EN

SPK207

Control Panel

User guide

SPK207_2017.04_0200_EN

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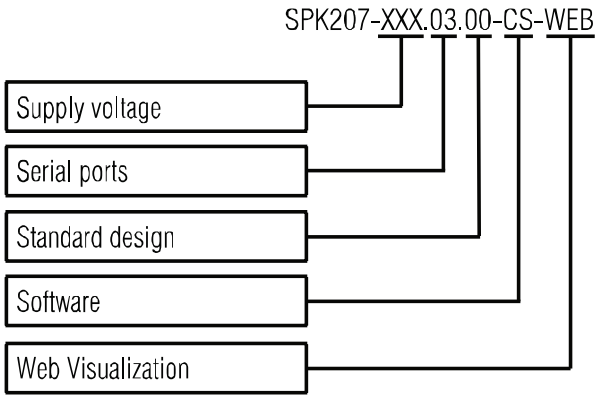
Contents

1 Description

1.1 Function

The Control Panel SPK207 is a PLC with a TFT touchscreen, freely programmable with CODESYS V3.5 software.
It is designed and manufactured for industrial applications and can be used as an operator or a control terminal.

1.2 Ordering Key



Supply voltage:
- 24 – 24 (18…32) V DC
- 230 – 230 (90…264) V AC; 50 (47…63) Hz

Serial ports:
- 03 – RS232, 2x RS232/RS485 configurable

Software installed:
- CS – CODESYS on Linux

Web Visualization:
- WEB – Integrated web visualization

1.3 Hardware

- RISC processor 800 MHz
- 128 MB dynamic memory (RAM)
- 128 MB persistent memory (Flash)
- Real Time Clock, battery backed
- Buzzer

1.3.1 Front Panel

- TFT color display with resistive touchscreen
- LED **POWER**
- LED **RUN**, lights while running user application
- 3 LEDs **P1**, **P2**, **P3**, blinks if data exchange is in progress on the serial ports **COM1**, **COM2**, **COM3**: green indicates data reception (RxD), red indicates data transmission (TxD)
- 6 LED-lit function buttons: **SYS**, **F1**…**F5**. The functions of the buttons and LEDs can be set in the user application.

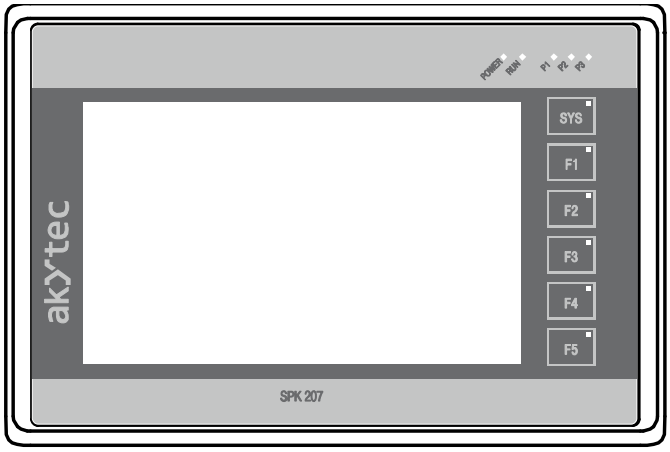


Fig. 1.1 Front Panel

1.3.2 Rear Panel

The rear panel is shown in the Fig. 1.2 and Fig. 1.3.

- **USB-Host**
- **USB-Device**
- **Debug** interface RS232 (RJ12) (service function)
- Ethernet 10/100 Mbit/s (RJ45)
- RS232 **COM1** (DE9M)
- 2x RJ45 for the RS232 and RS485 interfaces (**COM2** and **COM3**)
- 3-pin terminal block for the power supply
- Operation mode selector **RUN** (service function)
- Button **RESET** (recessed). The button can be pressed by a thin, pointed object of max. Ø3 mm.

The interface USB Host and SD slot can be used as a terminal for various Mass Storage Devices.

The interface of the serial port COM2 depends on the device model (Table 2.2).

The serial ports COM2 and COM3 are galvanically isolated and can be configured as follows:

SPK207-xxx.03

- The ports COM2 and COM3 can be configured as RS232 or RS485.

The pin assignments for all interfaces are shown in Appendix B.

Restart

The restart occurs in case of:

- switching the power supply off and on again
- pressing the **RESET** button
- touching a **REBOOT** key in the configuration mode

Only in the case of using a **REBOOT** key the data is backed up. Otherwise, the current process is terminated without data backup.

