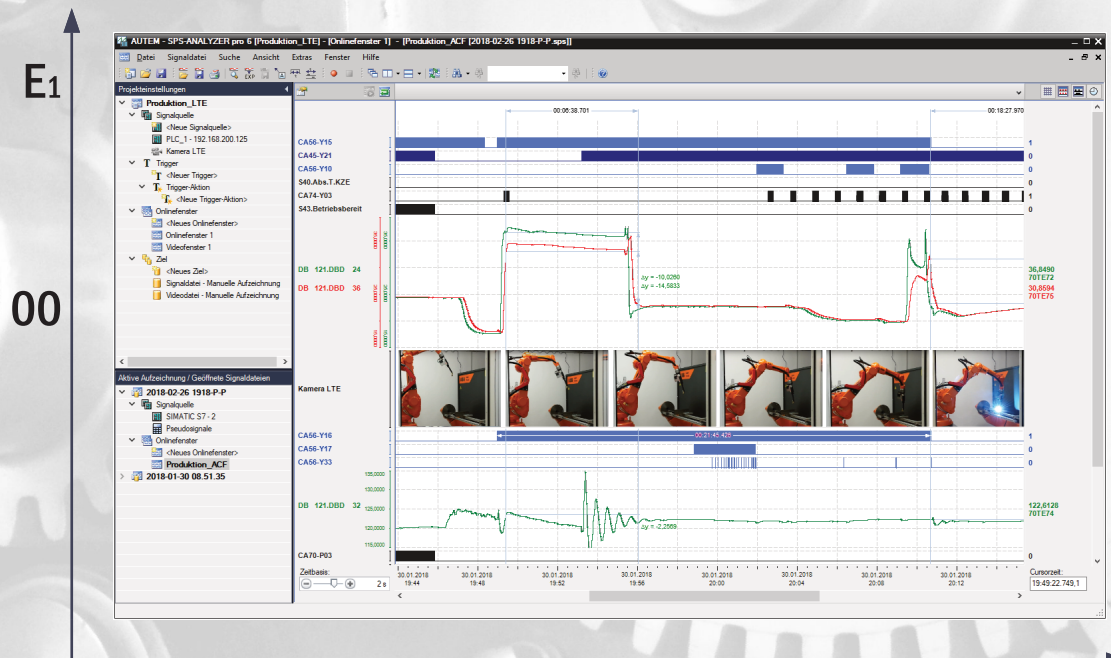


BLACKBOX 3

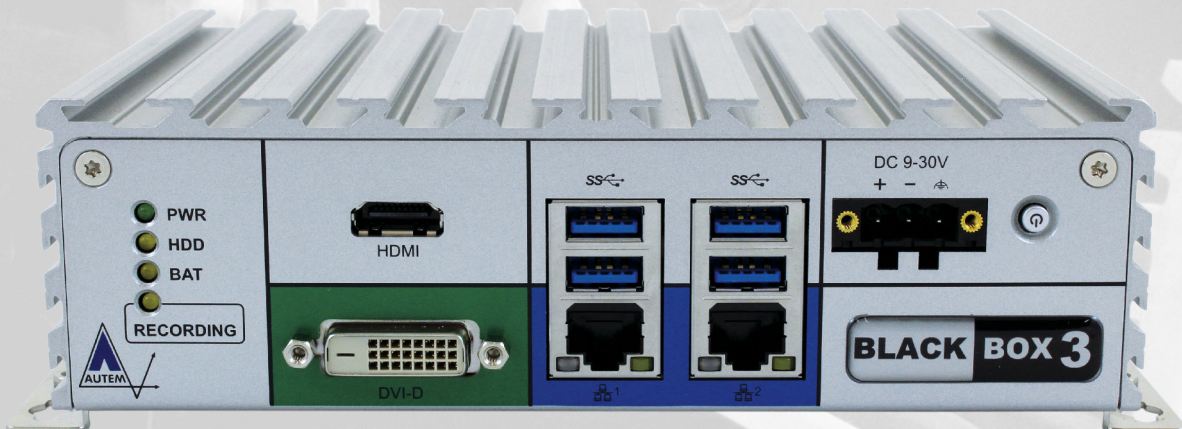
with PLC-ANALYZER pro 6

User Manual



AB

MW



The system for permanent
PLC process data recording

User Manual BLACKBOX 3 with PLC-ANALYZER pro 6

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2nd Edition 2021



WARNING

Errors that can occur in the automated facility endangering humans or causing large-scale material damage must be prevented by additional external measures. These measures (e.g. independent limit monitors, mechanical interlocks) must guarantee safe operation even in the case of dangerous errors.



WARNING

If you use the BLACKBOX within an unprotected network you should install Windows security updates regularly.



WARNING

For some types of signal recording (e. g. cycle-precise acquisition) PLC-ANALYZER pro has to modify the PLC program. An influence of this modification on the behaviour of the PLC can not be eliminated entirely. See driver addendum of the PLC driver for further information.



Warranty exclusions

The warranty on BLACKBOX is 12 months. The warranty no longer applies if the product is tampered with, or if the product is not handled properly, or if the product is stored under adverse conditions. The warranty also no longer applies if the device is used in a fashion that does not correspond to the manufacturer's intended use, or if used after wear-and-tear has taken effect, or if used with incorrect current or voltage, or if used after damage by surge, lightning, fire, water (dampness). The warranty no longer applies if the guaranty seal is removed or rendered unreadable.



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1 Introduction

1.1 Overview

The BLACKBOX from AUTEM provides an ultra-compact data acquisition computer for the long-term recording of PLC signals and external electrical values (PLC process data archiving) and also remote maintenance using the PLC-ANALYZER pro 6. Due to its small dimensions, the system can be integrated in a switching cabinet without any problem. The service technician can also conveniently transport the system to the customer in a suitcase (aircraft).

The BLACKBOX can continuously record and archive PLC signals over a longer period of time; typically more than 3 years¹.

The BLACKBOX is connected to the PLC by means supported by the PLC-ANALYZER pro 6, i.e. via connection to the PU interface or an automation network (MPI, PROFIBUS, Industrial Ethernet TCP/IP / PROFINET, Modbus+ ...).

The recording of any electrical signal outside the PLC is also possible by means of the AD_USB-Box (optional, Part.-No. ANA6510E).

The BLACKBOX automatically begins recording signals after being switched on and then archives the requested data.



NOTE

The BLACKBOX is equipped with a special version of PLC-ANALYZER pro 6. This version has special features that make an automated operation possible.

These additional functions includes e. g. the automatic starting of the data acquisition, the supervision of the data acquisition by watchdog functionality, the "LIFE-INDICATOR" and the "ACTION CONTACT" for external indication of operating status.



WARNING

In any case use the „LIFE-INDICATOR“ and, if necessary, also the „ACTION CONTACT“ to supervise the status of the BLACKBOX. This is the only way to recognize possible problems during data acquisition at an early stage.

¹ Depending on the number of recorded signals and signal value changes, the recording capacity may be considerably lower.

