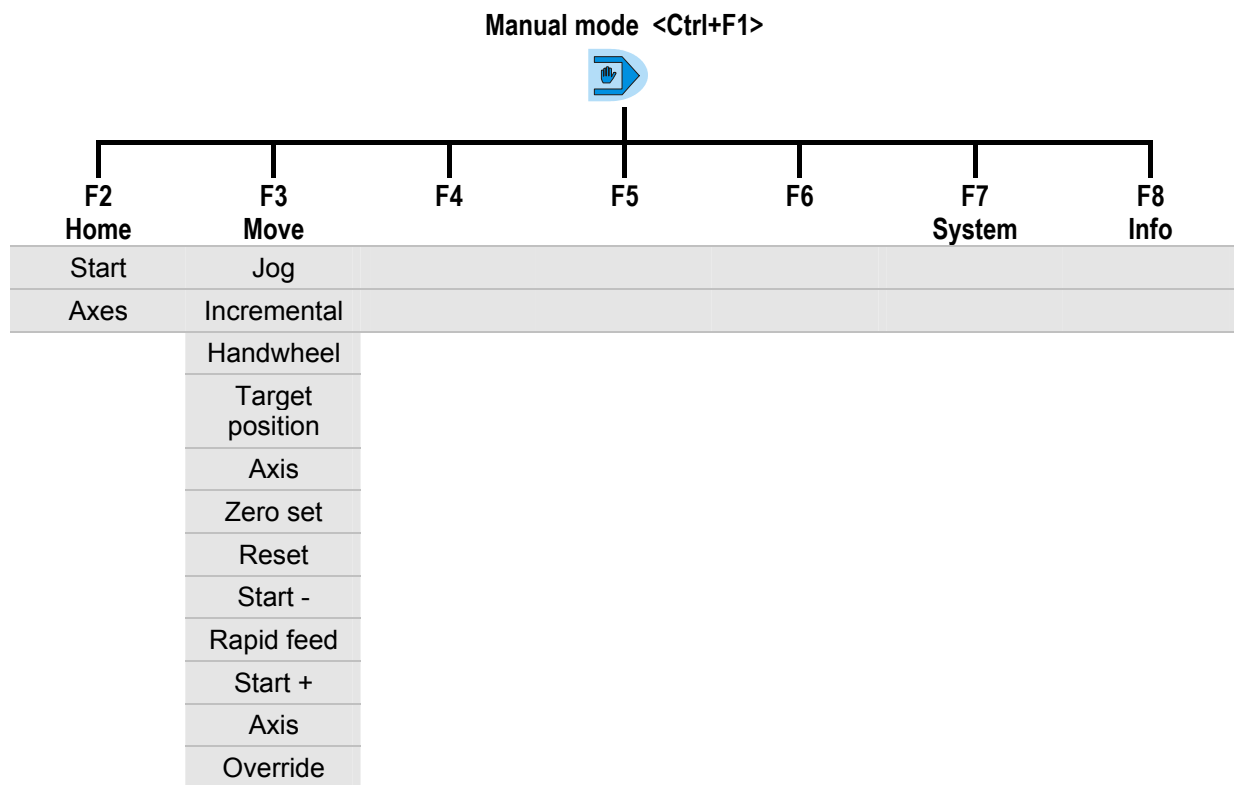
4.3.2 Schleicher dialog in ProNumeric



This section applies only to ProNumeric.

The controller menu and the operating elements in ProNumeric

The top level of the controller menu is the operating elements. The operating elements are oriented on the important machine activities. Softkey F1 is always for calling help pages. The help page contains further information on the content of the subsequent operating levels.



Automatic <Ctrl+F2>



F2	F3	F4	F5	F6	F7	F8
Program					System	Info
Activate						
MDI						
Single record						
Block record						
Record sequence						
Reset						
Start -						
Start +						
Stop						
Override						

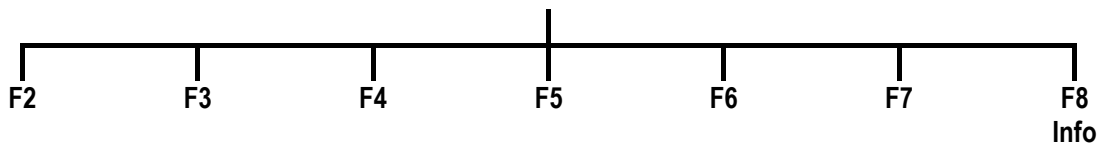
Programming <Ctrl+F3>



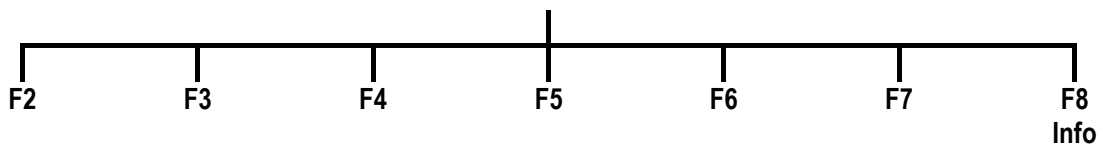
F2	F3	F4	F5	F6	F7	F8
Program	R parameter	Tool data	Zero point offsets			Info
Editing (NC editor)	Edit value	Edit value	Edit value			
New	Edit					
Accept	New					
Delete	Delete					



Access authorization <Ctrl+F4>

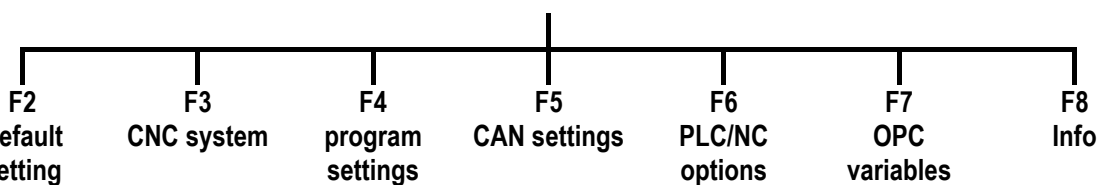


Start external software <Ctrl+F5>



Start application 1	Start application 2	Start application 3	Start application 4	Start application 5	Start application 6	

Startup <Ctrl+F6>



Other / edit	Edit				Edit value	
					Edit	
					New	
					Delete	



5 The PLC

- Operating system: ProConOS
- Programming: MULTIPROG to IEC 61131-3
- Communication with the CNC via shared RAM

5.1 Programming

The XCx is programmed on a PC using MULTIPROG software (to IEC 61131-3).



The programming software is made up of the MULTIPROG software and the *AddOns* for MULTIPROG from Schleicher.

The programming system and programming instructions can be ordered as accessories. See also the section on "Accessories and Spare Parts".

The PLC is supplied with a ready-configured MULTIPROG project, which you can use as the basis for programming the PLC (see "Start-up" section).

5.2 PLC Operating States and Starting Behaviour

5.2.1 Operating states

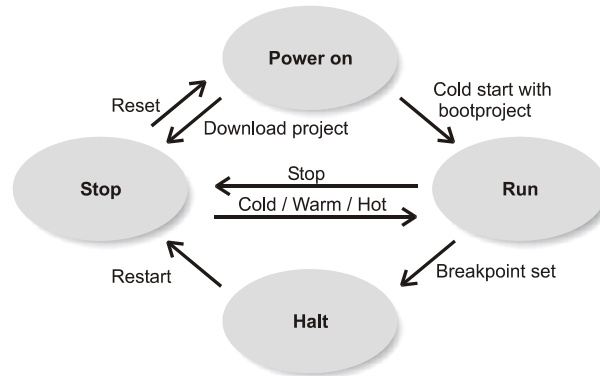
Operating state	Description
POWER ON	Power supply switched on No program loaded
STOP	Program loaded User tasks inactive Process map memory inputs are not updated Output signals are not sent to inputs and outputs
RUN	Program execution active User tasks active Process map memory inputs updated according to I/O configuration Process map memory outputs updated according to I/O configuration and program execution
HALT	Program execution will stop at a breakpoint User tasks inactive Process map memory inputs are not updated Process map memory outputs are not updated

The current state of the PLC is displayed in the MULTIPROG project control dialog in the "Status:" line.

If 'debug' is displayed behind the current state in the control dialog it means that breakpoints have been set or variables forced.

5.2.2 Changing operating states with MULTIPROG

You can use the graphic user interface of MULTIPROG to control when program execution on the PLC starts and stops. The buttons for changes which are not possible in the current operating state are shaded in the project control dialog.



Starting program execution

State change from → to	Button in control dialog	Description of what happens
Stop → Run	Cold	<ul style="list-style-type: none"> • Cold start • All data is initialized • SPG 1 is called • All user tasks are activated • Program execution activated
Stop → Run	Warm	<ul style="list-style-type: none"> • Warm start • Only non-buffered data is initialized • SPG 0 is called • All user tasks are activated • Program execution activated
Stop → Run	Hot	<ul style="list-style-type: none"> • Hot start • No data is initialized • All user tasks are activated • Program execution activated • Not available when you start program execution for the first time after downloading

Stopping program execution

State change from → to	Button in control dialog	Description of what happens
Run → Stop	Stop	<ul style="list-style-type: none"> • All user tasks are deactivated when their operating cycle is complete • SPG 2 is called • Process map memory outputs are written • Program execution stops • Physical outputs are set to zero or preferred shut-off state

General reset

State change from → to	Button in control dialog	Description of what happens
Stop → Power on	Reset	<ul style="list-style-type: none"> • The project is deleted • General reset



5.2.3 PLC starting behaviour after power supply is switched on

The PLC starting behaviour is set with the lockswitch on the XCx.

The following options are available:

- PROG PLC stop
- WARM PLC warm start to IEC 61131-3
- COLD PLC cold start to IEC 61131-3

5.3 System Variables

System variables provide information about the status of the system, for example about forced variables, CPU performance, etc. These variables have fixed memory addresses and can be used by the PLC program to obtain the corresponding information.

All the system variables in the following table are already declared in the Global_Variables area of the Global_Variables worksheet.

System variables				
Name	Data type	Log. addr. (byte)	Log. addr. (bit)	Description
PLCMODE_ON	BOOL	0	0	TRUE := current PLC state is ON
PLCMODE_RUN	BOOL	0	1	TRUE := current PLC state is RUN
PLCMODE_STOP	BOOL	0	2	TRUE := current PLC state is STOP
PLCMODE_HALT	BOOL	0	3	TRUE := current PLC state is HALT
PLCDEBUG_BPSET	BOOL	1	4	TRUE := one or more breakpoints have been set
PLCDEBUG_FORCE	BOOL	2	0	TRUE := one or more variables have been forced
PLCDEBUG_POWERFLOW	BOOL	2	3	TRUE := powerflow active
PLC_TICKS_PER_SEC	INT	44	-	Number of system ticks per second, used by the PLC as the basis for the system time. This value determines the time resolution of the PLC for time delay function blocks like TON, TOF and TP, and the shortest cycle time for the DEFAULT task and cyclical tasks.
PLC_SYS_TICK_CNT	DINT	52	-	Number of counted PLC system ticks

As well as these system variables, other variables are also defined, containing information on the system.

The type definitions of the variables can be found in the PLC_Types section of the SchleicherLib library.

5.4 Libraries and Function Blocks in MULTIPROG

The available function blocks are combined in libraries.

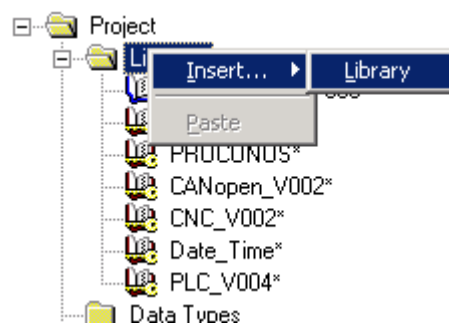
If new projects created with MULTIPROG, different libraries are inserted automatically, depending from the controller type. Other libraries can be inserted manually.

Libraries	XCN 7xx	XCS 7xx	XCN 5xx	XCS 5xx	XCN 3xx	XCS 3xx	Pro- Numeric	Pro- SyCon	MCS 20-20	MCS 20-21	Simulation
PROCONOS	+	+	+	+	+	+	+	+	+	+	+
BIT_UTIL	+	+	+	+	+	+	+	+	+	+	+
CANopen_Vxxx	+	+	+	+	0	0	+	+	-	+	-
CFB_Vxxx	0	0	0	0	0	0	0	0	-	-	-
CNC_Vxxx	+	-	+	-	+	-	+	-	-	-	-
Date_Time	+	+	+	+	+	+	+	+	+	+	-
Microline	-	-	-	-	-	-	-	-	+	+	-
MMI	0	0	0	0	0	0	0	0	0	0	-
PLC_Vxxx	+	+	+	+	+	+	+	+	-	-	-
Profibus_Vxxx	0	0	0	0	0	0	0	0	-	-	-
Serial	0	0	0	0	0	0	0	0	0	0	-
SchleicherLib_Vxxx	+	+	+	+	+	+	+	+	-	-	-
XCx7_Vxxx	+	+	-	-	-	-	-	-	-	-	-

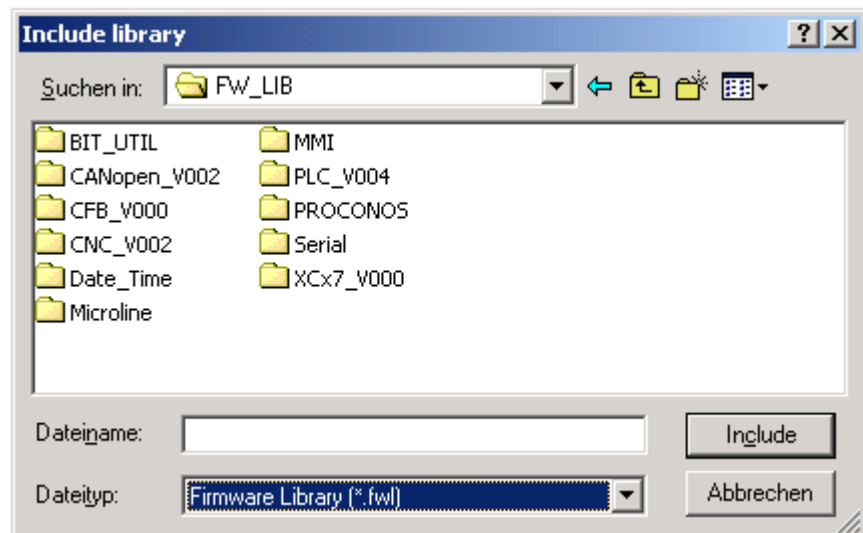
- + inserted automatically if a new MULTIPROG project created
- o can be inserted manually
- not needed

If other libraries needed, insert as follows:

- Click with the right mouse button on *Libraries* in the project tree to open the context menu *Insert/Library*.

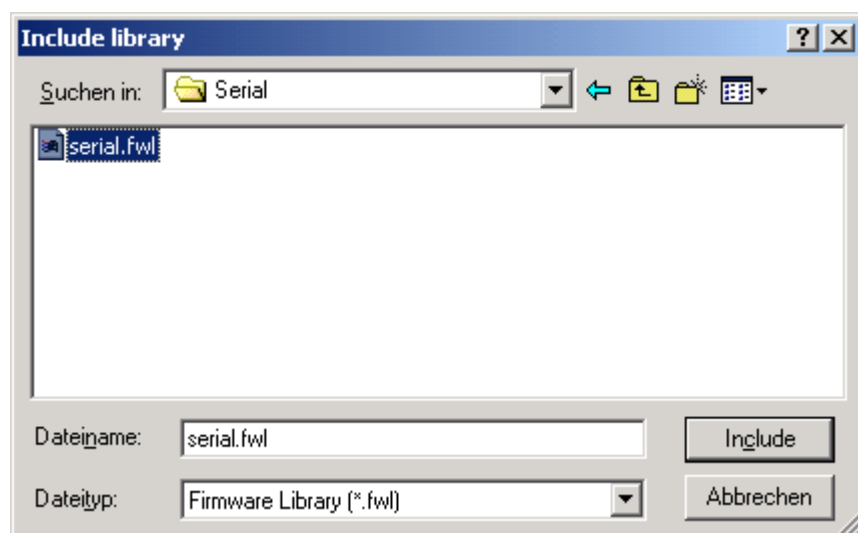


- Select the path `...\\KWSof\\MWT\\PLC\\FW_LIB` and the *File Type* *Firmware Library (*.fwl)*.



Each library is stored in a single directory.

Open the needed directory e.g. *Serial* to include the *serial.fwl*.



An online help function providing detailed information on the selected topic is available for the libraries (except SchleicherLib). You activate online help via the context menu of the respective library (click on the library icon with the right mouse button).

Note: Variable declarations in function block example programs

The example programs for the function blocks contain variable declarations to IEC 61131-3 with keywords VAR and END_VAR. If you wish to use the example programs with MULTIPROG you will have to enter the variable declarations manually, in tabular form on the variables worksheet of the respective POU.

5.4.1 CANopen_Vxxx library

The library contains function blocks for parameterizing and diagnosis the CANopen network.

Function block	No.	Description
CO_NET_SDO_WRITE	150	Sends a Service Data Object (SDO)
CO_NET_SDO_READ	151	Receives a Service Data Object (SDO)
CO_NET_GET_LOCAL_NODE_ID	152	Returns own node ID
CO_NET_GET_STATE	153	Supplies current CANopen status
CO_NET_GET_KERNEL_STATUS	154	Supplies current extended CANopen kernel status
CO_NET_NMT	155	Sets status of one or all devices in the CANopen network
CO_NET_RECV_EMY_DEV	156	Reads any emergency messages from a particular network node
CO_NET_RECV_EMY	157	Reads any emergency messages from any network node
CO_NET_RECV_ERR_DEV	160	Reads any error messages from a particular network node
CO_NET_RECV_ERR	161	Reads any error messages from any network node
CO_NET_SENDL2	162	Sends any CAN Layer 2 messages
CO_NET_PING	163	Executes a ping on a particular network node
CO_NET_RESTART_CAN	164	Restarts CANopen communication (e.g. after "bus-off")
CO_NET_RESTART_ALL	165	Restarts the complete CANopen stack
CO_NET_SHUTDOWN	166	Stops the CANopen stack
CO_NET_CAN_SYNC	170	Allows synchronization between PLC task and CANopen stack

5.4.2 CFB_Vxxx Library

Library like IEC 61131-5 with function blocks for "peer-to-peer" communication with TCP/IP.

Function blocks	No.	Description	Controller
CONNECT_V	60	Connect two members	XCx
USEND_V	61	Send data	ProNumeric
URCV_V	62	Recive data	ProSyCon



5.4.3 CNC_Vxxx library

The CNC library contains function blocks for reading and writing system data, SERCOS and XRIO motion parameters.

Function block	Nr.	Description	Controller
READ_Q_PARAM_*	200 bis 207	Reads a CNC system data parameter	XCN ProNumeric
WRITE_Q_PARAM_*	208 bis 215	Writes a CNC system data parameter	
SAVE_Q_PARAM_*	221	Saves the CNC system data parameter to the hard disk	
SAVE_R_PARAM_*	220	Saves the CNC arithmetic parameter to the hard disk	XCN
READ_SERC_PARAM	302	Reads a SERCOS parameter	
WRITE_SERC_PARAM	303	Writes a SERCOS parameter	
SET_SERC_PHASE	304	Switching SERCOS communication phase	
SET_SERC_COMMAND	308	execute a SERCOS command	
MC_ANALOG	300	XRIO Motion Control block	
MC_ANALOG_1_AXIS	307	XRIO Motion Control block one axis	
MC_CAN	301	CAN MotionControl block	
MC_DP	309	PROFIBUS-DP Motion Control block	
MC_DP_1_AXIS	310	PROFIBUS-DP Motion Control block one axis	

Note

The function blocks MC_ANALOG und MC_CAN are moved from library PCL_Vxxx to library CNC_Vxxx (effective from CNC_V003 / PLC_V005).

The function blocks MC_DP und MC_DP_1_AXIS available from version CNC_V004.

5.4.4 Date_Time library

The real time clock, included in XCx, can be read/set with the following function blocks.

Function block	No.	Description	Controller
GET_TIME	130	Reads time	all
GET_DATE	128	Reads date	
SET_TIME	131	Set time	
SET_DATE	129	Set date	

5.4.5 MMI Library

Communication with operating terminals COP using the serial interface of controller. The used protocol is PNet.

Function block	No.	Description	Controller
PPF_COP_COMM	140	Communication with COP	XCx MCS xx-xx

5.4.6 PLC library

This library provides controller-specific firmware function blocks over and above the standard IEC/ProConOS function blocks.

Function block	No.	Description	Controller
PUT_ERROR	400	Generates a user-defined error message (not for new design, instead of this use 401)	all
PUT_ERROR2	401	Generates a user-defined error message	
CLEAR_ERROR	402	Deletes an error message sent with a lock flag	
READ_FILE	405	File access read	
WRITE_FILE	406	File access write	
SEND_MAIL	410	Sends an E-MAIL (SMTP client)	
XFIO_CONFIG	420	XFIO interrupt configuration	
XRIO_STATE	422	XRIO status information	
GET_MTS	430	Supplies current time value in μ s ticks	

Note (up to CNC_V003 / PLC_V005):
The function blocks MC_ANALOG and MC_CAN moved from library PCL_Vxxx to library CNC_Vxxx.

5.4.7 Profibus_Vxxx Library

The library provides function blocks for PROFIBUS communication

Function block	No.	Description	Controller
DP_NET_GET_STATE	190	Get status of the PROFIBUS card	XCx
DP_NET_PUT_MSG	191	Put message to Message Interface of the Hilscher card	ProNumeric
DP_NET_GET_MSG	192	Get message from Message Interface of the Hilscher card	ProSyCon



5.4.8 Serial Library

Function blocks for controllers serial communication.

Function block	No.	Description	Controller
PORT_OPEN	135	Open a serial interface	all
PORT_CLOSE	136	Close a serial interface	
PORT_READ	137	Write character to serial interface	
PORT_WRITE	138	Read characters from serial interface	
PORT_STATE	139	Read status of a serial interface	

5.4.9 SchleicherLib_Vxxx library

XCx firmware data type definitions for MULTIPROG.
The library has no function blocks.

5.4.10 XCx7_Vxxx Library

Function blocks only for XCx controllers.

Function block	No.	Description	Controller
UZH_VR	250	Working with UZH 2VR modules	XCx 700
UBA_ERR_CTRL	251	UBA modules error handling	
READ_AXIS_PAGE	305	Read parameter from axis specific remote page	
WRITE_AXIS_PAGE	306	Write parameter to axis specific remote page	

5.5 PLC Operating System ProConOS

5.5.1 ProConOS.INI initialization file

You can use the ProConOS.INI file to make application-specific changes to advanced settings (e.g. communication drivers, system tasks, CANopen stacks).

If ProConOS.INI does not exist or has been deleted, a file called "initial" containing default values will be generated when the controller software starts up.

The file is saved on the compact flash at
/ata0/OS/PLC/ProConOS.INI.

Description of section and key entries

[PLC]

```
; start higher-priority PLC user tasks
USR_HIGH_PRIO = 1 ; yes = 1 (default), no = 0

; use the ProConOS socket communication driver
PC_SOCKET_DRV = 1 ; yes = 1 (default), no = 0
; max. number of ProConOS clients
; for simultaneous access to controller
PC_SOCKET_BLOG = 4 ; default

; use the ProConOS serial 0/1 communication driver
PC_SERIAL0_DRV = 0 ; yes = 1, no = 0 (default)
PC_SERIAL0_BR = 19200 ; Baud rate = 19200 (default)
PC_SERIAL1_DRV = 0 ; yes = 1, no = 0 (default)
PC_SERIAL1_BR = 19200 ; Baud rate = 19200 (default)
```

[CNC]

```
; start the higher-priority CNC IPO task
IPO_HIGH_PRIO = 0 ; yes=1, no=0 (default)
```

[CAN]

```
; start the higher-priority CANopen task
CAN_HIGH_PRIO = 0 ; yes = 1, no=0 (default)

; Restart the CANopen process after PLC STOP (NMT master!)
RESTART_CAN = 0 ; yes=1, no=0 (default)

; PLC STOP after CAN heartbeat error
HBE_STOP_PLC = 1 ; yes = 1 (default), no = 0
; PLC STOP after CAN Bus Off
CBO_STOP_PLC = 0 ; yes = 1 (default), no = 0
```

[PATHS]

```
; path for saving CNC online logging
ONLCONFIGPATH = "/ata0/OS/ONL"
; path for saving NC files
NCFILESPATH = "/ata0/OS/CNC"
```

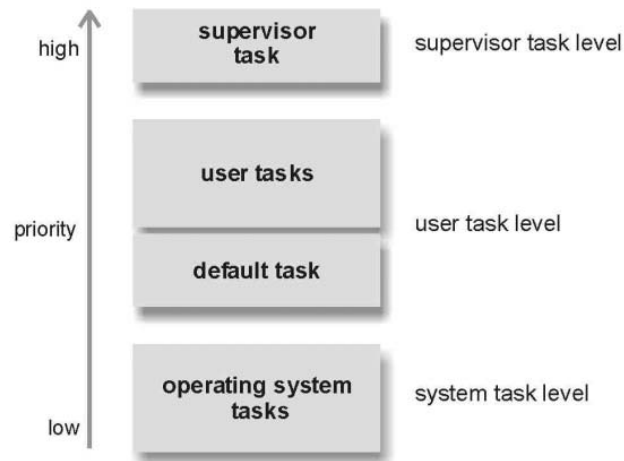


6 The Multi-Tasking System

6.1 Overview

The PLC runtime system is based on a real-time operating system controlled by task priorities. There are three priority levels for tasks:

- Supervisor task level
- User task level
- System task level



In the operating system there is a specially protected level for the supervisor task. The supervisor task is a system task with maximum priority. The supervisor task detects errors such as division by zero and task time overrun, and activates the appropriate system task.