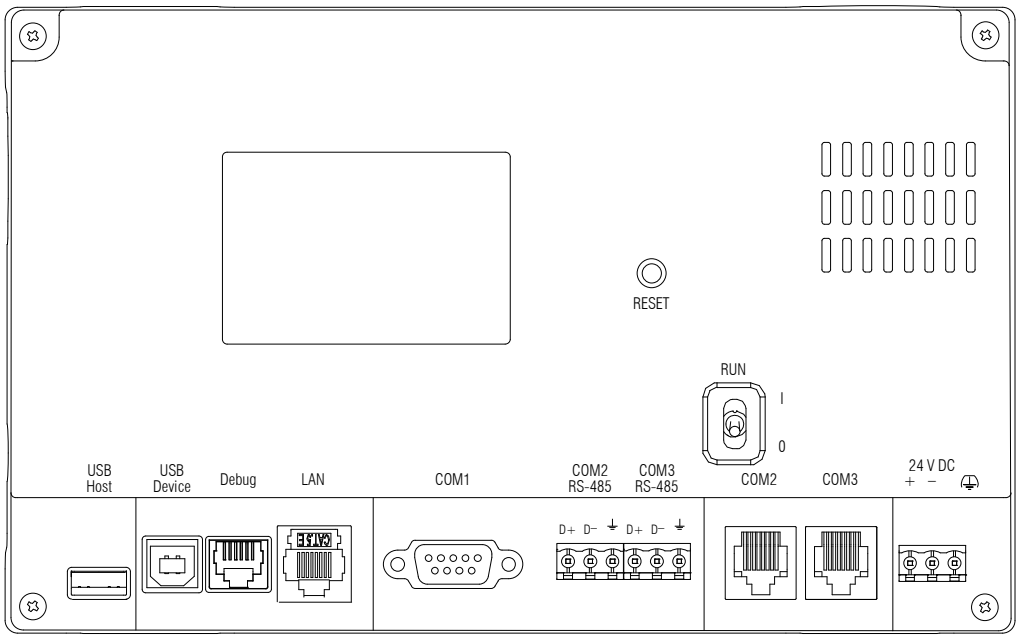


Fig. 1.2 SPK207-24.03 rear panel

1.3.3 Side View

On the right side of the device (Fig. 1.3):

- SD-Slot
- Audio output

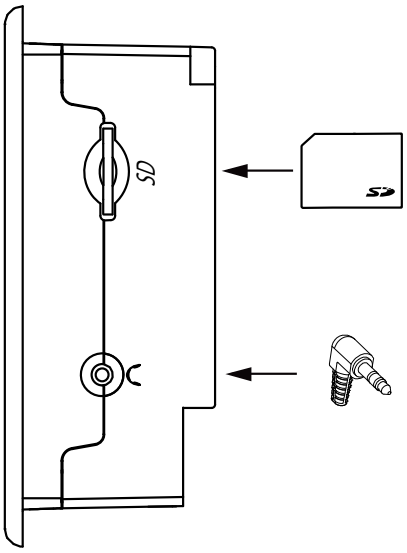


Fig. 1.3 SPK207 right side

1.3.4 Touchscreen

The touchscreen detects a finger touch or a touch with a stylus (not included in package).

▶ **NOTICE** ***The resistive touchscreen can be damaged by pointed or sharp objects. Therefore, it is recommended to touch the screen only with your finger or a non-damaging object!***

It is possible to use protecting coatings for resistive displays.

The PLC is delivered with a calibrated touchscreen. In case of malfunction, the touchscreen can be recalibrated (see 6.1).

1.3.5 Battery

The battery is located on the motherboard. Switch off the device, loose four screws and remove the rear case to replace the battery. When replacing the battery, the polarity must be observed.

► **NOTICE** ***When replacing the battery, the data in the retain memory will be deleted!***

2 Specifications

Table 2.1 General specifications

System		
CPU		ARM Cortex™-A8, 800 MHz
Memory	RAM	128 MB
	Flash	128 MB
Real Time Clock		Battery-backed (CR2032)
Backup time		360 hours at 20 ± 5 ºC [1]
Operating system		Linux
Programming software		CODESYS v3.5
HMI		
Display		TFT 7“
Colors		65536
Resolution		800 x 480 pixel (WVGA)
Display work area (W x H)		152 x 91 mm
Backlight		LED
Touch		resistive
LED-lit function keys		6
Audio output		3.5 mm, > 16 ohm
Power supply		
SPK207-24		24 (18…32) V DC
Power consumption	power on	< 20 W
	operation	< 15 W
SPK207-230		230 (90…264) V AC; 50 (47…63) Hz
Power consumption	power on	< 40 VA
	operation	< 20 VA
Interfaces		
Basic		USB-Host USB-Device Ethernet (10/100 Mbit/s) Debug (RS232) COM1 (RS232)
COM2, COM3 [2]	SPK207-xxx.03	2x RS232 / RS485 configurable
Baud rate	RS232, RS485	1.2…115.2 kbit/s
RS232, RS485 parameters		
Data length		5, 6, 7, 8
Stop bits		1, 1,5, 2
Parity		none, even, odd, mark (1), space (0)
Flow Control	COM1	RTS, CTS, DTR, DSR, DCD, RI, XON/XOFF or none
	COM2, COM3	none
Mechanical characteristics		
Material		Plastic
Dimensions		228 x 152 x 59 mm
Weight		approx. 0.7 kg

[1] *The buffer time is reduced if the ambient temperature is close to the limit of the operating temperature.*

[2] *The design of the interfaces is shown in Table 2.2.*

Table 2.2 Design of the serial ports

Device	Port	Interface	Connector
SPK207-xxx.03	COM1	RS232	DE9M
	COM2	RS232	RJ45
		RS485	RJ45 or 3-pin terminal block
	COM3	RS232	RJ45
		RS485	RJ45 or 3-pin terminal block

2.1 Environmental conditions

The device is designed for natural convection cooling that should be taken into account when choosing the installation site.

The following environment conditions must be met:

– clean, dry and controlled environment, low dust level
– closed non-hazardous areas, free of corrosive or flammable gases

Table 2.3 Environmental conditions

Conditions	Permissible range
Ambient temperature	-20…+50 °C
Storage temperature	-25…+55 °C
Relative humidity	up to 80% (at +35°C, non-condensing)
IP Code	IP20, front IP64
Altitude	up to 2000 m above sea level

3 Safety

Explanation of the symbols and keywords used:

⚠ **DANGER**	***DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.***
⚠ **WARNING**	***WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.***
⚠ **CAUTION**	***CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.***
► **NOTICE**	***NOTICE indicates a potentially harmful situation which, if not avoided, may result in damage of the product itself or of adjacent objects.***

3.1 Intended use

The device has been designed and built solely for the intended use described in this guide, and may only be used accordingly. The technical specifications contained in this guide must be observed.
The device may be operated only in properly installed condition.