1.2 Field of application

- Long-term PLC process data recording
- Failure diagnosis
- Determine cause of production loss / warranty case
- Objective inspection of operating parameters
- Preventive maintenance / Condition monitoring
- System documentation (QA), TPM, QEE, CMS
- PLC Remote-Service

1.3 Performance characteristics

- Massive aluminium case
- Mini-PC (FANless) with Intel Pentium Quadcore 1.6 GHz
- 500 GB SSD / 4 GB RAM
- Dimensions (WxDxH): 185 x 131 x 54 mm / 1,35 kg
- DIN rail mounting / Adapter scope of delivery
- Control-LEDs for RECORDING, PWR, HDD, BAT, LAN
- 4 x USB 3.0 (each 900 mA load-bearing)
- 2 x GbE LAN Port (Gigabit Ethernet)
- Video output: HDMI, DVI-D, DP-Display Port
- 2 x 9 pol. D-Sub RS232/RS422/485 (COM1/COM2),
- 2 x 9 pol. D-Sub RS232 (COM3/COM4)
- 1 x CFast slot
- 2 x Antenna connection for opt. Wi-Fi/3G/LTE-module
- Mini-PCIe slot for opt. addit. modules (Wi-Fi/LTE/...) full-size/half-size / integr. SIM card holder
- Power supply 9 ~ 30 V DC, 25 W
- Plug with cable for ext. DC power supply
- Ext. power supply 100 ~ 240 V AC, 1,5 A, 50 ~ 60 Hz
- Connection for remote PWR-ON/OFF, plug incl.
- Environment: -5°C ~ 55°C operating temperature (ambient with air flow / according to IEC60068-2-1, IEC60068-2-2, IEC60068-2-14),
10 % ~ 95 % rel. humidity – non-condensing
- Signal recording capacity typ. Ø 3 years
- Watchdog monitoring
- External, free floating contact (“LIFE-INDICATOR”) for external indication of operating status (plug is scope of delivery)
- External, free floating contact (“ACTION CONTACT”) for external indication by trigger action “ACTION CONTACT” (plug is scope of delivery)
- Status messages via E-mail or SMS
- 3 m LAN patch cable (Cat. 5e) for direct remote control by external PC scope of delivery

- Windows 10 pro (64-Bit) (multi-language)
Remote control via LAN, WAN, (radio-)modem/internet (VPN) possible
- BLACKBOX-license PLC-ANALYZER pro 6 with PLC-driver Siemens SIMATIC S7 - MPI/PPI/PROFIBUS cycle-precise, incl. documentation; other PLC-driver optional
- Software is completely installed, preconfigured („ready-to-run“)
- CE, FCC Class A
- 48 hour Burn-In, 12 months warranty

1.4 Typical operation

- Create a project with PLC-ANALYZER pro 6 and save it in the BLACKBOX directory
- Switch off BLACKBOX
- Connect BLACKBOX to PLC
- Switch on BLACKBOX
- Check RECORDING-LED (flashes when signal recording is running successfully)
- Process data recording is running ✓

1.5 Help / Support

Should problems occur when using the BLACKBOX for the PLC-ANALYZER pro 6, please read this user manual thoroughly for assistance. Refer especially to chapter 5 *Troubleshooting (FAQ)*. You can also find information and hints unter <http://www.autem.de>

If you cannot solve the problem, please contact our technical support:

Technical Support AUTEM:	
Tel.	+49-(0)4921-9610-0
Fax	+49-(0)4921-9610-96
E-mail	support@autem.de

In addition to an **exact error description**, please have the following information ready:

- Serial number of the BLACKBOX
- Version and serial number of PLC-ANALYZER pro
- If necessary, PLC model and CPU type (e.g. SIMATIC S7-1500 / CPU 1511-1 PN)

2 Installation

2.1 Installation

Due to the small dimensions, the BLACKBOX can be installed directly in a switching cabinet. It can be installed either horizontally or vertically. Please refer to *Fig. 2-1* for the exact dimensions.

The BLACKBOX should be protected against vibration and impacts. If necessary, use rubber vibration damper to protect the BLACKBOX from ambient vibration. An electric potential separation is also accomplished thereby.

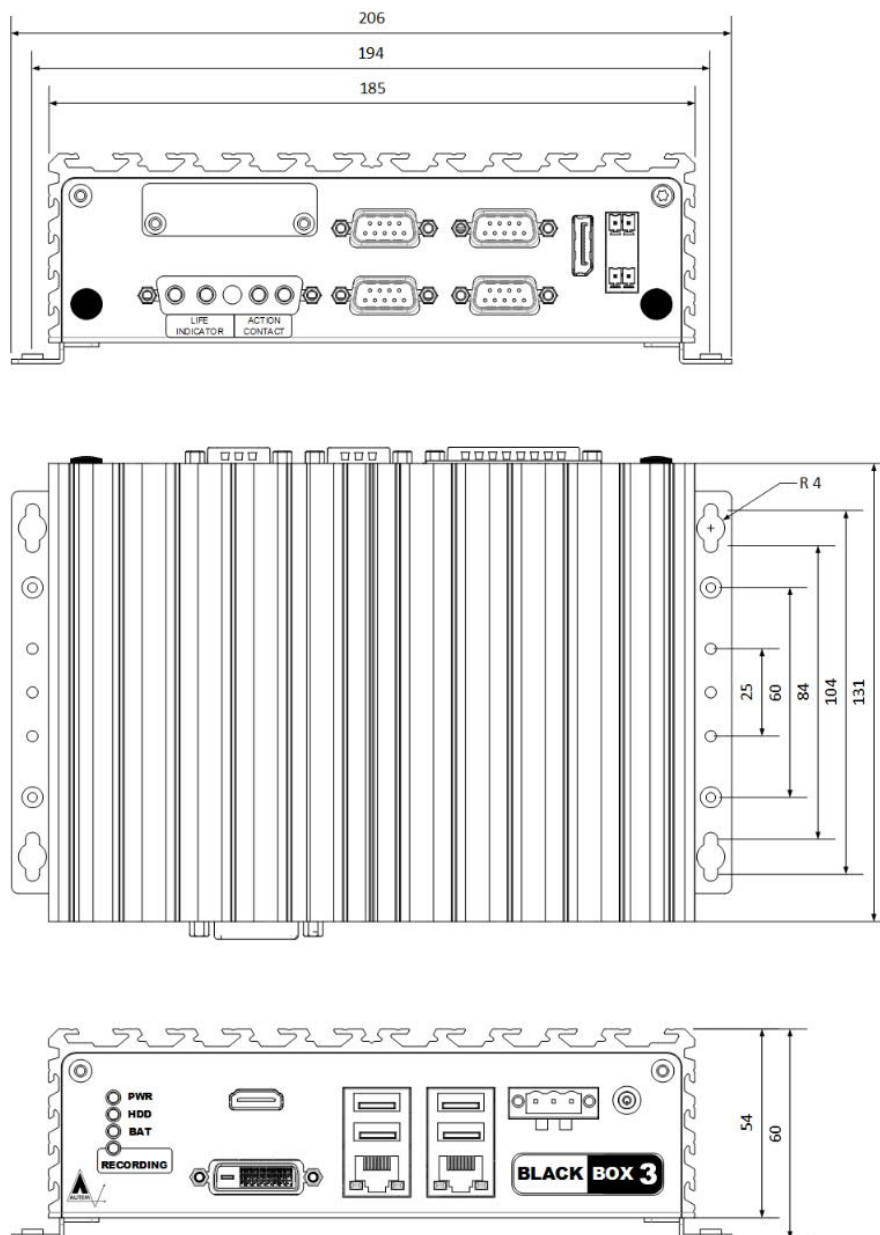


Fig. 2-1 BLACKBOX dimensions

Connect the BLACKBOX to power supply. The BLACKBOX requires a power supply of 9 ~ 30 Volt DC, 25 W. An appropriate DC connector is part of the material supplied. Connect + 9 ~ 30 V of DC to the left pin and DC ground to the middle pin. The right pin is the frame shield.

