OPERATING INSTRUCTIONS

QAL3 Master

PC Software for standard-compliant monitoring of emission measuring instruments

Description · Configuration · Application

SICK
Sensor Intelligence.

Described Product
Product name: QAL3 Master

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Legal Information

Original document
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Contents

1 Quick start

For experienced users

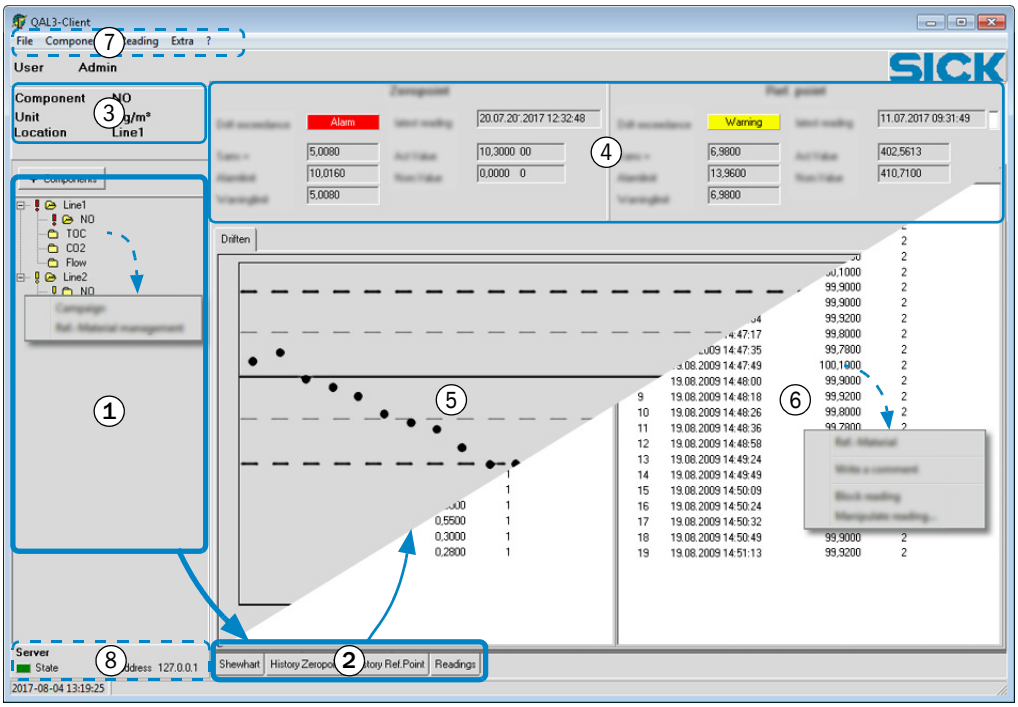
1.1 Starting operation

1 `Start QAL3Client.exe.`[1]
2 `Enter user and password.`
3 Select menu language.

››› The program interface appears (see Fig. 1).

1.2 Principle of operation

Fig. 1: Principle of operation



1	► Select a QAL3 component.
2	► Select the display function.

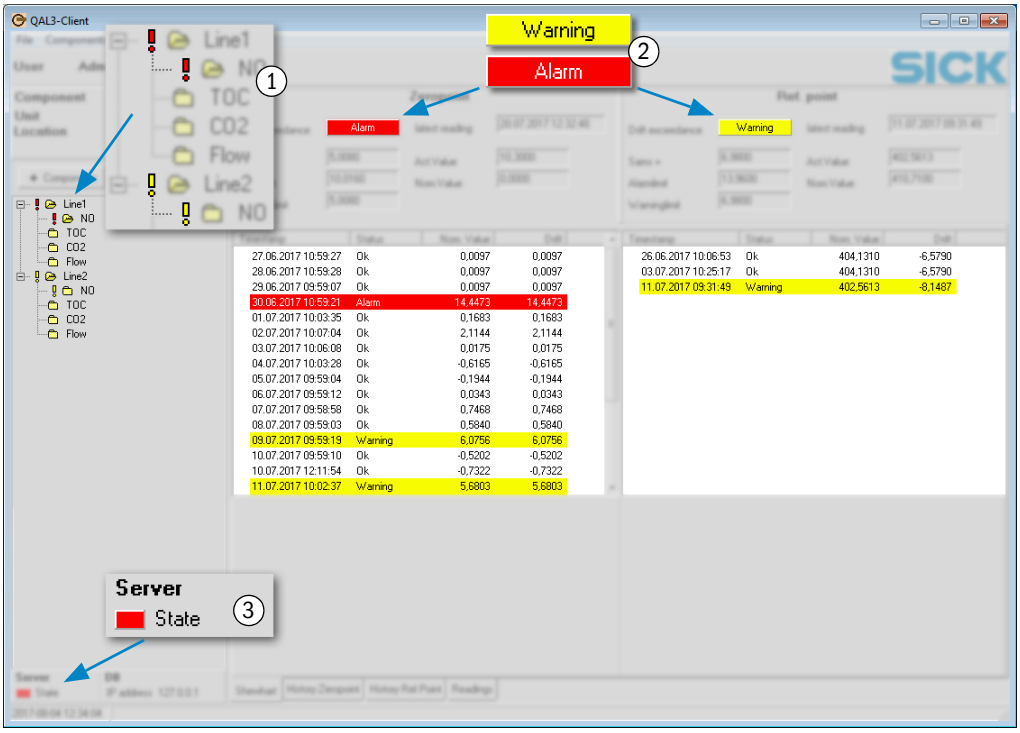
3	Selected QAL3 component[1]
4	QAL3 after last reference measurement [2]
5	Readings as graph [2]
6	Readings Table [2]
7	Menu functions
8	Status display for QAL3 Server

[1] Additional information “Standard reference material”, see Fig. 31, page 44.
[2] For the selected QAL3 component in the active campaign.

[1] The storage location (path) is selected during software installation (see page 14).

1.3 Warning signals

Fig. 2: Signals in QAL3 Client (with example data)



1	Notes in the QAL3 components list
2	Notes in the Control Card *(example for "Shewhart" evaluation method)*

Signal color		Significance [1]	
	Yellow	*Warning:*	|Actual value - nominal value| ≥ warning limit [2]
	Red	*Alarm:*	|Actual value - nominal value| ≥ warning limit [2]
	Blue	Configuration not complete.	

[1] *In the QAL3 Components list:* Applicable for at least one reading during the current campaign.
[2] After the last reading. – Values of warning and alarm limits, see "Managing active campaigns", page 28.

3	Status display for program module QAL3 Server" (evaluation of readings)

1.4 Mandatory user actions (short instructions)

Task	Steps
Start/end session:	Components → Campaign Management
Evaluate semi-automatic readings: [1]	Reading → Semi-automatic reading.
Manual entry of readings: [2]	Reading → Manual reading
Terminate session:	Components → Campaign Management → select campaign involved → [Close]

[1] Only in a scenario with semi-automatic readings.
[2] Only in a scenario without automatic readings.

1.5 User actions as required (short instructions)

Task	Steps
Enter a comment for a stored reading:	|Readings| → *Context menu*: Comment → Enter text.
Exclude a stored reading from the QAL3 evaluation:	|Readings| → *Context menu*: Block a reading.
Change the value in a stored reading:	|Readings| → *Context menu*: Change a reading... → enter new actual value.
Change the nominal value in a stored reading:	|Readings| → *Context menu*: Ref.-material → enter new nominal value.
Change a warning/alarm limit:	Components → Campaign Management → Change value.
Print the Control Card for the current campaign:	File → Print.
Cancel an active campaign and start a new campaign:	Components → Campaign Management → [+ New] → Enter new values for standard deviation → [Save].
View previous campaigns:	Extras → Offline mode.

2 Product description

2.1 Intended use

2.1.1 Purpose

QAL3 Master is a PC software to assist operators of automatic measuring instruments (AMS) to measure drift and precision of measuring instruments in accordance with EN 14181. Several measuring instruments can be monitored together.

Control ranges are automatically monitored. Discrepancies are automatically signaled. Control Cards are automatically updated.

2.1.2 Target group

- QAL3 Master should be used by skilled persons that know and implement the EN 14181 standard.
- These Operating Instructions are basically intended for skilled persons using QAL3 Master in operation. However, Sections “Installation”, “Initial start-up” and “Program configuration” are only intended for trained skilled persons preparing the QAL3 Master for operation and adapting it to the individual application.

2.2 Functional principle

Readings

In compliance with EN 14181, automatic measuring instruments must perform regular measurements with check media (QAL3). The results from these reference measurements are referred to as “readings” when transferred. The check media are referred to as “reference material”.

QAL3 Master stores all readings in a database. The actual values of readings are compared automatically against the nominal value. Deviations from the nominal value exceeding a set limit value are signaled in the operating program. An automatic e-mail can be generated at the same time (option).

Campaigns

All evaluations refer to a certain monitoring time (normally a calender time period). These monitoring times are referred to as “campaigns”. Campaigns are started and stopped in QAL3 Master using menu functions. The QAL3 monitoring functions are only in operation when a campaign is active.

QAL3 Master can directly store and evaluate readings provided by analyzers with a Modbus interface and supporting automatic readings. Analyzers not supporting this method must be connected via a MEAC system (see “Guideline: Connecting the analyzers”, page 16).

QAL3 Client

All operation and configuration functions are in program module “QAL3 Client”. “QAL3 Client” can be installed on several PCs depending on licencing. Simultaneous operation of several variants is possible.

2.3 Evaluation methods supported

The following evaluation methods can be selected during program installation:

- CUSUM Control Card (drift and precision evaluation)
- Shewhart Control Card (drift evaluation)

> *Evaluation method "CUSUM"* (cumulative sum)*:*
> Drift and precision (development of drifts) of the measuring instruments are monitored separately. Advantage: Better support of proactive planning of check and maintenance tasks.

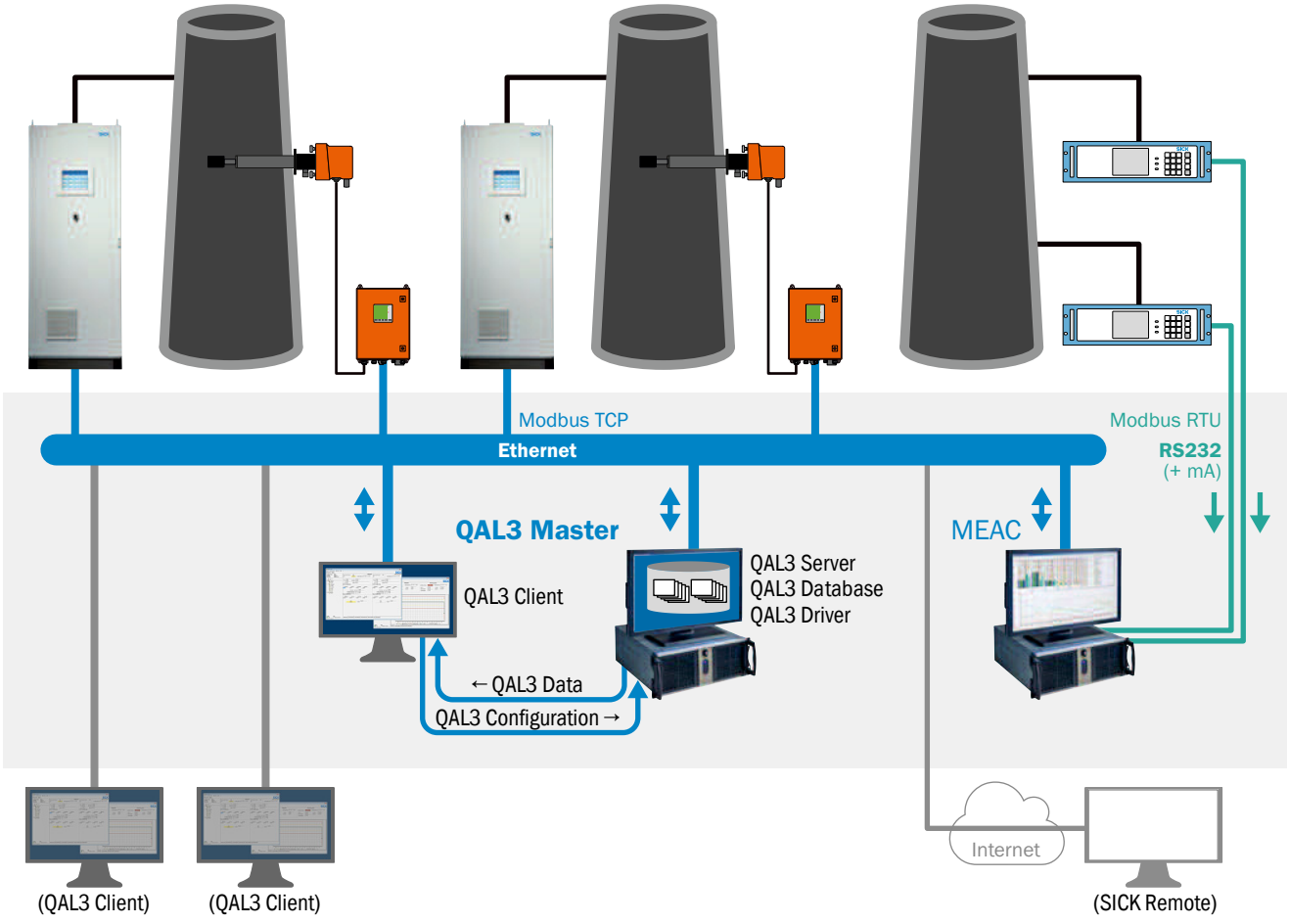
2.4 Program modules

Program module	Function
QAL3 Server [1]	• Processing data in the QAL3 database. • Connecting program module.
QAL3 Database	• Storing data of connected automatic measuring instruments. [2]
QAL3 Driver [1]	• Importing data of individual measuring instruments via a PC interface and storing in a QAL3 database.
QAL3 Client	• Creating displays and operating functions. • Providing functions for program configuration.