Improper use

Any other use is considered improper. Especially to note:

– This device should not be used for medical devices which receive, control or otherwise affect human life or physical health.
– The device should not be used in an explosive environment.
– The device should not be used in an atmosphere with chemically active substance.

4 Installation

⚠ **CAUTION**

Improper installation

Improper installation can cause serious or minor injuries and damage the control panel. Installation must be performed only by fully qualified personnel.

For the dimension drawings see Appendix A.

4.1 Requirements

- The device is designed for front mounting.
- The mounting panel must be accessible from both sides.
- A rectangular mounting cutout is required.
- The mounting enclosure must provide a clean, dry and controlled environment.
- The seal contact surface must be clean and smooth, so that the protection IP64 can be provided.
- The mounting panel can be placed at any angle.
- The device has been designed for natural convection cooling. Make sure that the cabinet provides sufficient clearance for natural convection.

4.2 Mounting

Mounting sequence:

- Make a cutout in the mounting panel for the device
- Make sure that the device is provided with the mounting seal.
- Fit the device into the cutout
- Insert the 4 fastening clips into the slots on the top and the bottom of the device.
- Insert the screws and tighten them to fix the device.

5 Wiring

⚠ **WARNING**

Dangerous voltage
Electric shock could kill or seriously injure.
All electrical connections must be performed by a fully qualified electrician.
Ensure that the mains voltage matches the voltage marked on the nameplate!
Ensure that the device is provided with its own power supply line and electric fuse!

⚠ **WARNING**

Switch on the power supply only after wiring of the device has been completed.

– The pin assignments are shown in Appendix B.
– The maximum conductor cross-section for power supply is 1.5 mm^2.

▶ **NOTICE**

Ensure that the functional ground (FE) is connected to the appropriate pin of the power supply terminal block (see Table B.1). Functional grounding is required to meet EMC level immunity.

▶ **NOTICE**

The device is not provided with an On/Off switch. If the external switch is not installed, the device will start up (boot) as soon as it is connected to the power supply.

5.1.1 Signal lines

▶ **NOTICE**

Signal cables should be routed separately or screened from the supply cables.

▶ **NOTICE**

Only a shielded cable may be used for signal lines.

A twisted pair cable should be used to connect an external device to the RS232 / RS485 interface. The cable lengths should not be exceeded:

– RS485 – 1200 m
– RS232 – see table 4.1

Table 5.1 RS232 connection cable length

max. baud rate	max. length
2.400	900 m
4.800	300 m
9.600	152 m
19.200	15 m
57.600	5 m
115.200	2 m

5.1.2 Ethernet

Use a CAT5 shielded twisted pair cable (STP) to connect device to Ethernet.
– Connection of one device to another: crossover cable
– Connecting to the hub / switch: 1:1 patch cable
– Maximum cable length: 100 m.

6 Starting

► NOTICE

Starting
Before switching on ensure that the unit was stored at the ambient temperature (-20… + 50 °C) at least 30 minutes.

- After switching on the device starts booting. The process takes 25 seconds.
- After the boot process has been completed the message **TAP 3 TIMES TO SERVICE MENU** appears for 3 seconds.
- If you touch the display 3 times within 3 seconds, the service menu will appear.

Fig. 6.1 Start screen

- Then the most important parameters can be set and the basic functions of the device can be used. For the detailed description of the service menu see sec. 6.
- If you don't touch the display within 3 seconds or you left the service menu, and there is a user program on the PLC, it will be immediately executed.
- If no user program is on the PLC, the display looks after booting as follows:

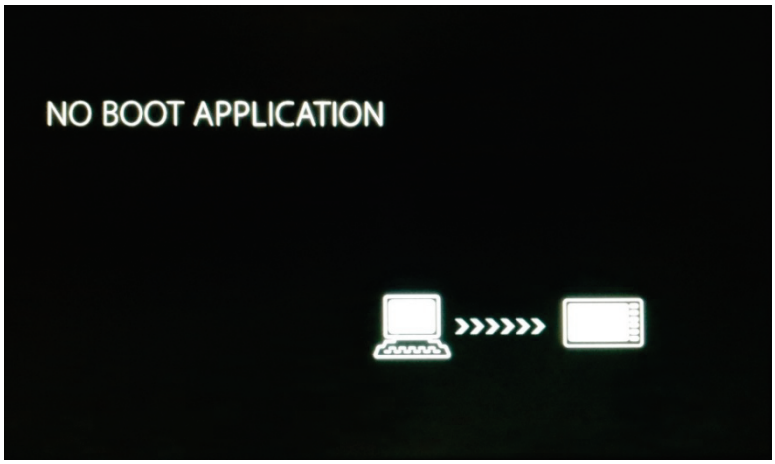


Fig. 6.2 Display without user program

- The PLC must be connected via Ethernet cable to the PC with CODESYS to load a user program. For details see Appendix C.
- Once the user program has been loaded to the PLC, it will be executed.
- For the programming instructions refer to the CODESYS documentation.

7 Service Menu

In this menu the most important parameters can be set and the basic functions of the device can be used.
Use the short touch to navigate between the individual menu items.
Use the long touch to select a menu item.