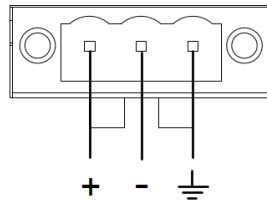


Fig. 2-2 Pinout Power Supply

Alternatively, the power adapter supplied can be used in order to operate the BLACKBOX with 100 ~ 240 Volt AC, 50 ~ 60 Hz.

Now connect the data cable between the BLACKBOX and the PLC.

2.2 Switching on the BLACKBOX

The BLACKBOX can be switched on either via the pushbutton switch on the front (Fig. 2-3 ON pushbutton) or via the SW contact (Fig. 2-4 SW contact) on the rear. The SW contact can be used to switch on the BLACKBOX remotely from your installation location if required. To switch on, the two upper pins of the SW contact are simply closed for a short time. This can be done by a pushbutton or, for example, by a potential-free PLC-initiated switching operation. The connection plug included in the scope of delivery of the BLACKBOX is used for the connection.

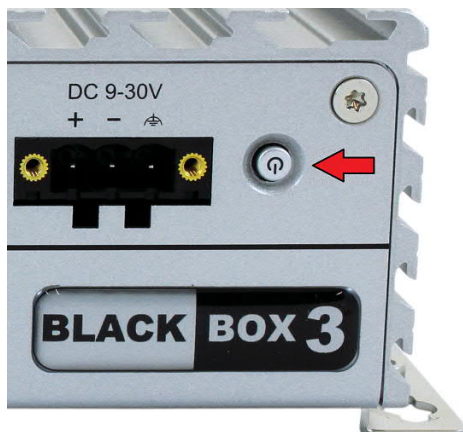


Fig. 2-3 ON pushbutton

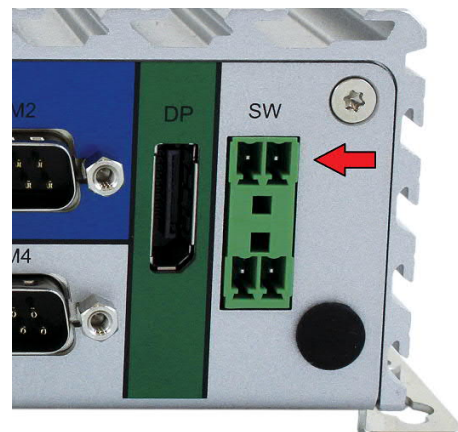


Fig. 2-4 SW contact



WARNING

The SW contact may only be closed potential-free to switch on the BLACKBOX. Never apply a voltage to the SW contact!

2.3 LIFE-INDICATOR for external indication of operating status

A floating contact located on the rear of the BLACKBOX provides the option of externally monitoring the operating status of the BLACKBOX. When PLC-ANALYZER pro 6 is operating properly, the LIFE-INDICATOR contact is closed. In the case of an interruption of the recording or computer malfunctions or crashes, the contact opens.

The electrical load of the contact is max. 15 W (max. switching voltage is 200 V DC.)

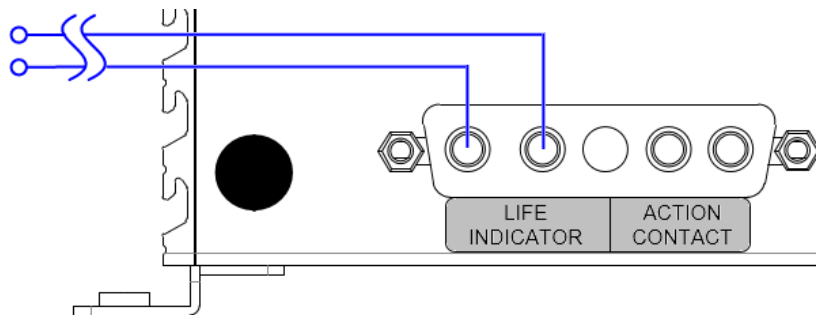


Fig. 2-5 LIFE-INDICATOR connection (floating contact)

2.4 ACTION-CONTACT

The ACTION CONTACT on the rear of the BLACKBOX is a floating contact switched by a trigger action of the PLC-ANALYZER pro 6 (see 4.5.3 Trigger action "ACTION CONTACT").

The electrical load of the contact is max. 15 W (max. switching voltage is 200 V DC.)

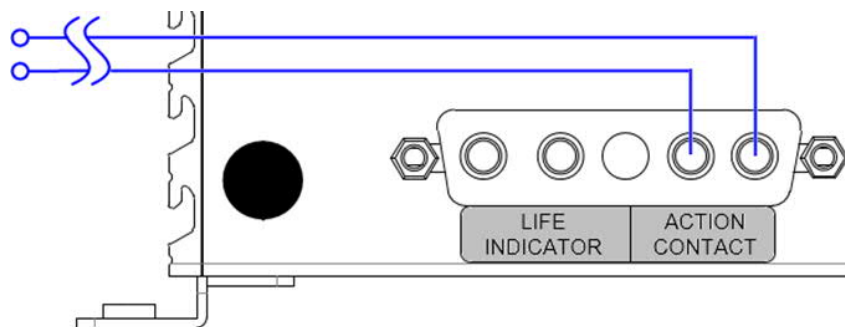


Fig. 2-6 ACTION-CONTACT connection (floating contact)

2.5 Installation of additional hardware

Other hardware and software components may need to be connected, depending on the purpose for which the BLACKBOX is being used. Examples of this are UPS for compensation of voltage interruption, a USB-WLAN-adapter, a LTE-modem/router for independent internet access or special software for remote access ("VNC", "TeamViewer" ...).

Usually the BLACKBOX is supplied with the requested software configuration ready installed („ready-to-run“).

2.5.1 Insert SIM card for LTE modem

If you have acquired BLACKBOX 3 with optional LTE modem (Part.-No. LTE1000), it is necessary to put a SIM card with suitable data tariff in the SIM card slot of the LTE modem. The SIM card must have „standard SIM“ format.