Table 1: Program modules

[1] Permanent background process.
[2] Database management system: MariaDB Server.

Fig. 3: QAL3 monitoring with QAL3 Master (example)



2.5 System requirements

2.5.1 Computer system

Computer component	Minimum requirements
Basis hardware:	• Windows compatible PC (type optional)
Operating system:	• Microsoft Windows 7 or Windows 10 • 32 bit or 64 bit
Working memory (RAM):	– *For 32 bit operating system:* ≥ 1 GB – *For 64 bit operating system:* ≥ 2 GB
Data medium (HD/SSD):	• ≥ 500 MB (available)
Connections:	• *For Modbus-TCP:* Ethernet interface (LAN) • *For Modbus-RTU:* Serial interfaces (RS232/RS485) [1]
Monitor:	• Color depth: 8 bit • Resolution: ≥ 1280 x 768 pixels (16:9 WXGA)

[1] One each serial interface for each analyzer of the measuring instrument.

2.5.2 Requirements for connected analyzers

Modbus type for analyzer	Mandatory prerequisites
Analyzer has no Modbus interface. Analyzer does not support automatic readings via Modbus.	• Analyzer data evaluated by a MEAC system. • MEAC system stores analyzer readings (QAL3 function). • QAL3 Master driver for MEAC installed on the MEAC system. MEAC driver stores the readings in the QAL3 database. • The measured values to serve as reference values during reference measurements (zero point, reference point) must be selected manually using QAL3 Client.
Analyzer supports automatic readings via Modbus.	– *Without MEAC system:* Modbus interface of analyzer connected to the PC on which the driver suitable for QAL3 Master is installed. – *With MEAC300:* At least one Modbus compatible interface or at least one IP port available on the analyzer. – *With a different MEAC system:* At least two Modbus compatible interfaces on the analyzer. [1]

[1] *If this is not possible:* The analyzer could be connected via an analog output (mA signal) on the MEAC system.

2.5.3 Compatible MEAC systems

– MEAC300 with Add-on “UniversalModbus”
– All other MEAC systems apart from MEAC2000 V2.0

2.5.4 Requirements for automatic readings

Alternative	Maximum function
– *Without MEAC system:* PC with Modbus interface, QAL3 Master, Software “UniversalModbus”	Fully automatic readings
– *With MEAC300:* MAC Add-on “UniversalModbus”	
– *With a different MEAC system:*[1] MEAC option “QAL3”	Semi-automatic readings

[1] MEAC2000 V2.0 is not compatible.

2.5.5 Requirements for automatic e-mail alarms (option)

– Direct access to an e-mail server (SMTP)
– An e-mail account available on this e-mail server

2.6 Scope of delivery

2.6.1 Standard scope of delivery

1 installation CD

Standard installation CD
• QAL3 Server
• QAL3 Client
• QAL3 Modbus driver
• Universal Modbus
• Operating Instructions as PDF (installed automatically)
• Serial number

- Licences, see “Entering the licence number”, page 15.
- Operating QAL3 Master requires the database management system “MariaDB Server”. – “MariaDB Server” is Open-Source software. This software cannot be delivered with the CD due to licence conditions (further information, see “Installing the database management system”, page 14).

2.6.2 Options

- *E-mail alarm:* When the actual value of a new reading exceeds the alarm limit, an e-mail is sent to all e-mail addresses stored in QAL3 Master.

3 Installation

3.1 Creating hardware connections

- Connect all PCs on which program modules from QAL3 Master are to run to a common Ethernet network (LAN).
- Connect analyzers for which readings are to be processed directly in QAL3 Master (via Modbus interface) to this network.
- *To pass QAL3 Data from a MEAC system to QAL3 Master:* Connect the MEAC system emission PC to this network.

Options for connecting analyzers, see “Guideline: Connecting the analyzers”, page 16.

3.2 Installing the software

3.2.1 Installing the database management system

- Download MariaDB Server from the internet (→ https://mariadb.org).
- Install MariaDB Server on the PC on which QAL3 Master will be installed. Note during installation:
  - IP address of the PC on which the database will be installed
  - IP port or network name of this PC

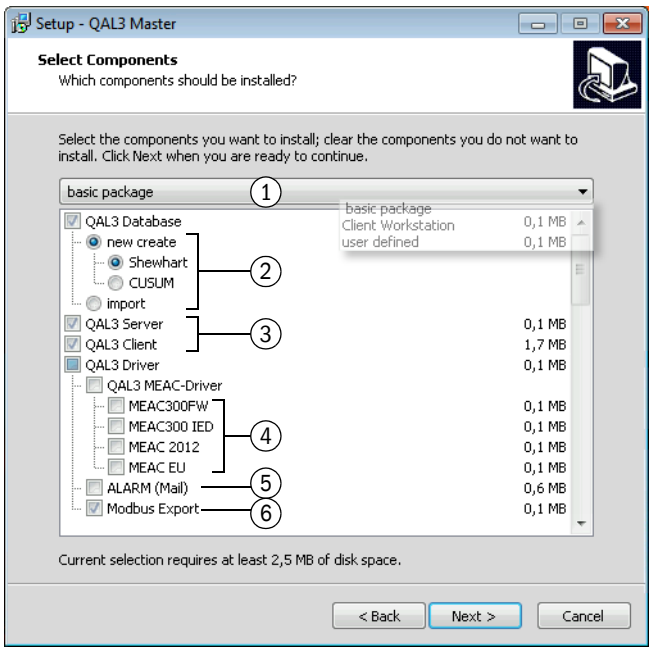
These data are required during QAL3 Master installation.

3.2.2 Installing the QAL3 Master

On each PC used:

- Start the QAL3 Master installation program (Setup) with administrator rights.
- Select the program components to be installed (see Fig. 4).
- Follow the instructions of the installation program.

Fig. 4: Selecting program components during installation



1	► *If required:* Select a standard installation.
2	► *Either:* Create a new QAL3 Database. Specify the evaluation method in this case (Shewhart or CUSUM). ► *Or:* Import and use an existing QAL3 Database. [1]
3	QAL3 Server, QAL3 Client: Mandatory program modules for the basic functions
4	► *If required:* Select the suitable MEAC Driver.
5	► *Only with option "E-mail alarm":* Select the Alarm driver.
6	Modbus driver: Mandatory program module for Modbus connections [2]

[1] Notes see "Using Backup functions", page 47.
[2] The installation program for "UniversalModbus" software starts automatically after the Modbus driver has been installed. Information on configuration measures required is displayed instead when MEAC300 is installed on a PC.

- Every PC on which QAL3 Client runs must have a network connection to QAL3 Database.

3.2.3 Entering the licence number

3.2.3.1 *Licencing principle*

- The Licence key is generated during an e-mail dialog with the manufacturer.
- Each QAL3 Master licence is valid for the hardware on which QAL3 Server and QAL3 Driver run. The data storage used (HD, SSD) is part of this hardware.
- The Licence key is saved in the `RegQAL3Svr.dat` file.
- When required, the Licence key can be renewed when, for example, a hardware component is changed.

3.2.3.2 *Licencing*

1 Start QAL3 Client on a PC.
2 Call up the Driver display (see “Checking drivers”, page 23).
3 Call up the Licencing menu (see “Checking drivers”, page 23).
4 Follow the instructions in the menu. Carry out the work steps described.
5 Terminate and restart QAL3 Client.

3.2.3.3 *Test operation without licence*

QAL3 Master functions completely when a Licence number has not been entered but only processes a maximum of 10 readings.

“Demo operation” is displayed in QAL3 Client during test operation.

3.2.4 Configuring Modbus connections

▶ see “Guideline: Configuring the Modbus connection of analyzers”, page 18.

4 Initial start-up

4.1 Guideline: Connecting the analyzers

Scenario 1 Analyzers + QAL3 Master (→ fully automatic readings without MEAC system)	
Characteristics	Measures
• Each analyzer has at least one Modbus interface available and supports automatic readings. • Readings to be stored and monitored directly in QAL3 Master. • MEAC systems not involved.	*Connections*: ▶ Connect the analyzers to QAL3 Master via Modbus. ▶ Install and configure one independent variant of the “Universal Modbus” program for each analyzer.
	In Universal Modbus configuration program: ▶ Configure one numeric input for each QAL3 relevant measuring component of the analyzer (see “Guideline: Configuring the Modbus connection of analyzers”, page 18).
	In QAL3 Master: ▶ Set up a QAL3 Component for each QAL3 relevant measuring component of the analyzer (see “Setting up QAL3 Components”, page 21). ▶ Make sure the Modbus Export Driver is running (Service “QAL3_Trb_ModbusExport”).

Scenario 2 Analyzers + MEAC300 + QAL3 Master (→ fully automatic readings with MEAC300)	
Characteristics	Measures
• Each analyzer has at least one Modbus TCP interface available and supports automatic readings. • Emission measured values to be processed in MEAC300. • QAL3 data of analyzers to be monitored with QAL3 Master.	*Connections*: ▶ Connect analyzers to the MEAC system via Modbus. ▶ Install the QAL3 Master MEAC driver on the MEAC system.
	In “MEAC-UniversalModbus” (Add-on): ▶ Configure one numeric input for each QAL3 relevant measuring component of an analyzer (see “Guideline: Configuring the Modbus connection of analyzers”, page 18).
	In QAL3 Master: ▶ As for scenario 1.

Scenario 3 Analyzers + MEAC system (apart from MEAC300) + QAL3 Master (→ fully automatic readings with MEAC [1])	
Characteristics	Measures
• Each analyzer has at least two Modbus interfaces available and supports automatic readings. • Analyzers readings to be transferred to a MEAC system and stored there. • QAL3 Data to be monitored with QAL3 Master.	*Connections*: ▶ Connect analyzers to QAL3 Master via Modbus. ▶ Install and configure one independent variant of the “Universal Modbus” program for each analyzer. ▶ Also connect analyzers to the MEAC system via Modbus.
	For Universal Modbus: ▶ As for scenario 1.
	In QAL3 Master: ▶ As for scenario 1.

[1] Requirements, see “Compatible MEAC systems”, page 11.