All tasks inserted by the user run at the user/default level.

Certain important firmware tasks that have to be considered when parameterizing user tasks also run on this level. See section Task Priorities.

Tasks running at the system task level are not influenced by the user; e.g. communication tasks, debug tasks, memory management tasks, system control tasks.

6.2 User Tasks

User tasks are all tasks that can be inserted by the application programmer.

The default task is also on the user task level. It is the user task with the lowest priority. The default task is executed when no other user task is active.



Incorrectly or inappropriately selected user task settings for type, priority, interrupt mode, etc. – especially in conjunction with longer program runtimes – can lead to controller malfunction when essential operating system tasks are displaced.
See section Task Priorities.

You can use various types of user task.

6.2.1 Cyclical tasks

Cyclical tasks execute the programs assigned to them within a defined interval under a user-defined priority.

In MULTIPROG you can give the individual tasks a priority between 0 and 31. Task 0 has the highest priority, task 31 the lowest. The task with the highest priority is called first. The user-task priorities are mapped to the priority levels of the real-time operating system. (See section Task Priorities)

If the watchdog time of a cyclical task is higher than the set interval time and task execution has not been completed, one or more execution cycles will be omitted.



6.2.2 Event tasks

The XCx operating system starts event tasks when particular events occur.

The following events are currently defined.

Internal designation	Event number	Comments
Interrupts		
PLC_EVENT_XFIO_I0	0	XFIO Interrupt (Input 0)
PLC_EVENT_XFIO_I1	1	XFIO interrupt (Input 1)
Reserved	2..3	
Synchronization		
PLC_EVENT_POS	4	Position controller task (XCN only)
PLC_EVENT_CAN	5	CANopen task
PLC_EVENT_IPO	6	CNC IPO task (XCN only)
PLC_EVENT_DECO	7	CNC DECO task (XCN only)
Reserved	8..15	

The event number is used in the MULTIPROG task setting to specify the event that starts the event task.

The specified priority is used unless a bypass option is set by the system. (Bypass cancels the normal task change so that the assigned programs are executed immediately when the event occurs.)

Up to 16 events will be put in a queue. So these events are not lost, and will be executed later. This also applies if new events occur before the assigned event task is executed.

6.2.3 System tasks

System tasks and system programs (SPGs) are started automatically by the operating system when an event occurs in connection with the operating system.

The SPGs which can be used are listed in the following table:

No.	Name	Event	Actions
SPG 0	WARM_START	Is executed during a warm start	<ul style="list-style-type: none"> • Retentive data is not initialized • Non-buffered data is initialized • The open function of the I/O driver is executed • User tasks are activated • PLC switches to 'run' state
SPG 1	COLD_START	Is executed during a cold start	<ul style="list-style-type: none"> • All data is initialized • The open function of the I/O driver is executed • User tasks are activated • PLC switches to 'run' state
SPG 2	TO_STOP	Is executed when program execution is stopped	<ul style="list-style-type: none"> • User tasks are deactivated • All outputs are updated • The close function of the I/O driver is executed • PLC switches to 'STOP' state
SPG 10	WATCHDOG	Is executed when a task has not been completed within its watchdog time	<ul style="list-style-type: none"> • User tasks are deactivated • All outputs are updated • The close function of the I/O driver is executed • PLC switches to 'STOP' state
SPG 11	ZERODIV	Is executed if division by zero occurs during program execution	<ul style="list-style-type: none"> • User tasks are deactivated • All outputs are updated • The close function of the I/O driver is executed • PLC switches to 'STOP' state
SPG 12	STACKOVER	Is executed if a stackover has occurred. Is only executed if the 'Stack-Prüfung' ['Stack check'] checkbox in the 'Ressource ... einrichten' [Resource ... Set up] dialog in MULTIPROG was activated.	<ul style="list-style-type: none"> • User tasks are deactivated • All outputs are updated • The close function of the I/O driver is executed • PLC switches to 'STOP' state
SPG 13	BADCAL	Is executed if a non-existent manufacturer-specific POU is called	<ul style="list-style-type: none"> • User tasks are deactivated • All outputs are updated • The close function of the I/O driver is executed • PLC switches to 'STOP' state
SPG 14	IOERROR	Is executed if an error occurs in the I/O driver while the process is running	<ul style="list-style-type: none"> • PLC continues execution
SPG 16	MATHERR	Is executed if a sliding point error occurs in an arithmetic function	<ul style="list-style-type: none"> • User tasks are deactivated • All outputs are updated • The close function of the I/O driver is executed • PLC switches to 'STOP' state
SPG 17	CPU_OVERLOAD	Is executed if a CPU overload occurs	<ul style="list-style-type: none"> • User tasks are deactivated • All outputs are updated • The close function of the I/O driver is executed • PLC switches to 'STOP' state
SPG 18	INITIODRV_ERR	Is executed if an error occurs in I/O driver initialization during a cold or warm start	<ul style="list-style-type: none"> • PLC does not start



No.	Name	Event	Actions
SPG 19	BOUNDS_ERR	Is executed if the limits of an array or a structure are exceeded. Is only executed if the 'Index-Prüfung' ['Index check'] or 'Feldbegrenzungs-Prüfung' ['Array limit check'] checkbox in the 'Ressource ... einrichten' [Resource ... Set up] dialog in MULTIPROG was activated.	<ul style="list-style-type: none">• User tasks are deactivated• All outputs are updated• The close function of the I/O driver is executed• PLC switches to 'STOP' state
SPG 20	BUS_ERR	Is executed if variables with a data type ≥ 2 bytes and uneven addresses were used or an internal error has occurred in MULTIPROG. Only on Motorola platforms.	<ul style="list-style-type: none">• User tasks are deactivated• All outputs are updated• The close function of the I/O driver is executed• PLC switches to 'STOP' state
SPG 21	STRING_ERR	Is executed if an error has occurred in a character string operation, e.g. if one character string is to be replaced by another, but cannot be found.	<ul style="list-style-type: none">• The behaviour of a character string exception has changed! In the standard setting SPG 21 is called after a character string exception has occurred. An entry with the module number and line number is also made in the error catalog. The PLC remains in 'RUN' status.



System tasks are not monitored by the watchdog.

6.2.4 Default task

The default task runs as a background task with the lowest possible user priority and is not time-monitored. It is activated when all higher-priority user tasks have been processed. The default task is configured so that it uses some of the available residual time (max. 80 %) but is executed no more than one every 20 ms. Only one default task is permitted in each resource.



All drivers in the I/O configuration that are not explicitly assigned to a user task automatically activate the default task and are executed in the context of the default task.



6.3 User Task Information

Information is mapped to system variables for each user task. The type definitions listed below for the system variables can be found in the PLC_Types section of the SchleicherLib library.

TYPE

```
TaskNameType : ARRAY [1..10] OF BYTE;
```

END_TYPE

TYPE

```
TaskInfoType0 : STRUCT
```

```
MaxTask : INT; (* 00: *)
```

Max. poss. number of tasks

```
CurTask : INT; (* 02: *)
```

Current number of tasks

```
END_STRUCT (* TaskInfoType0 *);
```

END_TYPE

TYPE

```
TaskInfoType1 : STRUCT
```

```
TaskName : TaskNameType; (* 04: *)
```

Task name

```
TaskPrio : INT; (* 14: *)
```

Task priority

```
TaskMode : INT; (* 16: *)
```

Task mode

```
TaskPeriod : INT; (* 18: [ms] *)
```

Task period in ms

```
TaskStack : INT; (* 20: *)
```

Size of used task stack

```
MainPoe : INT; (* 22: assigned PLC program *)
```

Assigned PLC program

```
TaskWatchDog : INT; (* 24: [ms] *)
```

Watchdog time in ms

```
reserve0 : DINT; (* 26: *)
```

```
MaxStack : INT; (* 30: max. used stack *)
```

Size of poss. task stack

```
CurDuration : INT; (* 32: [ticks] *)
```

Current task duration including prioritized calls

```
MinDuration : INT; (* 34: [ticks] *)
```

Minimum task duration

```
MaxDuration : INT; (* 36: [ticks] *)
```

Maximum task duration

```
AveDuration : INT; (* 38: [ticks] *)
```

Average task duration

```
CurDelay : INT; (* 40: [ticks] *)
```

Current task delay

```
MinDelay : INT; (* 42: [ticks] *)
```

Minimum task delay

```
MaxDelay : INT; (* 44: [ticks] *)
```

Maximum task delay

```
AveDelay : INT; (* 46: [ticks] *)
```

Average task delay

```
END_STRUCT (* TaskInfoType1 *);
```

END_TYPE

The variables are declared with *TaskInfoType0* and *TaskInfoType1*.

Global_Variables: Configuration.Resource - Configuration.Resource.Global_Variables							
	Name	Typ	Verwendung	Beschreibung	Adresse	Anfangsw...	Reman...
	TaskInfo0	TaskInfoType0	VAR_GLOBAL		%MD 1.1000		<input type="checkbox"/>
	TaskInfo1	TaskInfoType1	VAR_GLOBAL		%MD 1.1004		<input type="checkbox"/>
	TaskInfo2	TaskInfoType1	VAR_GLOBAL		%MD 1.1068		<input type="checkbox"/>
	TaskInfo3	TaskInfoType1	VAR_GLOBAL		%MD 1.1132		<input type="checkbox"/>
	TaskInfo4	TaskInfoType1	VAR_GLOBAL		%MD 1.1196		<input type="checkbox"/>
	TaskInfo5	TaskInfoType1	VAR_GLOBAL		%MD 1.1260		<input type="checkbox"/>

The following user task information is declared with an offset of 64 starting at 1004 ($1004 + 64 = 1068$ etc.).

The sequence of tasks is defined by the rank of the task in the *Physikalische Hardware/Configuration/Resource/Tasks* project tree.



6.4 Task Priorities

The table gives an overview of recommended task priorities and their relationship to important reserved firmware tasks (tfwLAGE, tfwCANhigh, tfwIPO).

MULTIPROG priority	RTOS* priority (default)	RTOS* task name	Application
0	30	Any	E.g. user task (event 0)
1	31	Any	E.g. user task (event 1)
2	32	Any	E.g. user task (event 4)
3	33	tfwLAGE	Reserved for position controller task (XCN only)
4	34	Any	E.g. user task (event 4, 5)
5	35	tfwCANhigh	Reserved for CAN stack task (option CAN_HIGH_PRIO = 1)
6	36	Any	E.g. user task (event 5, 6)
7	37	tfwIPO	Reserved for IPO task (XCN only)
8	38	Any	E.g. user task (event 5)
9	39	tfwCANhigh	Reserved for CAN stack task (option CAN_HIGH_PRIO = 0)
10	40	Any	E.g. user task (event 5)
11..15	41..45	Any	E.g. cyclical user tasks
16..31	46	Any	E.g. other cyclical user tasks
Default	127	Default	Background task

*Real Time Operating System



Incorrectly or inappropriately selected user task settings for type, priority, interrupt mode, etc. – especially in conjunction with longer program runtimes – can lead to controller malfunction when essential firmware tasks are displaced (tfwLAGE, tfwCANhigh, tfwIPO).



Schleicher controllers support 18 user tasks (priority levels 0..16 and the default task).
Tasks with priority ≥ 16 are executed with priority 16.

6.5 Tasks and Watchdogs

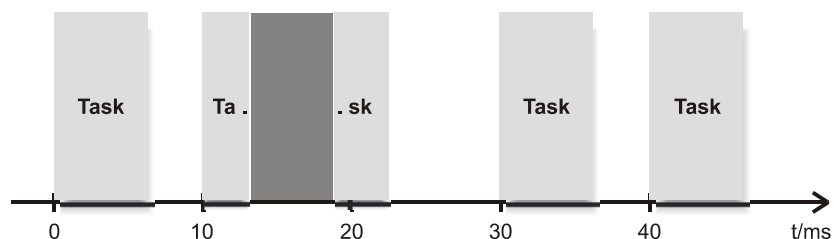
Each user-defined task has its own settable watchdog.

The watchdog checks that task execution is complete at the end of the watchdog time. If task execution is not complete at the end of this time the system task SPG 10 'WATCHDOG' is executed and the PLC switches to 'STOP' state if no other actions were programmed. An entry is also made in the error catalog. The watchdog time starts when the task is ready to execute. The watchdog interval is defined in the 'Task ... einrichten' [Task ... Setup] dialog in MULTIPROG.

If the execution time of the task and the watchdog time are roughly the same, and the CPU workload is high, the watchdog time may be exceeded during certain online operating steps.



The reason for this may be that you selected address status with powerflow when debugging in online mode.

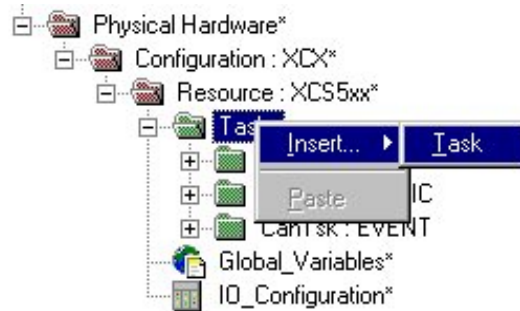


In this example the watchdog time of the displayed task is set to 10 ms. In the figure the task exceeds its watchdog time at 20 ms. If the watchdog time of the task is set to 20 ms it will next be executed at 30 ms. In this case task execution at 20 ms will be skipped.

6.6 Inserting Tasks and Assigning Programs

To insert a task you have to carry out the following steps in MULTIPROG.

- Click with the right mouse button on the *Tasks* directory in the project tree, to open the context menu.



- Select *Insert/Task*, the "Insert dialog appears.
- Enter the name for the task.
- Set the required task type in the *Task Type* list.
You can choose between default task, cyclical task, event task and system task.
Note: If task type 'DEFAULT' is not listed, the resource already has a default task.
- Confirm the dialog with *OK*.
The *Task Settings for ...* dialog appears. The dialog contains text and list fields, depending on the previously selected task.
- You have to enter the following parameters for the task:

Cyclical task	Time interval
Event task	Event number (number of interrupt)
System task	Number of a system program

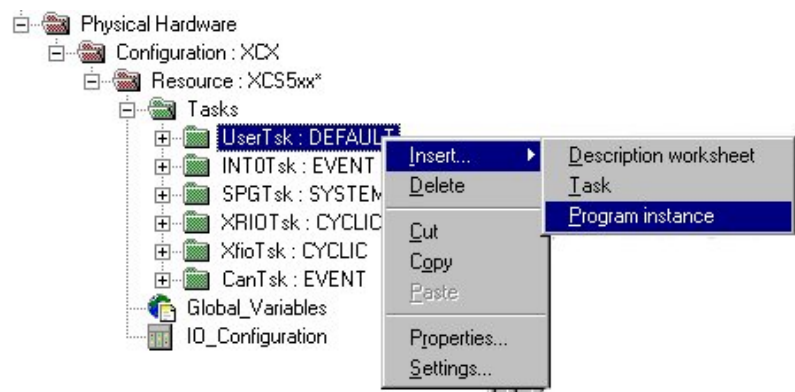
The instructions in section Task Priorities must be observed when assigning priorities.

Programs must be assigned to tasks before they can be executed. Assigning a program to a task means that an instance of the program will be executed when the task is activated. Different instances of a program can be assigned to different tasks.

Several programs can be assigned to one task. In this case the first program in the task directory will be executed first. Then the next program will be executed, and so on.

To insert programs you have to carry out the following steps in MULTIPROG.

- Click with the right mouse button on the project tree icon of the task in which the program is to be inserted.



- Select *Insert/Program instance* in the context menu.
- Enter an instance name for the program in the *Program instance* field.
- Set the required program in the *Program type* list box.
- Confirm the dialog with *OK*.
The program symbol is inserted in the project tree.

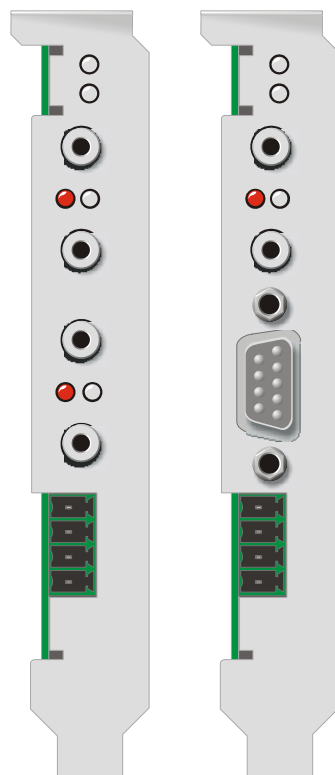


7 The CNC

The ProNumeric a IPC-CNC up to 64 axes / spindles and integrated high performance PLC.

8 SERCOS Axis Card PN-MIC

The axis card can operate SERCOS rings with independent NC axes. It is designed for use in PCs.



- SERCOS master acc. to IEC1491
- 16 or 8 axes
- Optical fibre connection to IEC 874-2
- Measuring sensor connection
- CANopen field bus interface
- PCI bus connection
- Comprehensive diagnosis functions

PN-MIC 21S
CAN

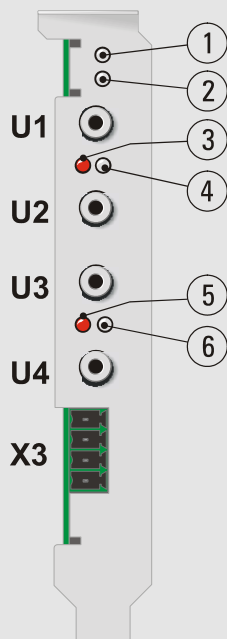
PN-MIC 11 S
CAN

Type	Properties
PN-MIC 21 S CAN	Two SERCOS rings 16 axes CANopen field bus connection elsewhere (interface on PCB)
PN-MIC 11 S CAN	One SERCOS ring 8 axes CANopen field bus connection on front plate

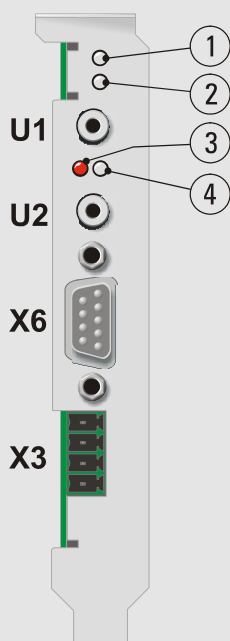
8.1 Displays and Connections

Displays and Connections on Front Plate

PN-MIC 21S CAN



PN-MIC 11S CAN



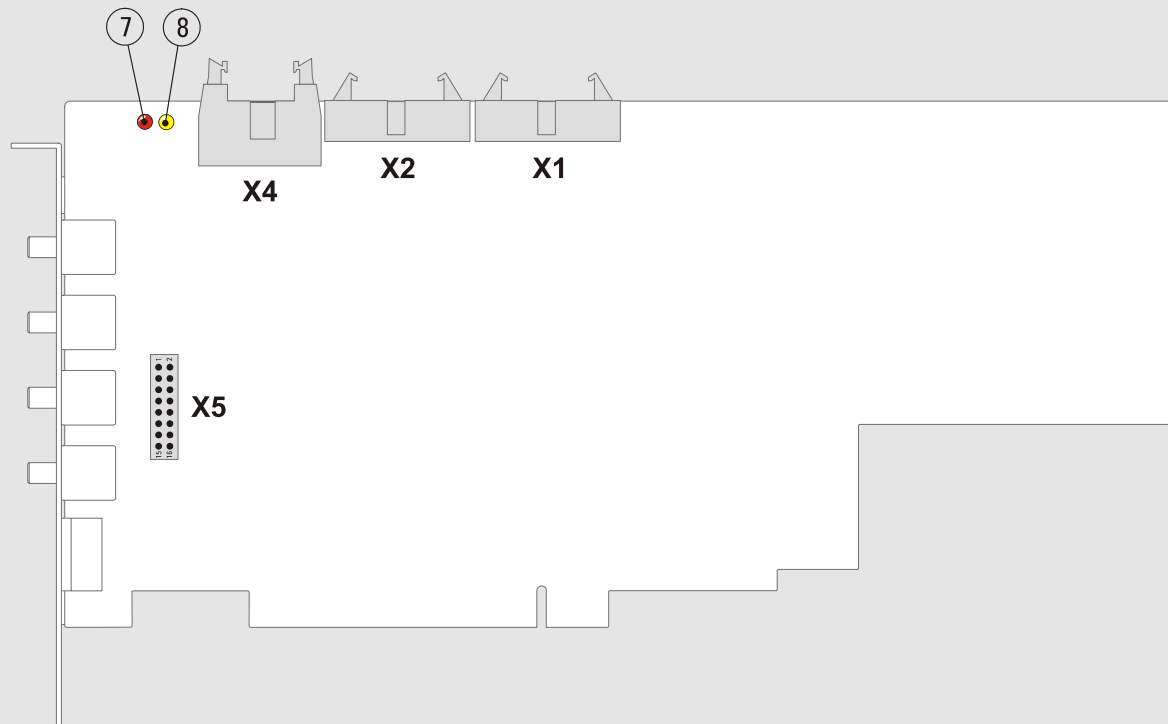
Displays

Designation	Colour	
1 NET	green/ red	CAN network status
2 MOD	green/ red	Modul status
3 SERCOS 1 ERROR	red	Hardware error Indicates the distortion of the received optical signal. The brightness gives an indication of the degree of distortion. Causes: Optical fibre bent or broken, connection dirty, ring not closed.
4 SERCOS 1 PHASE	green/ red	SERCOS startup phases Red on: phase 0 Red flashing: phase 1 Green slow flashing: phase 2 Green fast flashing: phase 3 Green on: phase 4
5 SERCOS 2 ERROR	red	As SERCOS 1 ERROR
6 SERCOS 2 PHASE	green/ red	As SERCOS 1 PHASE

Connections

Designation	Explanation
U1 SERCOS 1 OUT	F-SMA screw connection
U2 SERCOS 1 IN	
U3 SERCOS 2 OUT	
U4 SERCOS 2 IN	
X3 Measuring sensor connection and ready relay contact	
X6 CANopen field bus connection	Subminiature, 9-pin, plug connector

Internal displays and connections



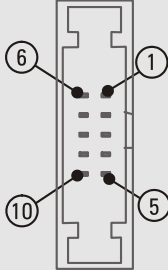
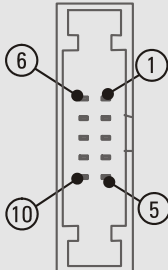
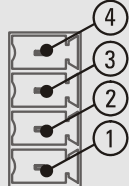

Displays

	Designation	Colour	ON	OFF
7	STOP	red		
8	WATCHDOG	yellow		

Connections

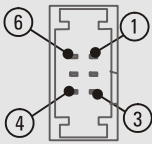
	Designation	Explanation
X1	UPS	Serial interface for UPS (Uninterruptible Power Supply)
X2	RS232	RS232 interface for terminal mode
X4	SYNC	Synchronization line for PN-MIC
X5	CANopen field bus connection (only PN-MIC 21S CAN)	For subminiature connector elsewhere

Connection assignment

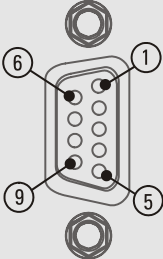
X1 UPS		
	Designation	Explanation
	1	BATTERY LOW
	2	NC
	3	VEBIAS
	4	SHUTDOWN
	5	GND
	6	NC
	7	INTERN (interface enable)
	8	ACFAIL
	9	NC
	10	NC
X2 RS232		
	Designation	Explanation
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
X3 Measuring sensor / ready		
	Designation	Explanation
	4 Ready for operation	
	3 Ready for operation	
		relay contact
	2 Measuring sensor	Reference point 0V
	1 Measuring sensor	Input +24 V DC



X4 SYNC

	Designation	Explanation
	1 SYNC	Pins 1-6 bridged
	2 SYNC	
	3 SYNC	
	4 SYNC	
	5 SYNC	
	6 SYNC	

X6 CANopen field bus connection subminiature, 9-pin, plug connector

	Designation	Explanation
	1 NC	Not connected
	2 CAN_L	
	3 V-	Ground
	4 NC	Not connected
	5 Drain	Shield connection optional
	6 V-	Ground
	7 CAN_H	
	8 NC	Not connected
	9 V+	Power supply

8.2 Accessing the Shared RAM

A function block for the PLC, to allow the PLC to access the shared RAM of the axis card, is being prepared.