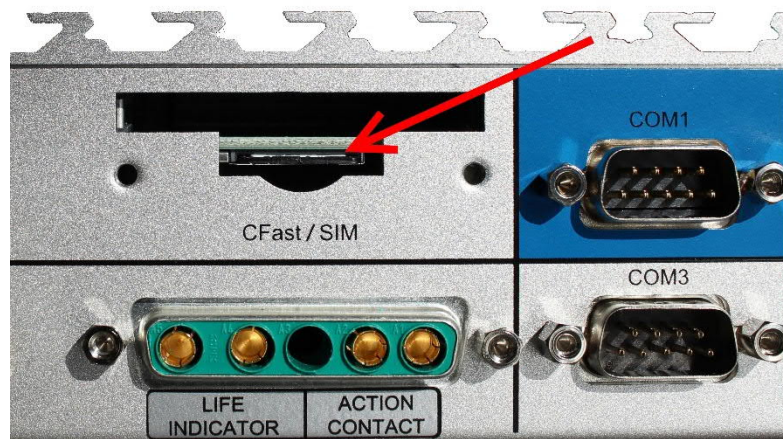


Fig. 2-7 SIM card slot of LTE-Modem

To get access to the SIM card slot, please loose both screws of the protecting cover. Insert SIM card into SIM card slot and close the protecting cover by tightening the screws again.

For further information about using the LTE modem for BLACKBOX 3 remote access via internet please refer to *3.2.2 Remote operation via Internet*.

3 Starting up and operation

There are two methods to start up the BLACKBOX for the first time for configuration purposes. These are explained in the following sections.



NOTE

The BLACKBOX is equipped with a watchdog which monitors the signal recording. In case of an unforeseen interruption of the recording or a computer crash, the BLACKBOX is automatically rebooted because of the watchdog.

See *section 3.4* for a detailed description of the watchdog and hints for how to disable it.



NOTE


The BLACKBOX clock is defaultly adjusted to CET/MEZ (central european time). Check time and date during putting into operation and adjust manually to local time if necessary, unless it is automatically updated via a time server (Internet).



NOTE

If the BLACKBOX is installed at a place far away from your location, the remote operation (*s. section 3.2 Remote operation of BLACKBOX*) is a good possibility to avoid long access routes for maintenance work. By this means you can also install software updates comfortably or download signal files for analysis.

3.1 Operation using keyboard, mouse and screen

- Connect the keyboard, mouse and screen to the corresponding connections on the BLACKBOX.
- Switch on the BLACKBOX. The power-on button is located on the front panel of the BLACKBOX .
- Press and hold the <Ctrl> key during the entire boot routine as long as the PLC ANALYZER pro 6 is started automatically. This prevent the activation of the Watchdog (also refer to *section 3.4*).

The BLACKBOX can then be operated as a normal PC running under Windows.



NOTE

The operation system of the BLACKBOX (Windows 10 Professional) is multi-lingual, i. e. the language can be changed during runtime. See *section 3.3* for further information.

3.2 Remote operation of BLACKBOX

3.2.1 Remote operation via LAN

For remote operation via LAN (network) connect the BLACKBOX by using of enclosed LAN patch cable either to a network hub/switch or directly to an external PC.

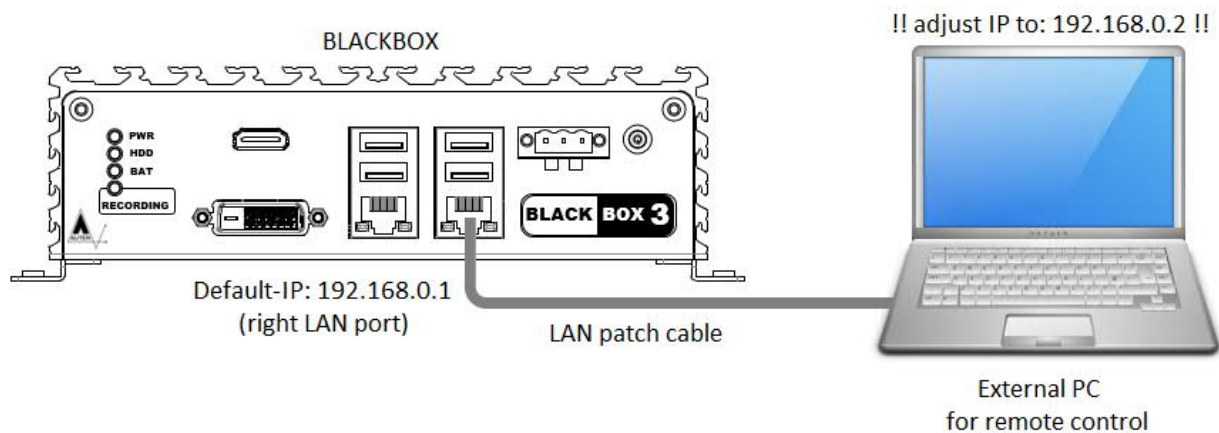


Fig. 3-1 Remote operation via LAN connection

Ensure that the corresponding LAN connection of the BLACKBOX is assigned to an IP address appropriate to your network address scheme.

For remote operation of the BLACKBOX, a PC or Notebook with Win9x / NT / 2000 / XP / Vista / 7 / 8 / 10 is required.

- Establish a connection between the right LAN port of the BLACKBOX and a hub/switch or LAN port of the external PC.
- Set the IP address for the network connection of the PC to 192.168.0.2

Since the hard disk C: of the BLACKBOX is enabled in the network, access is already available to the drive (Explorer / My Network Places), e.g. to copy PLC-ANALYZER pro 6 signal or project files.

- If Windows XP or higher is not installed on the PC, the client for remote operation must be installed on the external PC first of all. Otherwise, skip the following instruction: The client is located on the BLACKBOX's hard disk (`c:\blackbox\client\msrdpcli.exe`). Start the file and follow the instructions in order to install the client.
- Start the remote client:
Enter "Remote Desktop Connection" in windows search bar and start the listed app

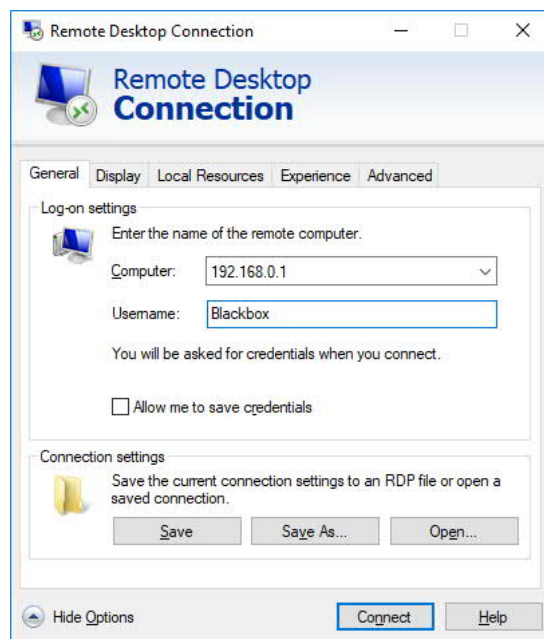


Fig. 3-2 Establish a Remote Desktop Connection

- Enter the *Logon settings*:
Computer: 192.168.0.1 (IP address of the BLACKBOX)
User name: Blackbox
- Select *Local Resources / Local devices and resources / More* and select the *Drives* checkbox. This is useful because it enables access to the local drives of the external PC during remote operation of the BLACKBOX.