Scenario 4 Analyzers without QAL3 Modbus function + MEAC System + QAL3 Master (→ semi-automatic readings)	
Characteristics	Measures
• Analyzers have no Modbus interface. *Or:* Analyzers have a Modbus interface but do not support automatic readings. • Analyzers have an electronic output which signals status “Reference measurement running”. • QAL3 data of analyzers to be monitored with QAL3 Master.	▶ Connect analyzers to a MEAC system (via data acquisition unit or Field module) either via Modbus (when available) or via analog signal (mA) and record analyzer emission measured values with the MEAC system.
	In the MEAC system: ▶ Install MEAC driver for QAL3 Master. ▶ Set up a MEAC component for each analyzer measuring component delivering QAL3 relevant emission measured values. *For each of these MEAC components:* ▶ *MEAC Universal Modbus:* Set up a digital Modbus input for analyzer status signal “Reference measurement running”. ▶ *Status signals to be considered during calibration:* Select the digital Modbus input “ Reference measurement running” of this analyzer for the “Calibration” status signal. ▶ *QAL3 component evaluation:* Activate.
	In QAL3 Master: ▶ Set up a QAL3 component for each of these MEAC components (see “Setting up QAL3 Components”, page 21). ▶ During operation:[1] Use the functions for semi-automatic readings to determine the reading values (see “Using semi-automatic readings”, page 42).

[1] In a QAL3 Client. Time point and frequency at user's discretion.

Scenario 5 Analyzers without electronic connection + QAL3 Master (→ manual readings)	
Characteristics	Measures
• Analyzers have no interface. • Analyzers cannot signal status “Reference measurement running” automatically.	▶ Install QAL3 Master on a PC. ▶ Read off reference measurements readings on the analyzers visually. ▶ Enter readings manually (see “Manual entry of readings”, page 45).

4.2 Guideline: Configuring the Modbus connection of analyzers

▶ Configure a Modbus input for the following data for each QAL3 Component to be monitored with QAL3 Master:

Reading data	▶ **Set up one numeric Modbus input for each**[1]
Actual values	• Actual value for zero point • Actual value for reference point
When included in readings: Nominal values	• Nominal value for zero point • Nominal value for reference point
When included in readings: Timestamp	• Timestamp for actual value at zero point • Timestamp for actual value at reference point

[1] Set up export parameters suitable for QAL3 Master.

Instructions on “UniversalModbus” software, see “Technical Information MEAC300 Add-ons”.

4.3 Guideline: Configuring program functions

Measure	Information
▶ Start a QAL3 Client.	see “Starting the program (QAL3 Client)”, page 19
▶ Set up QAL3 Components.	see “Setting up QAL3 Components”, page 21
▶ Carry out mapping.	see “Configuring Mapping (assigning data sources)”, page 24
▶ Set up campaigns.	see “Using campaigns”, page 28
If nominal values are not included in readings: ▶ Determine nominal values.	see “Managing reference material/determining nominal values (as required)”, page 44
▶ Activate automatic backups.	see “Configuring automatic backups”, page 47

4.4 Putting QAL3 Master into operation

Measure	Information
▶ Start a campaign for each single QAL3 component.	see “Using campaigns”, page 28
Make the following settings:	▶ Enter standard deviations.
	With evaluation method “Shewhart”: ▶ Set warning limits. [1] ▶ Set alarm limits. [1]
	With evaluation method “CUSUM”: ▶ Have alarm limits calculated.

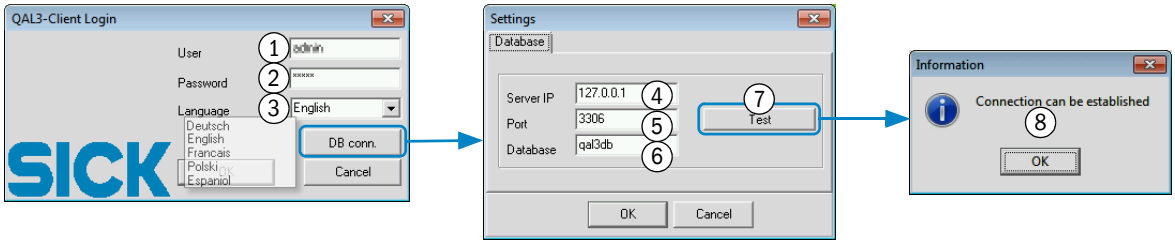
[1] Standard value is displayed.

5 Starting the program (QAL3 Client)

Step		Measure
1	► Start QAL3 Client.	*With MEAC System:* ► Call up menu function “QAL3 Monitoring” of the MEAC program.
		Without MEAC system: ► Double-click link symbol “QAL3 Client” (start QAL3Client.exe). [1]
2	► Select user (Login).	► Enter user and password. ► Select desired language.
3	*If required:*	► Check connection to QAL3 Database (see Fig. 5).

[1] Some program functions are only usable when QAL3 Client runs with Administrator rights (see information in text).

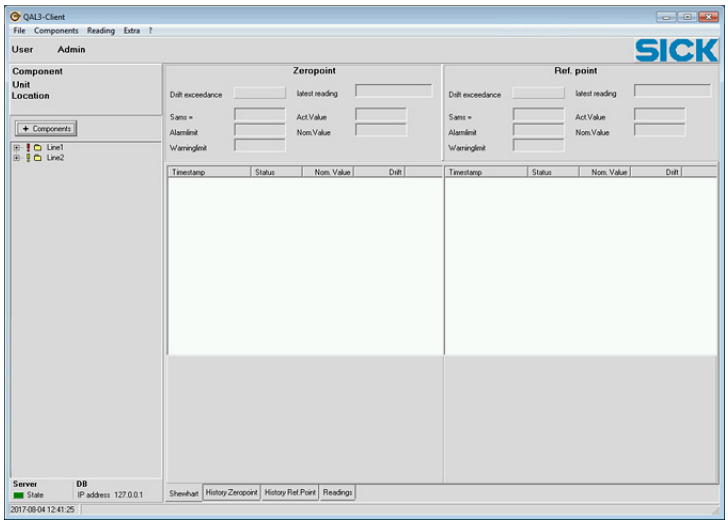
Fig. 5: Login and database test (with example data)



1	► Enter user name. [1]
2	► Enter user password.
3	► Select language.
4	IP address of PC on which QAL3 Database is installed
5	IP Port of this PC [2]
6	Internal name of QAL3 Database [2]
7	► Test connection to QAL3 Database.
8	Message after test.

[1] Selection, see “Setting up/managing users”, page 20.
[2] Defined during database management system installation.

Fig. 6: QAL3 Client after program start (example)



Principle of operation, see “Principle of operation”, page 6.

6 Program configuration

Only for trained Service technicians and administrators.

6.1 Setting up/managing users

Internal user functions

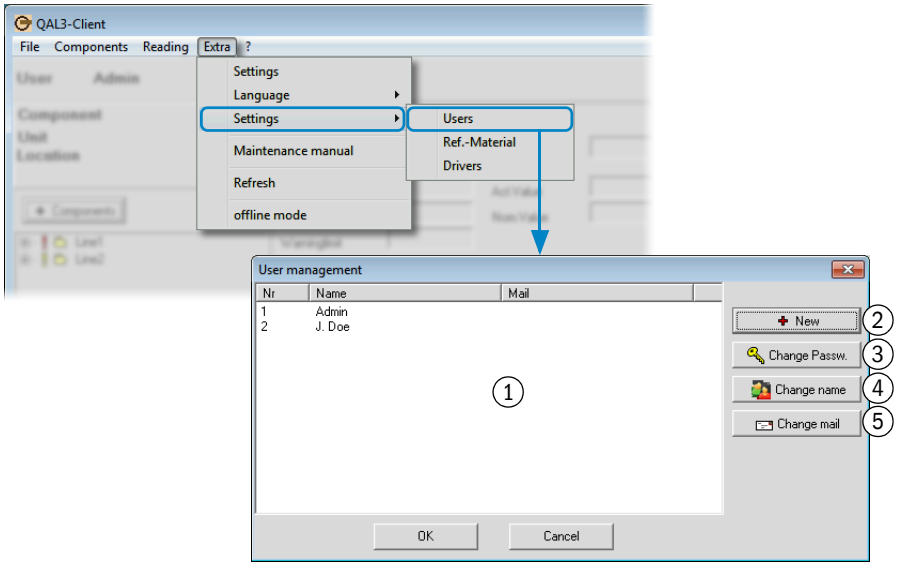
- The user selected during QAL3 Client start is named in the Maintenance Manual entries.
- *With option "E-mail alarm":* An individual e-mail address can be entered for each user to which the automatic alarm messages are to be sent.

Recommend minimum measures for initial start-up

▶ Change standard setting for user.
▶ *With option "E-mail alarm":* Enter e-mail addresses for users.

- Configuring automatic e-mail messages, see "Activating e-mail alarms", page 25.
- Automatic e-mail messages are only generated when QAL3 Server and Alarm driver are running.

Fig. 7: User management



1	List of users in QAL3 Master
2	▶ Add a user.
3	▶ Change password for marked user.
4	▶ Change name of marked user.
5	▶ Enter/change e-mail address of marked user. [1]

[1] Only available with option "E-mail alarm".

6.2 Setting up QAL3 Components

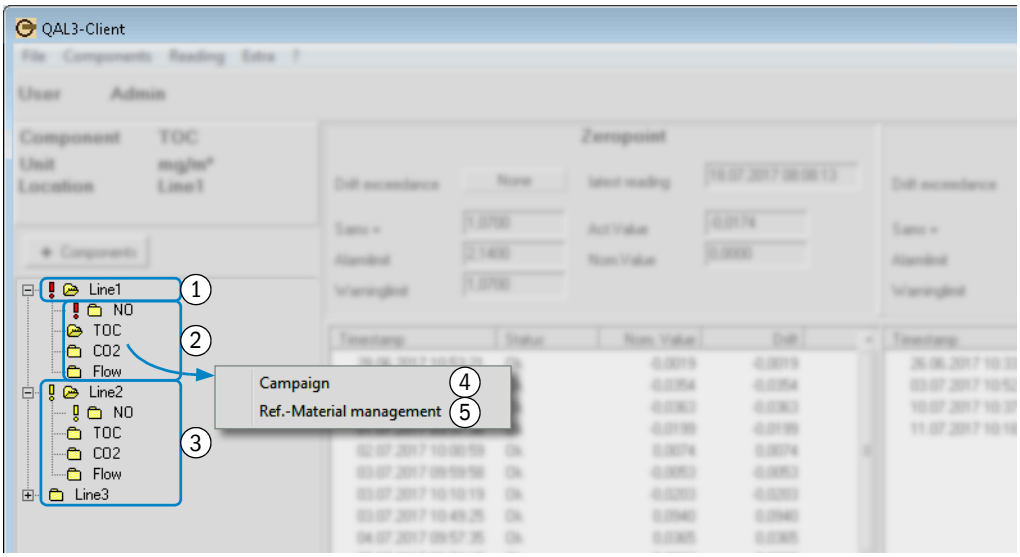
6.2.1 Functional principle of QAL3 Components in QAL3 Master

"QAL3 Components" are the measuring components to be monitored with QAL3 Master. QAL3 Master only functions when at least one QAL3 Component has been set up. The QAL3 Components must be set up using QAL3 Client during initial start-up.

Each QAL3 Component is assigned a "location". Several locations can be set up and given suitable names.

- Which measuring components are to be monitored normally depends on official requirements on the respective measuring instrument.
- An own QAL3 Component must be set up for each measuring range when a measuring component has several measuring ranges.

Fig. 8: QAL3 Components in QAL3 Master (example)



1	Location
2	QAL3 Components for this location
3	Further locations with their QAL3 Components
4	▸ Call up a campaign (see "Managing active campaigns", page 28).
5	▸ Call up reference material (see "Managing reference material/determining nominal values (as required)", page 44).