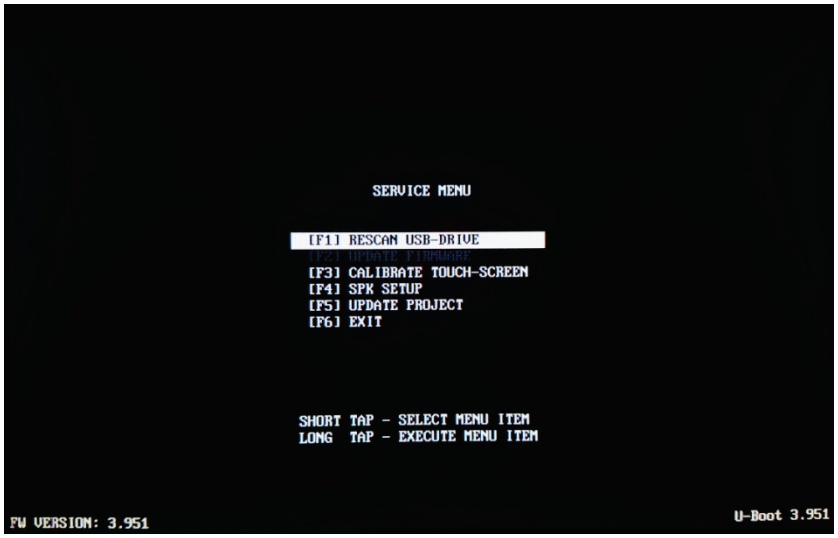


Fig. 7.1 Service Menu

Service Menu items:

– **RESCAN USB DRIVE**

  Enables USB mass storage device

– **FIRMWARE UPDATE**

  Firmware update from a USB mass storage device

– **CALIBRATE TOUCH-SCREEN**

  Touchscreen calibration (see 7.1)

– **SPK SETUP**

  Access to configuration menu

  Network parameters, COM interfaces, date, time, password and other important parameters of the device can be set (see 7.2).

– **UPDATE PROJECT**

  CODESYS project update (see 7.4).

– **EXIT**

  Exit menu

7.1 Touchscreen Calibration

The resistive touch is already calibrated. However, in case of touchscreen malfunction, recalibrate the touchscreen. To recalibrate the touchscreen:

– select **CALIBRATE TOUCH-SCREEN**
– touch the crosses that appears consecutively exactly at its center
– When the calibration is complete, the user program will be executed.

7.2 Configuration

– Select **SPK SETUP**.

– The access is password protected. Enter the password using the on-screen keyboard on the Main Screen (Fig. 7.2). The default password is **12345**. Use the **Shift** key as a Caps Lock key.
– Touch **OK** after the password input. If the password is correct, the configuration dialog will appear (Fig. 7.3).

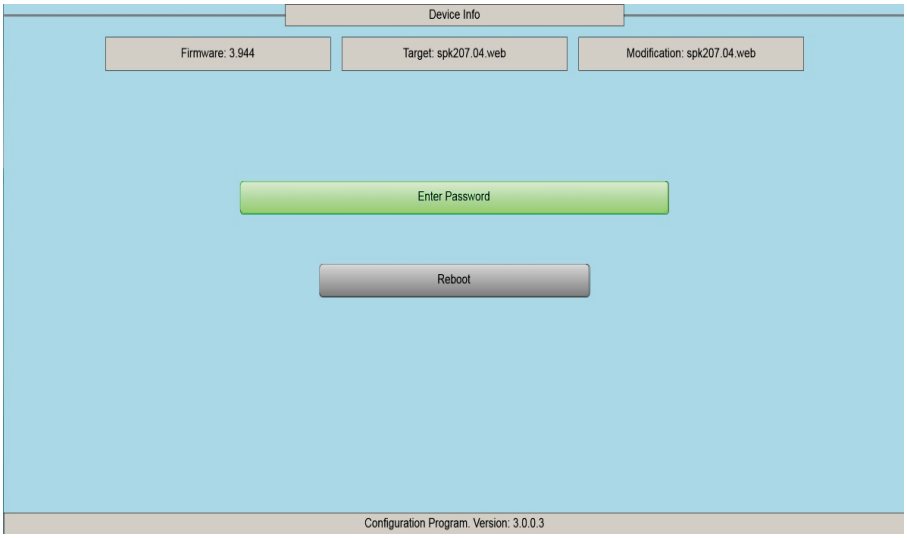


Fig. 7.2 Configuration Mode - Main Screen

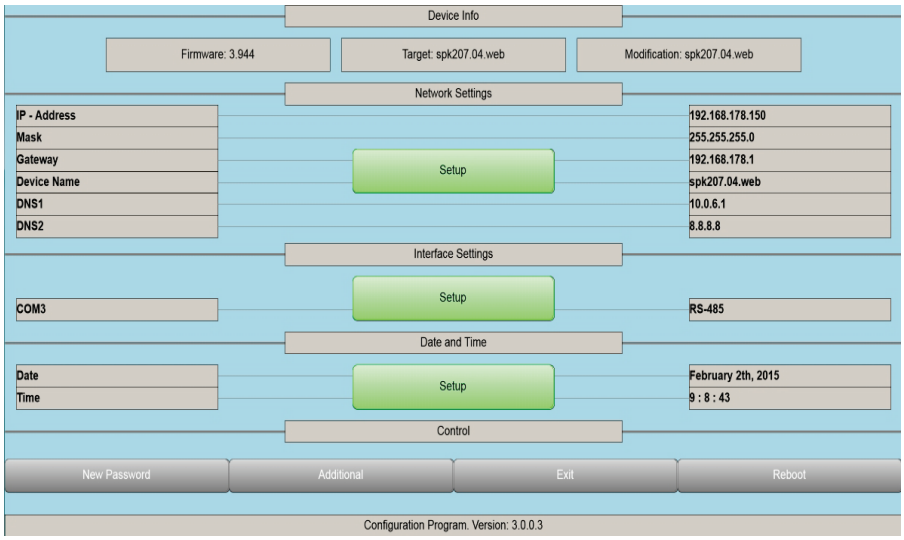


Fig. 7.3 Configuration Mode - SPK207

In these dialog network and serial interfaces parameters, date and time can be set and the password can be changed. The configuration parameters are divided into groups:

– **Network Settings**
  Network parameters for the connection to PC (see 7.2.1)
– **Interface Settings**
  Select the RS232 or RS485 interface from the drop-down list for serial ports COM2 and COM3 (see 7.2.2)
– **Date and Time**
  Real Time Clock settings (see 7.2.3)
– **Control**
  Access to the dialogs **New Password**, **Additional** and the keys **Exit** and **Reboot**
– **New Password**

Password change (see 7.2.4)

– **Additional**
  Additional features (see 7.2.5)
– **Exit**
  Return to the main screen
– **Reboot**
  Exit the configuration dialog and reboot the PLC

Changes to parameter take effect immediately without confirmation.