8.3 Setting the System Parameters

System parameters		Range	Explanation
Q34	SERCOS cycle time		Ring cycle time in μs steps (default is 2000)
Q.091	Card number (axis-specific)	0-4	The axis belongs to the axis card whose number is entered. 0 is entered for test purposes, for example when there is no drive.
Q.093	Channel number (axis-specific)	1 ... 8	The axis belongs to channel 1... 8 on the first SERCOS ring.
		9 ... 16	The axis belongs to channel 1... 8 on the second SERCOS ring.

The axis-specific Q-parameters have a dot for the axis number. Q.043 for axis 3 is Q3043.

Q.091 and Q.093 must be entered by the user (i.e. there is no default setting for these parameters).

The channel numbers of a SERCOS ring must be assigned without gaps. (Axis1:Channel1, Axis2:Channel2, ...).



8.4 Setting Axis Parameters

The axis-specific Q-parameters have a dot for the axis number. Q.043 for axis 3 is Q3043.

Axis parameters	
Q.043	Maximum desired speed
Q.050 / Q.051	Pulse evaluation factor
Q.023	Maximum velocity
Q.055	Axis position 4

Q.043 Maximum desired speed

Content	Max. desired speed
Unit	r.p.m.
Comment	The maximum desired speed can be smaller than the rated speed of the motor, but not larger.

Q.050 / Q.051 Pulse evaluation factor

Content	Q.050	Number of motor revolutions for the path in Q.051
	Q.051	Path in interpolation fineness for the number of motor revolutions in Q.050
Comment		This sets the resolution for the position data.

Example 1

Specification: One motor revolution corresponds to 4 mm travel on axis 1, the interpolation fineness is 0.1 μm . i.e. 4 mm = 40000 interpolation increments. Thus:

Q1050 = 1 Number of motor revolutions
Q1051 = 40000 Path for one (Q1050) motor revolution

Example 2

Specification: Three motor revolutions correspond to 5mm travel on axis 3, the interpolation fineness is 1 μm . i.e. 5mm = 5000 interpolation increments. Thus:

Q3050 = 3 Number of motor revolutions
Q3051 = 5000 Path for three (Q3050) motor revolutions

Q.023 Maximum velocity

Content	Maximum achievable velocity of axis
Unit	mm/min
Comment	The maximum velocity is calculated with the following parameters: Q.023 = Path in mm per motor revolution * maximum speed Increments per motor revolution

Example

	(Q.051 or Q.068 for the incremental encoder / absolute value encoder setting) Maximum speed of motor in r.p.m. (from Q.043)
--	--

Path per revolution of drive 1 = 30 mm
 Maximum speed of drive 1 = 4000 r.p.m. (Q1043)
 $Q1023 = 30 * 4000 = 120000 \text{ mm/min}$

Q.055 Axis position 4

Content	Bit 0 = 1	Absolute value encoder connection
	Bit 2 = 1	Telegram on 4
	Bit 2 = 0	Telegram on 7
	Bit 3 = 1	Position controller in encoder (always 1 for axis card PN-MIC)



8.5 Setting the Operating Data in the Drive

The following drive parameters are sent to the drives during SERCOS communication phases 2 and 3.

Drive parameter	
S-0-0044	Weighting type for velocity data
S-0-0045	Weighting factor for velocity data
S-0-0046	Weighting exponent for velocity data
S-0-0052	Reference dimension actual position value 1
S-0-0055	Position polarity parameter
S-0-0076	Weighting type for position data
S-0-0079	Rotational position resolution
S-0-0091	Velocity limit value bipolar
S-0-0103	Modulo value
S-0-0104	Position controller KV factor
S-0-0121	Gear input speed
S-0-0122	Gear output speed
S-0-0160	Weighting type for acceleration data
S-0-0161	Weighting factor for acceleration data
S-0-0162	Weighting exponent for acceleration data

Weighting of operating data

Weighting defines the values of the data which is exchanged between drives (slaves) and the axis card. It does **not** define the processing precision in the drives and the CNC.

S-0-0044 Weighting type for velocity data

Type	Rotational parameter weighting
Unit	Revolution (r.)
Time unit	Minute (p.m.)
Data reference	On motor shaft
Default setting	10 dec / 000A hex / 0000 0000 0000 1010 bin For rotational parameter weighting

S-0-0045 Weighting factor for velocity data

Set value = 1 dec

S-0-0046 Weighting exponent for velocity data

Set value = -4 dec

The set weighting type for velocity data means that the speed setpoint is given in 10^{-4} r.p.m. via the SERCOS ring.



Note that the set weighting also applies to the limit parameters S-0-0091, S-0-0038, S-0-0039.

S-0-0076 Weighting type for position data

Type	Rotational parameter weighting
Unit	Angular degrees
Data reference	On motor shaft
Processing format	Absolute for linear axes Modulo for rotary/modulo axes
Default setting	10 dec / 000A hex for linear axes 138 dec / 008A hex for rotary/modulo axes

S-0-0079 Rotational position resolution

The value for this parameter is calculated from the set Q parameters.
Q1068 For the absolute value encoder setting

Q1051 / Q1050 * 2ⁿ For the incremental encoder setting

In the incremental encoder setting n is calculated internally, in order to achieve sufficient resolution.

S-0-0160 Weighting type for acceleration data

Type	Rotational parameter weighting
Unit	Radian
Data reference	On motor shaft
Default setting	10 dec / 000A hex for rotational



S-0-0161 Weighting factor for acceleration data

Set value = 1 dec

S-0-0162 Weighting exponent for acceleration data

Set value = -3 dec

The set weighting type for acceleration data means that the acceleration is given in $10^{-3} \text{ rad/sec}^2$ via the SERCOS ring.

S-0-0091 Velocity limit value bipolar

Set value = $Q1043 * 10^4$

S-0-0052 Reference dimension 1

Set value = $Q1034 * 2^n$

In the absolute value encoder setting n is zero. In the incremental encoder setting n is calculated internally, in order to achieve sufficient resolution.

S-0-0055 Position polarities

Bit 0 and 1	=	Q1052 bit 1 (setpoint sign reversal)
Bit 2 and 3	=	Q1052 bit 0 (actual value sign reversal)

S-0-0103 Modulo value

$Q1067 * Q1068$ For the absolute value encoder setting

$Q1162 * 2^n$ For the incremental encoder setting

For explanation see rotational position resolution, S-0-0079.

S-0-0104 Position controller KV factor

Set value = $Q1022 / 10$

S-0-0121 Gear input speed

Set value = 1

S-0-0122 Gear output speed

Set value = 1

Cycle time SERCOS rings

Cycle time for cyclical data exchange between the PN-MIC and the drives. This cycle time is also the scan rate for the fine interpolator on the PN-MIC. The cycle time is entered via the NC dialog, startup section.

Data transmission rate via SERCOS ring

Two different baud rates are available for communication via the SERCOS ring.

1	2 Mbaud (Default)
0	4 MBaud

8.6 Startup

For startup you have to carry out the following settings in the listed order.

1. Set SERCOS cycle time
Q34 = (in microseconds)
2. Assign axis to required SERCOS ring.
Q1091 = Number of PN-MIC card (1...4)
Q1093 = Channel number (1...16)
3. Set max. motor speed
Q1043 = (less than or equal to rated motor speed)
4. Set pulse evaluation factor
Incremental encoder / absolute value encoder
Q1050 / Q1067 = Number of motor revolutions for the path in
Q1051
Q1051 / Q1068 = Path in IPO fineness.
5. Set max. velocity
Q1023 = Increments per motor revolution * max. motor
speed

You can set additional drive parameters for optimizing drives using SercTop (or driveTop).



8.7 SERCOS Error Messages

Normally the CNC reads the error messages from the shared RAM of the PN-MIC, displays them and enters them in the logbook. Controller lock is active as long as an error message is present. When the error has been rectified the error message must be acknowledged using the NC dialog manual mode or automatic reset.

In the shared RAM you can find the following data fields for each axis.

Address	Name (content)	Comment
	Diagnosis status	Error status (0 => no error message)
	SERCOS error bits (S-0-0011)	Error of status class 1 acc. to SERCOS specification
	Manufacturer-specific error	(for Indramat P-0-0009)
	Diagnosis text length	Length = 0 => no diagnosis text available (max. 60)
	Diagnosis text	Diagnosis text from drive (S-0-0095) (Length: max. 60 bytes)

Diagnosis status

Diagnosis status	Meaning
	No error message
	Drive addresses not correct
	Service channel HS timeout
	Double AT failure
	Drive error
	Switching: phase 2 => 3 not possible
	Switching: phase 3 => 4 not possible
	Instruction cannot be executed in drive

Error bits

Errors of status class 1; S-0-0011 are described in the SERCOS specification. Only one text is stored in the controller for each error bit. These error messages are entered in the logbook.

A text ("drive error") is stored in the controller for each manufacturer-specific error number. The error number is also stored in the controller. The logbook entry appears as follows:

.../././ Date Time **Manufacturer-specific error: Error number**

Diagnosis texts are read from the drive and entered in ... as C-string.

Diagnosis text length = 0 means that no diagnosis text is available.

Diagnosis text is only entered in the active error buffer as an NC message, but not in the logbook.

The error bits also activate the controller lock.

Bits	Meaning	Cause / rectification
0		
1		
2		
3		
4		
5		
6	Task overflow	Cycle time Q34 too small or hardware defect
7	SERCOS communication error in phase 4	
8	Measuring circuit error / broken cable	Rectify cause and press reset key
9	Zero-speed error	Acknowledge with reset
10		
11		
12		
13	Desired speed is too high	Can only occur when position controller is on the axis card.
14		
15		

Bits	Meaning
0	Initialization active
1	Drive is not ready for switching to load
2	Drive is not ready for switching to torque
3	Drive is not ready to follow setpoints
4	At least one of error bits (RW 269,05) bit 0..bit 4 is active
5	
6	Task overflow has occurred
7	SERCOS communication error has occurred in phase 4
8	Measuring circuit error has been activated
9	Zero-speed error has been activated
10	
11	
12	
13	Desired speed was too high
14	Position controller off or brake on
15	Controller lock through PLC or CNC (\$25)



8.8 Establishing Communication via the SERCOS Ring

Communication on the SERCOS ring is established in 5 phases (phases 0..4).

Establishment of communication is always restarted when

- The controller is switched on
- The reset button on the PC box is operated, or
- An error (e.g. cable break) is found on the SERCOS ring

Several seconds may pass before communication phase 4 is achieved. You can follow the establishment of communication using the LED displays.

8.9 Technical Data

Basic data			
Number of controllable axes	PN-MIC 11S CAN	8	(1 SERCOS ring)
	PN-MIC 21S CAN	16	(2 SERCOS rings)
Bus connection	PCI		

Electrical data		
Input signal voltage		Measuring sensor 24 V DC
Isolation		
Internal power consumption	DC 24V	
	DC 5V	

Connection system		
SERCOS optical fibre connection IN / OUT	F-SMA screw connections acc. to IEC 874-2	
X5 CANopen	PN-MIC 11S CAN	On front plate subminiature, 9-pin, plug connector
	PN-MIC 21S CAN	On PCB for connecting a subminiature, 9-pin, plug connector elsewhere
X1 USV		
X2 RS232		
X3 Measuring sensor / ready		
X4 SYNC		

Position controller data			
Travel distance	$\pm 1\text{m}$ at $0.1\text{ }\mu\text{m}$ resolution		
	$\pm 10\text{m}$ at $1\text{ }\mu\text{m}$ resolution		
	$\pm 100\text{m}$ at $10\text{ }\mu\text{m}$ resolution		
Velocity	1 mm/min to 300 m/min		
Acceleration	1 mm/s^2 to 100 m/s^2		
SERCOS cycle time	0.5 ms ... 4 ms		

Other data			
Processor		MCF 5307 90MHz, 32 Bit	
Memory		8MB SD-RAM, 2MB FLASH-EPROM	

Dimensions / weight			
Dimensions (H x W x D)		mm x	mm
Weight		kg	

8.10 Ordering Information

Axis card	
Ordering designation	Article number
PN-MIC 11S CAN	
PN-MIC 21S CAN	



9 CANopen Field Bus



This chapter describes the CANopen field bus for ProNumeric and ProSycon.

This chapter contains references to:	Order No.
Software	
CANopen Configurator ProCANopen	320 156 41
Operating manuals	
Commissioning Field Bus Systems	322 152 48 German 322 152 49 English

9.1 Fundamentals

General

CANopen is based on the CAN Application Layer for industrial CAL applications. The CANopen communications profile CiA DS-301 specifies the mechanisms for configuring and the communication between devices in real-time environments.

CANopen uses the data transmission layer in accordance with ISO 11898 and CAN 2.0 A+B:

- Description of device details via an EDS (Electronic Data Sheet)
- Object-oriented communication with PDOs and SDOs
- Transmission of real-time data with 'pure' CAN as the PDO (Process Data Object)
- Complex data or services with low priorities are transmitted or processed via SDOs (Service Data Objects)
- PDOs can be sent by all stations, either event-driven or synchronized
- CANopen Configuration managers (or masters) carry out, for example, network management during network start-up. However, they are not necessary for communication between the slaves
- Theoretically, up to 127 stations on one bus are possible
In practice the number of stations on a bus is restricted by the chosen bus topology and especially by the selected type of CAN transceiver components
(currently 64 for Schleicher CAN devices)

CANopen and ProNumeric/ProSycon

ProNumeric/ProSycon uses CANopen for the connection of digital I/Os. We recommend using the Schleicher **Remote Input Output System RIO**, however, any device with CANopen capabilities can also be used.

The CANopen processor is fitted on PN-MIC cards. One card can be used to set up one CANopen network.

Up to four cards can be used simultaneously.

9.1.1 Process Data Objects (PDOs)

The following mappable PDO types are available for the control unit: byte, word and double word network variables.

The PLC program uses the CANIO driver to access network variables via a process data map.

In addition, so-called direct network variables are provided which can be accessed without any special drivers and without process maps (!). We recommend using a CANopen Configurator such as ProCANopen to configure the communication relationships in the CANopen network. The supplied EDS files provide all the information regarding numbers, object, index, data types etc.

ProNumeric is a device which complies with CiA DSP 302 (Framework for Programmable CANopen Devices) or DSP 405 (Device Profile for IEC 1131 Programmable Devices) and does therefore not provide a default mapping functionality for PDOs.

For a list of mappable objects refer to Parameterizing and diagnosis data and Network variables .

9.1.2 Service Data Objects (SDOs)

Special “SDO objects” are provided to read/write consistent user data of up to 128 bytes.

If you want the PLC to access these objects you must declare the respective arrays in the PLC code first.

Object index	Direction	Address range	No. of bytes
0x4100	Rx	Depending on IO configuration	128
0x4110	Rx		128
0x4120	Rx		32
0x4130	Rx		64
0x4200	Tx		128
0x4210	Tx		128
0x4220	Tx		32
0x4230	Tx		64

Rx: Can be written externally via “Write Request”

Tx: Can be read externally via “Read Request”

9.1.3 Node guarding

Node guarding allows a guarding master to detect a failed slave. To detect a failed slave the master sends messages to the guarding ID (100Eh) of the slave in periodic cycles. The slave replies with a guarding message which also includes a toggle bit.

If you configure a Schleicher PLC as the guarding master any guarding errors in the PLC program can be evaluated using a function block.



9.1.4 Life guarding

While node guarding is used by the guarding master to detect a failed station, the monitored station uses these guarding telegrams to detect a failed master. This monitoring function of a station is called life guarding.

To detect a broken cable and enforce a shut-down of the outputs with CANopen, the node and life guarding functions must be activated.

To activate life guarding the NMT manager must describe the Guard Time (100Ch) and the Life Time Factor (100Dh) objects.

If the monitoring period

$$\text{Life Time} = \text{Life Time Factor} * \text{Guard Time [ms]}$$

has expired and no guarding telegram has arrived at the station a guarding error is concluded:

- A RIO CANopen bus coupler or compact module changes the NET LED to flashing red and shuts down the outputs
- A Schleicher PLC with CANopen transmits the guarding error to the PLC program via a function block

If one of the above mentioned objects is 0 no life guarding and therefore no cable break detection is carried out.

9.2 CANopen-specific PLC addresses

9.2.1 Parameterizing and diagnosis data

Diagnosis data		
CANopen object index	PLC address	Contents
0x3100 Diagnostic Input	Depending on IO configuration	Input data
0x3200 Diagnostic Output	Depending on IO configuration	Output data

(see also Diagnosis data and operating instructions for CANopen extension for Prodoc Plus)

9.2.2 Network variables

Network variables		
CANopen object index	PLC address	Contents
0x54c0 IB Input Byte 0x5580 IW Input Word 0x5680 ID Input Dword	Depending on IO configuration	Direct NVs input data
0x5040 QB Output Byte 0x5100 QW Output Word 0x5200 QD Output DWord	Depending on IO configuration	Direct NVs output data
0xa4c0 IB Input Byte 0xa580 IW Input Word 0xa680 ID Input Dword	Depending on IO configuration	Generic NVs input data
0xa040 QB Output Byte 0xa100 QW Output Word 0xa200 QD Output DWord	Depending on IO configuration	Generic NVs output data

(see also CANopen extension for Prodoc Plus)

All network variables can also be accessed via a Service Data Object (SDO).

Mapping to Process Data Objects (PDOs) can also be carried out via SDO. We strongly recommend using the CANopen Configurator "ProCANopen" for ease of use, to avoid mistakes and for diagnosis purposes.



All network variable outputs (QW) are set to 0 at PLC stop.



Network variables are read and written like a process map via the CANIO driver.



Direct network variables are read and written without process maps.

9.2.3 Accessing network variables and IO configuration

Network variables, function codes and parameters of the parameterizing and diagnosis functions are mapped to PLC addresses using the IO configuration and are assigned symbolic names in the variables declaration. The CANIO driver can be customized by setting the required driver parameters.

CANIO user parameters:		
DRIVER_PARAMETER	Code	Contents
DRIVER_PAR1	0 (default)	<ul style="list-style-type: none"> Access to diagnosis data deactivated Process data (outputs) are automatically set to 0 at PLC STOP
DRIVER_PAR1	Bit 0 = 1	<ul style="list-style-type: none"> Activate access to diagnosis data
DRIVER_PAR1	Bit 1 = 1	<ul style="list-style-type: none"> Process data (outputs) are not automatically set to 0 at PLC STOP
DRIVER_PAR2	0 (default)	<ul style="list-style-type: none"> Update process map without using semaphores Ensures 32 bit data consistency, not consistency of the complete map! Fast with low overhead Suitable for pure I/O access
DRIVER_PAR2	Bit 0 = 1	<ul style="list-style-type: none"> Update process map by using semaphores Data consistency in the whole network variables range Slow and with overhead, with waiting time for release of semaphores Uses the timeout value from DRIVER_PAR3 e.g. for superimposed protocols
DRIVER_PAR2	Bit 1 = 1	<ul style="list-style-type: none"> Prevents task changes during process data update
DRIVER_PAR2	Bit 2 = 1	<ul style="list-style-type: none"> Double buffer mode, update process map by using semaphores Data consistency in the whole network variables range Fast but with overhead, no waiting time for release of semaphores e.g. for the exchange of consistent data structures

DRIVER_PAR3	Value	<ul style="list-style-type: none"> • Timeout in μs (when using semaphores) • Default max. 500μs

Example 1

```
(* CAN1> - Don't remove this label*)
PROGRAM netin1 : INPUT
(
  VAR_ADR      := 1000, (* CAN card / network 1 *)
  END_VAR_ADR := 1255,
  DEVICE       := DRIVER,
  DRIVER_NAME  := 'CANIO'
  (* use defaults *)
);
PROGRAM netout1 : OUTPUT
(
  VAR_ADR      := 1000,
  END_VAR_ADR := 1255,
  DEVICE       := DRIVER,
  DRIVER_NAME  := 'CANIO'
  (* use defaults *)
);
(* diagnostic interface *)
PROGRAM netin1d : INPUT
(
  VAR_ADR      := 1256, (* CAN card / network 1 *)
  END_VAR_ADR := 1259,
  DEVICE       := DRIVER,
  DRIVER_NAME  := 'CANIO',
  DRIVER_PAR1  := 1
);
PROGRAM netout1d : OUTPUT
(
  VAR_ADR      := 1256, (* CAN card / network 1 *)
  END_VAR_ADR := 1259,
  DEVICE       := DRIVER,
  DRIVER_NAME  := 'CANIO',
  DRIVER_PAR1  := 1
);
(* <CAN1 - Don't remove this label *)
```

Declaration in PLC program:

```
VAR_GLOBAL
mNVInput1      AT %IW 1000 : INT;
mNVOutput1     AT %QW 1000 : INT;
mDiag1Input1   AT %IW 1256 : UINT;
mDiag1Input2   AT %IW 1258 : UINT;
mDiag1Output1  AT %QW 1256 : UINT;
mDiag1Output2  AT %QW 1258 : UINT;
VAR_END
```

The required PN-MIC card (network) is selected by the PLC address:

VAR_ADR:=1000 ... PN-MIC card / network 1
VAR_ADR:=2000 ... PN-MIC card / network 2
VAR_ADR:=3000 ... PN-MIC card / network 3
VAR_ADR:=4000 ... PN-MIC card / network 4

Please also note that DRIVER_PAR1=1 must be set so that the CANIO driver accesses the parameterizing and diagnosis functions. This will create maps for the memory locations of the parameterizing and diagnosis functions.

Example 2

```
(* CAN2> - Don't remove this label*)
PROGRAM netin1 : INPUT
(
  VAR_ADR      := 2000, (* CAN card / network 2 *)
  END_VAR_ADR  := 2255,
  DEVICE       := DRIVER,
  DRIVER_NAME  := 'CANIO',
  DRIVER_PAR1  := 0,
  (*
    use sema, task lock, double buffer, timeout = 500 µs
  *)
  DRIVER_PAR2  := 7,
  DRIVER_PAR3  := 500,
);
PROGRAM netout1 : OUTPUT
(
  VAR_ADR      := 2000, (* CAN card / network 2 *)
  END_VAR_ADR  := 2255,
  DEVICE       := DRIVER,
  DRIVER_NAME  := 'CANIO',
  DRIVER_PAR1  := 0,
  (*
    use sema, task lock, double buffer, timeout = 500 µs
  *)
  DRIVER_PAR2  := 7,
  DRIVER_PAR3  := 500,
);
(* <CAN2 - Don't remove this label *)
```



If the double buffer mode is activated anywhere in the I/O configuration this setting will be used by all drivers when accessing the activated CAN card.

9.2.4 Accessing direct network variables

Direct network variables are declared in the PLC program as follows:

```
VAR_GLOBAL
(* CAN card / network 1 *)
mNV1Input  AT %MW 3.1010000 : UDINT;
mNV1Output AT %MW 3.1010512 : UDINT;
(* CAN card / network 2 *)
mNV2Input  AT %MW 3.1020000 : UDINT;
mNV2Output AT %MW 3.1020512 : UDINT;
VAR_END
```

It is also possible to access the respective memory locations of the parameterizing and diagnosis functions directly, i.e. without using the CANIO driver.

```
VAR_GLOBAL
mDiag1Input1 AT %MW 3.1019992 : UINT;
mDiag1Input2 AT %MW 3.1019994 : UINT;
mDiag1Output1 AT %MW 3.1019996 : UINT;
mDiag1Output2 AT %MW 3.1019998 : UINT;
VAR_END
```

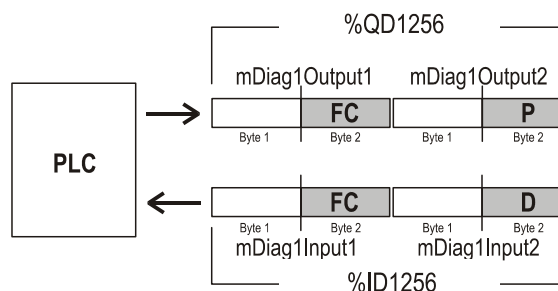
This will not create maps for the memory locations of the parameterizing and diagnosis functions.