Symbol[1]	Significance
BLUE **?**	Configuration not complete.
YELLOW **!**	*Warning:* |Actual value – nominal value| ≥ warning limit [2]
RED **!**	*Alarm:* |Actual value - nominal value| ≥ alarm limit [2]

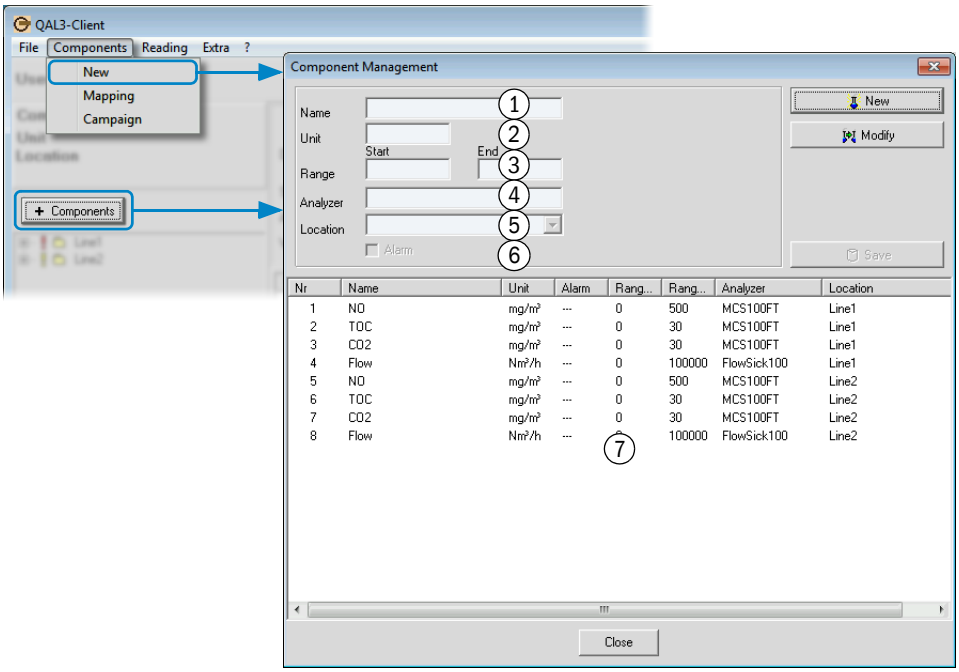
[1] Also displayed for the group.
[2] After the last reading.

6.2.2 Configuring QAL3 Components

One QAL3 Component must be configured for each component of an analyzer for which the readings are to be monitored in QAL3 Master.

▶ *Carry out for each desired QAL3 Component:*

Fig. 9: QAL3 Component Management (with example data)



1	▶ Enter desired QAL3 Component name.
2	▶ Enter physical unit of measured values.
3	▶ Enter start and end values of measuring range.
4	▶ Enter (desired) analyzer name from which measured values originate.
5	▶ *Either:* Select an existing location. ▶ *Or:* Enter new location name.
6	▶ Activate automatic alarm messages via e-mail for this QAL3 Component.

7	List of configured QAL3 Components

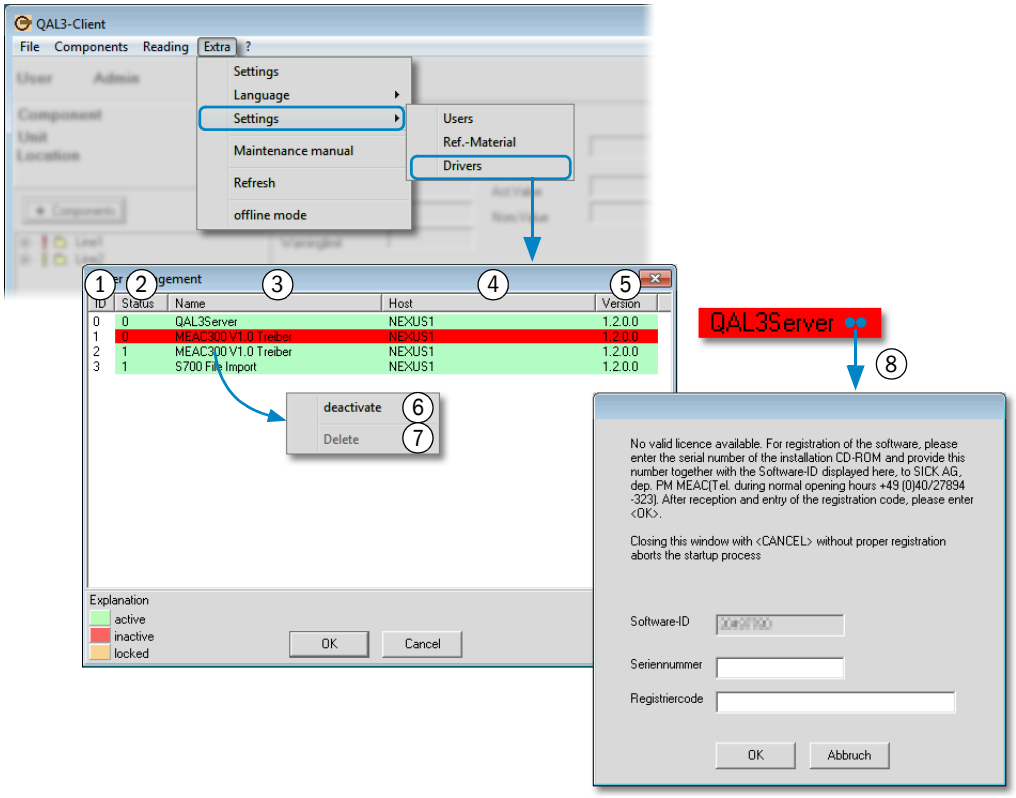
Also necessary:
▶ Carry out Mapping (see “Configuring Mapping (assigning data sources)”, page 24).

6.3 Checking drivers

Drivers in QAL3 Master serve to import readings automatically and store these in the QAL3 Database. The Alarm driver is required for automatic alarm messages via e-mail (option).

Licencing is also carried out in this menu (see “Entering the licence number”, page 15).

Fig. 10: Driver management



1	Driver number in QAL3 Master
2	Current status of driver (1 = active, 0 = deactivated)
3	Driver name
4	Name of PC on which the driver is installed
5	Driver software version

6	► Activate/deactivate marked driver. [1]
7	► Delete marked driver. [2]

[1] Only possible when QAL3 Client has been started with Administrator rights.
[2] Only use for unnecessary drivers.

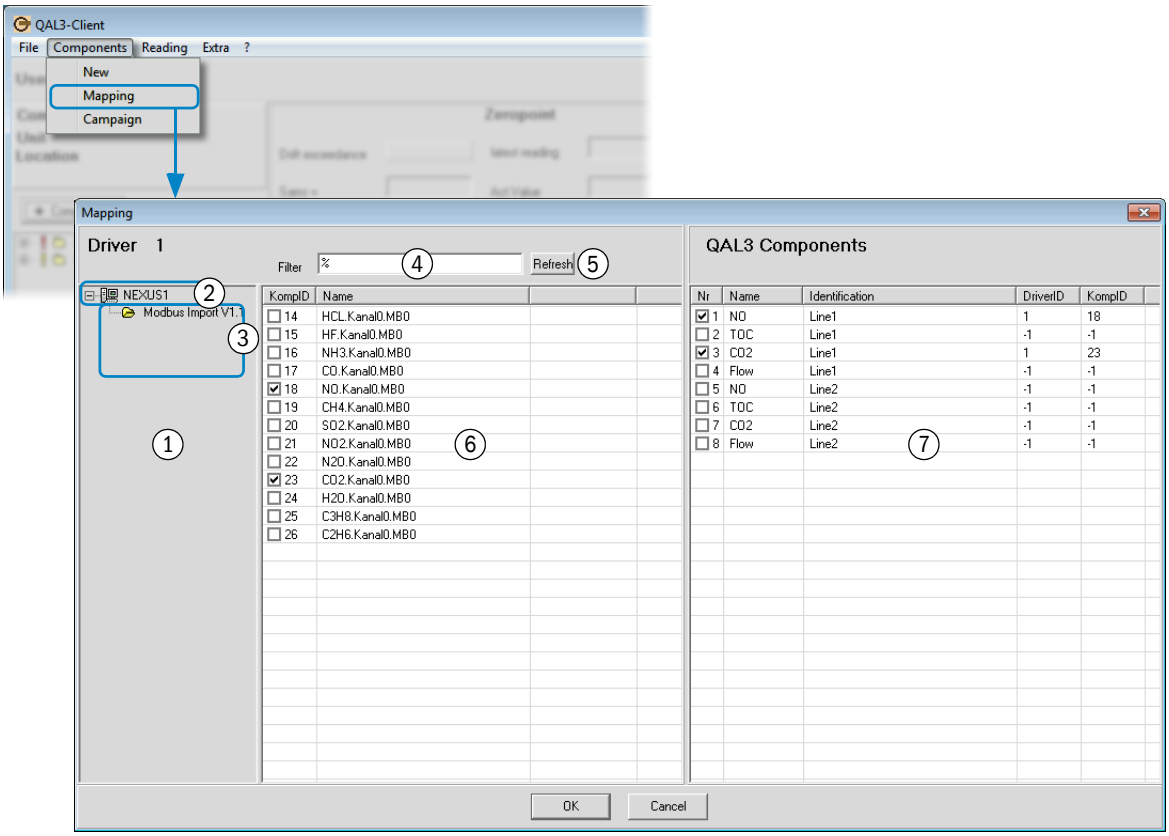
8	► *To call up the Licencing menu:* Double-click “QAL3 Server”. [1]

[1] Licencing explanation, see “Entering the licence number”, page 15.

6.4 Configuring Mapping (assigning data sources)

"Mapping" serves to assign measuring components for which readings are imported via the QAL3 Driver to the QAL3 Components.

Fig. 11: Mapping (example)



1	List of connected PCs and installed drivers
2	PC name in network
3	Driver for QAL3 Master installed on this PC
4	▶ Enter filter text for list [6]. [1]
5	▶ Activate entered filter text.
6	List of measuring components for which the marked driver delivers readings to QAL3 Master [2]
7	List of configured QAL3 Components (see "Configuring QAL3 Components", page 22) [2]

[1] Joker character: "%".
[2] *With name:* Assigned (configured). *Without name:* Not assigned.

To assign a certain measuring component to a QAL3 component:

1 Mark driver which delivers readings for this measuring component.
2 Mark name of the measuring component (mouse-click).
3 Drag measuring component name to name of associated QAL3 component (Drag & Drop).

▶ *During initial start-up:* Repeat these work steps until every QAL3 component is assigned a measuring component.

6.5 Activating e-mail alarms

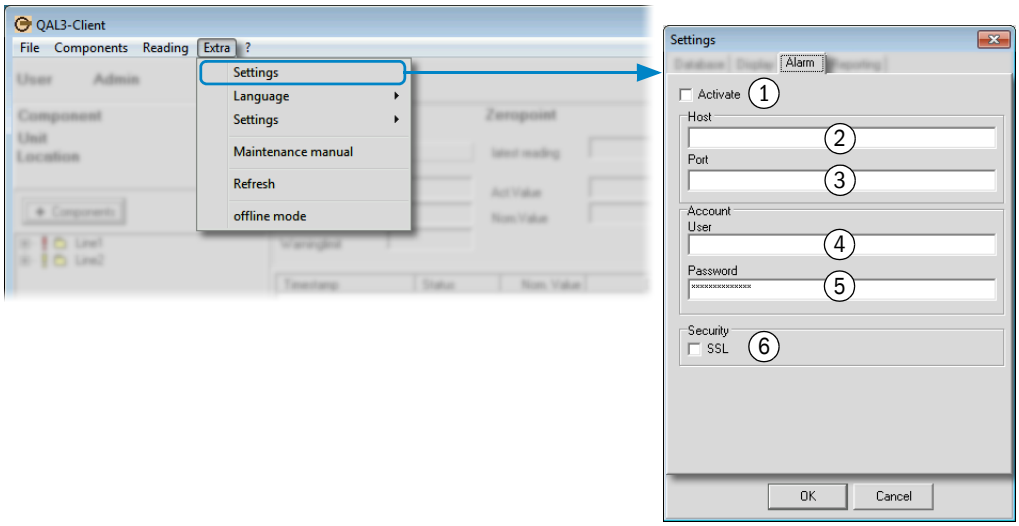
Only valid when option “E-mail alarm” is installed.

When e-mail alarm is activated, an e-mail is generated automatically when the evaluation of the last reading of an analyzer shows that the analyzer no longer works within the permissible range. This e-mail is sent automatically to all users for which an e-mail address is specified (see “Setting up/managing users”, page 20).

QAL3 Master requires direct access to an e-mail account to be able to send automatic e-mails. Configure this access here.

Requirements for automatic e-mail alarms:
- QAL3 Server running.
- Alarm driver running.