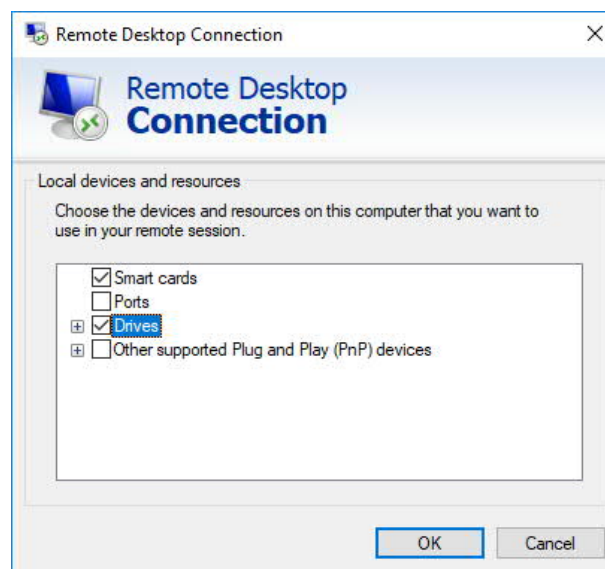


Fig. 3-3 Enable access to the local drives of the external PC

- Press the *Connect* button. The remote desktop connection is established. Enter the logon password:
Password: Blackbox

- Now the BLACKBOX can be controlled by remote operation.

**NOTE**

If necessary, you can assign any other IP addresses to the LAN connections of the BLACKBOX. Write down any change made to the IP address of the right LAN connection because it is essential for establishing a connection for remote operation. More detailed information on network parameter settings in Windows is available in the Windows Help.

**NOTE**

If necessary, the user name and password of the BLACKBOX (Default: "Blackbox") can be modified under *Start / Control Panel / User Accounts*. Note down any changes to the settings clearly. More information is available in the Windows Help.

3.2.2 Remote operation via Internet

Remote operation of the BLACKBOX can also be performed via Internet. This requires an Internet connection first. Define the necessary settings under *Start / Control Panel / Network and Internet* (Window 7 / 8 / 10).

The Internet connection can be established, for example, via an existing LAN with Internet access, a DSL router, a mobile radio router (UMTS 3G / LTE 4G), etc.

To establish a remote connection over the Internet, the BLACKBOX must be addressable from outside via a static IP address or a DynDNS IP address. If the system can be reached, the remote desktop connection or programs such as "VNC" or corresponding derivatives can be used.

A much easier procedure for remote operation is the use of programs like "TeamViewer". Simply install the "TeamViewer Host" on the BLACKBOX. A static or DynDNS IP address is not necessary for this. Firewalls and proxy servers are no obstacle and are easily tunnelled.

3.3 Set up the language of Windows 10 operating system

The operation system of the BLACKBOX (Windows 10 professional) is multi-lingual, i. e. the language can be changed during runtime.

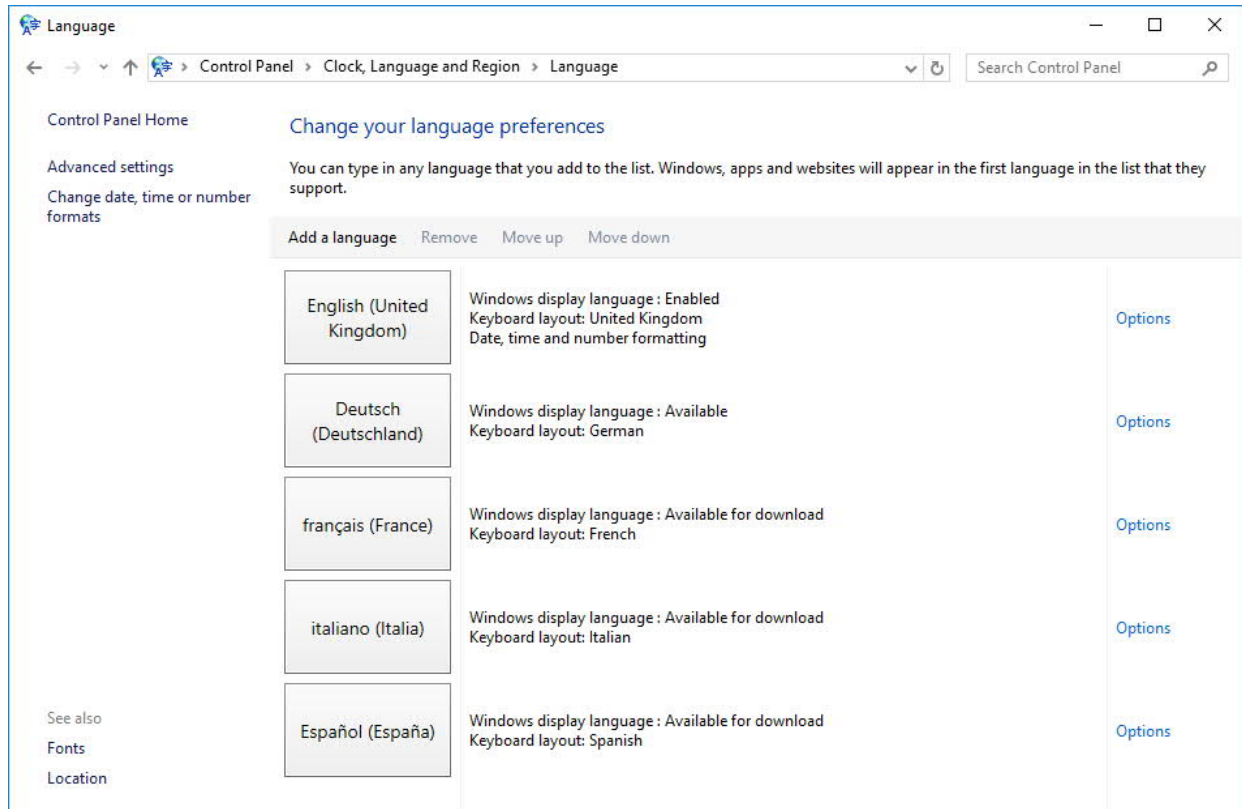


Fig. 3-4 Set up Language

Change the language in *Start / Control Panel / Clock, Language and Region / Language*. Choose the desired language and move it to the top of the list.

Log off the user „Blackbox“ (*Right mouse button on start / Shut or sign out / sign out*). After re-login the user „Blackbox“ (password: Blackbox) the menus and dialogs are displayed in the selected language.