9.2.5 Accessing parameterizing and diagnosis functions

The PLC requests a function by entering the required function code in the mDiag1Output1 variable.

If a function and its parameter are required the parameter must be entered in mDiag1Output2 and the function code must be entered in mDiag1Output1.

When the function is processed the function code is always displayed in mDiag1Input1. The diagnosis data can then be read from mDiag1Input2.



FC = Function Code
P = Parameter
D = Data

Direct assignments in 32 bit variables (e.g. %QD1256 and %ID1256) are also possible.



9.3 SDO function blocks

Supported functions

SDO Write
SDO Read
Read Error and Emergency Entries

More detailed descriptions can be found in the CiA Draft Standard 301 and the respective profiles (e.g. CiA DSP 405, 401 etc.).

See also Operating manual for the CANopen extension Prodoc Plus.

9.4 Commissioning of CANopen

ProNumeric/Prosycon is supplied with a simple, preconfigured CANopen network (see also chapter The preconfigured CANopen network) to make commissioning easy. The network starts up automatically after ProNumeric/ProSycon has been launched.

If you want to extend the CANopen network we recommend using the ProCANopen Configurator. ProCANopen provides you with all the necessary features to fully and easily commission a network.

The operating instructions “Commissioning Field Bus Systems” are another useful resource.

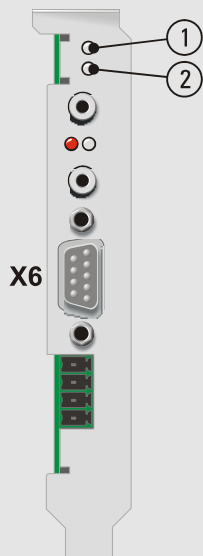
9.4.1 CANopen displays and ports on the PN-MIC

The CANopen processor with its displays (LEDs) and ports is fitted on PN-MIC cards. Depending on the type of PN-MIC used the port will either be on the front side of the card or offset.

Each card can take the master function in a network. Up to four cards can be used simultaneously.

CANopen displays and ports

PN-MIC 11S CAN

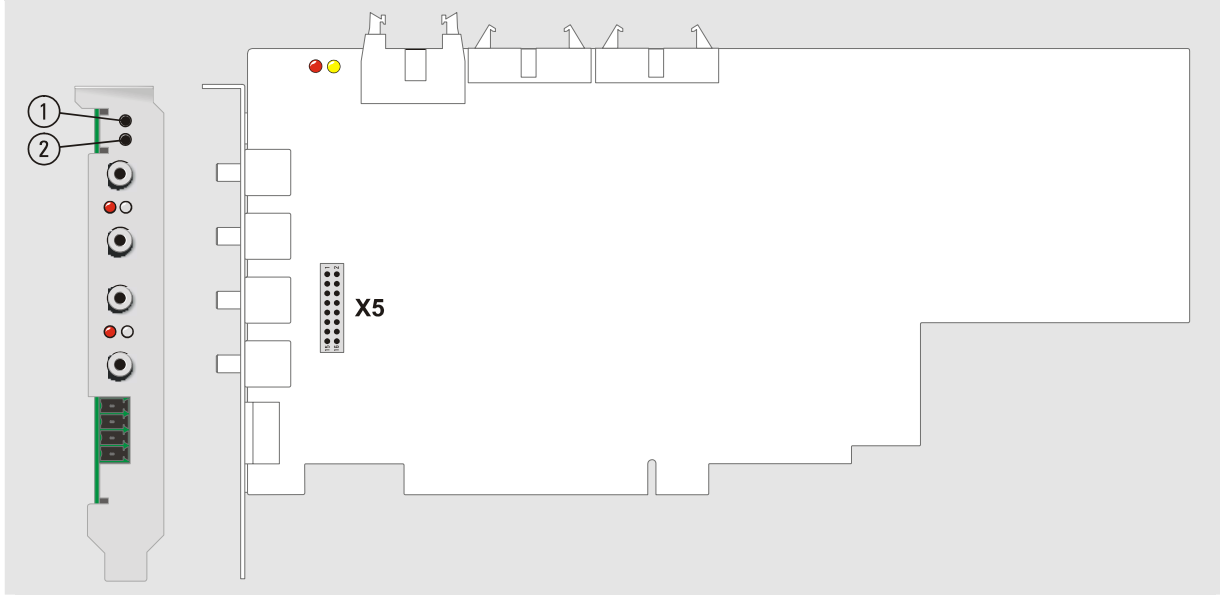


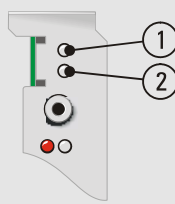
LEDs

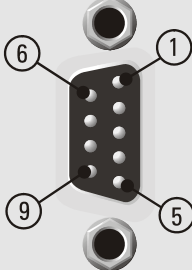
	Designation	Colour
1	NET (network status)	Green/ red
2	MOD (module status)	Green/ red

Ports

	Designation	Explanation
X6	CANopen field bus port	Subminiature, 9-pin, plug connector
X5	CANopen field bus port	Connector to install a 9-pin subminiature plug connector off the device

PN-MIC 21S CAN

CANopen LEDs

		No.	Name	Colour	Meaning
	1	NET (network status)	Green	ON	CAN state operational
				Flashing	CAN state pre-operational
				OFF	CAN State Prepared or device switched off
			Red	ON	BUS OFF E.g. broken cable, hardware error of a CAN controller in the network
	2	MOD (module status)		Flashing	CAN error E.g. 24V at CAN controller but no active CAN controller at the bus, wrong baud rate, problems with bus physics (but no broken cable!)
				OFF	CAN State Prepared or device switched off
			Green	ON	CAN stack is initialized, control unit is ready
				Flashing	No or invalid CAN configuration
			Red	ON	Control unit is not ready yet (initialized) or fatal error (cannot be corrected by user)
				Flashing	Error in controller, control unit is not ready

CANopen field bus port**Subminiature, 9-pin, pins**


Designation	Meaning
1 NC	Not connected
2 CAN_L	
3 V-	Ground
4 NC	Not connected
5 Drain	Shield connection optional
6 V-	Ground
7 CAN_H	
8 NC	Not connected
9 V+	Power supply +24V

9.4.2 CANopen wiring**Cable lengths**

The maximum cable length depends on the chosen data transmission rate.

Cable lengths	
Data transmission rate in KBAud	Cable length in m
10	5000
20	2500
62.5	1000
125	500
250	250
500	100
800	50
1000	30

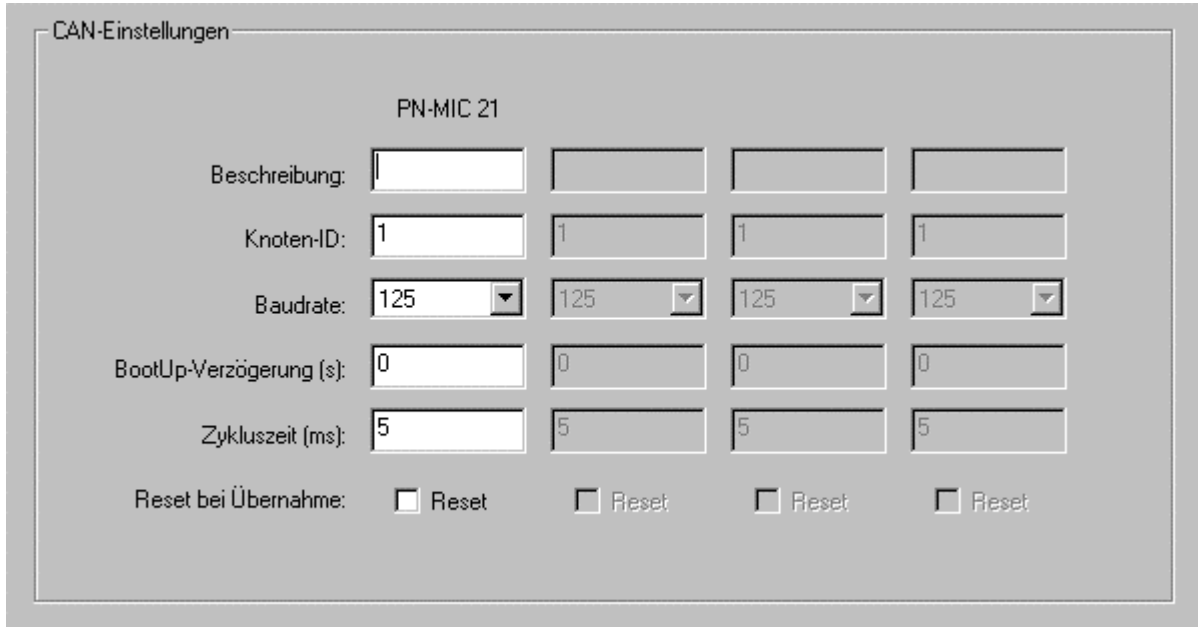
Terminating resistors

A 120Ω terminating resistor must be fitted at each end of the trunk line between CAN_L and CAN_H.

9.4.3 Setting node numbers and data transmission rates

Setting node numbers and data transmission rates using the NC commissioning dialog

Press the following shortcut combination on the keyboard to open the CAN Settings dialog: <Ctrl + F6> (Commissioning mode), <F5>



	PN-MIC 21			
Beschreibung:				
Knoten-ID:	1	1	1	1
Baudrate:	125	125	125	125
BootUp-Verzögerung (s):	0	0	0	0
Zykluszeit (ms):	5	5	5	5
Reset bei Übernahme:	<input type="checkbox"/> Reset	<input type="checkbox"/> Reset	<input type="checkbox"/> Reset	<input type="checkbox"/> Reset

Node numbers (node IDs) must be unique. If you assign one node number twice the system will return errors and you will not be able to run the network correctly. You can assign numbers from 1 to 127. Node number 127 is usually used by the CANopen Configurator ProCANopen.

Setting node numbers and data transmission rates using the parameterizing functions

You can also set the node number via parameterizing function 1 and the data transmission rate via parameterizing function 2.



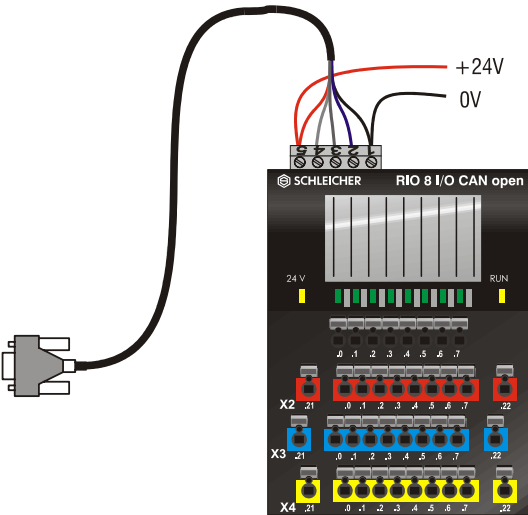
To apply the new parameters you must reset the PN-MIC (select the option *Reset bei Übernahme* (Reset to apply changes)).

If you changed parameters at the network nodes you also need to switch off the power supply at the network nodes and turn it back on in order to enforce a restart.

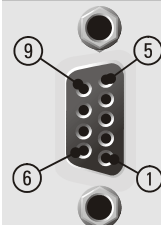
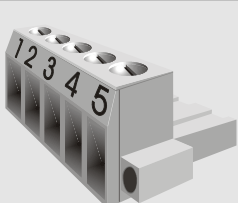
9.4.4 The preconfigured CANopen network

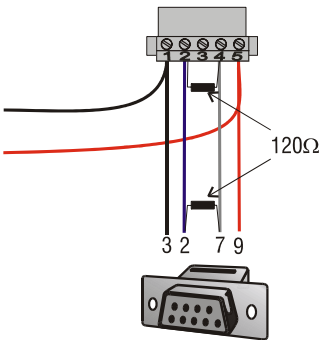
In order to make commissioning easier a simple network has already been preconfigured on the ProNumeric/ProSycon.

The network consists of only one RIO compact module with 8 inputs/outputs which will be connected to the ProNumeric/ProSycon.



Wiring

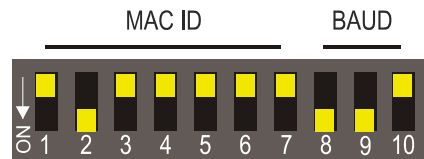
ProNumeric/Prosycon			RIO	
Subminiature, 9-pin, socket connector			Open style connector, 5-pin	
	Pin	Meaning	Pin	
	3	V- (Ground)	1	
	2	CAN_L	2	
		Drain (shield connection optional)	3	
	7	CAN_H	4	
	9	V+ (24 V DC)	5	



Terminating resistors must be fitted at both ends of the bus cable between CAN_L and CAN_H.

Setting node numbers and data transmission rates

Set the node number for the compact module (MAC ID) to 2 and the data transmission rate (BAUD) to 125 Kbaud. Move the DIP switch of the compact module as shown below to achieve this.

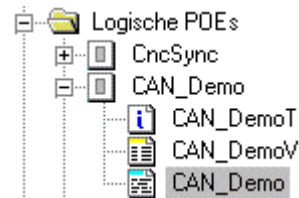


Powering up

After you have switched the power supply for the RIO compact module on and the ProNumeric/Prosycon has been launched the network will be powered up. The two green LEDs on the compact module and the PN-MIC are ON.

The PLC program on ProNumeric/ProSycon

A PLC program runs on ProNumeric/ProSycon which can be found in CAN_Demo in the ProdocPlus folder.



The program links the inputs X1.1 and X1.2 with OR and outputs them to output X1.0.

```
out00 := in01 OR in02;
```

The required variables for the inputs/outputs of the compact module have been declared in the resource called IO_Variables.

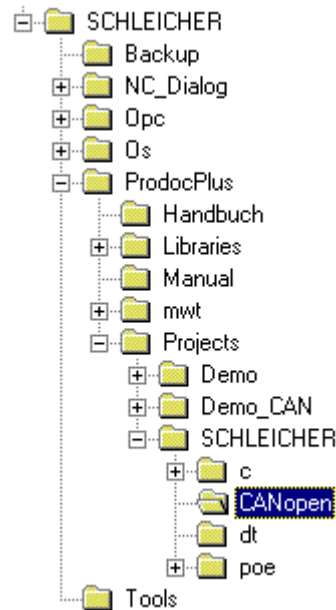
```
VAR_GLOBAL
    in00          AT %IX 1000.0 : BOOL;
    in01          AT %IX 1000.1 : BOOL;
    in02          AT %IX 1000.2 : BOOL;
    in03          AT %IX 1000.3 : BOOL;
    in04          AT %IX 1000.4 : BOOL;
    in05          AT %IX 1000.5 : BOOL;
    in06          AT %IX 1000.6 : BOOL;
    in07          AT %IX 1000.7 : BOOL;
    out00         AT %QX 1000.0 : BOOL;
    out01         AT %QX 1000.1 : BOOL;
    out02         AT %QX 1000.2 : BOOL;
    out03         AT %QX 1000.3 : BOOL;
    out04         AT %QX 1000.4 : BOOL;
    out05         AT %QX 1000.5 : BOOL;
    out06         AT %QX 1000.6 : BOOL;
    out07         AT %QX 1000.7 : BOOL;
END_VAR
```

9.4.5 Expanding the CANopen network

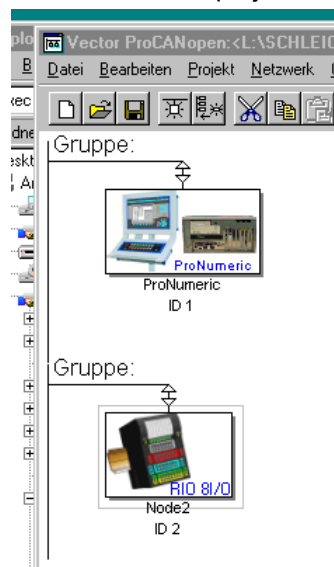
If you want to extend the CANopen network we recommend using the ProCANopen Configurator. ProCANopen provides you with all the necessary features to fully and easily commission a network and to perform a network diagnosis.

The operating instructions “Commissioning Field Bus Systems” are a useful resource.

The preconfigured ProCANopen project is in the following directory:
SCHLEICHER/ProdocPlus/Projects/SCHLEICHER/CANopen

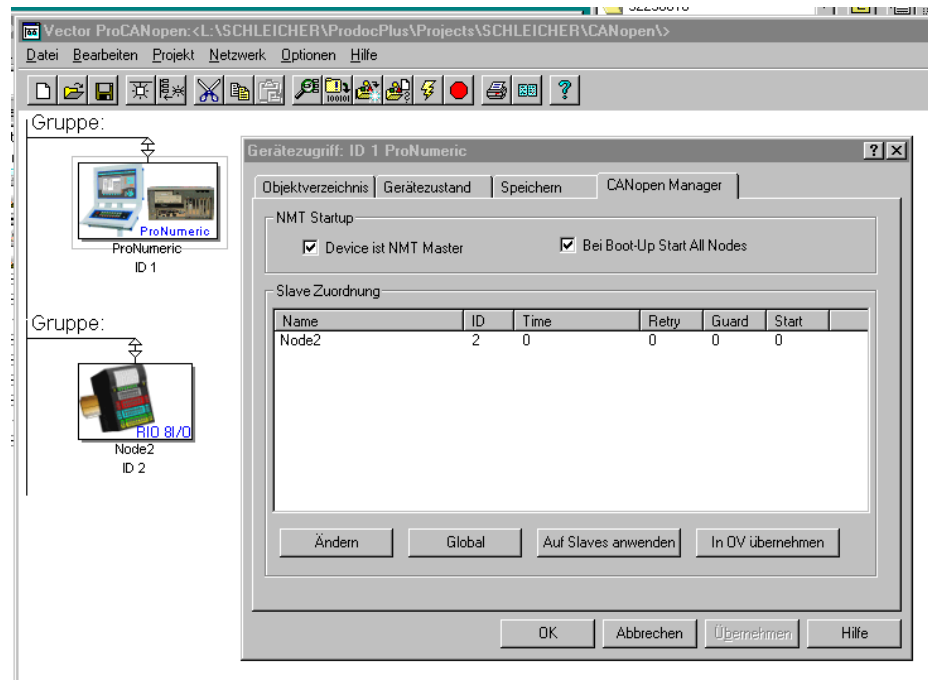


You can use this project to create your own project.

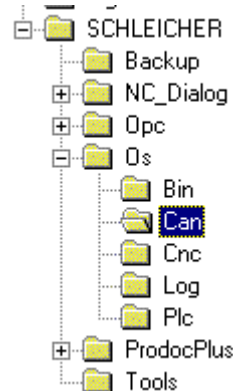




ProNumeric/ProSycon is registered as the NMT manager.



Once the project is on the network the CANopen processor of the ProNumeric/ProSycon can create the file CANconf0.dat. This file is saved on the hard disk of ProNumeric/ProSycon under *SCHLEICHER/Os/Can*.



Every time the system is restarted the CANopen processor uses this file to start up the network.



The file CANconf0.dat can be copied to any ProNumeric/ProSycon if you want to reuse the configuration of the CANopen network.

9.5 Overview of parameterizing and diagnosis functions

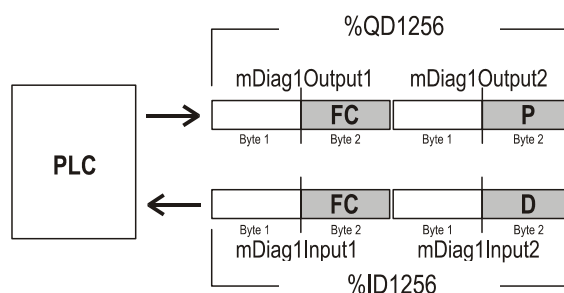
The PLC can trigger parameterizing and diagnosis functions in the CANopen processor (which is fitted on the PN-MIC) by transmitting a code.

Function	
0	No function
1,17	Read and set node number (NodeID) Range of values: 1..127 Reboot required!
2	Read and set baud rate Range of values: 1..8 Reboot required!
3 ... 5	Reserved
6	Read CAN status code
7	Read error status of CAN card
8	Read firmware version of CAN card
9..15	Reserved
16	Read effective runtime of CAN stack (in 1/100ms)
17..19	Reserved
20	Read and set startup delay Range of values: 1..60s
21...101	Reserved
102	Read and set cycle time of CAN stack Range of values: 1..10ms Reboot required!
103...254	Reserved
255	Reset

The PLC requests a function by entering the required function code in the mDiag1Output1 variable.

If a function and its parameter are required the parameter must be entered in mDiag1Output2 and the function code must be entered in mDiag1Output1.

When the function is processed the function code is always displayed in mDiag1Input1. The diagnosis data can then be read from mDiag1Input2.



FC = Function Code

P = Parameter

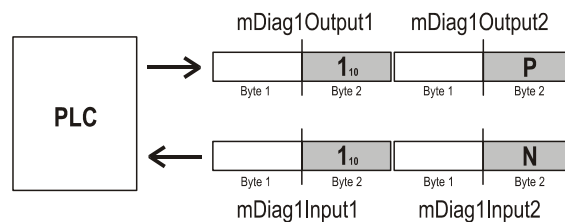
D = Data

Direct assignments in 32 bit variables (e.g. %QD1256 and %ID1256) are also possible.



9.5.1 Function 1 Set and read CANopen Node Number

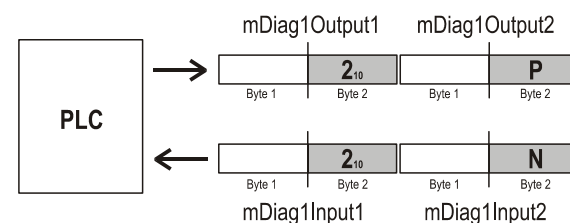
P Parameter	
0	Read node number
1	Set node number 1
.	.
127	Set node number 127



N Currently set node number	
1	Node number 1
.	.
.	.
27	Node number 127

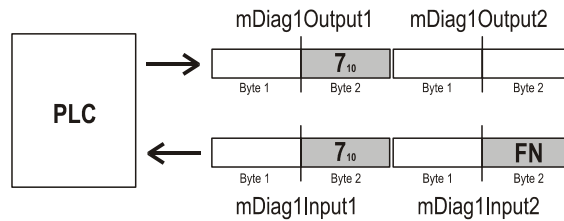
9.5.2 Function 2 Set and read data transmission rate

P Parameter	
0	Read currently set data transmission rate
1	Set 10 KBaud
2	Set 20 KBaud
3	Set 50 KBaud
4	Set 125 KBaud
5	Set 250 KBaud
6	Set 500 KBaud
7	Set 800 KBaud
8	Set 1000 KBaud



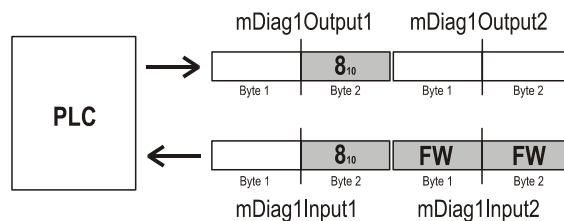
N Currently set data transmission rate in KBaud	
1	10
2	20
3	50
4	125
5	250
6	500
7	800
8	1000

9.5.3 Function 7 Read CANopen error number



FN Error number - see error messages.

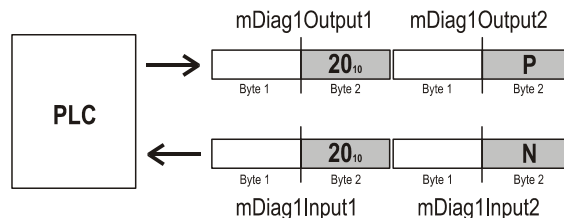
9.5.4 Function 8 Read CANopen firmware version



FW Firmware version

The firmware version is displayed in hexadecimal code.

9.5.5 Function 20 Set CANopen startup delay



P Startup delay in seconds (requested value)

N Startup delay in seconds (actual value)



CAN stations require different amounts of time to get ready to receive CAN telegrams after the power supply has been switched on. The NMT manager can only send telegrams when all stations on the bus are ready.

Setting a startup delay is therefore only required if the CANopen processor of the ProNumeric is configured as the NMT manager.



9.6 Error messages

Error messages of the CANopen processor are entered in the active error buffer or the log book. You can view these entries in the NC dialog commissioning tool.

The error number can be read by the PLC with diagnosis function 7.

For an explanation of error messages refer to chapter “Error messages” in the ProNumeric/ProSycon operating manual.

10 Configuration Data

10.1 Overview

General configuration data	Q00 to Q99	
Subsystem-specific configuration data	Q100 to Q124	Subsystem is selected with instruction &sysno <nn> nn = number of selected subsystem.
Axis-specific configuration data	Q.000 to Q.099	When axis-specific data is accessed the respective axis number must be entered in place of the dot in the address.