Fig. 12: Configuring automatic e-mails



1	► Activate automatic e-mail alarms.
2	► Enter IP address or host name of the e-mail server belonging to the e-mail account [4] (SMTP -Server).
3	► Enter port number of e-mail server.
4	► Enter user name of mail account to send the e-mail alarms. [1]
5	► Enter password of this user.
6	► *If desired:* Activate SSL encryption for sent e-mails.

[1] The account e-mail address is often used here in internet.

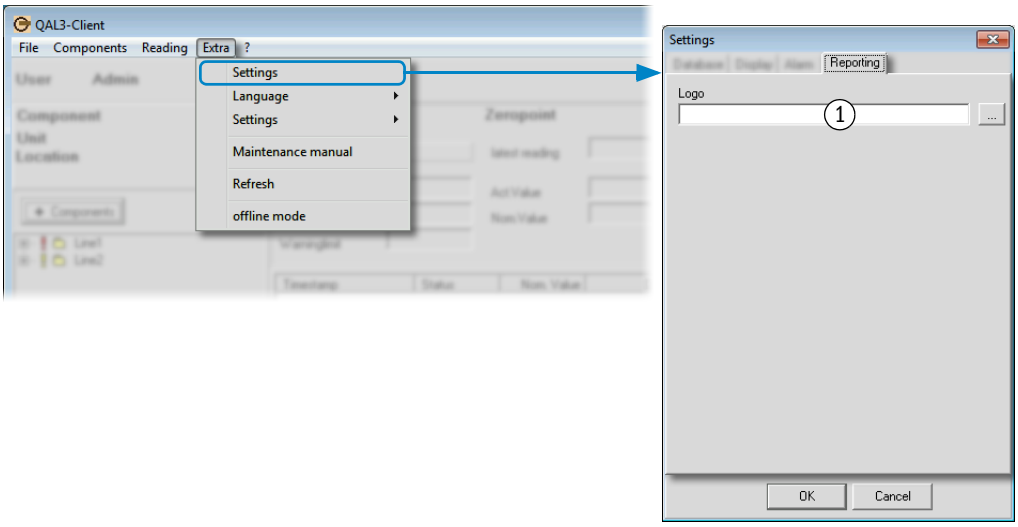
These settings are valid for all QAL3 Master users.

6.6 Selecting the logo for Control Cards

The graphic chosen is automatically shown in the printed Control Cards.

- *Application options (example):* Operating company logo, plant symbol.
- *Allowable graphic formats:* PNG, JPG, BMP.

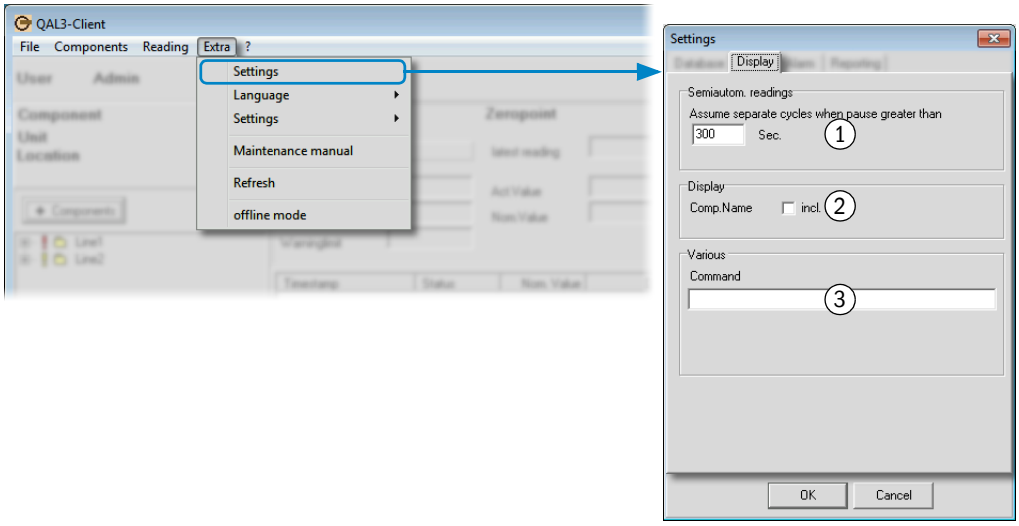
Fig. 13: Selecting the logo for Control Cards



1	► Enter graphic file name (complete path).

6.7 Additional functions

Fig. 14: Additional functions



1	► *For semi-automatic readings:*[1] Set the minimum time interval (seconds) that must elapse between two reference measurements so that these reference measurements can be shown separately in QAL3 Master. [2]
2	► *For the list of QAL3 Components:*[3] Display the measuring ranges.
3	► *Only for trained skilled persons:* Enter a system command.

[1] see “Using semi-automatic readings”, page 42. A larger value serves to show several reference measurements that were made in a short time gap together.
[2] Standard value: 300 seconds.
[3] see “Functional principle of QAL3 Components in QAL3 Master”, page 21.

7 Handling during operation

7.1 Using campaigns

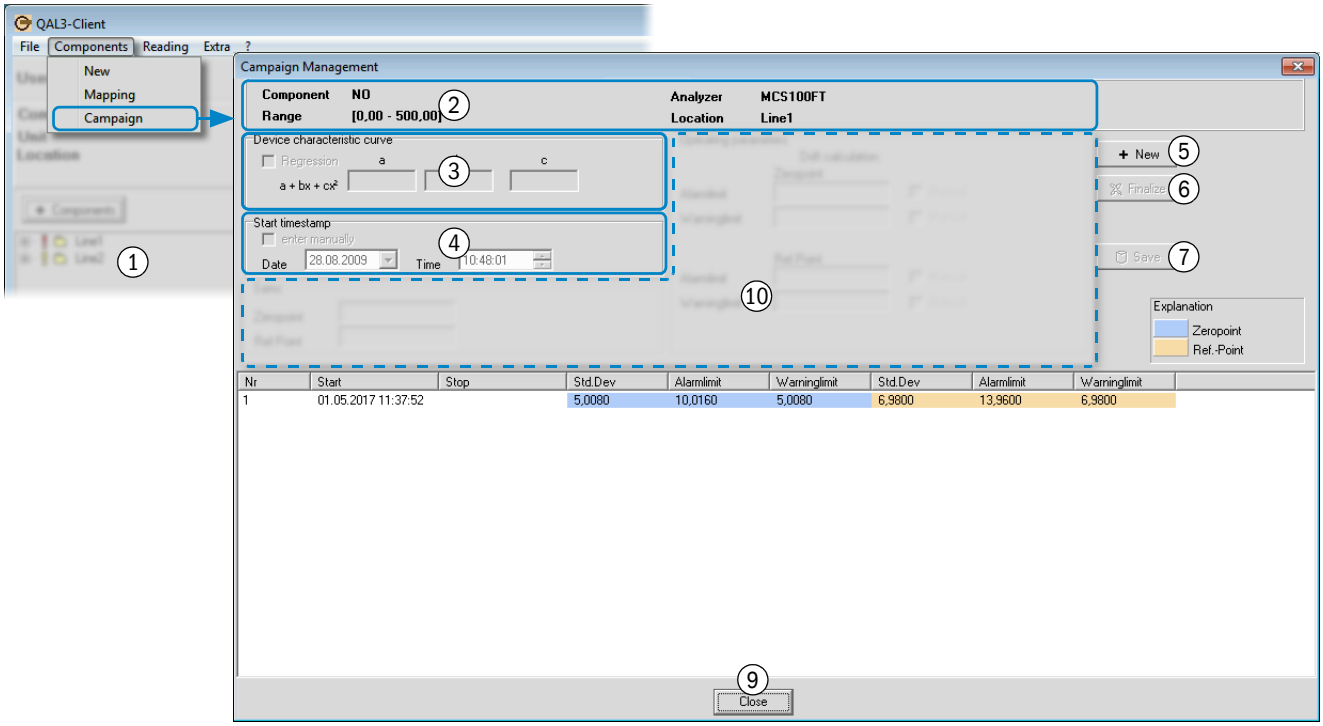
7.1.1 Managing active campaigns

- QAL3 monitoring only functions when a campaign is running.
- A campaign is only valid for one single QAL3 component.

► *To activate QAL3 monitoring:* Start a campaign for each QAL3 component.
► *Important when using evaluation method "Shewhart":* Always start a new campaign when an alarm limit has been changed.

- Always start a new campaign after defining a new standard deviation – e.g., after an annual function test (AST).
- Campaign run times are normally coordinated to local requirements.

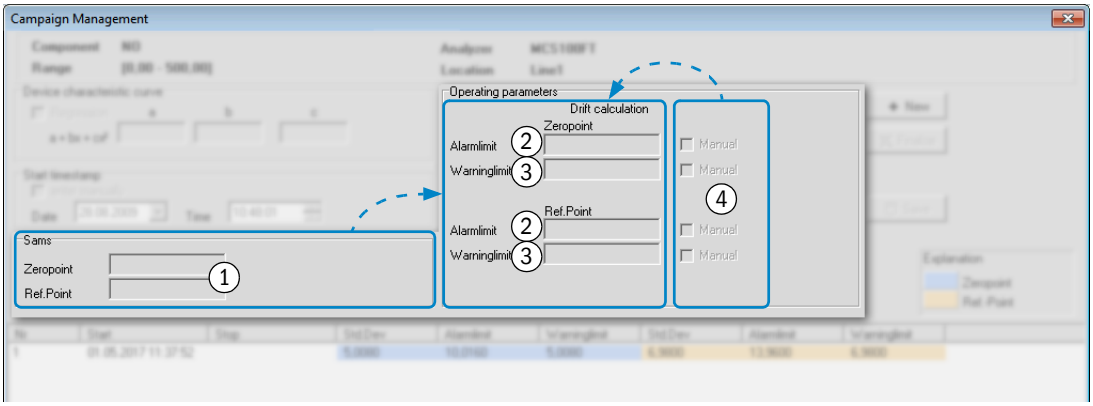
Fig. 15: Campaign management for a QAL3 Component (with example data)



1	► Select a QAL3 Component.
2	Information on selected QAL3 Component
3	► *If required:* Activate regression formula for actual value conversion and enter regression formula factors. [1]
4	► *If required:* Enter/set start time for new campaign. [2]
5	► Set up a new campaign.
6	► Terminate active campaign.
7	► Start the new campaign.
8	List of campaigns for selected QAL3 Component (including data). Grey text = previous campaigns. [3]
9	► Terminate campaign management.
10	Standard deviations, warning limits/alarm limits – For evaluation method "Shewhart", see Fig. 16, page 29 – For evaluation method "CUSUM", see Fig. 17, page 29

[1] Application option: Conversion from electronic to physical value.
[2] Otherwise the time used when selecting [5] is used.
[3] see "View previous campaigns (Offline mode)", page 30.

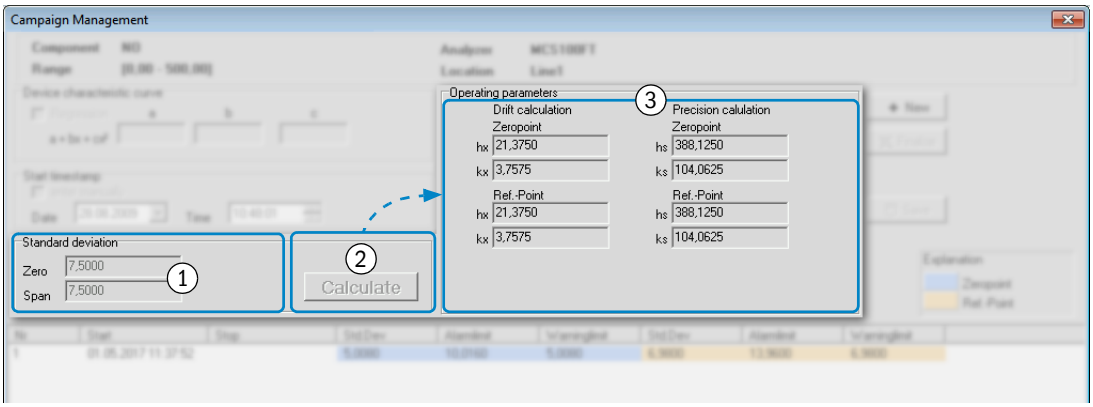
Fig. 16: Standard deviation and alarm limits/warning limits for “Shewhart”



1	► Enter standard deviations from last Test Report (physical values).
	Standard values for alarm limit and warning limit are generated automatically from the values entered (alarm limit = 200 % · standard deviation; warning limit = standard deviation).-
2	Alarm limit for this QAL3 component in this campaign
3	Warning limit for this QAL3 component in this campaign
4	► *If required:* Activate manual entry. [1]
	► Then enter desired value (replaces standard value).