7.2.1 Network Settings

The IP address, the SubnetMask and the standard gateway can be set.
Use the **Setup** key to change the parameters. The following mask appears:

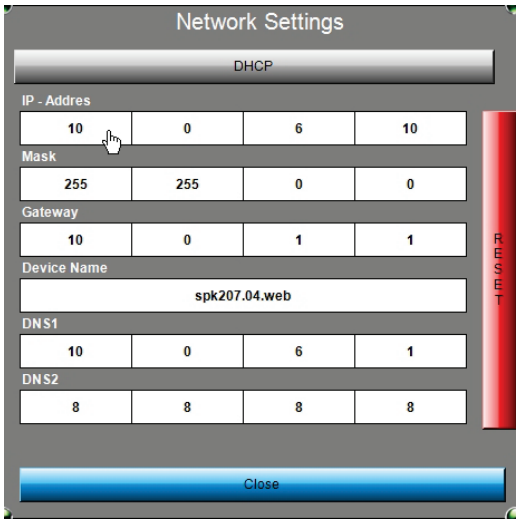


Fig. 7.4 Input mask "Network Settings"

– If DHCP is disabled, the PLC uses a static IP address. The IP address, the Subnet-Mask and the standard gateway must be defined. If DHCP is enabled (green **DHCP** key), a DHCP server will assign IP address automatically.
– In the field **Device Name** the PLC name can be changed. The name will be used by CODESYS after network scan. Enter the name using numerals, Latin letters and underscore only.
– The **DNS** field can be used to enter domain names instead of IP addresses.
– Use **Close** key to exit the dialog.
– Use **RESET** key to apply the factory settings (see 7.3).

7.2.2 Interface Settings

The serial ports COM2 and COM3 can be used as RS232 and RS485 interfaces.
Use the **Setup** key to change the interface. The following screen appears:

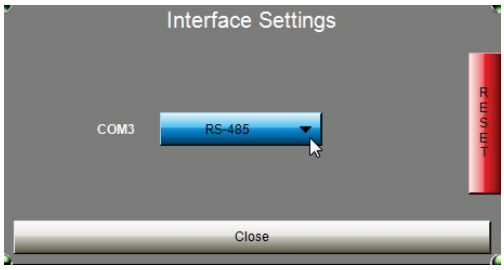


Fig. 7.5 Input mask "Interface Settings"

Use the **Close** key to exit the dialog.
Use the **RESET** key to apply the factory settings (see 7.3).
The numbering of the serial ports should be observed in the CODESYS project.

Table 7.1 Serial ports in CODESYS

Port	COM1	COM2	COM3
Number	2	3	4

7.2.3 Date and Time

Use the **Setup** key for setting the real-time clock. The following screen appears:

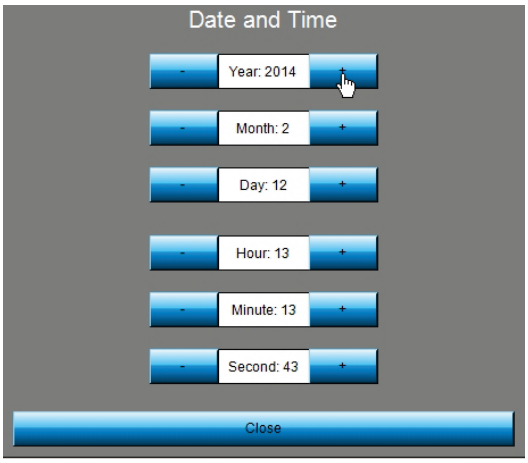


Fig. 7.6 Input mask "Date and Time"

Use the on-screen NumPad, that appears if you touch white field or the **+/-** keys to change the settings.
Use the **Close** button to exit the dialog.

7.2.4 New Password

Use the **New Password** key to change the factory set password (see 7.2).
Enter the new password using the on-screen keyboard.
Use the **OK** key to save the new password.

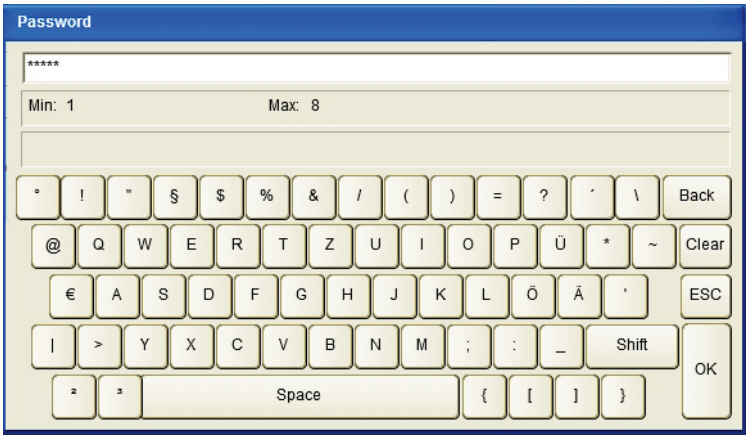


Fig. 7.7 On-screen keyboard "Password"