3.4 Watchdog

The BLACKBOX is equipped with a watchdog which monitors the signal recording. In case of an unexpected recording interruption or a computer crash, the watchdog makes sure, that the PLC-ANALYZER pro is stopped and the BLACKBOX is automatically rebooted.

Watchdog is always activated when the PLC-ANALYZER pro 6 is started with the `-watchdog` parameter active (setting in Startup).

There are three ways in which to **disable** the BLACKBOX Watchdog function for maintenance work and remote operation:

- Hold the <Ctrl> key pressed during the boot routine and start of PLC-ANALYZER pro 6 (only with a keyboard which is connected directly).
- Manual termination of signal recording in PLC-ANALYZER pro 6.

- Availability of a PC for remote operation of the BLACKBOX in the network whose IP address (network address) was made known to the PLC-ANALYZER pro 6 during startup with the `-cip:<ip-address>` parameter (refer to *section 4.3*)

3.5 Control LEDs

The BLACKBOX has some control LEDs which are described below.

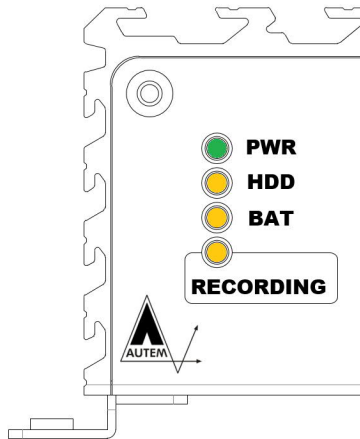


Fig. 3-5 Control-LEDs

LED	Description
PWR	BLACKBOX is running
HDD	Read/write operation on the hard disk
BAT	Voltage of the BIOS backup battery too low. Exchange required.
RECORDING	Flashes at intervals of one second when signal recording is running successfully

Tabelle 3-1 Control-LEDs

4 Operation with *PLC-ANALYZER pro 6*

Before beginning long-term data acquisition, the PLC-ANALYZER pro 6 must be appropriately configured. The most important steps are described, briefly, below. More information on the PLC-ANALYZER pro 6 is available in *PLC-ANALYZER pro 6 User Manual*.



NOTE

The BLACKBOX is equipped with a special version of PLC-ANALYZER pro 6. This has additional functions that enable automated autonomous operation.

4.1 Creating a project for signal recording

Start the PLC-ANALYZER pro 6 and create a project file for recording the signals. The PLC-ANALYZER pro 6 is configured so that it automatically starts the signal recording defined in the project after switching on the BLACKBOX. Information on the PLC-ANALYZER pro 6 start parameters can be found in *section 4.3*.

For reasons of data integrity, it is recommended to limit the size of the signal files created for long-term recording. We recommend a size of 60 minutes. Select *Destination / Signal file* in the project tree and set *File Size* to 60 minutes.



NOTE

Avoid large signal files to prevent possible data loss in case of e. g. unexpected powering off the BLACKBOX during data acquisition. Small signal files have additional advantages. They can be transferred more easily during a remote session.

If not specified otherwise, signal files are stored to the hard disk up to 50 GB free space. Thereafter the oldest signal files are being automatically deleted step by step (FIFO ring buffer). With `-d` you can specify a period of time in days, after that the oldest signal file is being deleted gradually (refer to *section 4.3*).

Save the project on the BLACKBOX hard disk in the `c:\blackbox\project` folder under the name `blackbox.prj`.



WARNING

For some types of signal recording (e. g. cycle-precise acquisition) PLC-ANALYZER pro has to modify the PLC program. An influence of this modification on the behaviour of the PLC can not be eliminated entirely. See driver addendum of the PLC driver for further information.

4.2 Start signal recording

- Open `c:\blackbox\project` and check whether a valid project file `blackbox.prj` is available.
- Terminate the Windows session and switch off the BLACKBOX.
- Check the correct connection to the PLC and power supply. If you want the BLACKBOX to work autarkicly, disconnect the keyboard, mouse and screen connections now.
- Switch on the BLACKBOX. The system is booted and signal recording should start, fully automatically, after about 1 minute.
- The RECORDING LED (*see Fig. 4-1*) flashes at intervals of one second when signal recording has been started successfully.
- The system is now active. Signal files now recorded according to the project settings.
- The bottom status bar of PLC-ANALYZER pro continuously displays the number of *Reboots* caused by watchdog, the *Reconnects*, the *Created signal files*, the *Trigger* and the duration of recording.
- With the BLACKBOX, practically complete signal recording over long periods of time is possible. When the hard disk is full, the oldest signal file is automatically deleted to make room for new signal data.

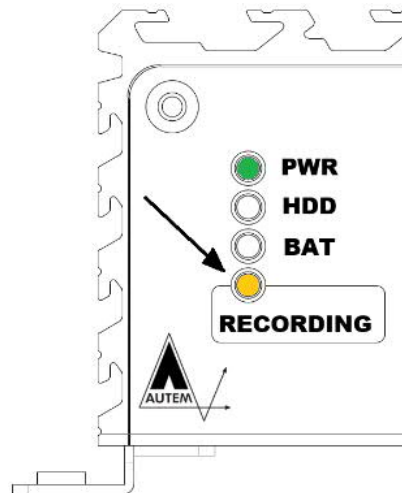


Fig. 4-1 RECORDING LED



NOTE

If the RECORDING LED does not start to flash at intervals of one second after 2 minutes, signal recording has not been started successfully. Also, permanent rebooting of the BLACKBOX ("Beep") indicates that signal recording has not been successfully started.

**NOTE**

We recommend to monitor the LIFE-INDICATOR (see *section 2.2*) electrically e.g. by integrating it into process visualisation (HMI / SCADA). Thereby the machine operator is informed immediately about a possible interrupt in data acquisition.

**NOTE**

A further possibility of monitoring data acquisition is dispatching status messages (see *section 4.5 Status Messages via Trigger action*) or the use of the ACTION-CONTACT (see *section 2.4 ACTION-CONTACT*).

4.3 Start parameters for **PLC-ANALYZER pro 6**

The PLC-ANALYZER pro 6 is started automatically through an entry in the Windows *Startup* folder after the BLACKBOX has been booted. To get to the startup folder, press the window key + <R>, enter „shell:common startup“ and click *OK*.

The start parameters of the PLC-ANALYZER pro 6 are set in *Extras – Settings -Startup*.