[1] Only possible for alarm limit before this campaign is started. Also possible for warning limit when this campaign is active. These values can no longer be changed after the campaign has been terminated.

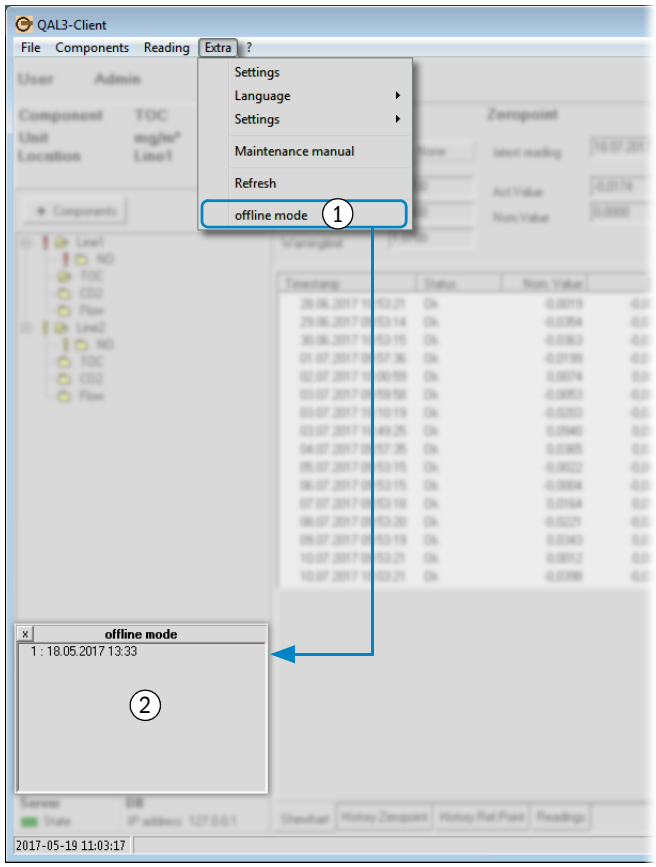
Fig. 17: Standard deviation and alarm limits/warning limits for “CUSUM” (with example data)



1	► Enter standard deviations from last Test Report (physical values).
2	► Calculate current CUSUM operating parameters automatically using the standard deviations.
13	Current CUSUM operating parameters

7.1.2 View previous campaigns (Offline mode)

Fig. 18: Mode for previous campaigns



1	▸ Activate mode to view and print previous campaigns.
2	List of campaigns for selected QAL3 Component (including active campaign).
	▸ Select campaign to display data.

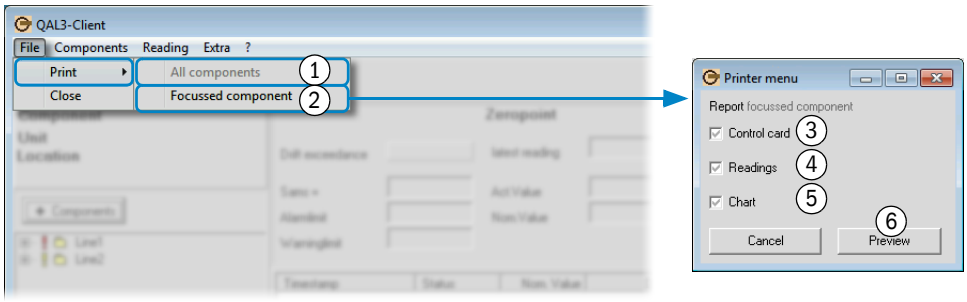
▶ *To use this mode:* Call up Campaign Management (see Fig. 15, page 28).
▶ *To terminate this mode:* Close the mode display.

▶ Use the print function when desired (see “Printing Control Cards/readings”).

Data from previous campaigns cannot be modified.

7.1.3 Printing Control Cards/readings

Fig. 19: Print functions



1	► Print summary for all QAL3 Components for which a campaign is active. [1]
2	Print functions for selected QAL3 Component [2]
3	► Print Control Card for active campaign.
4	► Print readings for active campaign as Table. [1]
5	► Print readings for active campaign as graph.
6	► Start print preview. [3]

[1] Only for evaluation method “Shewhart”.
[2] Only functions when a campaign is running.
[3] Use the print function there to print.

Examples, see “Printed data examples”, page 53.

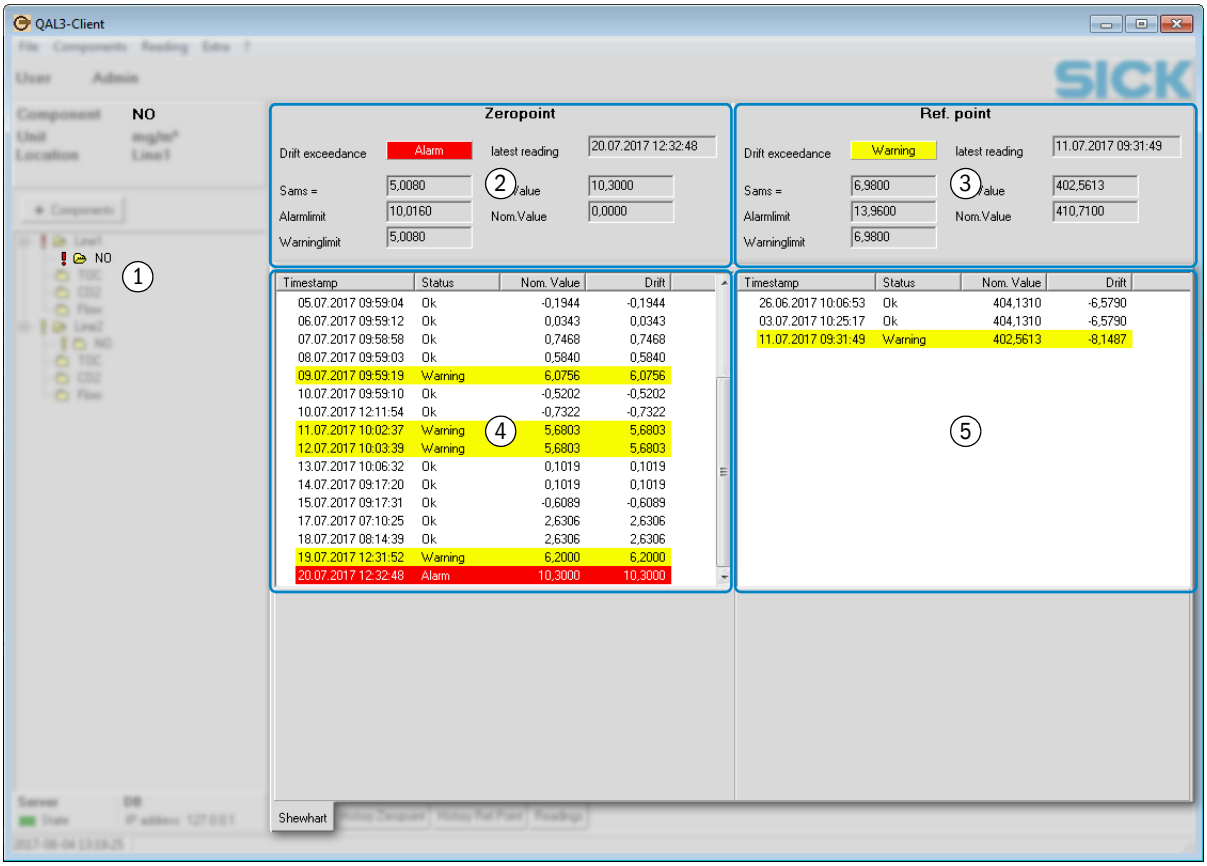
7.2 Using Shewhart functions

Only valid when evaluation method “Shewhart” has been installed.

The functions are valid for the respective active campaign of selected QAL3 Component.

7.2.1 Shewhart: Viewing current Control Cards and readings – tabular

Fig. 20: Shewhart: Control Cards and readings - tabular (with example data)

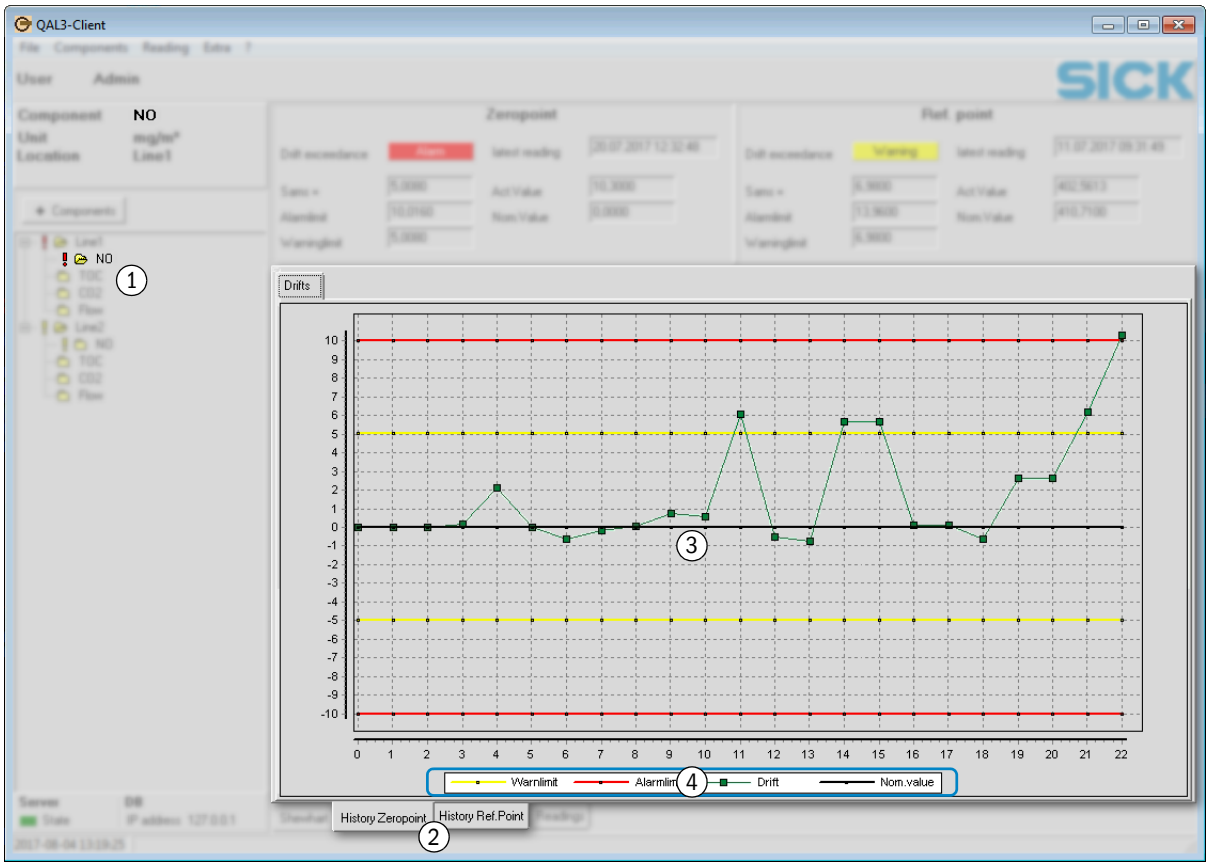


1	▸ Select a QAL3 Component.
2	Control Cards: Current zero point data
3	Control Cards: Current reference point data
4	Readings and calculated drifts: Zero point data
5	Readings and calculated drifts: Reference point data

Printing these values, see “Printing Control Cards/readings”, page 31.