7.2.5 Additional

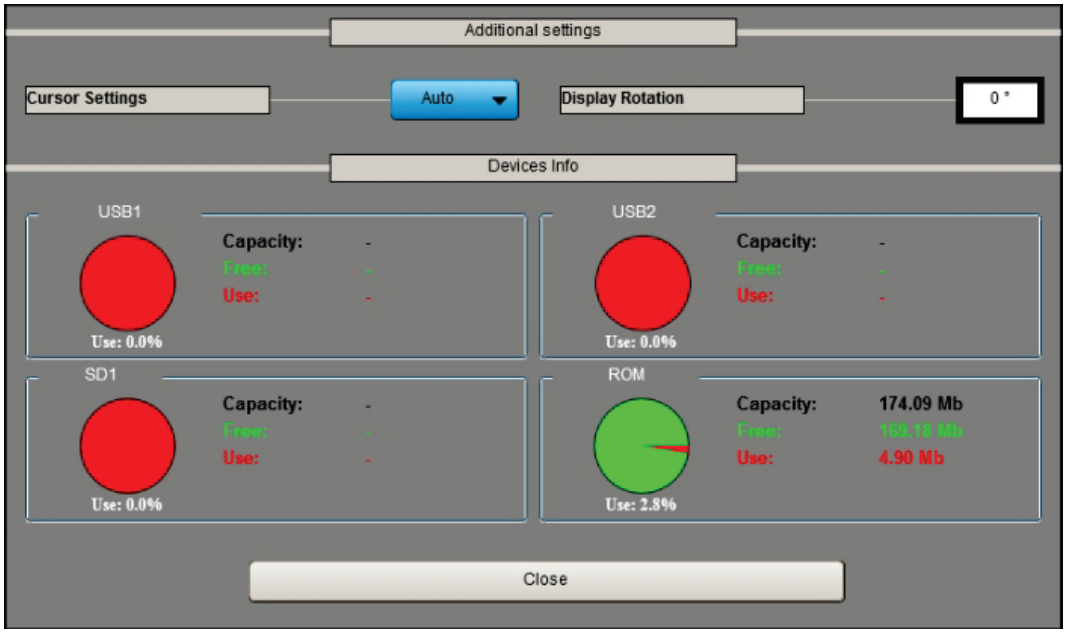


Fig. 7.8 Dialog "Additional Settings"

The additional features include:

- **Cursor Settings**
  - **On** – pointer is always visible
  - **Off** – pointer is invisible
  - **Auto** – pointer becomes invisible if the display is not touched within 10 seconds
- **Display Rotation**
  Image on the display can be rotated 90° counterclockwise.
- **Devices Info**
  Information about the memory usage of the PLC flash memory (ROM), the connected USB mass storage device and SD card
  The memory devices are scanned every 10 seconds.
- **Remove**
  Safely remove mass storage device
  The function is available when a mass storage device is connected.
- **Format**
  Format mass storage device to FAT32
  The function is available when a mass storage device is connected.

Use the **Close** key to exit the dialog.

7.3 Factory settings

IP address	10.0.6.10
SubnetMask	255.255.0.0
Gateway	10.0.6.1
COM2, COM3	RS485

Use the **Exit** key to exit the configuration dialog.

Use the **Reboot** key to restart PLC.

7.4 CODESYS project update

The CODESYS project can be updated using a USB mass storage device. To transfer a new CODESYS project to the PLC the following steps must be taken:

- format the USB mass storage (16 GB max.) to FAT32
- create a folder named **APP** in the root directory
- open the project in CODESYS and select **Build -> Build** in the menu
- select **Online -> Create Boot Application** in the menu to create a boot application for PLC
- select a folder on the PC drive in the pop-up dialog box **Save As ...** to save the boot application
- copy the content of the selected folder in the folder **APP** on the USB mass storage
- connect the USB mass storage to the PLC
- power on the PLC and enter the Service Menu
- select **RESCAN USB DRIVE**
- select **UPDATE PROJECT**

The new project is transferred to the SPK and will be executed immediately.

8 Maintenance

The maintenance includes:

– cleaning of the housing and terminal blocks from dust, dirt and debris
– checking the fastening of the device
– checking the wiring (connecting leads, fastenings, mechanical damage).

The device should be cleaned with a damp cloth only. No abrasives or solvent-containing cleaners may be used. The safety information in section 3 must be observed when carrying out maintenance.

9 Transportation and Storage

Pack the device in such a way as to protect it reliably against impact for storage and transportation. The original packaging provides optimum protection.

If the device is not taken immediately after delivery into operation, it must be carefully stored at a protected location. The device should not be stored in an atmosphere with chemically active substances.

Permitted storage temperature: -25...+55 °C

▶ NOTICE

Transport damage, completeness
The device may have been damaged during transportation.
Check the device for transport damage and completeness!
Report the transport damage immediately to the shipper and akYtec GmbH!