General configuration data

Q25	Decoder settings
Q37	CNC options 1
Q38	CNC options 2
Q55	Online memory
Q56	Online parameter 1
Q57	Online parameter 2
Q58	Online parameter 3
Q59	Online parameter 4
Q60	Online trigger signal
Q61	Online CNC request
Q69	Test run velocity

System-specific configuration data

Q105	Interpolation fineness
Q106	Circle end position tolerance
Q111	Decoder settings
Q112	Transformation ID
Q125	Offset Z
Q126	Offset X
Q130	Initialization program
Q137	Cartesian minimum acceleration
Q138	Cartesian path acceleration
Q139	Cartesian path deceleration
Q141	Path acceleration
Q142	Path deceleration



Axis-specific configuration data	
Q.000	Manual velocity
Q.001	Cartesian manual velocity
Q.002	Clearance distance
Q.020	Assigned system
Q.021	Address letter
Q.022	KV factor
Q.023	Maximum velocity
Q.025	Acceleration
Q.026	Deceleration
Q.027	Sin ² ramp factor
Q.028	Rapid feed manual
Q.029	Rapid feed automatic
Q.030	Homing velocity
Q.031	Homing search velocity
Q.032	Home position shift
Q.033	Home position search distance
Q.034	Home coordinate
Q.035	Software limit switch +
Q.036	Software limit switch -
Q.037	Encoder increments / axis revolution
Q.038	Interpolation units / axis revolution
Q.040	Follow-up window
Q.041	Extension angle
Q.042	Maximum following error
Q.043	Maximum motor speed
Q.046	Zero-speed control
Q.047	Delay time zero-speed control
Q.048	Exact stop boundary
Q.049	Backlash compensation
Q.050 / Q.051	Motor revolutions / travel
Q.051	Travel / motor revolutions
Q.052	Axis options 1
Q.053	Axis options 2
Q.054	Axis options 3
Q.055	Axis options 4
Q.056	Transforming axis (slave)
Q.057	Transforming axis (master)
Q.058	Gear factor numerator
Q.059	Gear factor denominator
Q.060	Cartesian rapid feed velocity manual
Q.061	Setup velocity
Q.062	Cartesian axis letter
Q.063	Kinematic axis sequence
Q.065	Homing sequence
Q.067	Number of revolutions absolute value encoder
Q.068	Number of pulses absolute value encoder
Q.070	Interpolation fineness
Q.075	Axis options 5
Q.076	Axis options 6
Q.078	Following error compensation
Q.079	Velocity factor
Q.084	Home position coordinate 2
Q.088	Backlash compensation position cycle
Q.090	Offset home cam



Q.098	Offset Z
Q.099	Offset X

10.2 Data Types

Type	Meaning
B	Byte data with value range 0 to 255 Special case bit: settings with bit patterns
B signed	Byte data with value range -128 to +127
W	Word data with value range 0 to 6553
W signed	Word data with value range - 32768 to + 32767
D	Double word data with value range - 999999999 to + 999999999 input -2 147 483 647 to +2 147 483 647 display
>	Read access by NC program
<	Write access by NC program (see Q37 bit 6)



10.3 General Configuration Data (Q00 - Q99)

Q25 Decoder settings

Specification	Decoder settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning if bit = 1
	0	G91 not effective (incremental dimension)
	1	G97 not effective (spindle speed)
	2	IJK absolute, for circular/helical interpolation the reference point of the coordinates is the programmed home position.
	3	Reserved
	4	Inch/mm conversion for F/S word
	5	In the NC program M17/M30 program end identifier is not required
	6	Reserved
	7	Safety start lock If the the current axis position at NC program start is not the first programmed axis coordinate then the first approach to the programmed axis coordinates will be in repositioning mode.

Q37 CNC options 1

Specification	General CNC options	
Type	B (special form bit)	
Bit pattern	Bit	Meaning if bit = 1
	0	Reserved
	1	Update actual value display with \$31/\$32 (synchronous operation) 0: Display is updated with M30 or reset (default setting). 1: Display is updated when synchronous operation is deselected with \$32.
	2	Default setting inch
	3	No automatic repositioning
	4	Sin ² ramp as default setting
	5	Reserved
	6	Q parameter can be changed by the CNC program
	7	Reserved

Q38 CNC options 2

Specification	General CNC options	
Type	B (special form bit)	
Bit pattern	Bit	Meaning if bit = 1
	0	Reserved
	1	Cutting velocity in m/s, default: mm/min
	2	G0 (rapid feed) without exact positioning. Automatic selection of G9 in G0 records is suppressed. Selected exact positioning level is retained.
	3	Q38 bit 3 = 1: System parameter conversion carried out every time reset key is pressed. The message "Q PARAMETERS CONVERTED" appears for 3 seconds. When all Q parameters are successfully converted the PLC flag <i>cncMem.comSect.flgN2P.bSysCfgRdy</i> is set to 1 for at least 1 interpolation cycle. This way, Q parameters can be written and transferred parameters can be activated with a software RESET (all PLC-controlled). The bit is reset after activation.
	4	Reserved
	5	Reserved
	6	G53 self-maintaining
	7	Reserved

Q55 Online memory

Specification	Size of internal ring memory for online logging
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment:	Info in lines (4 values).

Q56 Online parameter 1

Specification	Number of first Q parameter to be logged
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment:	Example: 1112 = set position of 1st axis



Q57 Online parameter 2

Specification	Number of second Q parameter to be logged
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment:	Example: 2112 = set position of 2nd axis

Q58 Online parameter 3

Specification	Number of third Q parameter to be logged
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment:	Example: 3006 = partial set value of 3rd axis

Q59 Online parameter 4

Specification	Number of fourth Q parameter to be logged
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment:	Example: 153 = Path partial set value

Q60 Online trigger signal

Specification	Number of the bit signal for CNC instruction
Type	B
Unit	None
Value min/max/default	0 / 255 / 0
Comment:	In the NC record logging can be switched on and off with SE<nn>, RS<nn> (SE = online on, RS = online off). The number of the bit signal used is entered in Q60.

Q61 Online CNC request

Specification	Request word for online logging
Type	B
Unit	None
Value min/max/default	0 / 255 / 0
Comment:	0 = no online 5 = select online (acknowledged with 6)

Q69 Test run velocity

Specification	Test run velocity
Type	W
Unit	mm/min
Value min/max/default	0 / 65535 / 1000
Comment:	The velocity for program execution in "TEST RUN" mode. No axes move. Enter in mm/min.

10.4 Subsystem-specific Configuration Data (Q100 bis Q199)**Q105 Interpolation fineness**

Specification	Interpolation fineness setting			
Type	B (special form bit)			
Bit pattern	Bit	Interpolation fineness	Display	Travel distance
	0	0.00005	0.0000	± 0.9999999 m
	1	0.0001	0.0000	± 0.9999999 m
	2	0.0005	0.000	±9.999999 m
	3	0.001	0.000	±9.999999 m
	4	0.005	0.00	±99.99999 m
	5	0.01	0.00	±99.99999 m
	6	0.05	0.0	±999.9999 m
	7	0.1	0.0	±999.9999 m

Q106 Circle end position tolerance

Specification	Maximum circle end position error
Type	W
Unit	Interpolation fineness
Value min/max/default	0 / 65535 / 100
Comment:	The circle end position error is the difference between the starting and finishing radius of a circular path (see G2 / G3). A circle end position error can occur when the coordinates of the centre are programmed with I, J and K. An error less than Q106 is finished via a spiral, while a larger error generates an error message.

Q111 Decoder settings

Specification	Decoder settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning
	0	0 Feedrate in mm/min (deg/min for rotary axes) 0 Feedrate in mm/s (deg/ms for rotary axes)
	1	Reserved
	2	Reserved
	3	Feed stop without ramp in automatic mode when software limit switch or working space limitation is reached.
	4 - 7	

Q112 Transformation ID

Specification	ID of required transformation
Type	B



Unit	None
Value min/max/default	0 / 255 / 0
Comment:	Only relevant for special kinematics Every kinematic transformation is identified by an ID. A specific transformation is activated by entering the corresponding ID.

Q125 Offset Z

Specification	Joint offset in Z direction
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\ 147\ 483\ 647$ / 0
Comment:	Only relevant for special kinematics Length offset in Z direction for transition from one robot joint to the next (Denavit-Hartenberg rules). Here, the offset from the base coordinate system to the first joint system.

Q126 Displacement X

Specification	Joint offset in X direction
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\ 147\ 483\ 647$ / 0
Comment:	Only relevant for special kinematics Length offset in X direction for transition from one robot joint to the next (Denavit-Hartenberg rules). Here, the offset from the base coordinate system to the first joint system.

Q130 Initialization program

Specification	Number of initialization program
Type	D
Unit	None
Value min/max/default	0 / 99999999 / 99999999
Comment:	The program with the entered program number is activated after controller start and can be started directly. If Q.30 = 0 no program is active after controller start-up.

Q137 Cartesian minimum acceleration

Specification	Minimum Cartesian acceleration
Type	W
Unit	mm/s ²
Value min/max/default	0 / 65535 / 10
Comment:	Only relevant for special kinematics This value is the minimum value for acceleration in order to allow smooth initiation of even critical robot movements. An example of a critical position is arm stretching.

Q138 Cartesian path acceleration

Specification	Acceleration value for Cartesian path movements
Type	W
Unit	mm/s ²
Value min/max/default	0 / 65535 / 0
Comment:	Only relevant for special kinematics

Q139 Cartesian path deceleration

Specification	Deceleration value for Cartesian path movements
Type	W
Unit	mm/s ²
Value min/max/default	0 / 65535 / 0
Comment:	Only relevant for special kinematics

Q141 Path acceleration

Specification	Acceleration on path (maximum value)
Type	W
Unit	mm/s ²
Value min/max/default	0 / 65535 / 0
Comment:	Limitation of path acceleration over values set for individual axes.

Q142 Path deceleration

Specification	Deceleration on path (maximum value)
Type	W
Unit	mm/s ²
Value min/max/default	0 / 65535 / 0
Comment:	Limitation of path deceleration over values set for individual axes.



10.5 Axis-specific Configuration Data

Q.000 Manual velocity

Specification	Velocity for manual mode
Type	D
Unit	mm/min
Value min/max/default	0 / 65535 / 1000
Comment:	

Q.001 Cartesian manual velocity

Specification	Cartesian manual velocity
Type	D
Unit	mm/min
Value min/max/default	0 / 65535 / 1000
Comment:	Only relevant for special kinematics Velocity at which a machine with special kinematics or a robot moves manually in Cartesian space.

Q.002 Clearance distance

Specification	Distance to be moved when clearing
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / ± 2 147 483 647 / 0
Comment:	After PLC signal <i>cncMem.sysSect[nn].flgP2N.freeTrav</i> the value entered here will be moved at rapid velocity Q.029 Rapid feed automatic.

Q.020 Assigned system

Specification	System to which axis is assigned
Type	B
Unit	None
Value min/max/default	1 / 32 / 1
Comment:	Number of NC subsystem to which an axis is normally assigned.

Q.021 Address letter

Specification	Axis designation for programming	
Type	B	
Comment	Permissible address letters	ASCII code
	A	01000001
	B	01000010
	C	01000011
	D	01000100
	L	01001100
	O	01001111
	P	01010000
	U	01010101
	V	01010110
	W	01010111
	X	01011000
	Y	01011001
	Z	01011010
	I	01001001
	J	01001010
	K	01001011

Q.022 KV factor

Specification	KV factor
Type	W
Unit	(m/min)/mm
Value min/max/default	0 / 65535 / 1000
Comment:	Amplification factor in closed-loop control circuit. Indicates the velocity in m/min at which an axis can move before a following error of 1 mm is reached. Default setting is KV factor 1.

Q.023 Maximum velocity

Specification	Maximum achievable axis velocity
Type	D
Unit	mm/min
Value min/max/default	0 / 2 147 483 647 / 5000
Comment:	The maximum axis velocity is the product of travel per motor revolution (Q.051 Travel / motor revolution) and maximum motor speed (Q.043 Maximum motor speed).

Q.025 Acceleration

Specification	Acceleration ramp
Type	D
Unit	mm/s ²
Value min/max/default	0 / 65535 / 100
Comment:	The entered value must not exceed the acceleration capacity of the drive.

**Q.026 Deceleration**

Specification	Deceleration ramp
Type	D
Unit	mm/s ²
Value min/max/default	0 / 65535 / 100
Comment:	The entered value must not exceed the deceleration capacity of the drive.

Q.027 Sin² ramp factor

Specification	Sin ² ramp steepness
Type	W
Unit	None
Value min/max/default	0 / 65535 / 100
Comment:	The set value is the multiplication factor for the acceleration values of the linear ramp (Q.025 and Q.026). It is divided by 100 internally. You will then get the following minimum and/or maximum values: Entered value 1 -> 0.01 least steep ramp Entered value 65535 -> 655,35 steepest ramp For reasons of compatibility the input value 0 corresponds to factor 1.00.

Q.028 Rapid feed manual

Specification	Rapid feed velocity in conventional operation
Type	D
Unit	mm/min
Value min/max/default	0 / ±2 147 483 647 / 2000
Comment:	

Q.029 Rapid feed automatic

Specification	Rapid feed velocity in automatic operation
Type	D
Unit	mm/min
Value min/max/default	0 / ±2 147 483 647 / 5000
Comment:	

Q.030 Homing velocity

Specification	Approach velocity for home cam
Type	D
Unit	mm/min
Value min/max/default	0 / 65535 / 1000
Comment:	This is the velocity with which the axis approaches the home cam.

Q.031 Homing search velocity

Specification	Velocity for homing search
Type	D
Unit	mm/min
Value min/max/default	0 / 65535 / 500
Comment:	This is the velocity with which the axis returns from the home cam and searches for the first zero mark.

Q.032 Home position shift

Specification	Home position shift
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / 2 147 483 647 / 0
Comment:	Once the axis has detected the zero mark it moves to this mark and then remembers the new position as the home coordinate. The sign defines whether the shift is in approach direction from zero pulse (+) or whether the direction is reversed after detection of zero pulse (-).

Q.033 Home position search distance

Specification	Search distance for home position mark
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\ 147\ 483\ 647$ / 0
Comment:	Having left the home cam the axis searches the zero mark on this path. If the axis cannot find a zero mark it returns to the cam and repeats the search procedure. The search distance must be smaller than the distance between two zero pulses (pulse/rotation – 1), corresponding to a position encoder rotation.

Q.034 Home coordinate

Specification	Home coordinate
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\ 147\ 483\ 647$ / 0
Comment:	Once the axis has detected the zero mark and performed a shifting motion as defined in Q032 (if applicable) the axis is set to the home coordinate value and is now considered as being synchronized (<i>cncMem.axSect[nn].flgN2P.bSync = TRUE</i>).



Q.035 Software limit switch +

Specification	Software limit switch plus
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / 2 000 000 000
Comment:	Not effective until axis synchronized (<i>cncMem.axSect[nn].flgN2P.bSync</i>).

Q.036 Software limit switch -

Specification	Software limit switch minus
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / -2 000 000 000
Comment:	Not effective until axis synchronized (<i>cncMem.axSect[nn].flgN2P.bSync</i>).

Q.037 Encoder increments / axis revolution

Specification	Actual value evaluation for rotary axes
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / 0
Comment:	Number of encoder increments per revolution of the axis. Gear ratios must be included in the calculation. For axes with travel limitation enter 0 here, as for Q.038 Interpolation units / .

Q.038 Interpolation units / axis revolution

Specification	Display value in interpolation fineness for one axis revolution
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / 0
Comment:	If an axis is set as a rotary axis (Q.054 , bit 4-6), the display will jump to 0 when the set value is reached (modulo calculation). For axes without travel limitation but are not rotary axes, for example axes driving a conveyor belt, modulo calculation is performed only if the NC program so instructs (e.g. via M05).

Q.040 Follow-up window

Specification	Follow-up window
Type	W
Unit	Interpolation fineness
Value min/max/default	0 / 65535 / 0
Comment:	<p>The value determines when (after which axis offset and after a controller lock) an axis must be repositioned or when the message Reposition should appear.</p> <p>Entry 0: always reposition regardless of offset</p> <p>Entry > 0: follow-up window</p> <p>If the axis offset is less than the value entered in Q.040 the position controller compensates the offset as soon as it is enabled. The offset does not appear in the actual value display.</p> <p>If the axis offset is greater than the value entered in Q.040 the offset above Q.040 is incorporated in the actual position of the CNC. When the CNC is started within a program and the controller is enabled you must reposition the axis.</p>

Q.041 Extension angle

Specification	Extension angle for axis transformation special function
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / 2 000 000 000
Comment:	<p>Only relevant for special kinematics.</p> <p>With this value you can specify the axis angle at which the robot joint is extended. In this joint position the speed setpoint approaches infinity. The NC can reduce the acceleration when moving off from this position.</p> <p>At the default value 2 000 000 000 the extension angle is not monitored.</p>

Q.042 Maximum following error

Specification	Maximum following error
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / 5000
Comment:	Maximum following error for an axis. If this value is exceeded the message 2200003: "Following Error too Large" is output and feed stop with ramp is triggered.



Q.043 Maximum motor speed

Specification	Maximum motor speed
Type	W
Unit	1 / min
Value min/max/default	0 / 65535 / 5000
Comment:	Maximum motor speed of Sercos drive in revolutions per minute. The calculated desired speed is always limited to this maximum value.

Q.046 Zero-speed control

Specification	Zero-speed control
Type	W
Unit	Interpolation fineness
Value min/max/default	0 / 65535 / 1000
Comment:	The parameter indicates the maximum permissible deviation from set position for an axis. In standstill the axis must not move out of the window left and right of the set position.

Q.047 Delay time zero-speed control

Specification	Delay time for zero-speed control
Type	W
Unit	ms
Value min/max/default	0 / 65535 / 50
Comment:	The time set here is valid for zero-speed control and desired-speed control. The axis must be in the monitoring window for zero-speed control before this time has expired. This window is defined by the value set in Q.046 Zero-speed control around the set position.

Q.048 Exact stop boundary

Specification	Contour precision with G60/G9
Type	W
Unit	Interpolation fineness
Value min/max/default	0 / 65535 / 100
Comment:	This value defines a window around the set value that determines when an axis has reached the programmed set position. When moving with exact stop the record does not change until the following error is less than or equal to the set value. When exact stop is reached the CNC sets the <i>cncMem.axSect[nn].flgN2P.axInPos</i> flag. The smaller the exact stop window, the greater the positioning precision. When moving with exact stop the minimum execution time for an NC record is 3 interpolation cycles.

Q.049 Backlash compensation

Specification	Gear backlash compensation
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / 65535 / 0
Comment:	<p>With this value you can compensate the axis gear backlash when the direction is changed.</p> <p>Compensation is active from the first change of direction.</p> <p>The value entered in the parameter is displayed by the position controller as an additional distance every time the axis changes direction.</p> <p>For larger amounts a step size can be entered in Q.088.</p>

Q.050 Motor revolutions / travel

Specification	Motor revolutions for a particular distance
Type	W
Unit	None
Value min/max/default	0 / 65535 / 1
Comment:	<p>Number of motor revolutions for the distance entered in Q.051 Travel / motor revolution. Normally one revolution is entered here. In cases where the ratio is not a whole number other values can be entered.</p>

Q.051 Travel / motor revolution

Specification	Travel per motor revolution
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / 2 147 483 647 / 0
Comment:	<p>Distance in interpolation fineness for the number of motor revolutions entered in Q.050 Motor revolutions / travel.</p>

**Q.052 Axis options 1**

Specification	Axis settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning if bit = 1
	0	Reverse sign in actual value system
	1	Reverse sign in set value system
	2	Homing (negative approach)
	3	Do not reference axis
	4	Reserved
	5	Reserved
	6	Suppress measuring circuit error (spindle without encoder)
	7	Axis available Default value: 1

Q.053 Axis options 2

Specification	Axis settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning
	0	Set value loop without actual value feedback For spindles without actual value feedback
	1	Spindle without encoder
	2	Reserved
	3	Home position = 1 st zero mark
	4	Home position = zero mark behind the cam After travelling over the cam the axis looks for the 1 st zero mark. The direction is not reversed.
	5	Homing against dead stop The axis is set to 0 at the maximum following error (Q.042).
	6	Reserved
	7	Reserved

Q.054 Axis options 3

Specification	Axis settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning
	0	Axis parallel to X (for circular path and tool compensation)
	1	Axis parallel to Y (for circular path and tool compensation)
	2	Axis parallel to Z (for circular path and tool compensation) Bit 0 to 2 for cartesian coordinate allocation. To use tool radius compensation (SRK) applications (selected through G41 to G44) you must declare at least one plane in the cartesian zone. Default setting: 1st Axis bit 0 = 1 2nd Axis bit 1 = 1 3rd Axis bit 2 = 1 Select machining plane, see G17, G18, G19
	3	Main spindle axis S, M03, 04, 05
	4	Rotary axis around X
	5	Rotary axis around Y
	6	Rotary axis around Z
	7	Axis not in display

Q.055 Axis options 4

Specification	Axis settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning
	0	Absolute value encoder connection
	1	Parking axis (Sercos setting) 0: (Default value) 1: parking axis
	2	Sercos telegram type for position controller in actuator (bit 3=1) 0: Telegram type 7 for Sercos 1: Telegram type 4 for Sercos
	3	Position controller in actuator Default value: 1 If setting is 0 (position controller not in actuator) Sercos telegram type 5 is activated (in preparation).
	4	In REF mode (referencing) no synchronization through Q.057 Transforming axis (master).
	5	Maximum motion of rotary axis +/- 180° If this bit is set rotary axes will move by max. 180°. E.g. if 420° is programmed the axis will move to 60°, i.e. only the modulo value is moved (420 mod 360 = 60)
	6	With G90 the rotary axis will move to the programmed coordinate on the shortest path
	7	Diameter programming for turning If the bit = "1" the programmed motion path is interpreted as a diameter and the axis travels along the radius distance (= ½ the programmed distance).

**Q.056 Transforming axis (slave)**

Specification:	Number of superposed axis
Type:	B
Unit	None
Value min/max/default	0 / 255 / 0
Comment:	<p>With parameters Q.056, Q.057, Q.058 and Q.059 you can realize a fixed gear transformation. This means that you can compensate unwanted compensating movements that may arise, for example through rolling movements in gears.</p> <p>The set values of the <u>superposing</u> axis (Q.057) are multiplied by a gear factor (quotient of Q.058 / Q.059) and added to the set value of the <u>superposed</u> axis (Q.056).</p> <p>An axis can be superposed by several other axes.</p> <p>Superposed axes can themselves superpose other axes (chaining). Superposing is executed in the numerical order of the Q parameters (Q1056 before Q2056 before Q3056 etc.).</p> <p>Pseudo-axes (axes without drive) can be used.</p> <p>If Q.057 = 0 no gear transformation will take place.</p>

Q.057 Transforming axis (master)

Specification	Number of superposing axis
Type	B
Unit	None
Value min/max/default	0 / 255 / 0
Comment	<p>Parameter for gear transformation</p> <p>If Q.057 = 0 no gear transformation will take place.</p> <p>Description see Q.056</p>

Q.058 Gear factor numerator

Specification	Gear factor numerator
Type	B signed
Unit	None
Value min/max/default	-128/+127 / 0
Comment	Description see Q.056

Q.059 Gear factor denominator

Specification	Gear factor denominator
Type	B
Unit	None
Value min/max/default	0 / 255 / 0
Comment	Description see Q.056

**Q.060 Cartesian rapid feed velocity manual**

Specification	Rapid feed velocity for manual mode
Type	D
Unit	mm/min
Value min/max/default	0 / 65535 / 5000
Comment	Only relevant for special kinematics

Q.061 Setup velocity

Specification	Setup velocity
Type	D
Unit	mm/min
Value min/max/default	0 / 65535 / 0
Comment	Setup velocity is activated by setting <i>cncMem.sysSect[n].flgP2N.bSetupSpd</i> (for the nth CNC subsystem). It is effective in all operating modes and limits the programmed velocity if necessary.

Q.062 Cartesian axis letter

Specification	Designation of Cartesian axes	
Type	B	
Comment	Only relevant for special kinematics	
	Permissible axis letters	ASCII code
	A	01000001
	B	01000010
	C	01000011
	D	01000100
	L	01001100
	O	01001111
	P	01010000
	U	01010101
	V	01010110
	W	01010111
	X	01011000
	Y	01011001
	Z	01011010
	I	01001001
	J	01001010
	K	01001011

**Q.063 Kinematic axis sequence**

Specification	Kinematic axis sequence
Type	B
Unit	None
Value min/max/default	0 / 64 / 0
Comment	Only relevant for special kinematics The joint sequence for axistransformation is entered with reference to the kinematics. The required values for special kinematics are specified.