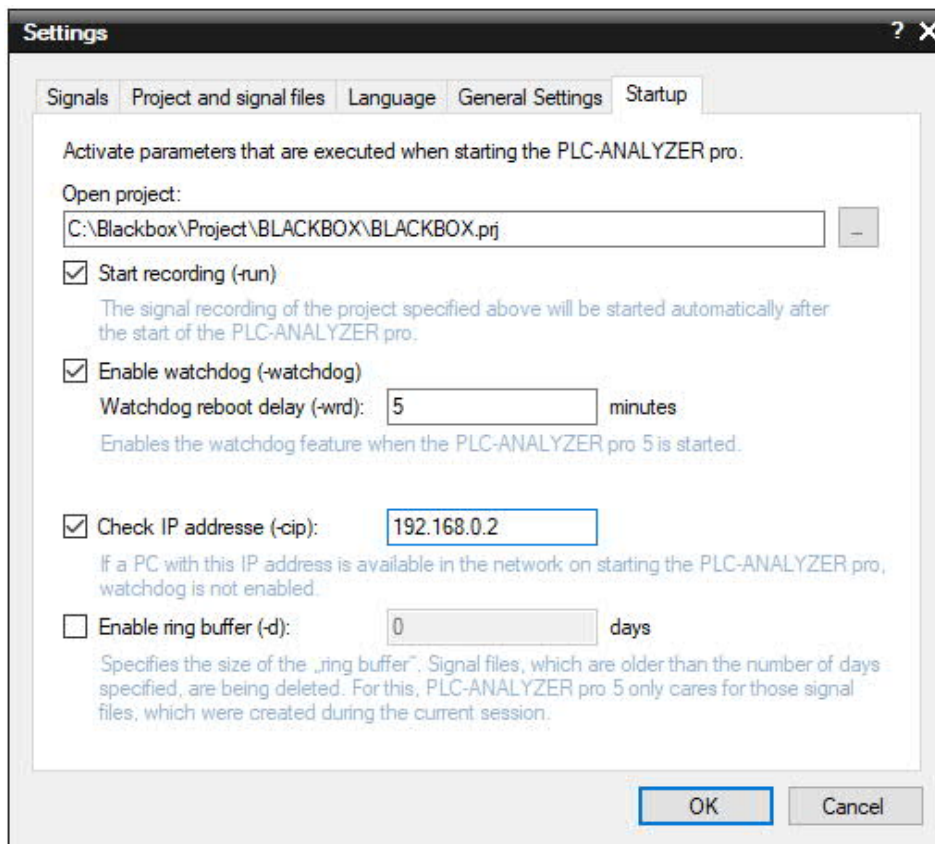


Fig. 4-2 Set the start parameters

First select the project that is to be opened when the PLC ANALYZER pro 6 is started. Activate *Start acquisition (-run)* to automatically start the signal recording of the selected project after starting the PLC ANALYZER pro.

With *Enable watchdog (-watchdog)* the watchdog of the BLACKBOX is activated (see also *section 3.4 Watchdog*). The *Watchdog reboot delay (-wrp)* indicates the time the watchdog waits until the BLACKBOX is rebooted after an interruption of the signal recording.

By activating *Check IP address (-cip)*, the watchdog is not started, if a PC with the entered IP address is present in the network when the PLC ANALYZER pro is started (see also *section 3.4*). This can be helpful for maintenance purposes.

Activate *Enable ring buffer (-d)*, so that signal files of the last number of *days* are always available on the hard disk ("ring buffer"). Older signal files are deleted step by step. Only the signal files generated during the current acquisition are considered (see also *section 4.1 Creating a project for signal recording*).

4.4 Reading out recorded signal files

Signal files can be copied at any time from the `c:\blackbox\project` folder - even when signal recording is actually running. For more information on operation, refer to *section 3*.

4.5 Status Messages via Trigger action

It is possible to monitor the operation of the BLACKBOX from a distance. Therefore, the PLC-ANALYZER pro 6 for BLACKBOX provides the possibility of dispatching messages via SMS or E-mail. In addition to any text, various variables (signal and status values) can also be sent. The ACTION CONTACT can also be used for signalling.

Create a new trigger to perform trigger actions. Double-click on *<New trigger>* in the project settings.

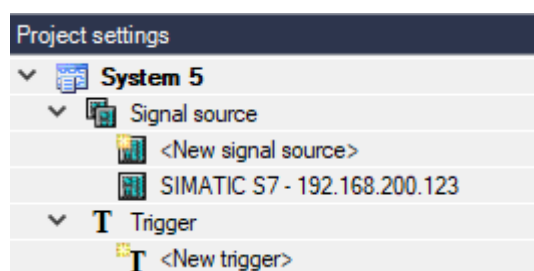


Fig. 4-3 Add Trigger

After creating the trigger, the settings of the trigger opens. Define a trigger condition and add trigger actions that you have previously created.

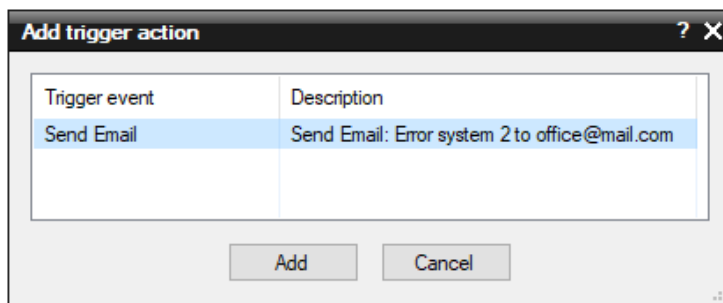


Fig. 4-4 Add trigger action

The added trigger actions are executed when the trigger is triggered. Further information on trigger configuration can be found in the *user manual PLC-ANALYZER pro 6*.

4.5.1 Trigger action “Send E-Mail”

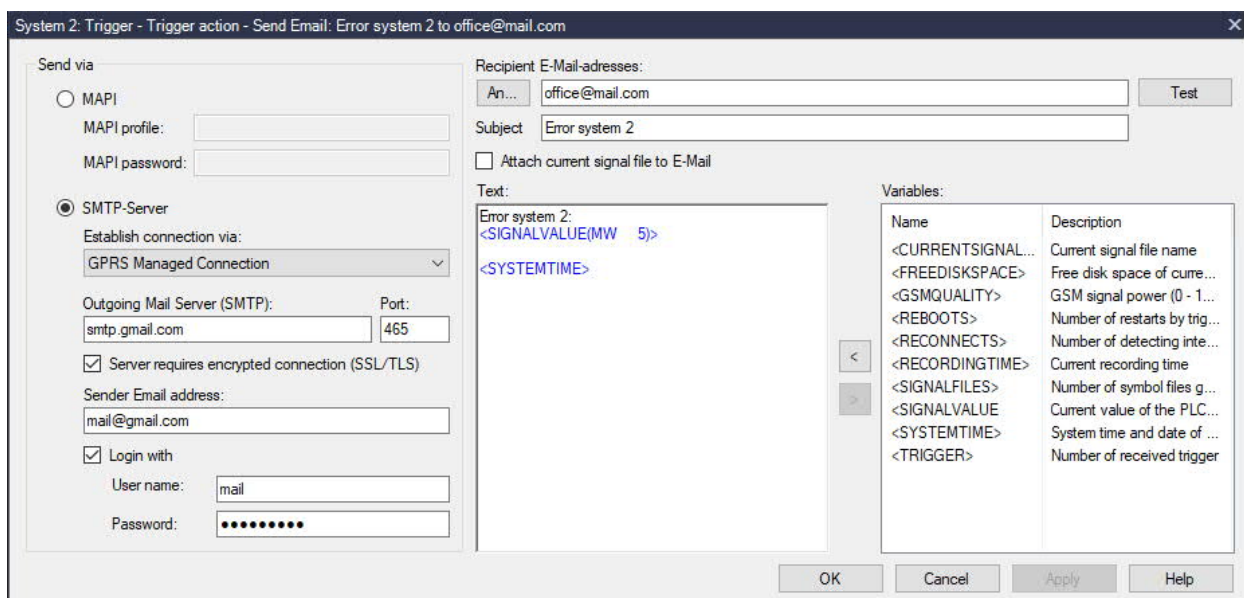


Fig. 4-5 Trigger action “Send Email”

To configure E-Mail dispatch, select whether the E-Mail is to be sent via *MAPI* or via an *SMTP server*. When sending using *MAPI*, enter the existing *MAPI profile* and *MAPI password*.