10 Scope of delivery

–	SPK207	1
–	Fasteners and screws (Set)	1
–	3-pole plug-in screw terminal block	3
–	Ethernet Patch cable	1
–	Short guide	1
–	USB stick with software and documentation	1

Appendix A Dimensions

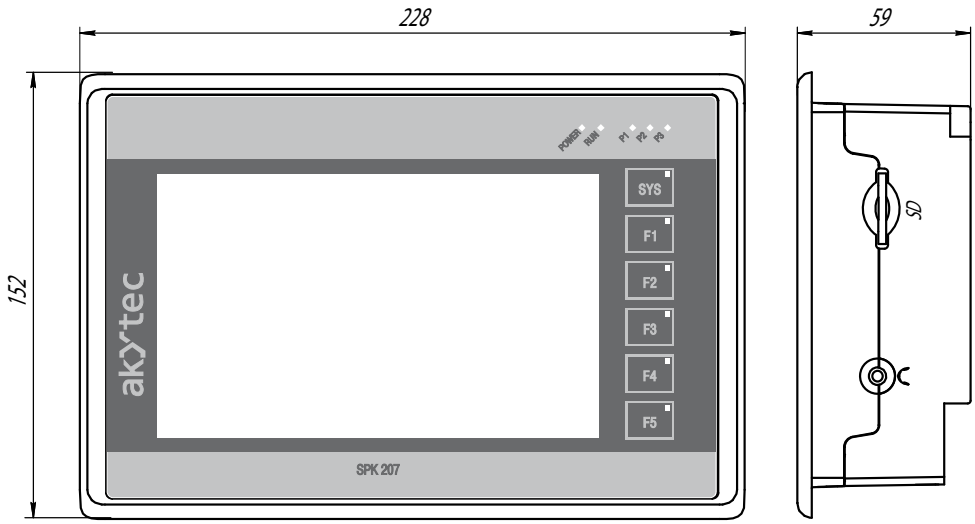


Fig. A.1 Dimensions

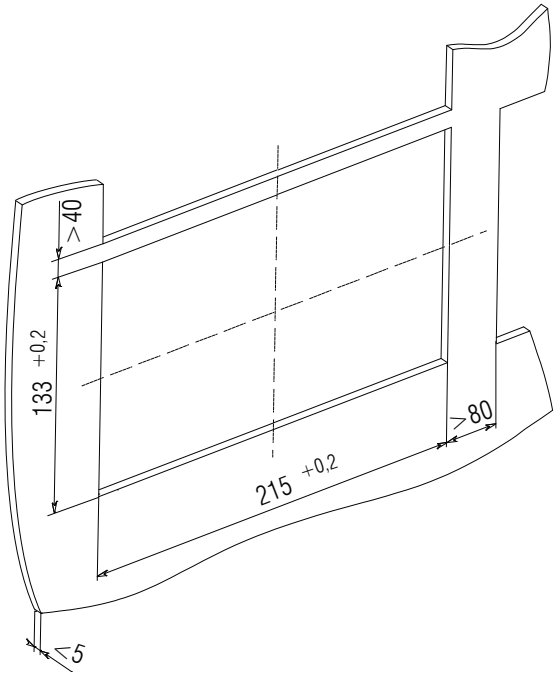
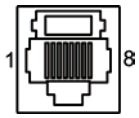
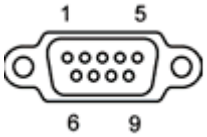
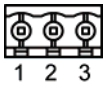


Fig. A.2 Mounting cutout

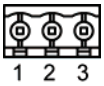
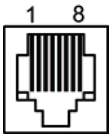
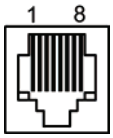
Appendix B Pin assignment

Table B.1 Pin assignment

Connector	Pin number	Signal	
USB A (Host)			
	1	+5 V	
	2	Data-	
	3	Data+	
	4	GND	
USB B (Device)			
	1	+5 V	
	2	Data-	
	3	Data+	
	4	GND	
Debug RJ12			
	1	TXD	
	2	RXD	
	3	not used	
	4	not used	
	5	not used	
	6	GND	
LAN (Ethernet) RJ45			
	1	Etx+	
	2	not used	
	3	Etx-	
	4	Erx+	
	5	not used	
	6	Erx-	
	7	not used	
	8	not used	
COM1 (RS232) DE9M			
	1	DCD	
	2	RXD	
	3	TXD	
	4	DTR	
	5	GND	
	6	DSR	
	7	RTS	
	8	CTS	
	9	RI	
Power supply			
		SPK207-24	SPK207-230
	1	+24VDC	L
	2	0V	N
	3	GND	GND

Appendix B Pin assignment

Table B.2 Pin assignment COM2, COM3

Pin number			
	COM2, COM3 RS485	COM2, COM3 RS232 – RJ45	COM2, COM3 RS485 – RJ45
1	Data+(A)		
2	Data-(B)	RTS	
3	GND	GND	GND
4		TXD	
5		RXD	
6			Data- (B)
7		CTS	
8			Data+ (A)

Appendix C Connection with PC and CODESYS

Use the Ethernet interface to connect the PLC to the PC with the CODESYS programming environment. The PLC can be connected to PC via a crossover cable or can be integrated into a common network with the PC. (see 4.3.2).

– Start CODESYS, open the project and double-click **Device** in the Device tree.
– Select the sub-dialog **Communication settings** in the device editor and define the local Gateway Server if no gateway is defined.