Q.065 Homing sequence

Specification	Sequence for homing
Type	B
Unit	None
Value min/max/default	0 / 64 / 0
Comment	Precondition for synchronizing (referencing) the axis is that the axis whose number is entered here must be synchronized first. If default value = 0 the axis will be synchronized independently for every homing task.
Example	Q1065 = 2: Synchronize axis 2 first, i.e. Axis 1 can only be synchronized after axis 2 has been synchronized.

Q.067 Number of revolutions absolute value encoder

Specification	Number of revolutions of absolute value encoder
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment	Take the value from the encoder specification

Q.068 Number of pulses absolute value encoder

Specification	Number of pulses of absolute value encoder
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment	Pulses per revolution of absolute value encoder

Q.070 Interpolation fineness

Specification	Axis-specific interpolation fineness setting			
Type	B (special form bit)			
Bit pattern	Bit	Interpolation fineness	Display	Travel range
	0	0.00005	0.0000	± 0.9999999 m
	1	0.0001	0.0000	± 0.9999999 m
	2	0.0005	0.000	± 9.999999 m
	3	0.001	0.000	± 9.999999 m
	4	0.005	0.00	± 99.99999 m
	5	0.01	0.00	± 99.99999 m
	6	0.05	0.0	± 999.9999 m
	7	0.1	0.0	± 999.9999 m
Comment	Entering a value here sets a different interpolation fineness than the system-specific value. All the Q parameters of this axis then refer to this IPO fineness. If default value = 0 the system-specific interpolation fineness applies (Q105 Interpolation fineness)			

Q.075 Axis options 5

Specification	Axis settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning
	0	Reserved
	1	Reserved
	2	Reserved
	3	Reserved
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved

Q.076 Axis options 6

Specification	Axis settings	
Type	B (special form bit)	
Bit pattern	Bit	Meaning
	0	Spindle STOP only with M05. Set value output of spindle switched off only with M05 or cold start. Pressing the <RESET> button on the operator panel or program end (M30) does not cause spindle stop. In Q38 bit 3 must be = 0, otherwise there will be a short spindle stop with restart after reset or M30.
	1	Reserved
	2	Zero-speed control off
	3	Reserved
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved



Q.078 Following error compensation 1

Specification	Following error compensation at constant velocity
Type	W
Unit	None
Value min/max/default	0 / 65535 / 0
Comment	Factor for speed precontrol (1000 corresponds to 100 %) If value is greater than 0 following error compensation will be activated.

Q.079 Velocity factor

Specification	Velocity factor
Type	D
Unit	None
Value min/max/default	0 / 2 147 483 647 / 0
Comment	Corrects the programmed velocity of an axis by the entered value divided by 1000. At default value 0 there is no correction and the axis moves at programmed velocity.

Q.084 Home position coordinate 2

Specification	Set second home position coordinate
Type	D
Unit	None
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / 0
Comment	Alternative home position. The parameter is activated by setting the shared RAM variable <i>cncMem.axSect[n].flgP2N. bRefCam2</i> .

Q.088 Backlash compensation position cycle

Specification	Set the backlash compensation per position cycle
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\,147\,483\,647$ / 0
Comment	With larger compensation values the backlash is compensated by the position controller in the step size set here. The backlash value is entered in Q.049.

Q.090 Offset home cam

Specification	Home cam offset
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\ 147\ 483\ 647$ / 0
Comment	The distance between the falling edge of the home cam and the zero mark is displayed on the shared RAM <i>cncMem.axSect[n].wrdN2P.IRefCamOffs</i> . With the home cam offset you can pass over the 1 st zero mark after leaving the cam, provided the cam is in the switch hysteresis of the home switch.

Q.098 Offset Z

Specification	Joint offset in Z direction
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\ 147\ 483\ 647$ / 0
Comment	Only relevant for special kinematics Length offset in Z direction for transition from one robot joint to the next (Denavit-Hartenberg rules). Here the offset between the joint systems according to kinematic axis sequence (Q.063 Kinematic axis sequence)

Q.099 Displacement X

Specification	Joint offset in X direction
Type	D
Unit	Interpolation fineness
Value min/max/default	0 / $\pm 2\ 147\ 483\ 647$ / 0
Comment	Only relevant for special kinematics Length offset in X direction for transition from one robot joint to the next (Denavit-Hartenberg rules). Here the offset between the joint systems according to kinematic axis sequence (Q.063 Kinematic axis sequence)



10.6 Table for Converting from Promodul-U/F

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Q56	ONLINE-Q-PARA-1'	Online parameter 1	
Q57	ONLINE-Q-PARA-2'	Online parameter 2	
Q58	ONLINE-Q-PARA-3'	Online parameter 3	
Q59	ONLINE-Q-PARA-4'	Online parameter 4	
Q60	ONLINE TRIGGER'	Online trigger signal	
Q61	CNC ONLINE REQUEST'	Online CNC request	
Q69	TEST RUN VELOCITY MM/MIN	Test run velocity	119

System-specific Q parameter	Old designation	New designation	See page
Q105	IPO FINENESS	Interpolation fineness	119
Q106	TOL CIRC.END POSITION (IPO FINENESS)	Circle end position tolerance	119
Q111	DECO DEFAULT SETTINGS	Decoder settings	119
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Q137	CART.MIN.ACC.	Cartesian minimum acceleration	121
Q138	CART.PATH.ACC.	Cartesian path acceleration	121
Q139	CART.PATH.DEC.	Cartesian path deceleration	121
Q141	PATH ACC	Path acceleration	121
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Axis-specific Q parameter	Old designation	New designation	See page
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Q.063	KINEMATIC AXIS SEQUENCE	Kinematic axis sequence	134
Q.065	HOME POSITION SEQUENCE	Homing sequence	134
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Q.075	ABIT4	Axis options 5	135
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Q.099	OFFSET X	Offset X	137



11 Error messages

11.1 Structure of Error Messages

Error messages in the active error buffer and the error log book have error numbers and additional information.

Structure of Error Messages

Error messages are made up of a hexadecimal error number, an error text and up to three optional parameters, which can be shown in the error text.

Error No.(hexadecimal) / Par. 1 / Par. 2 / Par. 3. / Error text

Errors to which no error text is assigned are shown as follows:

```
Fehler %ErrX%, Parameter %ParX% (Par1=%Par1%, Par2=%Par2%,
Par3=%Par3%)
[Error %ErrX%, Parameter %ParX% (Par1=%Par1%, Par2=%Par2%,
Par3=%Par3%)]
```

With this nomenclature the following numerical values can be shown in the error message.

%ErrX%	Error number (32 bit hexadecimal)
%ParX%	Parameter value (32 Bit, hexadecimal), contains parameters 1 to 3: D31...D24 -- Parameter 1 D23...D16 -- Parameter 2 D15...D0 -- Parameter 3
%Par%	Parameter value (32 Bit, decimal), contains parameters 1 to 3: D31...D24 -- Parameter 1 D23...D16 -- Parameter 2 D15...D0 -- Parameter 3
%Par1%	Parameter value 1 (8-bit, decimal, signed)
%Par2%	Parameter value 2 (8-bit, decimal, signed)
%Par3%	Parameter value 3 (16-bit, decimal, signed)

Example (representation in error logbook)

Date	Time	Error text	Error number	Error parameter	Status
04.03.03	08:04:06	Fehler 0x04100006, Parameter 0x00640001 (Par1=0, Par2=100, Par3=1) [Error 0x04100006, Parameter 0x00640001 (Par1=0, Par2=100, Par3=1)]	0x04100006	0x00640001	O
04.03.03	08:04:04	Power-On	0x01100006	0x00000000	O
04.03.03	08:04:01	NC nicht betriebsbereit [NC not ready]	0x02000000	0x00000000	A

The status column in the error logbook and the active error buffer can have the following values:

A	(Active) Active error message in active error buffer
L	(Locked) Locked error message in active error buffer
I	(In) Error occurred and error message entered in active error buffer
O	(Out) Error rectified and removed from active error buffer
N	(New) Transitional status: error message entered in active error buffer but not yet in error logbook
N A	(Not Active) Transitional status: error message shortly before status "Out"

Structure of error numbers

The error number is a 32-bit number. The high word contains the grouping, the low word the consecutive error number.

Grouping of error numbers

0x0100nnnn	PLC runtime error
0x0110nnnn	General PLC error messages
0x0120nnnn	XRIO error
0x0200nnnn	General CNC error messages
0x0210nnnn	Subsystem-specific CNC error
0x0211nnnn	Decoder error
0x0212nnnn	Record insertion error
0x0213nnnn	Error in tool nose radius compensation
0x0214nnnn	Error in interpolation preparation
0x0220nnnn	Axis-specific error
0x0221nnnn	SERCOS diagnosis status (only on ProNumeric / PN-MIC)
0x0222nnnn	SERCOS status class 1 (only on ProNumeric / PN-MIC)
0x0223nnnn	Manufacturer-specific SERCOS error (only on ProNumeric / PN-MIC)
0x0224nnnn	Manufacturer-specific SERCOS error text (only on ProNumeric / PN-MIC)
0x0230nnnn	Drive-specific error (only on XCN)
0x0300nnnn	CAN-specific operating system error
0x0301nnnn	CAN driver error
0x0400nnnn to 0x04FFnnnn	User-defined errors, can be entered in the error logbook by the PUT_ERROR2 function block

Documentation note: Parts of the table are also in the following sections.



11.2 PLC Error Messages

0x0100nnnn	PLC runtime error
0x0110nnnn	General PLC error messages
0x0120nnnn	XRIO error

11.2.1 0x0100 PLC runtime error

Errors with this classification are ProConOs runtime errors that are merely passed on by the ProNumeric runtime system. An error number consists of a part describing the error type – error, information, warning – and the actual error number itself.

0000: Error

4000: Flag for optional information

8000: Flag for a warning

C000 : Flag for optional information + warning

Example: 0x0100 4051: Internal error: Root task error number n
This error is also marked as information.

Group 0001 Task communication

Errors in this error group can occur at any time when ProConOs is running.

Error no.	Error text
0x01004021	Internal error : Memory task error number n
0x01004031	Internal error : Communication task error number n
0x01004041	Internal error : Debug task error number n
0x01004051	Internal error : Root task error number n
0x01000061	Internal error : Remote control disabled

Group 0002 Code generation

Errors in this error group can occur when projects, programs or parts of programs are sent to the controller.

Additional parameters such as %u and n are replaced when the error is output.

Error no.	Error text
0x01004012	Internal Error : No code for module n
0x01004022	Memory Error! WN %u: Not enough memory in PLC! -> Shrink project
0x01004032	Error! WN %u: Instruction not implemented or incorrect data type! ->Don't use this instruction Don't use this instruction in conjunction with this datatype
0x01004042	Error! WN %u: Code exceeds 64K limit! -> shrink POU
0x01004052	Error WN %u: Missing Label -> insert missing label
0x01004062	Internal Error! WN %u: Error passing on parameter! -> check parameter passing
0x01004072	Error! "WN %u: Nesting level of parenthesis exceeded -> use less brackets
0x01004082	Error! WN %u: Nesting error! -> check brackets
0x01004092	Internal Error! WN %u: Undefined parameter! -> tried to access a parameter that wasn't passed
0x010040A2	Error! Automatic datatype conversion of operand not possible! ->use explicit type conversion
0x010040B2	Error! Automatic datatype conversion of accumulator not possible ! ->use explicit type conversion

0x010040C2	Error! WN %u: Maximum number of errors reached, code generation stopped ->clear previously occurred errors
0x010040D2	Error! Error(s) occurred in POU %u during code generation !
0x010040E2	Internal Error! WN %u: Error passing on parameter! ->check parameter passing
0x010040F2	Internal Error! WN %u: Operand not implemented or area exceeded! -> check used operand operand number
0x01004102	Error! WN %u: Illegal data type of accumulator (expecting ANYNUM)
0x01004112	Error! WN %u: Illegal data type of accumulator (expecting ANYBIT)
0x01004122	Internal Error : WN %u: Data type of accumulator not valid
0x01004132	Internal Error : WN %u: Selected index register not valid
0x01004142	Internal Error! WN %u: Illegal data type of accumulator
0x01004152	Internal Error : WN n: Not all accumulator values that were pushed are popped
0x01004162	Internal Error : WN n: Maximum number of accumulator pushes reached
0x01004172	Internal Error : WN n: Tried to pop an accumulator which was not pushed
0x01000182	Error! Versions of used MSFC doesn't match -> ask distributor for matching versions
0x01000192	Error! No MSFC data to run project! PLC resetted!

Group 0003 Memory management

Errors in this error group can occur when projects, programs or parts of programs are sent to the controller.

Error no.	Error text
0x01004013	Internal Error: POU '%s' invalid
0x01004023	Internal Error: POU '%s' has unknown POU type
0x01004033	Memory Error! Not enough memory on PLC for POU '%s' during insertion! -> Shrink project
0x01004043	Memory Error! POU '%s' exceeds 64K module size during insertion! -> shrink POU
0x0100C053	Warning : POU %s uses more than 80 percent of POU memory
0x01008063	Error ! Cannot insert a POU because there is no project known
0x01008073	Warning : Project uses more than 80 percent of program memory
0x01004083	Error ! Tried to insert the POU that does not belong to this project on PLC
0x01000093	Internal Error : Error in memory management
0x0100C0A3	Warning : Actual project size : %u kByte
0x010000B3	Internal Error : inserting POU
0x010040E3	Internal Error : Invalid POU type for POU '%s'
0x010000F3	Internal Error : Memory reorganization not possible, PLC stopped!
0x0100C103	Warning : Actual POU size : %u byte
0x0100C113	Internal Error : PG '%u' is defined more than once!
0x0100C123	Internal Error : SPG '%u' is defined more than once!
0x01004133	Error : Memory error for initialized data of POU '%s'!
0x01000143	Error : Acception of retain CRC failed! possible reasons: actual project hasn't any retain data actual project is 'old style' without retain CRC PLC isn't in STOP mode



0x0100C153	Internal Error : FB '%u' is defined more than once!
0x010001B3	Internal Error : Not all POU sent!
0x010001C3	Internal Error : No program memory defined!
0x010041D3	Internal Error : Invalid FB number %u!
0x010041E3	Internal Error : Invalid PG number %u!
0x010041F3	Internal Error : Invalid SPG number %u!

Group 0004 PLC user error

Errors in this error group can occur when a user program is executed.

Error no.	Error text
0x01004014	Internal Error : Invalid function or function block n!
0x01004024	Error : Invalid firmware function or function block n!
0x01004034	Internal Error : Invalid program n!
0x01008044	Internal Error : Invalid change of mode!
0x01000054	Internal Error : Unknown system mode! PLC stopped!
0x01000074	Error : Division by 0! PLC stopped!
0x010080A4	Warning : Function PLC_STOP executed, PLC stopped!
0x010000B4	Error : Bus error! PLC stopped! -> This error appears on systems with memory management units (MMU) when it was tried to access memory which isn't available
0x010000C4	Error : Stack overflow! PLC stopped! -> increase stack size
0x010000D4	Internal Error : Not implemented CPU instruction! PLC stopped! -> Appears on M68-systems.
0x010000E4	Internal Error : Non initialized interrupt! PLC stopped! -> Appears on M68-systems.
0x010000F4	Internal Error : Wrong interrupt, PLC stopped! -> Appears on M68-systems.
0x01004104	Error : System Error in modul xx (belongs to previous) system error)
0x01004114	Error : System Error at line xx (belongs to previous) modul no)
0x01000124	Error : Error during indirect variable access!
0x01004134	Watchdog exceeded in task %02u
0x01000144	Internal Error : Error in task configuration
0x01000154	Error : Error in I/O configuration
0x01008164	Warning : Warmstart not possible! Coldstart performed.
0x01008174	Warning : No retain area to hold startup information.
0x01004184	Error : CPU is occupied with xx percent, PLC stopped!
0x01000194	Error : Initializing I/O driver failed!
0x010001A4	Internal error : Breakpoint unexpected, PLC stopped!
0x010001B4	Error : Unknown I/O driver
0x010041C4	Internal error : Watchdog exceeded in system task ID = %02u
0x010001D4	Internal Error : Error in data configuration!
0x010001E4	Internal Error : Error in retain data configuration!
0x01000204	Internal Error : Critical error in floating point unit!
0x01000214	Internal Error : Fatal error!
0x01000224	Error : String error! PLC stopped! -> Appears on wrong string accessing
0x01000234	Error : String error!
0x01000244	Error : String error! Output string is too short

0x01000254	Error : String error! Input string is too short
0x01000264	Error : String error! Invalid input parameter 'p' (position in string)
0x01000274	Error : String error! The second string is identical to the output string
0x01000284	Error : String error! Invalid string comparison
0x01000294	Error : String error! Datatype not supported for the string conversion
0x010002A4	Error : String error! Error in the format string
0x010002B4	Error : String error! Invalid input value for this format string -> e. g.: value = 0 + format = %c
0x010002C4	Error : String error! Error during string conversion

Group 0005 Debug

Errors in this error group can occur while a user program is being debugged.

Error no.	Error text
0x01000025	Error : Operand not implemented or area exceeded!
0x01000035	Error : wrong or missing trigger condition
0x01000045	Error : no memory available
0x01000055	Error : datatype not supported
0x01004065	Internal Error : Setting breakpoint at function or function block n not possible! -> Could only be possible during single stepping
0x0100C075	Error : Cannot set breakpoint at this line (WN n)! -> set breakpoint one line before or after
0x01008095	Error : write access is not allowed for this variable
0x010000A5	Error : error in recorded logic analyzer data
0x010000B5	Error : Too many powerflow addresses!
0x010000C5	Error : Powerflow not possible! -> previous error(s) shows the reason
0x010080D5	Internal Error : Error in powerflow list (invalid entries)!
0x010000F5	Internal Error : Invalid type of list!
0x01004115	Error : No debug information for POU n
0x01004125	Error : No debug information for WN n
0x01000135	Error : This debug function is not available when the program is in (E)EPROM
0x01004145	Internal Error : Missing code for POU n!
0x010041A5	Internal Error : Breakpoint in PG n not possible!
0x010041B5	Internal Error : Breakpoint in SPG n not possible!
0x010041D5	Internal Error : No force list available!
0x01000205	Internal Error : Debug task not installed! -> chosen function isn't possible with this PLC-system

Group 0006 Exchange of system data

Errors in this error group can occur when system data is being exchanged (PLC tasks, I/O configuration, boot project, PDD, ...).

Exception: 0x010000B6: Memory Error : Out of memory (dynamic memory)!
This error can occur at any time when ProConOs is running.

Error no.	Error text
0x01008016	Internal Error : Invalid type of module!
0x01000026	Error : Accessing Initialization file failed



0x01000036	Internal Error : Too many data requested!
0x01000046	Internal Error : Less data send!
0x01000056	Internal Error : Unexpected online service order!
0x01004066	Error : Installation of IO-Driver %u failed
0x01004076	Error : Instantiation of IO-Driver %u failed
0x01000086	Internal Error : Error during accessing file!
0x01004096	Error : Instantiation of Instance @%u failed
0x010000A6	Internal error : Data group exceeds limit of 64K!
0x010000B6	Memory Error : Out of memory (dynamic memory)!
0x010000C6	Internal Error : Incorrect refresh of retain data!
0x010000D6	Error : Device for holding retain data not available!
0x010000E6	Internal Error : Invalid group for retain data!
0x010040F6	Internal Error : (PDD) Definition of data type (%u) was made twice!
0x01004106	Internal Error : (PDD) Data type (subtype) definition (%u) not found!
0x01004116	Internal Error : (PDD) Unknown data type (%u)!
0x01004126	Internal Error : (PDD) Symbol not found (process variable : %u)!
0x01000136	Internal Error : (PDD) Symbol exists several times!
0x01004146	Internal Error : (PDD) Operand area exceeded (process variable : %u)!
0x01000156	Internal Error : (PDD) No memory for fast symbol access (information only)!
0x01004166	Error : IO-Driver %d not announced
0x01000176	Error : zip device is not installed
0x01000186	Error : file device is not installed

Group 0007 IO driver errors

Errors in this error group can occur when IO driver functions are used (init, open, close, read, write).

Error no.	Error text
0x01004017	Error : Board No. %u not instantiated
0x01004027	Error : Board No. %u not allowed
0x01004037	Error : Input Group (VAR_ADR := %u) doesn't fit
0x01004047	Error : Output Group (VAR_ADR := %u) doesn't fit
0x01004057	Error : Board No. %u not found
0x01004067	Error : Error reading inputs (Board No. %u)
0x01004077	Error : Error writing outputs (Board No. %u)
0x01004087	Internal Error : Can't create Semaphore (Board No. %u)
0x01004097	Error : Invalid memory size (Board No. %u)
0x010040A7	Error : Invalid board address (Board No. %u)
0x01000307	Error : Error occurred in IO-Driver 'CIF_DRV'
0x01004317	Error : Can't switch Host State (Board No. %u)
0x01004327	Error : CIF Error Number: %u
	Folgende Fehler sind nur für CANopen relevant
0x01000407	Error : Error occurred in IO-Driver 'CANOPEN'
0x01004417	Error : CAN Error Number: %d

11.2.2 0x0110 General PLC errors

Error no.	Error text	Cause / Remedy
0x01100000	Inkompatible Koppelspeicher-Struktur (Version PLC/CNC = x, Version MULTIPROG = y) [Incompatible shared RAM structure (Version PLC/CNC = x, Version MULTIPROG = y)]	The shared RAM structure in the PLC programming system differs from the one in the runtime system. Update runtime system or announce other firmware libraries.
0x01100001	Inkompatible Hardware-Konfiguration [Incompatible hardware configuration]	The current hardware configuration does not match the saved configuration. Hardware reset required.
0x01100002	PLC-Option PSOn nicht freigegeben [PLC option PSO<n> not enabled]	Option not enabled for this control system.
0x01100003	Not-Aus !!! [Emergency stop]	Emergency stop has been triggered and must be acknowledged.
0x01100004	PN-MIC n asynchron [PN-MIC n asynchron]	Only on ProNumeric / PN-MIC: SYNC line not OK.
0x01100005	Clear Error-Logbook	Note: error logbook deleted.
0x01100006	Power-ON	Note: power switched on.
0x01100007	Falsches Datum und falsche Uhrzeit nach Ausfall der Batterie [Incorrect time and date after battery failure]	Possible causes: - Battery discharged - CPU PCB card removed from controller Time and date have been reset to the preparation time and date of the operating system version.
0x01100008	Datenverlust im SRAM-Speicher nach Ausfall der Batterie [Data loss in SRAM memory after battery failure]	Possible causes: - Battery discharged - CPU card previously removed from controller SRAM memory has been completely deleted.
0x01100009	PLC Start	Note: PLC started
0x0110000A	PLC Stop	Note: PLC stopped



11.2.3 0x0120 XRIO errors

These error messages apply only to the XCx.

The XRIO connection number is indicated in the first parameter.