7.2.2 Shewhart: Viewing readings and drift - as graph

Fig. 21: Shewhart: Readings and drift - as graph (with example data)

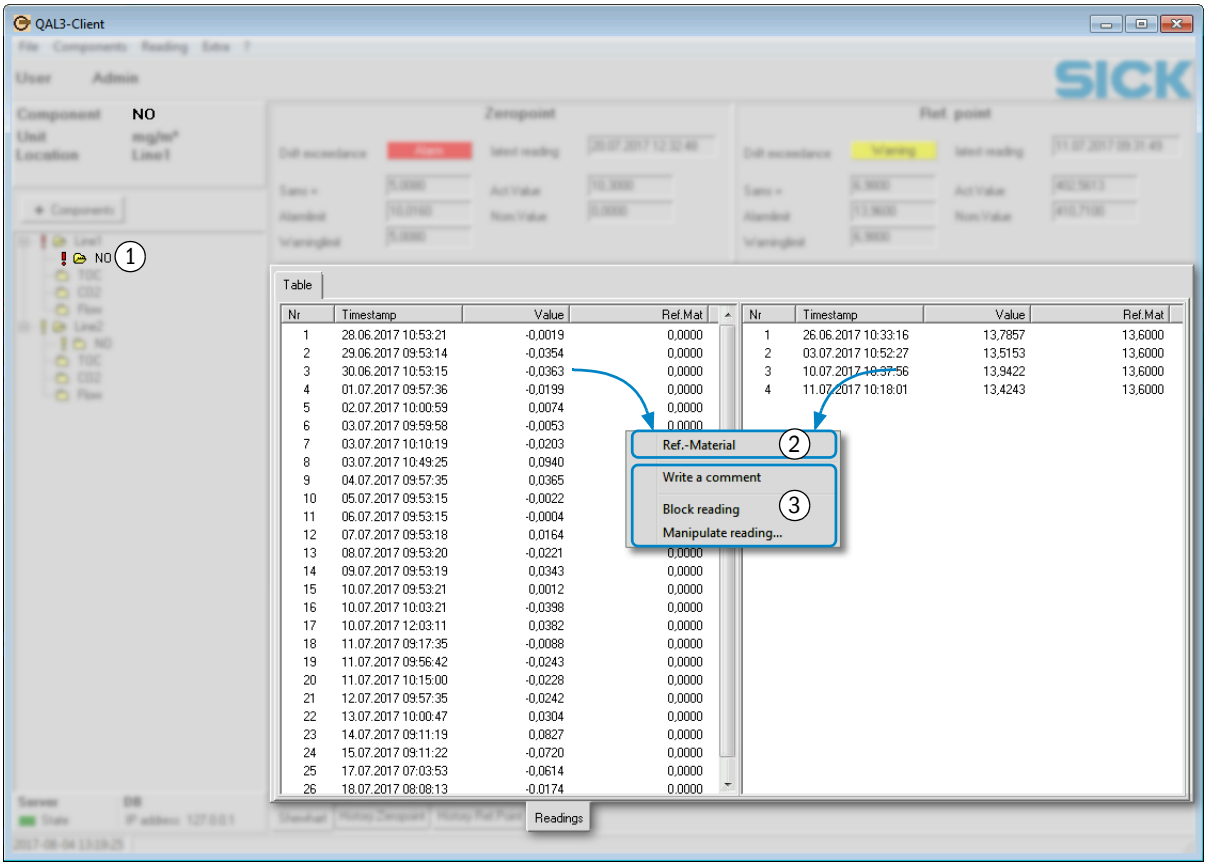


1	► Select a QAL3 Component.
2	► Select Zero or Ref. point.
3	Readings course in active campaign
4	Format explanation

Printing these values, see “Printing Control Cards/readings”, page 31.

7.2.3 Shewhart: Readings, viewing/changing (tabular)

Fig. 22: Shewhart: Viewing readings (with example data)



1	► Select a QAL3 Component.
2	► Change reference material/nominal value (see “Managing reference material/determining nominal values (as required)”, page 44). [1]
3	► Edit marked readings (see “Editing stored readings”, page 41).

[1] *When several readings are marked:* Valid for all marked readings.

Printing displayed values, see “Printing Control Cards/readings”, page 31.

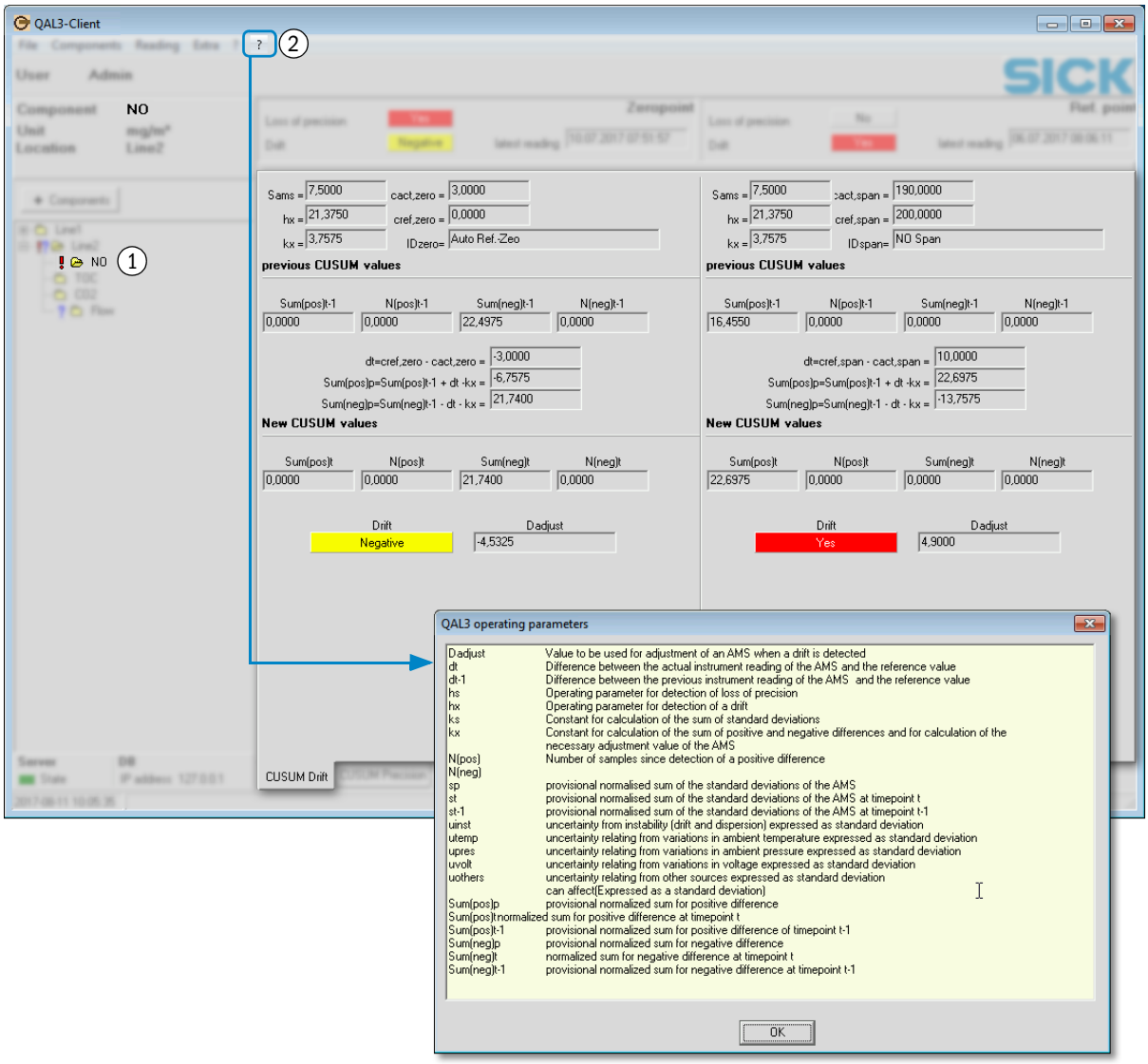
7.3 Using CUSUM functions

Only valid when evaluation method “CUSUM” has been installed.

The functions are valid for the respective active campaign of selected QAL3 Component.

7.3.1 CUSUM: View current drift Control Card

Fig. 23: CUSUM: Control Card for drift (with example data)

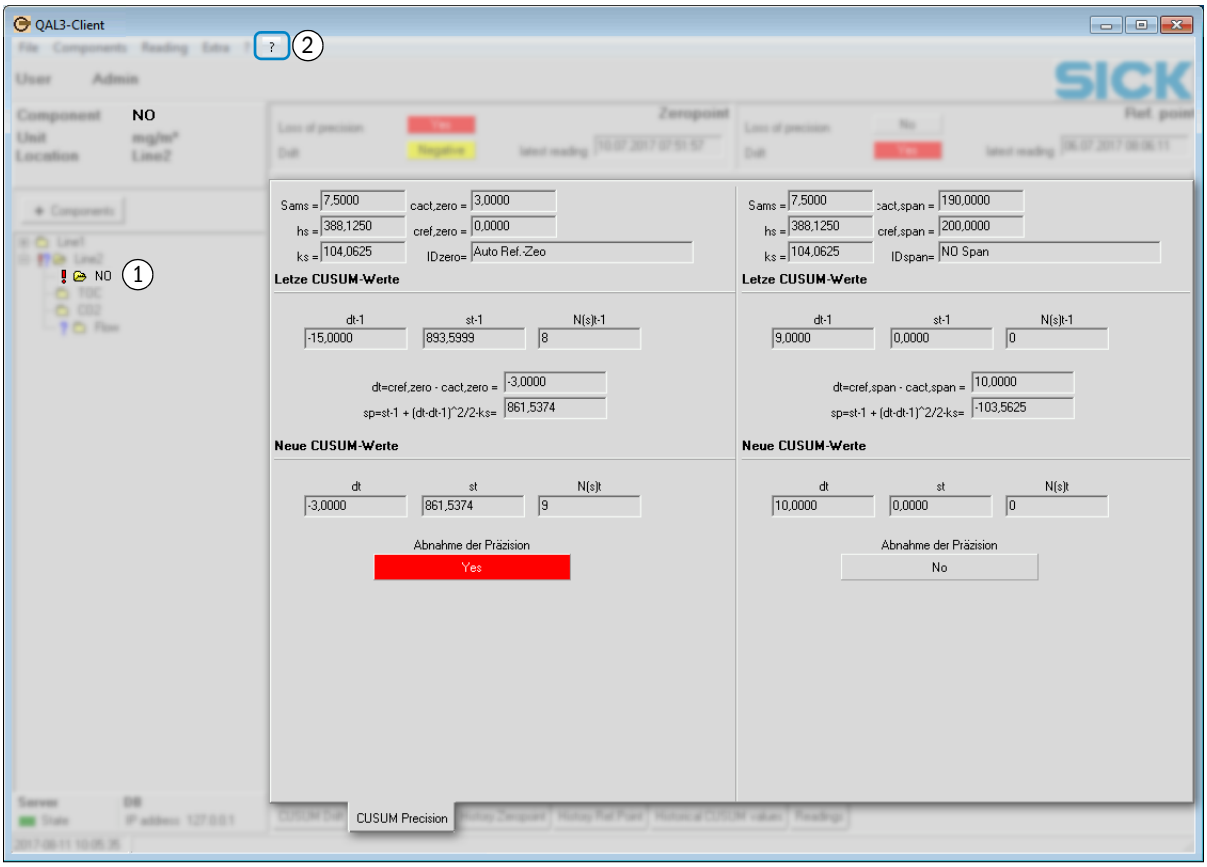


1	► Select a QAL3 Component.
2	► Show character legend.

Printing these values, see “Printing Control Cards/readings”, page 31.