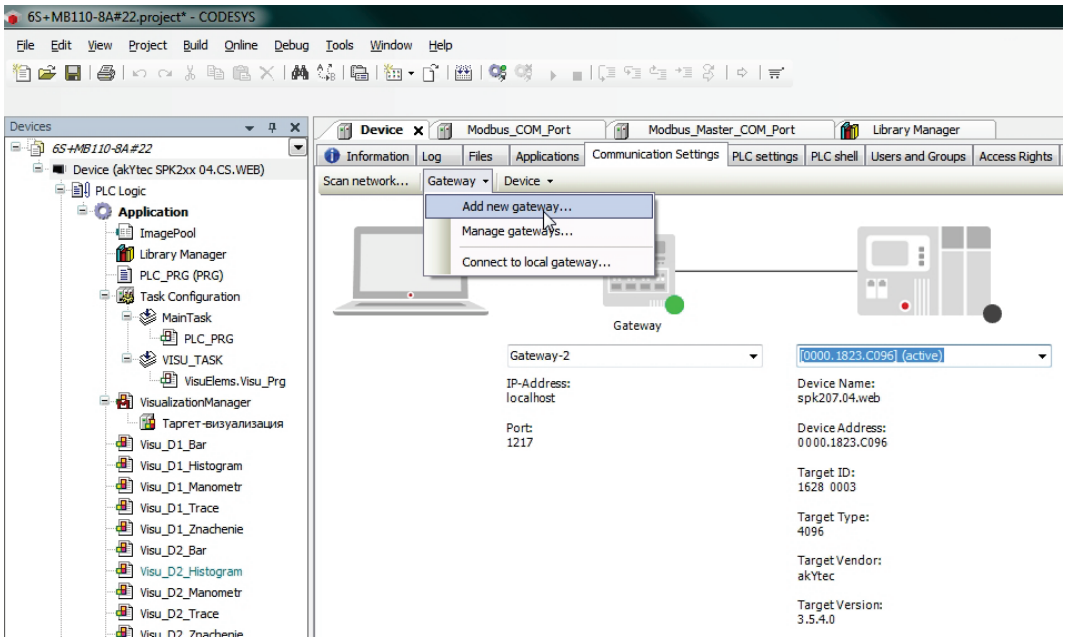


Fig. C.1 Sub-dialog "Communication Settings"

– Select **Add new gateway…** in the menu **Gateway** to open the following dialog:

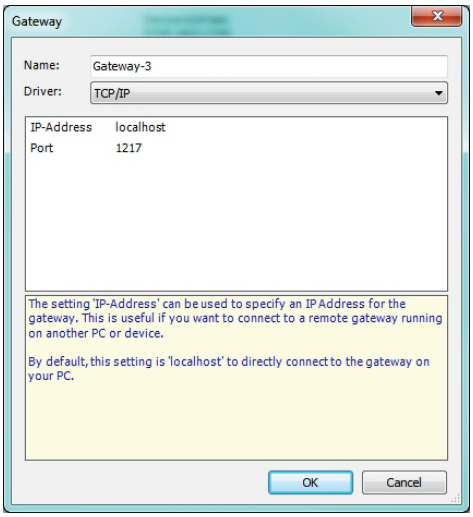


Fig. C.2 Dialog “Gateway”

– For IP address use the gateway address of the network adapter (PLC factory setting 10.0.6.1), complete the dialog with **OK**.
– Switch power on and click **Scan network….** This command opens a dialog and lists all configured gateways with the associated devices.
– Select the device from this list and click **Set active path** (Fig. C.3).

Appendix C Connection with PC and CODESYS

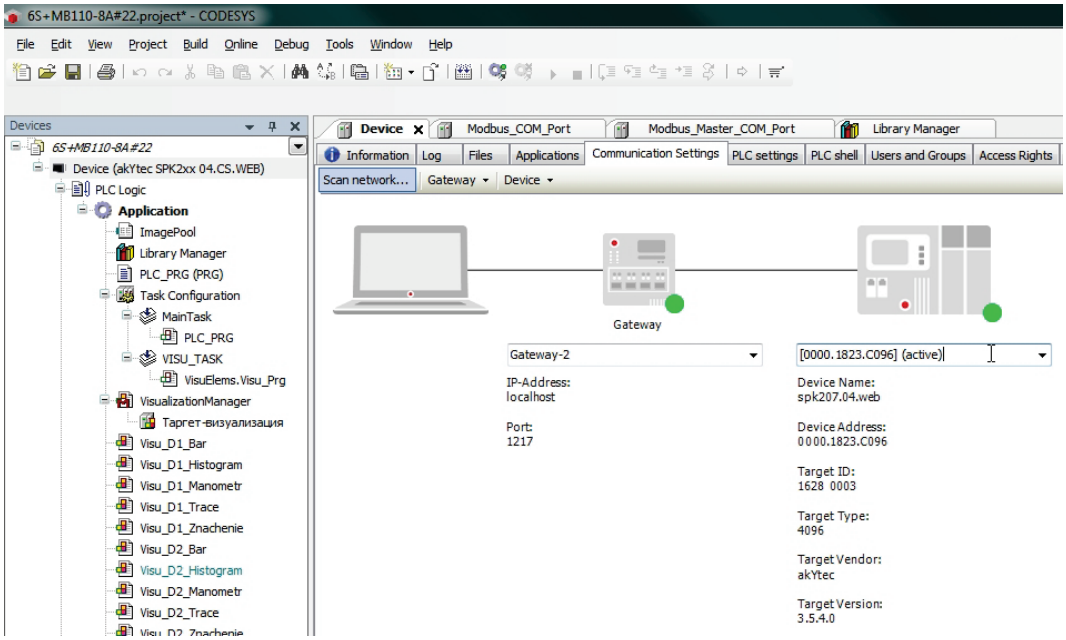


Fig. C.3 Correct connection to PLC

– Select **Online** → **Login** to transfer the application to the PLC
– In the following dialog (Fig. C.4) click **Yes** to enable the transfer.

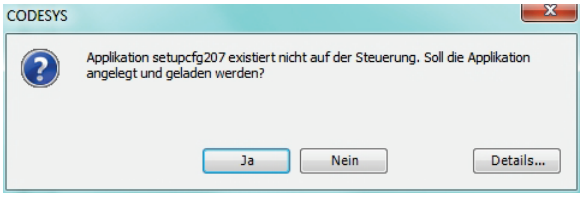


Fig. C.4 Application transfer confirmation