Error no.	Error text	Cause / Remedy
0x01200001	XRIO: Fehler während der Initialisierung (XRIO Verbindung n, Status=m) [XRIO: Error during initialization (XRIO connection n, status=m)]	
0x01200002	XRIO: Unbekannte Modul-ID (XRIO Verbindung n, Modul-ID=m) [XRIO: Unknown module ID (XRIO connection n, module ID=m)]	
0x01200003	XRIO: Zu viele Module werden benutzt (XRIO Verbindung n, Anzahl=m) [XRIO: Too many modules used (XRIO connection n, number=m)]	
0x01200004	XRIO: Maximale Anzahl von Bytes überschritten (XRIO Verbindung n, Anzahl=m) [XRIO: Max. number of bytes exceeded (XRIO connection n, number=m)]	
0x01200005	XRIO: Steckplatzlisten-Fehler (XRIO Verbindung n) [XRIO: Module location list error (XRIO connection n)]	
0x01200006	XRIO: Fehler während der Übertragung (XRIO Verbindung n, Status=m) [XRIO: error during transmission (XRIO connection n, status=m)]	

11.3 CNC Error Messages

0x0200nnnn	General CNC error message
0x0210nnnn	Subsystem-specific CNC error
0x0211nnnn	Decoder error
0x0212nnnn	Record insertion error
0x0213nnnn	Error in tool nose radius compensation
0x0214nnnn	Error in interpolation preparation
0x0220nnnn	Axis-specific error
0x0221nnnn	SERCOS diagnosis status (only on ProNumeric / PN-MIC)
0x0222nnnn	SERCOS status class 1 (only on ProNumeric / PN-MIC)
0x0223nnnn	Manufacturer-specific SERCOS error (only on ProNumeric / PN-MIC)
0x0224nnnn	Manufacturer-specific SERCOS error text (only on ProNumeric / PN-MIC)
0x0230nnnn	Drive-specific error (only on XCN)



11.3.1 0x0200 General CNC errors

Error no.	Error text	Cause / Remedy
0x02000000	NC nicht betriebsbereit [NC not ready]	Possible causes: - PLC not running - Emergency stop activated - Drive module not recognized or initialization failed - Measuring circuit error (on SERCOS module)
0x02000001	IPO-Zykluszeit zu klein [Interpolation cycle time too short]	Set interpolation time not sufficient. This time is set in the controller's default settings (Schleicher Dialog - Startup - Default settings)
0x02000002	CNC-Option PSO<n> nicht freigegeben [CNC option PSO<n> not enabled]	Option not enabled. Please request enabling code.
0x02000003	Laufzeitüberwachung PN-MIC (Karte n) [Runtime monitoring PN-MIC (card n)]	Only on ProNumeric / PN-MIC: Interpolation runtime too long, so axis setpoint for drive card (PN-MIC) is provided too late. If increasing the interpolation scan rate does not help there is a serious system error! Please contact Schleicher Service.
0x02000004	Kein Speicher für CNC-Systemdaten (Fehler-Nr. n) [No memory for CNC system data (Error no. n)]	A system error has occurred while generating CNC data fields. Please contact Schleicher Service.
0x02000005	CNC-System auf falscher (SPS-) Hardware [CNC system on incorrect (PLC) hardware]	This error occurs if you attempt to run a CNC operating system on a controller CPU that is only configured for a PLC operating system.
0x02000006	Systemparameter inkonsistent [System parameters inconsistent]	This error message occurs when the controller is powered up. System parameters (Q parameters) can become inconsistent if the number of system parameters has changed. This can occur, for example, if you change the number of CNC axes or if an operating system update has been carried out. The system parameters must be updated if the CNC is to run properly. When Schleicher Dialog starts this error is detected and a dialog window opens for you to instruct the controller to update the system parameters.
0x02000007	Kein Speicher für Remote-Page [No memory for remote page]	This error message can occur when the controller is powered up, for example if insufficient memory has been provided for the drives. Please contact Schleicher Service.
0x02000008	MC-Zykluszeit zu klein [MC cycle time too short]	Increase MC cycle time (drive parameter <i>CYCLE_TIME</i>).

11.3.2 0x0210 Subsystem-specific CNC errors

In this error group the subsystem number is indicated in the additional parameter.

Error no.	Error text	Cause / Remedy
0x02100000	Einlesefreigabe fehlt (System n) [No input enable (System n)]	This message indicates that input enable is missing (no acknowledgement of a flag indicating an NC function change: <i>cncMem.sysSect[n].flgN2P.</i> <i>bMFct1Mod,</i> <i>bMFct2Mod,</i> <i>bMFct3Mod,</i> <i>NcBlkMod,</i> <i>TFctMod,</i> <i>SFctMod</i>)
0x02100001	Arbeitsraumbegrenzung (System n) [Working area limits (System n)]	
0x02100002	Unerreichbare Position (System n) [Unreachable position (System n)]	
0x02100003	Gewindebohren aktiv (System n) [Tapping active (System n)]	
0x02100004	Falsche Transformation-Schnittstelle (System n) [Wrong transformation interface (System n)]	This error message appears if the interface version of the loaded transformation does not match the interface version of the installed operating system version. Please contact Schleicher Service.
0x02100005	Falsche Anzahl Roboterachsen (System n, Qnnnn) [Wrong number of robot axes (System n, Qnnnn)]	The number of robot axes is defined by the number of NC axis entries (in Q.063 – kinematic axis sequence). This error message appears if that number does not match the number set in the transformation.
0x02100006	Kein Speicher für Transformation (System n) [No memory for transformation (System n)]	
0x02100007	Linkparameter unzulässig (System n, Qnnnn) [Invalid link parameter (System n, Qnnnn)]	The required entries for robot arm length are checked according to the respective transformation. The criterium here is merely whether a required parameter is not equal to zero, but not whether an arm length has the correct value. This error message appears if a required arm length has not been entered. In that case there is an invalid value in link parameter Q.nnn, System n.



11.3.3 0x0211 Decoder errors

The subsystem number is indicated in the first parameter, the number of the NC record in the second parameter.

Error no.	Error text	Cause / Remedy
0X02110000	Mehr als 4 Kennbuchstaben (System n, Nnnn) [More than four identifiers (System n, Nnnn)]	CNC words begin with a maximum of 4 letters.
0X02110001	Zahl länger als 14 Ziffern (System n, Nnnn) [Number longer than 14 digits (System n, Nnnn)]	Numerical values must have more than 14 digits (including the decimal point).
0X02110002	Mehr als 3 Sonderzeichen (System n, Nnnn) [More than 3 special characters (System n, Nnnn)]	
0X02110003	Unzulässiges Zeichen (System n, Nnnn) [Invalid character (System n, Nnnn)]	Delete the CNC record and re-enter if necessary (try programming on a PC text system using lower case letters or no ASCII symbols).
0X02110004	LF oder ")" fehlt (System n, Nnnn) [LF or ")" missing (System n, Nnnn)]	
0X02110005	Unzulässige Zeichenkombination (System n, Nnnn) [Invalid character combination (System n, Nnnn)]	
0X02110006	Unzulässige G-Funktion (System n, Nnnn) [Invalid G function (System n, Nnnn)]	
0X02110007	Achszahl zu klein für \$-Funktion (System n, Nnnn) [Number of axes too low for \$ function (System n, Nnnn)]	E.g. \$ 30 (synchronous operation): At least 2 axes have to be programmed.
0X02110008	Keine Rundachse o. Spindel im System (System n, Nnnn) [No rotary axis or spindle in the system (System n, Nnnn)]	see Q.054.
0X02110009	Achse im System unbekannt (System n, Nnnn) [Axis not known in system (System n, Nnnn)]	Axis letter is set in Q.021. Pay attention to system group Q.020.
0X0211000A	Achse keine Rundachse o. Spindel (System n, Nnnn) [Axis not rotary axis or spindle (System n, Nnnn)]	see Q.054.
0X0211000B	Winkelgeschwindigkeit = 0 (System n, Nnnn) [Angular velocity = 0 (System n, Nnnn)]	With G95 a velocity greater than 0 must be programmed.



0X0211000C	Syntaxfehler in \$-Funktion (System n, Nnnn) [Syntax error in \$ function (System n, Nnnn)]	
0X0211000D	Zu viele Befehle (System n, Nnnn) [Too many instructions (System n, Nnnn)]	
0X0211000E	Unzulässige \$-Funktion (System n, Nnnn) [Invalid \$ function (System n, Nnnn)]	
0X0211000F	Befehl unbekannt (System n, Nnnn) [Instruction unknown (System n, Nnnn)]	
0X02110010	Zu viele SE,RS,WA,M,T,D,H Funktionen (System n, Nnnn) [Too many SE, RS, WA, M, T, D, H functions (System n, Nnnn)]	For each CNC record you can program 8 SE, RS, WA functions, 3 M functions and 2 H functions.
0X02110011	Unzulässiger Wert (System n, Nnnn) [Invalid value (System n, Nnnn)]	E.g. B%R0 with R0 <= 0
0X02110012	Unzulässiger R-Parameter (System n, Nnnn) [Invalid R parameter (System n, Nnnn)]	Parameter does not exist or must not be changed (R300...R310).
0X02110013	Unzulässige Verknüpfung (System n, Nnnn) [Invalid operation (System n, Nnnn)]	Error in parameter calculation
0X02110014	Funktion noch nicht vorhanden (System n, Nnnn) [Function not yet available (System n, Nnnn)]	
0X02110015	Satz nicht gefunden (System n, Nnnn) [Record not found (System n, Nnnn)]	Record does not exist in the selected program/program section.
0X02110016	Unterprogramm-Schachtelung größer als 4 (System n, Nnnn) [Subroutine nesting greater than 4 (System n, Nnnn)]	
0X02110017	Programm nicht gefunden (System n, Nnnn) [Program not found (System n, Nnnn)]	The selected program does not exist.
0X02110018	Werkzeug verschlissen (System n, Nnnn) [Tool worn (System n, Nnnn)]	



0X02110019	Keine Koordinate erlaubt (System n, Nnnn) [Coordinates not allowed (System n, Nnnn)]	E.g. axis is in follow-up operation.
0X0211001A	Werkzeug-Speicher nicht vorhanden (System n, Nnnn) [Tool memory not available (System n, Nnnn)]	The called tool compensation number T...0x is not in the memory. You can set the number of the tool memory in Q.01.
0X0211001B	M17/M30 fehlt (System n, Nnnn) [M17/M30 missing (System n, Nnnn)]	Program end identifier missing. M17/M30 does not have to be programmed if Q28 bit 5 is set.
0X0211001C	Zu viele Nullpunkt-Verschiebungen (System n, Nnnn) [Too many zero point offsets (System n, Nnnn)]	E.g. N10 G54 G55 in one CNC record.
0X0211001D	G02/03-Satz falsch programmiert (System n, Nnnn) [G02/03 record incorrectly programmed (System n, Nnnn)]	Less than two axes or no mid-point coordinate or the plane selection was programmed incorrectly. The error message is also displayed if the assignment to the coordinate system is missing in Q.54.
0X0211001E	Radius = 0 (System n, Nnnn)	
0X0211001F	Kreisendpunkt-Fehler (System n, Nnnn) [Circle end position error (System n, Nnnn)]	The difference between the programmed start and end radius is larger than the circle end position control (can be set with Q.06).
0X02110020	Zu viele Achsen programmiert (System n, Nnnn) [Too many axes programmed (System n, Nnnn)]	
0X02110021	G33 - Achsanzahl > 2 (System n, Nnnn) [G33 - number of axes > 2 (System n, Nnnn)]	You are only allowed to program 2 axes.
0X02110022	Division durch 0 (System n, Nnnn) [Division by 0 (System n, Nnnn)]	Parameter calculation results in a division by 0.
0X02110023	Modulozahl Q.037 = 0 (System n, Nnnn) [Modulo number Q.037 = 0 (System n, Nnnn)]	If you use rotary axes you must enter the pulses/rotation in Q.037.
0X02110024	Q-Parameterzugriff nicht erlaubt (System n, Nnnn) [Q parameter access not allowed (System n, Nnnn)]	The CNC program can only change alterable Q parameters if Q37 bit 6 is set.
0X02110025	G97 (S in 1/min) nicht erlaubt (System n, Nnnn) [G97 (S in 1/min) not allowed (System n, Nnnn)]	
0X02110026	Radiusachse nicht definiert (System n, Nnnn) [Radius axis not defined (System n, Nnnn)]	The radius axis assignment in \$ 34 for programming cutting speeds is incorrect. The selected axis is the main spindle.



0X02110027	Keine Leitachse für \$30/\$31 (System n, Nnnn) [No lead axis for \$30/\$31 (System n, Nnnn)]	
0X02110028	Nur ein Unterprogramm-Aufruf erlaubt (System n, Nnnn) [Only one subroutine call permitted (System n, Nnnn)]	
0X02110029	SRK-Ebene undefiniert (System n, Nnnn) [SRK level undefined (System n, Nnnn)]	The coordinate assignment in Q.054 is incomplete. The plane assignment with G17 to G19 or instruction \$47 is missing.
0X0211002A	Syntaxfehler in G76/G77 (System n, Nnnn) [Syntax error in G76/G77 (System n, Nnnn)]	
0X0211002B	\$33 nicht programmiert (System n, Nnnn) [\$33 not programmed (System n, Nnnn)]	
0X0211002C	G76 Schnittanzahl <= 0 (System n, Nnnn) [G76 number of cuts <= 0 (System n, Nnnn)]	
0X0211002D	G76/G77 Steigung <= 0 (System n, Nnnn) [G76/G77 lead <= 0 (System n, Nnnn)]	
0X0211002E	G76/G77 Gewinde nicht möglich (System n, Nnnn) [G76/G77 thread not possible (System n, Nnnn)]	
0X0211002F	G76/G77 Winkel zu groß (System n, Nnnn) [G76/G77 angle too large (System n, Nnnn)]	
0X02110030	G76/G77 keine Hauptspindel (System n, Nnnn) [G76/G77 no main spindle (System n, Nnnn)]	
0X02110031	F/S-Wert < 0 [F/S value < 0]	
0X02110032	Option nicht freigegeben (System n, Nnnn)n [Option not enabled (System n, Nnnn)n]	
0X02110033	Illegaler Befehl OCI (System n, Nnnn) [Invalid OCI instruction (System n, Nnnn)]	
0X02110034	SRK mit G25 nicht erlaubt (System n, Nnnn) [SRK with G25 not permitted (System n, Nnnn)]	



0X02110035	Keine Achse oder nur \$38 programmiert (System n, Nnnn) [No axis programmed or only \$38 (System n, Nnnn)]	
0X02110036	Zusätzliche OCI-Achse programmiert (System n, Nnnn) [Additional OCI axis programmed (System n, Nnnn)]	
0X02110037	Illegaler Befehl, Vorgängersatz OCI (System n, Nnnn) [Invalid instruction, previous OCI record (System n, Nnnn)]	
0X02110038	Falscher FFTP-Wert (System n, Nnnn) [Incorrect FFTP value (System n, Nnnn)]	FFTP value > 100 or < 0, the FFTP value must be programmed in % of rapid feed
0X02110039	Keine Transformation aktiv (System n, Nnnn) [No transformation active (System n, Nnnn)]	
0X0211003A	Precompilieren nicht möglich (System n, Nnnn) [Precompiling not possible (System n, Nnnn)]	
0X0211003B	Vorschub zu groß (System n, Nnnn) [Feedrate is too high (System n, Nnnn)]	
0X0211003C	Verfahrstrecke zu groß (System n, Nnnn) [Travel too large (System n, Nnnn)]	For a rotary/continuous axis if the travel distance programmed in the NC record exceeds the internal resolution
0X0211003D	Unerreichbare Position (System n, Nnnn) [Unreachable position (System n, Nnnn)]	
0X0211003E	Kein Programm aktiv (System n, Nnnn) [No program active (System n, Nnnn)]	
0X0211003F	G77 Beschleunigungsfehler (System n, Nnnn) [G77 Beschleunigungsfehler (G77 acceleration error)]	
0X02110040	G77 Verzögerungsfehler (System n, Nnnn) [G77 deceleration error (System n, Nnnn)]	
0X02110041	Gelenkkonfiguration nur in PTP erlaubt (System n, Nnnn) [Joint configuration allowed only in PTP (System n, Nnnn)]	

0X02110042	G39 verboten bei Spiegeln / Drehen (System n, Nnnn) [G39 prohibited with mirroring/rotation (System n, Nnnn)]
0X02110043	Unzulässiger Rampenwert (ACC) (System n, Nnnn) [Invalid ramp value (ACC) (System n, Nnnn)]
0X02110044	Falsche Transformation (System n, Nnnn) [Incorrect transformation (System n, Nnnn)]
0X02110045	G72 .. G75 fehlt (System n, Nnnn) [G72 .. G75 missing (System n, Nnnn)]

11.3.4 0x0212 Error in automatic record insertion

The subsystem number is indicated in the first parameter, the number of the NC record in the second parameter.

Error no.	Error text	Cause / Remedy
0x02120000	Radius / Fase zu groß (System n, Nnnn) [Radius/chamfer too large (System n, Nnnn)]	In a CNC record you have programmed a transition radius (RA..) or a transition chamfer (RB..) whose starting position is outside the programmed coordinates of the CNC record in which the radius or the chamfer is programmed or whose target position would go beyond the coordinates of the next CNC record.
0x02120001	Übergangsfase nicht erlaubt (System n, Nnnn) [Transition chamfer not allowed (System n, Nnnn)]	In a CNC record you have programmed a transition chamfer (RB..) that is not between two G1 records.
0x02120002	Unerreichbare Position (System n, Nnnn) [Unreachable position (System n, Nnnn)]	
0x02120003	G02/03-Satz falsch programmiert (System n, Nnnn) [G02/03 record incorrectly programmed (System n, Nnnn)]	
0x02120004	Kreisendpunktfehler (System n, Nnnn) [Circle end position error (System n, Nnnn)]	



11.3.5 0x0213 Error in tool nose radius compensation

The subsystem number is indicated in the first parameter, the number of the NC record in the second parameter.

Error no.	Error text	Cause / Remedy
0x02130000	NC-Satz ohne Verfahrbewegung (System n, Nnnn) [NC record without motion (System n, Nnnn)]	
0x02130001	Konturradius <= Schneidenradius (System n, Nnnn) [Contour radius <= tool radius (System n, Nnnn)]	
0x02130002	Konturradius = 0 (System n, Nnnn) [Contour radius = 0 (System n, Nnnn)]	
0x02130003	Winkel zu spitz (System n, Nnnn) [Angle too sharp (System n, Nnnn)]	The selected tool cannot move to the programmed position.
0x02130004	Werkzeugradius zu groß (System n, Nnnn) [Tool radius too large (System n, Nnnn)]	The selected tool cannot move to the programmed position.
0x02130005	Startpunkt = Endpunkt (System n, Nnnn) [Start position = end position (System n, Nnnn)]	The selected tool cannot move to the programmed position.
0x02130006	SRK mit G50 nicht möglich (System n, Nnnn) [SRK with G50 not possible (System n, Nnnn)]	

11.3.6 0x0214 Error in interpolation preparation

The subsystem number is indicated in the first parameter, the number of the NC record in the second parameter.

Error no.	Error text	Cause / Remedy
0x02140000	Speicher voll (System n, Nnnn) [Memory full (System n, Nnnn)]	
0x02140001	Unerreichbare Position Satzanfang (System n, Nnnn) [Unreachable position record start (System n, Nnnn)]	
0x02140002	Unerreichbare Position Satzende (System n, Nnnn) [Unreachable position record end (System n, Nnnn)]	
0x02140003	Unerreichbare Position Satzmitte (System n, Nnnn) [Unreachable position record middle (System n, Nnnn)]	



0x02140004	Kreisendpunktfehler (System n, Nnnn) [Circle end position error (System n, Nnnn)]
0x02140005	Keine Gewindeleitachse (System n, Nnnn) [No thread lead axis (System n, Nnnn)]
0x02140006	Kein Spindelwert (System n, Nnnn) [No spindle actual value (System n, Nnnn)]
0x02140007	M03 / M04 / M05 falsch (System n, Nnnn) [M03 / M04 / M05 incorrect (System n, Nnnn)]
0x02140008	\$61 Stichlänge=0 (System n, Nnnn) [\$61 Stich length=0 (System n, Nnnn)]
0x02140009	Programmierter Weg zu lang (System n, Nnnn) [Programmed path too long (System n, Nnnn)]
0x0214000A	Wechsel der Gelenkkonfiguration nicht möglich (System n, Nnnn) [Joint configuration change not possible (System n, Nnnn)]



11.3.7 0x0220 Axis errors

The axis number is indicated in the parameter.

Error no.	Error text	Cause / Remedy
0x02200000	Messkreisfehler (Achse n) [Measuring circuit error (Axis n)]	Cyclical data exchange between the PN-MIC xx and the drive has been interrupted.
0x02200001	Stillstandsüberwachung (Achse n) [Zero-speed control (Axis n)]	An axis has left the zero-speed control window Q.046 without a travel assignment or did not reach the set control window quickly enough. The control deletes the controller enable after the delay time Q.047 (ms). Possible causes: <ul style="list-style-type: none"> • Control time too short (Q.047) • Control window too small (Q.046) • Controller amplification factor too small • Drift compensation set incorrectly
0x02200002	Schleppabstand zu groß (Achse n) [Following error too large (Axis n)]	The drive cannot follow the values set in the CNC. Following error control causes feed stop with ramp. Possible cause: Either the maximum velocity Q.023 is too large, the maximum following error Q.042 too small, the KV factor Q.022 too small or the drive defective.
0x02200003	Reglerfreigabe fehlt (Achse n) [no controller enable (Axis n)]	The position controller was opened from the outside by taking away the controller enable while the axis was moving.
0x02200004	Softwareendschalter + (Achse n) [Software limit switch + (Axis n)]	The boundary set in Q.035 has been reached (only effective after homing).
0x02200005	Softwareendschalter - (Achse n) [Software limit switch - (Axis n)]	The boundary set in Q.036 has been reached (only effective after homing).
0x02200006	Vorschubfreigabe fehlt (Achse n) [No feed enable (Axis n)]	The travel assignment of an axis cannot be executed due to a missing feed enable (PLC program).
0x02200007	Hardwareendschalter + (Achse n) [Hardware limit switch + (Axis n)]	The axis is on the + hardware limit switch. It can be moved manually in "-" direction.
0x02200008	Hardwareendschalter - (Achse n) [Hardware limit switch - (Axis n)]	The axis is on the - hardware limit switch. It can be moved manually in "+" direction.



0x02200009	Achse nicht referenziert (Achse n) [Axis not referenced (Axis n)]	A program can only be started after all its axes have been synchronized. If axes do not need to be homed, e.g. rotary axes/spindles set Q.52 bit 3 = 1 to tell the program that the axis has been synchronized.
0x0220000A	Repositionieren (Achse n) [Repositioning (Axis n)]	
0x0220000B	SERCOS-Zykluszeit zu klein (Achse n) [SERCOS cycle time too short (Axis n)]	The set cycle time for SERCOS is too short.
0x0220000C	Fehler beim Nachführbetrieb (Achse n) [Error in follow-up operation (Axis n)]	A non-programmed follow-up operation was executed during the CNC program.
0x0220000D	Sollwertfehler (Achse n) [Set value error (Axis n)]	
0x0220000E	Gewindefehler (Achse n) [Thread error (Axis n)]	
0x0220000F	Watchdog Antriebsmodul (Achse n) [Drive module watchdog (Axis n)]	
0x02200010	PCI-Basisadresse ungültig (Achse n) [PCI base address invalid (Axis n)]	Only on ProNumeric / PN-MIC
0x02200011	Falsche Modul-Nummer (Achse n) [Incorrect module number (Axis n)]	
0x02200012	Falsche Kanal-Nummer (Achse n) [Incorrect channel number (Axis n)]	
0x02200013	Kartenkennung ungültig (Achse n) [Card ID invalid (Axis n)]	
0x02200014	Drehzahlsollwert zu groß (Achse n) [Desired rotary speed too high (Axis n)]	



11.3.8 0x0221 SERCOS diagnosis status

These error messages apply only to ProNumeric / PN-MIC.
The axis number is normally indicated in the first parameter.

Error no.	Error text	Cause / Remedy
0x02210000	Falsche Adresse des Antriebs (Achse n) [Incorrect drive address (Axis n)]	
0x02210001	Handshake-Timeout SERCOS (Achse n) [SERCOS handshake timeout (Axis n)]	
0x02210002	Antriebstelegramm-Ausfall SERCOS (Achse n) [SERCOS drive telegram failure (Axis n)]	
0x02210003	Antriebsfehler (Achse n) [Drive error (Axis n)]	
0x02210004	Fehler beim Umschalten Phase 2 -> 3 (Achse n) [Error while switching phase 2 -> 3 (Axis n)]	
0x02210005	Fehler beim Umschalten Phase 3 -> 4 (Achse n) [Error while switching phase 3 -> 4 (Axis n)]	
0x02210006	Kommandofehler Antrieb (Achse n) [Drive instruction error (Axis n)]	
0x02210007	SERCOS-PLL asynchron (Ring n, Antrieb n) [SERCOS PLL asynchronous (Ring n, Axis n)]	



11.3.9 0x0222 SERCOS status class 1

These error messages apply only to ProNumeric / PN-MIC.
The axis number is indicated in the first parameter.

Error no.	Error text	Cause / Remedy
0x02220000	Überlast Antrieb (Achse n) [Overload drive (Axis n)]	
0x02220001	Übertemperatur Verstärker (Achse n) [Amplifier overheated (Axis n)]	
0x02220002	Übertemperatur Motor (Achse n) [Motor overheated (Axis n)]	
0x02220003	Kühlung Antrieb (Achse n) [Drive cooling (Axis n)]	
0x02220004	Steuerspannung Antrieb (Achse n) [Control voltage drive (Axis n)]	
0x02220005	Messkreisfehler Antrieb (Achse n) [Drive measuring circuit error (Axis n)]	
0x02220006	Kommutierung Antrieb (Achse n) [Drive commutation (Axis n)]	
0x02220007	Überstrom Antrieb (Achse n) [Drive overcurrent (Axis n)]	
0x02220008	Überspannung Antrieb (Achse n) [Drive overvoltage (Axis n)]	
0x02220009	Unterspannung Antrieb (Achse n) [Drive undervoltage (Axis n)]	
0x0222000A	Phasenfehler Antrieb (Achse n) [Drive phase error (Axis n)]	
0x0222000B	Regelfehler Antrieb (Achse n) [Drive control error (Axis n)]	



0x0222000C	Kommunikation Antrieb (Achse n) [Drive communication (Axis n)]
0x0222000D	Lagegrenzwert Antrieb (Achse n) [Drive position limit (Axis n)]
0x0222000E	Reserviert Antrieb (Achse n) [Drive reserved (Axis n)]
0x0222000F	Fehler Antrieb (KLasse 1) (Achse n) [Drive error (class 1) (Axis n)]

11.3.10 0x0223 Manufacturer-specific SERCOS errors

These error messages apply only to ProNumeric / PN-MIC.