If the E-Mail is to be sent via an *SMTP server*, specify which network connection you want to use to connect to the SMTP server. A prerequisite for this is that a network connection has already been set up under Windows. Please refer to the Windows Help for instructions on how to create such a connection.

In addition to the *Outgoing Mail Server (SMTP)*, enter the *Sender's E-Mail address* and, if necessary, a *user name* and a *password*. If the server requires a secure SSL/TLS connection, activate *Server requires encrypted connection (SSL/TLS)*.

Enter one or more *E-Mail addresses* and specify a subject line. Enabling *Attach Current Signal File to E-Mail* automatically adds the current signal file to the email as an attachment.

Enter the message in the textbox *Text*. Besides normal text also variables can be used. Drag the desired variable from the list of *Variables* to the textbox or use `<variable>` and `>`.

Variable	Description
<CURRENTSIGNALFILE>	Current signal file name
<FREEDISKSPACE>	Free space on current disk drive
<GSMQUALITY>	GSM signal strength (0 - 100 %)
<REBOOTS>	Number of BLACKBOX reboots (watchdog)
<RECONNECTS>	Number of reconnects after acquisition interrupt
<RECORDTIME>	Current duration of acquisition
<SIGFILES>	Number of created signal files
<SIGVALUE(X)>	Current value of PLC signal X
<SYSTIME>	System time and date in the time of message dispatching
<TRIGGER>	Number of trigger events

Table 4-1 status variables

4.5.2 Trigger action "Send SMS"

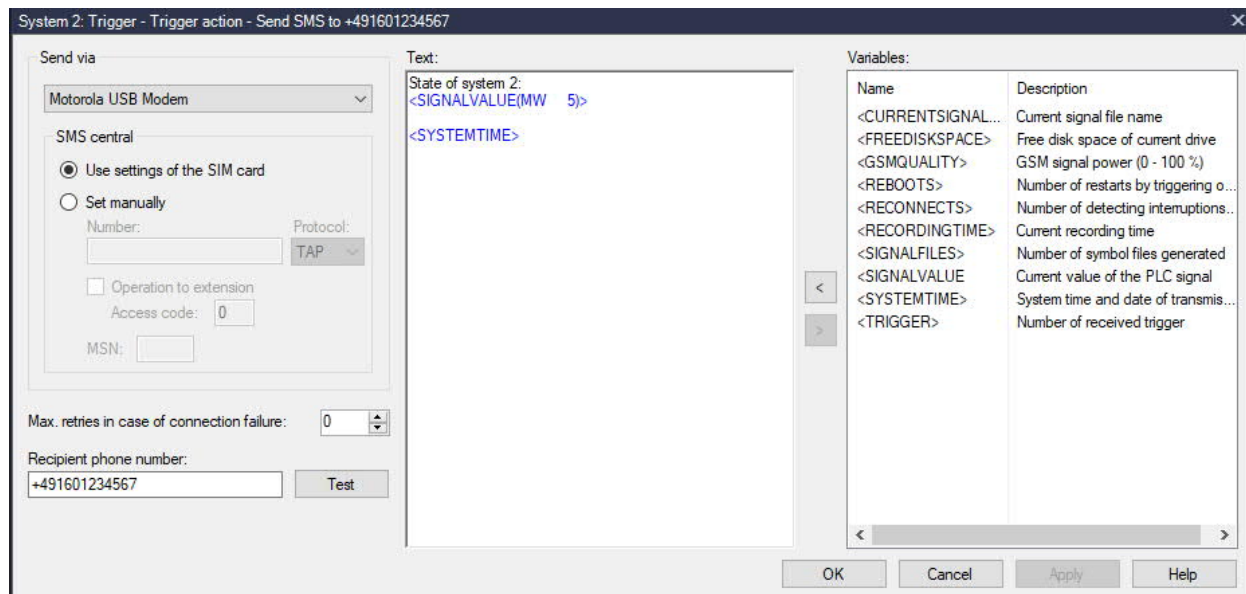




Fig. 4-6 E-mail settings

To configure SMS sending, first select the connection via which the SMS is to be sent. The prerequisite for this is the installation of a modem.

Now select the *SMS centre*. You can use the *settings of the SIM card* or enter them *manually*. When entering manually, enter the *number* of the SMS centre and the *protocol* supported by the SMS centre. If necessary, enter your *MSN* number and activate the check box *Operation on Extension* if your modem is connected to an extension. If necessary, also enter an *Access code*. Set the *Max. retries in case of connection failure*.

Enter the recipient's number and insert the *text* to be sent. Besides normal text also variables can be used. Drag  and  variable (s. *table 4-1 status variables*) from the list of *Variables* to the textbox or use `%` and `%`.

An SMS status message is limited to 160 characters.



NOTE

Pay attention to the fact that high costs may incur depending on sending interval and transmission path.

4.5.3 Trigger action "ACTION CONTACT"

The BLACKBOX has a potential-free ACTION CONTACT on the back, which can be switched with the trigger action "ACTION CONTACT".

System 2: Trigger - Trigger action - ACTION CONTACT close

ACTION CONTACT

Close
Close the ACTION CONTACT

Open
Open the ACTION CONTACT

Change
Change the state of the ACTION CONTACT. When the contact is open, it closes and opens when the contact is closed.

Pulse

positive
Closes the ACTION CONTACT for the set time and then opens it again

negative
Opens the ACTION CONTACT for the set time and then closes it again

Number:

Pulse duration: Seconds

Pulse pause: Seconds

Test

OK Cancel Apply Help

Fig. 4-7 Trigger Action "ACTION CONTACT"

First define the type of switching. Select whether the ACTION CONTACT should be closed, opened or whether the state should be changed. For the switching type *Pulse*, enter the *number* of pulses as well as the pulse duration and pause.

With *Test* you can test the settings.

5 Troubleshooting (FAQ)

This chapter provides hints for troubleshooting the BLACKBOX.

Symptom	Help
BLACKBOX reboots permanently	Reason: The watchdog is enabled and signal recording could not be established successfully. Disable the watchdog (<i>see 3.4 Watchdog</i>), if you want to do maintenance work. Check the connection with the PLC, if the problem occurs during data recording. More information about the configuration of data recording, see <i>user manual PLC-ANALYZER pro 6</i> .

Table 5-1 Troubleshooting