The drive's manufacturer-specific error numbers are displayed.

11.3.11 0x0224 Manufacturer-specific SERCOS error texts

These error messages apply only to ProNumeric / PN-MIC.

The drive's manufacturer-specific error texts are displayed.

11.3.12 0x0230 Drive errors

These error messages apply only to the XCN.

The CNC axis number is normally indicated in the first parameter.

In the following error messages MC stands for MotionControl.

Error no.	Error text	Cause / Remedy
0x02300001	SLM: Sende/Empfangs (Tx,Rx) Fehler [SLM: Send/receive error (Tx, Rx)]	
0x02300002	SLM: SLM nicht vorhanden (Achse n, Ort=m) [SLM: SLM not found (Axis n, Location=m)]	Possible cause: - Access to the SLM-ASIC defective
0x02300003	SLM: Unbekannte SLM-ID (Achse n, Ort=m) [SLM: Unknown SLM ID (Axis n, Location=m)]	SLM-ID not recognized. Possible causes: - SLM drive without power - Communication with SLM drive not possible
0x02300004	SLM: Checksum Fehler (Encoder-Object) (Achse n, Ort=m) [SLM: Checksum error (encoder object) (Axis n, Location=m)]	Possible cause: - The encoder data saved in the SLM module (on the motor) is defective.
0x02300005	SLM: Checksum Fehler (Motor-Object) (Achse n, Ort=m) [SLM: Checksum error (motor object) (Axis n, Location=m)]	Possible cause: - The motor data saved in the SLM module (on the motor) is defective.
0x02300006	SLM: Parameter konnte nicht gelesen werden (Achse n, Ort=m) [SLM: Parameter could not be read (Axis n, Location=m)]	Possible causes: - Read access currently not possible - Parameter does not exist
0x02300007	SLM: Parameter konnte nicht geschrieben werden (Achse n, Ort=m) [SLM: Parameter could not be written (Axis n, Location=m)]	Possible causes: - Write access currently not possible - Parameter does not exist
0x0230000C	SLM: Kommunikations Fehler (Achse n, Ort=m) [SLM: Communication error (Axis n, Location=m)]	Possible cause: - SLM cable malfunction due to external influences
0x0230000D	SLM: CRC-Fehler (Achse n, Ort=m) [SLM: CRC error (Axis n, Location=m)]	Possible cause: - SLM cable malfunction due to external influences
0x0230000E	SLM: Fehler Service-Kanal (Achse n, Ort=m) [SLM: Service channel error (Axis n, Location=m)]	Possible cause: - Time limit overrun while reading or writing
0x02300014	MC: Zykluszeit MotionControl falsch [MC: Incorrect MotionControl cycle time]	Possible cause: The cycle time (position controller scan rate) is set incorrectly: The <i>CYCLE_TIME</i> parameter must be set in 1000 µs steps (Schleicher Dialog, <i>Startup/Drive Configuration/Drive Parameters</i> menu).



0x02300015	MC: Zykluszeit IPO falsch [MC: Incorrect interpolation cycle time]	Possible cause: - The interpolation cycle time (interpolation scan rate) is set incorrectly: The number entered for the <i>Interpolation scan rate</i> must be a whole-number multiple of the position control cycle (Schleicher Dialog, <i>Startup/Default Settings</i> menu).
0x0230001E	MC: CAN-Interface ist nicht bereit [MC: CAN interface not ready]	Possible cause: - No ready message from PLC in MC_CAN() function block status word
0x0230001F	MC: XRIO (ANALOG) -Interface ist nicht bereit [MC: XRIO (ANALOG) interface not ready]	Possible cause: - No ready message from PLC in MC_ANALOG() function block status word
0x0230005A	MC: Aufruf ohne Initialisierung [MC: Call without initialization]	Possible cause: - The cyclical MotionControl task has detected a defective initialization (see logbook for further error messages)
0x02300060	MC: zu wenig Speicher (Ort=m) [MC: Insufficient memory (Location=m)]	The memory required for MotionControl could not be generated.
0x02300061	MC: Funktion z.Z. nicht verfügbar (Ort=m) [MC: Function currently not available (Location=m)]	
0x02300062	MC: unbekannte Antriebsschnittstelle (Ort=m) [MC: Unknown drive interface (Location=m)]	
0x02300063	MC: fataler Fehler (Ort=m) [MC: Fatal error (Location=m)]	
0x02300064	MC: Datei (drive_*.ini) kann nicht generiert werden (File_ID=m) [MC: File (drive_*.ini) cannot be generated (File_ID=m)]	
0x02300065	MC: Datei (drive_*.ini) ist nicht vorhanden (File_ID=m) [MC: File (drive_*.ini) does not exist (File_ID=m)]	
0x02300066	MC: Datei (drive_*.ini) kann nicht geschrieben werden (File_ID=m) [MC: File (drive_*.ini) cannot be written (File_ID=m)]	The INI, OLD or CRC file is write-protected
0x02300067	MC: fehlende/fehlerhafte Parameter in Datei (drive_*.ini) (File_ID=m) [MC: Missing or defective parameter in file (drive_*.ini) (File_ID=m)]	No current value was found in the INI file or the parameter does not exist.

0x02300068	MC: Datei (drive_*.ini) ist fehlerhaft (File_ID=m) [MC: File (drive_*.ini) is defective (File_ID=m)]	The INI file contains invalid or defective data.
0x02300069	Warnung: MC: neue Achse (mit Default-Einstellungen) eingefügt (File_ID=m) [Warning: MC: New axis inserted (with default settings (File_ID=m)]	Note, warning: One or more axes have been inserted in the XCN.
0x0230006A	Warnung: MC: nicht zugeordnete Achse(n) in Datei (drive_*.ini) (File_ID=m) [Warning: MC: File (drive_*.ini) contains non-assigned axis/axes (File_ID=m)]	Note, warning: One or more axes have been deleted in the XCN.
0x0230006B	Warnung: MC: Zuordnung der Achsen wurde geändert in Datei (drive_*.ini) (File_ID=m) [Warning: MC: Axis assignment changed in file (drive_*.ini) (File_ID=m)]	Note, warning: The assignment of one or more axes has been changed in the XCN.
0x0230006C	MC: Datei (drive_*.old) kann nicht generiert werden (File_ID=m) [MC: File (drive_*.old) cannot be generated (File_ID=m)]	The OLD file could not be generated.
0x0230006D	MC: Datei (drive_*.crc) kann nicht generiert werden (File_ID=m) [MC: File (drive_*.crc) cannot be generated (File_ID=m)]	The CRC file could not be generated.
0x0230006E	MC: temporäre Datei (drive_*.ini) ist nicht vorhanden (File_ID=m) [MC: Temporary file (drive_*.ini) does not exist (File_ID=m)]	The drive_*.ini file on the RAM disk in the XCN – with the drive parameters that have been edited online – does not exist after the accept request.
0x02300095	MC: TaskSynchronisation TIMEOUT	The time limit for initial MotionControl task synchronization with the interpolation task has been exceeded. Check the interpolation cycle time and the MotionControl cycle time. Dividing the interpolation cycle time by the MotionControl cycle time must produce a whole number. (Interpolation cycle time / MotionControl cycle time) = whole number



0x02300096	MC: Task asynchron [MC: Asynchronous task]	The MotionControl task is not synchronized with the interpolation task. Check the interpolation cycle time and the MotionControl cycle time. Dividing the interpolation cycle time by the MotionControl cycle time must produce a whole number. (Interpolation cycle time / MotionControl cycle time) = whole number
0x023000A0	MC: CAN-Antriebsfehler (Achse n, Ort=m) [MC: CAN drive error (Axis n, Location=m)]	This error message is generated as soon as the PLC program signals a drive error via STATUS_WORD (bit 3) in the MC_CAN function block.
0x023000A1	MC: Analog-Antriebsfehler (Achse n, Ort=m) [MC: Analog drive error (Axis n, Location=m)]	This error message is generated as soon as the PLC program signals a drive error via STATUS_WORD (bit 3) in the MC_ANALOG function block.
0x02300FA0	SERCOS: Allgemeiner Fehler [SERCOS: General error]	
0x02300FA1	SERCOS: Fataler Fehler [SERCOS: Fatal error]	
0x02300FA2	SERCOS: Fehler bei der Phasenumschaltung (Achse n, IDN=x) [SERCOS: Error during phase switching (Axis n, IDN=x)]	The SERCOS communication phase cannot be changed. Possible cause: - A SERCOS parameter was rejected by the drive. IDN displays this parameter number.
0x02300FA3	SERCOS: Zustandsklasse 1 Fehler (Achse n, IDN 11=x) [SERCOS: Status class 1 error (Axis n, IDN 11=x)]	A SERCOS error has occurred (status class 1). IDN 00011 contains the rest of the error information:
		Bit 0: Overload shutdown
		Bit 1: Amplifier overheating shutdown
		Bit 2: Motor overheating shutdown
		Bit 3: Cooling error shutdown
		Bit 4: Control voltage error
		Bit 5: Feedback error
		Bit 6: Error in commutation system
		Bit 7: Overcurrent
		Bit 8: Overvoltage
		Bit 9: Undervoltage error
		Bit 10: Phase error in power supply
		Bit 11: Excessive deviation
		Bit 12: Communication error
		Bit 13: Position limit exceeded
Bit 14: (reserved)		
Bit 15: Manufacturer-specific error		
0x02300FA4	SERCOS: Herstellerspezifischer Fehler (Achse n, Fehler-Nr.=x) [SERCOS: Manufacturer-specific error (Axis n, Error no.=x)]	Shows the drive manufacturer's error number.

0x02300FA5	SERCOS: Kommunikationsfehler / Ring nicht geschlossen [SERCOS: Communication error / ring not closed]	
0x02300FA6	SERCOS: 2. Ring/Modul ist nicht erlaubt [SERCOS: 2nd ring/module not permitted]	
0x02300FC0	Warnung: Altes Betriebssystem, keine PLC-SERCOS Schnittstelle [Warning: Old operating system, no SPS-SERCOS interface]	Only on ProNumeric / PN-MIC: The CNC operating system is incompatible with the SERCOS interface on the PN-MIC card.

The parameter that defines the Location or File_ID is defined as follows:

Parameter value	Error location	Comment
100	CALLING_PARAMETERS	
200	ALLOCATE_MEMORY	
300	READ_FILE	
301	SLM_INI_FILE_ID	Error while generating / modifying the DRIVE_SLM.INI file
302	CAN_INI_FILE_ID	Error while generating / modifying the DRIVE_CAN.INI file
303	ANALOG_INI_FILE_ID	Error while generating / modifying the DRIVE_ANA.INI file
304	SERCOS_INI_FILE_ID	Error while generating / modifying the DRIVE_SRC.INI file
400	CALCULATE_PARAMETERS	
500	INIT_CNC_INTERFACE	
600	INIT_DRIVE_INTERFACE	
601	IDENTIFYSLM	
602	READENCODER	
603	READMOTOR	
604	INITSLMPHASE1	
605	INITSLMPHASE2	
900	CYCLIC_TASK	



11.4 CAN Error Messages

0x0300nnnn	CAN-specific operating system error
0x0301nnnn	CAN driver error

11.4.1 0x0300 CAN-specific operating system errors

The first parameter indicates the card number of the active CAN card (on ProNumeric this is a PN-MIC card).

Error no.	Error text	Cause / Remedy
0x03000001	CAN: Ungültige Karte oder falsche Shared Memory Revision (Karte n) [CAN: Invalid card or incorrect shared memory revision (Card n)]	Only on ProNumeric / PN-MIC: Update PN-MIC firmware.
0x03000002	CAN: Karte nicht verfügbar (Heartbeat-Fehler) (Karte n) [CAN: Card not available (heartbeat error) (Card n)]	Only on ProNumeric / PN-MIC: PN-MIC card possibly defective. Switch computer off and on again.
0x03000003	CAN: Synchronisationsfehler (Treiberzugriff gesperrt) (Karte n) [CAN: Synchronization error (driver access blocked) (Card n)]	Warning that I/O map has been delayed.
0x03000011	CAN: Fehler Speicherzuweisung für Ereignisliste (Karte n) [CAN: Memory allocation error for event list (Card n)]	Max. memory for event list exceeded. Collect events (see SDO function blocks).
0x03000012	CAN: Überlauf Fehler-Ereignisliste (Karte n) [CAN: Error event list overrun (Card n)]	Max. number of error events exceeded.
0x03000013	CAN: Überlauf Emergency-Ereignisliste (Karte n) [CAN: Emergency event list overrun (Card n)]	Max. number of emergency events exceeded.
0x03000014	CAN: Überlauf Ereignisliste (Karte n) [CAN: Event list overrun (Card n)]	Max. number of general events exceeded.

11.4.2 0x0301 CAN driver errors

The first parameter indicates the card number of the active CAN card (on ProNumeric this is a PN-MIC card).

Error no.	Error text	Cause / Remedy
0x03010006	CAN: Feldbusfehler (Karte n) [CAN: Field bus error (Card n)]	Check CAN network installation.
0x03010096	CAN: SPS- (Betriebsystem-) Fehler (Karte n) [CAN: PLC (operating system) error (Card n)]	Check I/O configuration in PLC programming system. Reset controller if necessary.
0x030100A0	CAN: Konfiguration konnte nicht gelesen werden oder SPS-Timeout (Karte n) [CAN: Configuration could not be read or PLC timeout (Card n)]	Reset controller if necessary.
0x030100AA	CAN: Ungültige Konfiguration (Karte n) [CAN: Invalid configuration (Card n)]	Check CAN bus configuration.
0x03010328	CAN: Unbekannter CAN-Fehler (Karte n) [CAN: Unknown CAN error (Card n)]	Error on card <n>. Check CAN network.



11.5 User-defined Error Messages

0x0400nnnn to 0x04FFnnnn	User-defined errors, can be entered in the error logbook by the PUT_ERROR function block
--------------------------------	--

11.5.1 0x0400 User-defined error messages

User-defined errors (in groups 0x0400 to 0x04FF), which can be entered in the error logbook by the PUT_ERROR function block

A user-defined error text can be assigned to each of these error numbers (including display parameters which can be transferred to the function block).

Error message examples:

Error no.	Error text	Cause / Remedy
0x04000000	Anwender-Fehler [Gruppe 0, Nummer 0] (Par1=x, Par2=y, Par3=z) [User error [Group 0, Number 0] (Par1=x, Par2=y, Par3=z)]	
0x04000001	Anwender-Fehler [Gruppe 0, Nummer 1] (Par1=x, Par2=y, Par3=z) [User error [Group 0, Number 1] (Par1=x, Par2=y, Par3=z)]	
0x04000002	Anwender-Fehler [Gruppe 0, Nummer 2] (Par1=x, Par2=y, Par3=z) [User error [Group 0, Number 2] (Par1=x, Par2=y, Par3=z)]	

11.6 NC Memory Access Errors

These error messages are not entered in the active error buffer.

These are dialog errors that can occur when the CNC memory is accessed, if Schleicher Dialog, via the shared RAM, makes requests that have caused an error (e.g. accept or delete NC programs or accept configuration data). They are returned in the request cell.

Accepting NC programs:

cncMem.comSect.wrdPNRw.lRecvNcPrg

Accepting the configuration file:

cncMem.comSect.wrdPNRw.lRecvConfig

Accepting the arithmetic parameter file:

cncMem.comSect.wrdPNRw.lRecvRVal

Deleting NC programs:

cncMem.comSect.wrdPNRw.lRqDelNcPrg

Error no.	Error text	Cause / Remedy
-2	Datei-Fehler: Die Datei kann nicht geöffnet werden [File error: File cannot be opened]	Access to PC file system not possible
-3	NC-Speicherfehler: Die max. Anzahl der NC-Programme ist überschritten [NC memory error: Max. number of NC programs exceeded]	Increase number of NC programs or delete programs
-4	NC-Speicherfehler: Der NC-Programmspeicher ist voll [NC memory error: Der NC-Programmspeicher ist voll]	Enlarge NC program memory or delete programs
-5	NC-Speicherfehler: Der NC-Satz ist zu lang (max. 120 Zeichen) [NC memory error: NC record too long (max. 120 characters)]	
-6	NC-Speicherfehler: Das NC-Programm läuft gerade [NC memory error: NC program running]	An active program cannot be overwritten or deleted
-7	NC-Speicherfehler: Das NC-Programm befindet sich gerade im Lesezugriff [NC memory error: NC program in read access]	A program in read access cannot be deleted or overwritten
-8	NC-Speicherfehler: Das NC-Programm befindet sich gerade im Schreibzugriff [NC memory error: NC program in write access]	A program in write access cannot be deleted or overwritten
-9	NC-Speicherfehler: Das NC-Programm ist nicht vorhanden [NC memory error: Das NC-Programm ist nicht vorhanden]	Selected program number for deleting does not exist



-10	NC-Speicherfehler: Falsche NC-Programmnummer [NC memory error: Incorrect NC program number]	Selected program number for deleting is incorrect
-11	NC-Speicherfehler: Das NC-Programm ist aktiv [NC memory error: The NC program is active]	An active program cannot be deleted or overwritten
-12	Falsche Anfangskennung (Q- oder R-Parameter-Datei) (Zeile n) [Incorrect start identifier (Q or R parameter file) (Line n)]	An error has occurred in line <n> due to an incorrect start identifier.
-13	Falsche Parameternummer (Q- oder R-Parameter-Datei) (Zeile n) [Incorrect parameter number (Q or R parameter file) (Line n)]	An error has occurred in line <n> due to an incorrect parameter number.
-14	Falscher Parameterwert (Q- oder R-Parameter-Datei) (Zeile n) [Incorrect parameter value (Q or R parameter file) (Line n)]	An error has occurred in line <n> due to an incorrect parameter value.
-15	Parameter nicht vorhanden (Q- oder R-Parameter-Datei) (Zeile n) [Parameter does not exist (Q or R parameter file) (Line n)]	An error has occurred in line <n>. The parameter does not exist.
-16	Falsche Systemnummer (Q- oder R-Parameter-Datei) (Zeile n) [Incorrect system number (Q or R parameter file) (Line n)]	An error has occurred in line <n>. The selected system does not exist.
-17	Falsche Achsnummer (Q- oder R-Parameter-Datei) (Zeile n) [Incorrect axis number (Q or R parameter file) (Line n)]	An error has occurred in line <n>. The selected axis does not exist.
-18	Steuerung befindet sich nicht im Resetzustand (Q- Parameter-Datei) [Controller not in reset status (Q parameter file)]	Configuration data can only be transferred if the control system is in reset status: Carry out NC reset.
-19	Es konnten nicht alle NC-Programme gelöscht werden [Not possible to delete all NC programs]	Not possible to delete running programs.
-20	MDI-Satz nicht möglich [MDI record not possible]	NC must be in an automatic mode. If an NC program is running the NC must be in NC stop status. There are also other particular causes for this error message, e.g. - Tool radius compensation active - Threading cycle active - RA, RB, RD record - OCI record active
-21	Fehler beim Teachen [Error while teaching]	Possible causes are: - Maximum record length exceeded (120 characters) - An axis in the system has not been referenced



Appendix

11.7 Trademarks

- WINDOWS is a registered trademark of Microsoft Corporation.
- CANopen is a registered trademark of CAN in Automation e.V,
- ProCANopen is a registered trademark of Vector Informatik GmbH
- CANalyzer is a registered trademark of Vector Informatik GmbH
- Pentium is a registered trademark of Intel Corp.
- VxWorks is a registered trademark of Wind River Systems Inc.

All other trademarks or product names are registered trademarks of their respective owners.

12 Safety-related Informations

The term automation system as used in this manual includes control units, their components (modules), other parts (such as racks, cables), operator panels, and the software used for programming, commissioning and operating the control units. This operating manual can only describe a fraction of the automation system (e.g. modules).

The technical design of SCHLEICHER automation systems is based on the EN 61131-2 (IEC 61131-2) product norm. The systems and devices have CE marking according to the EMC directive 89/336/EEC and, if applicable, the low-voltage directive 73/23/EEC.

The machinery directive 89/392/EEC is not applicable, because the safety objectives of the directive are covered by the low-voltage and EMC directives.

When SCHLEICHER automation systems are part of the electrical equipment of a machine, the manufacturer must include them in the conformity evaluation process. In this case the DIN EN 60204-1 norm must be observed (safety of machines, general requirements for electrical equipment of machines).

When an automation system is properly maintained and used for its intended purpose it will not normally cause damage to property or present health hazards. However, improper configuration, installation, maintenance or operation of the system or machine, ignoring the instructions in this manual, or intervention by insufficiently qualified personnel may result in connected actuators (such as motors, hydraulic units, etc.) becoming a source of danger.

12.1 Correct Use of the System

SCHLEICHER automation systems are state-of-the-art products and manufactured to recognised safety requirements. All the same, their use can cause danger to the health and safety of operators and others, or damage machines, systems or other property.

The automation system must only be used in perfect technical condition for its intended purpose, with attention given to safety and danger, and observing the operating manual. Correct transport, storage, installation, operation and maintenance of the system are all prerequisites for smooth and safe operation of the control system. Malfunctions, in particular those which may affect safety, must be immediately resolved.

Automation systems are designed exclusively to control machines and systems. Automation systems are not intended for any other use than the above. The manufacturer will therefore accept no liability for any damages resulting from the incorrect use of the systems.

When using automation systems, all instructions given in this manual regarding mechanical and electrical setup, commissioning and operation must be observed.

12.2 Selection and Qualification of Personnel



All configuring, programming, installation, commissioning, operation and maintenance work on the automation system must be carried out by trained personnel such as electricians or electrical engineers. Personnel responsible for configuring and programming the system must be familiar with all safety-related issues in automation technology.

System operators must be instructed on the operation of the control system and be familiar with the relevant operating instructions.

All personnel responsible for installing, commissioning and maintaining the system must have had appropriate training qualifying them to work on automation systems.

12.3 Configuring, Programming, Installation, Commissioning and Operation

The automation system will in most cases be a part of a larger system in which machines are controlled. When configuring, installing and commissioning automation systems to control machines the machine manufacturer and the user must observe the safety regulations as defined in the machinery directive 89/392/EWG. For specific applications national accident prevention regulations such as VBG 4.0 will apply.

Safety-related components on the controlled machine must be designed such that they operate independently from the control system. Emergency stop components must be operational in all control modes. In an emergency stop the power supply to all switching elements controlled by the control system must be cut off.

Measures must be taken for restarting an interrupted control program following voltage dips or power failures. Operating conditions should never cause danger, not even for a short time. In the event of danger the emergency stop must be immediately triggered.

In order to prevent an open-circuit in the signal circuit causing non-controllable conditions in the control system, the relevant hardware and software safety precautions must be taken for I/O interfacing. Control elements and their assigned control panel elements must be installed in a place where they are sufficiently protected against inadvertent use.

12.4 Maintenance

Measuring and testing on active devices must be carried out in accordance with the regulations and instructions of the VBG 4.0 accident prevention regulation. The appropriate power tools must be used. Repairs on control components must be carried out at repair shops authorised by SCHLEICHER. Opening the components and repairs by unauthorised personnel may lead to personal injury or damage to property.

Always be disconnected the device from the mains before opening it (either disconnect the mains plug or use the cut-out switch).

Control modules may only be replaced when the power is switched off. Disassembly and assembly must be carried out according to the directives for mechanical assembly.

Fuses may only be replaced with those types specified in Technical Data.

Batteries may only be replaced with those types specified in Technical Data. Batteries must always be disposed as hazardous waste.

12.5 High Voltages



When the cabinet is opened or casing is removed from system components certain parts of the automation system are exposed. These parts may be subject to dangerous high voltages.

The user must prevent any unauthorised and incorrect access to the system (for example, by ensuring that the cabinet is locked).

Personnel must be familiar with all sources of danger and measures for commissioning and maintaining the system in line with the instructions given in this manual.

12.6 Dealing With Used Batteries

When the batteries in the automation system are dead they must be disposed of in a battery return system or through public waste disposal facilities.

Batteries should be fully discharged before disposal. A battery is discharged when the function of the device is impaired due to insufficient battery capacity.

When batteries for disposal are not fully discharged precautions must be taken to prevent short circuits. For example by sticking tape over the poles of the battery.



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