7.3.2 CUSUM: View current precision Control Card

Fig. 24: CUSUM: Control Card for precision (with example data)

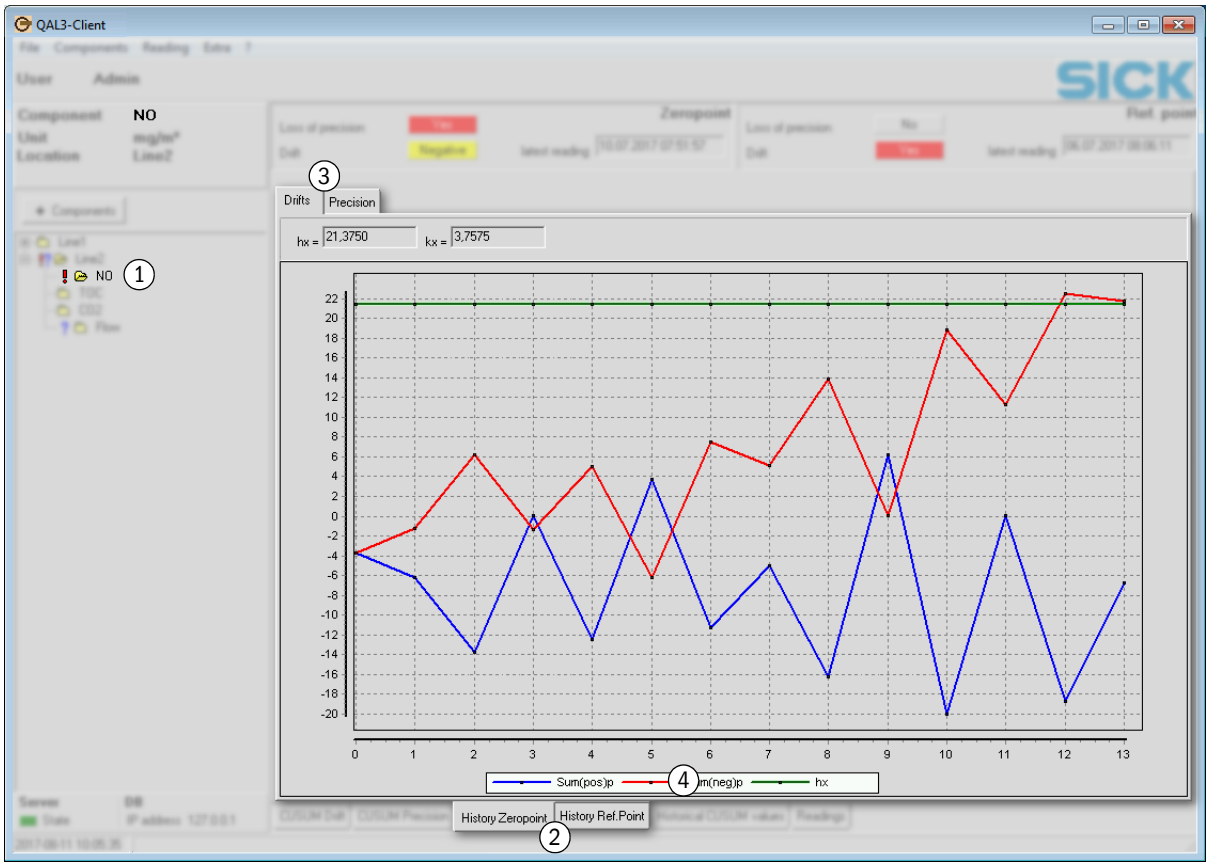


1	► Select a QAL3 Component.
2	► Show character legend.

Printing these values, see “Printing Control Cards/readings”, page 31.

7.3.3 CUSUM: Viewing drift/precision course (as graph)

Fig. 25: CUSUM: Course of drift/precision (with example data)

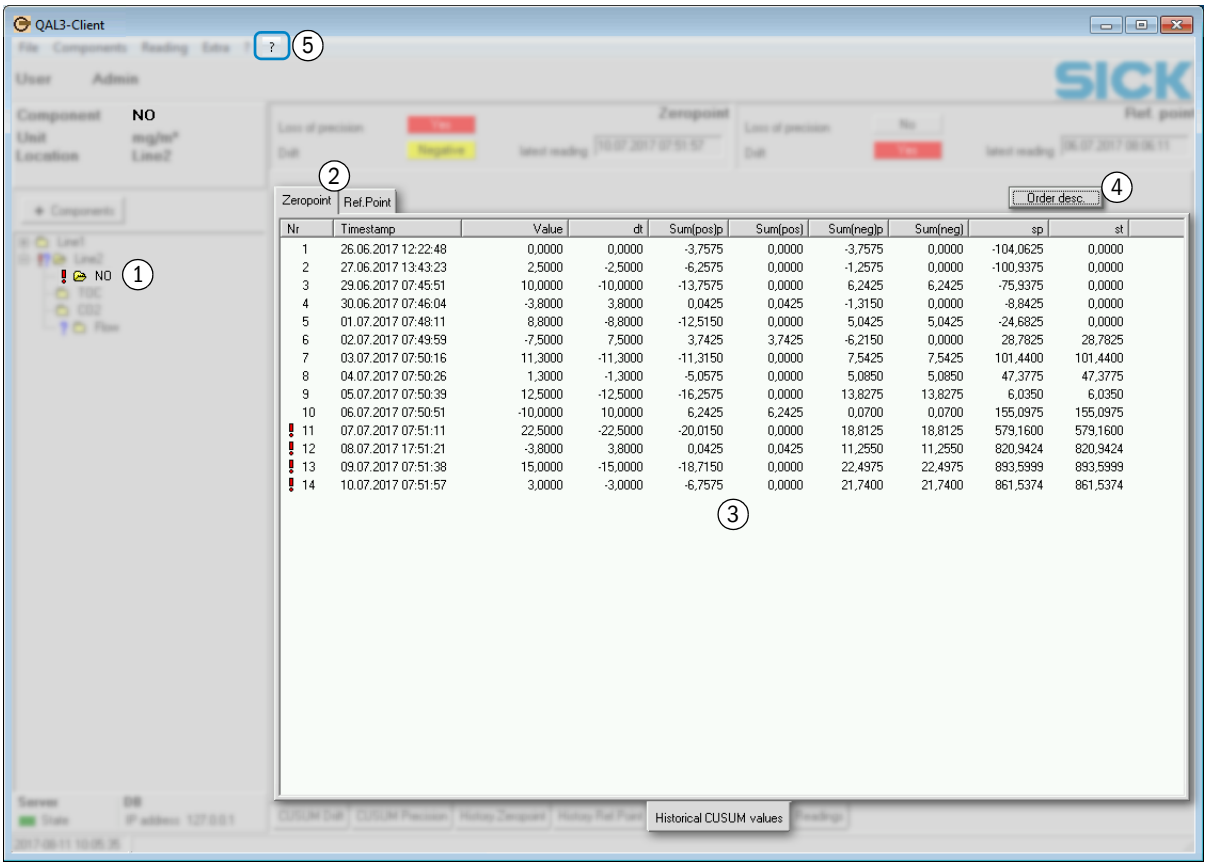


1	► Select a QAL3 Component.
2	► Select Zero or Ref. point.
3	► Select drift or precision.
4	Format explanation

Printing these values, see “Printing Control Cards/readings”, page 31.

7.3.4 CUSUM: Viewing Control Card values

Fig. 26: CUSUM: Control Card values (with example data)



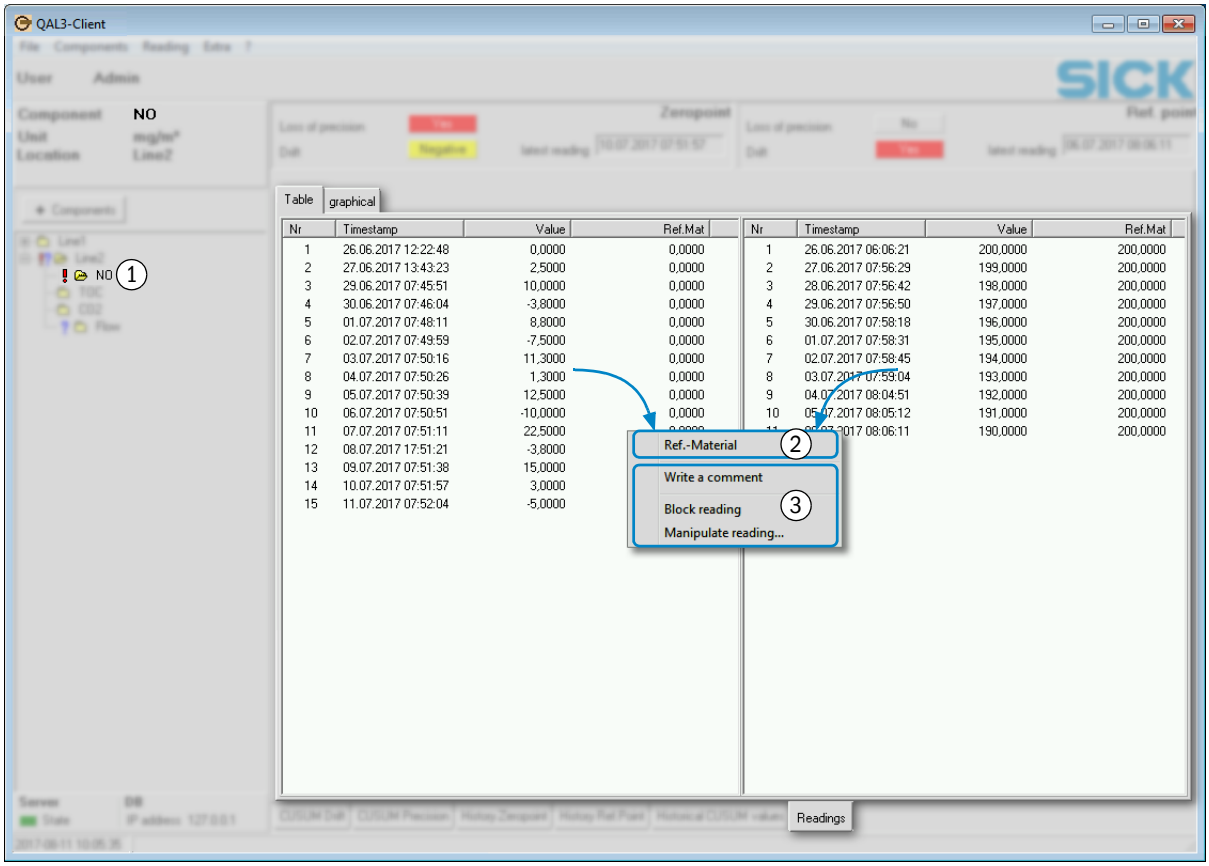
Nr	Timestamp	Value	dt	Sum(pos)p	Sum(pos)	Sum(neg)p	Sum(neg)	sp	st
1	26.06.2017 12:22:48	0,0000	0,0000	-3,7575	0,0000	-3,7575	0,0000	-104,0625	0,0000
2	27.06.2017 13:43:23	2,5000	-2,5000	-6,2575	0,0000	-1,2575	0,0000	-100,9375	0,0000
3	29.06.2017 07:45:51	10,0000	-10,0000	-13,7575	0,0000	6,2425	6,2425	-75,9375	0,0000
4	30.06.2017 07:46:04	-3,8000	3,8000	0,0425	0,0425	-1,3150	0,0000	-8,8425	0,0000
5	01.07.2017 07:48:11	8,8000	-8,8000	-12,5150	0,0000	5,0425	5,0425	-24,6825	0,0000
6	02.07.2017 07:49:59	-7,5000	7,5000	3,7425	3,7425	-6,2150	0,0000	28,7825	28,7825
7	03.07.2017 07:50:16	11,3000	-11,3000	-11,3150	0,0000	7,5425	7,5425	101,4400	101,4400
8	04.07.2017 07:50:26	1,3000	-1,3000	-5,0575	0,0000	5,0850	5,0850	47,3775	47,3775
9	05.07.2017 07:50:39	12,5000	-12,5000	-16,2575	0,0000	13,8275	13,8275	6,0350	6,0350
10	06.07.2017 07:50:51	-10,0000	10,0000	6,2425	6,2425	0,0700	0,0700	155,0975	155,0975
11	07.07.2017 07:51:11	22,5000	-22,5000	-20,0150	0,0000	18,8125	18,8125	579,1600	579,1600
12	08.07.2017 17:51:21	-3,8000	3,8000	0,0425	0,0425	11,2550	11,2550	820,9424	820,9424
13	09.07.2017 07:51:38	15,0000	-15,0000	-18,7150	0,0000	22,4975	22,4975	893,5999	893,5999
14	10.07.2017 07:51:57	3,0000	-3,0000	-6,7575	0,0000	21,7400	21,7400	861,5374	861,5374

3

1	► Select a QAL3 Component.
2	► Select Zero or Ref. point.
3	Control Card values (sorted in chronological sequence)
4	► Reverse sort sequence.
5	► Show character legend (see Fig. 24, page 36).

7.3.5 CUSUM: Viewing/changing readings - tabular

Fig. 27: CUSUM: Readings - tabular (with example data)



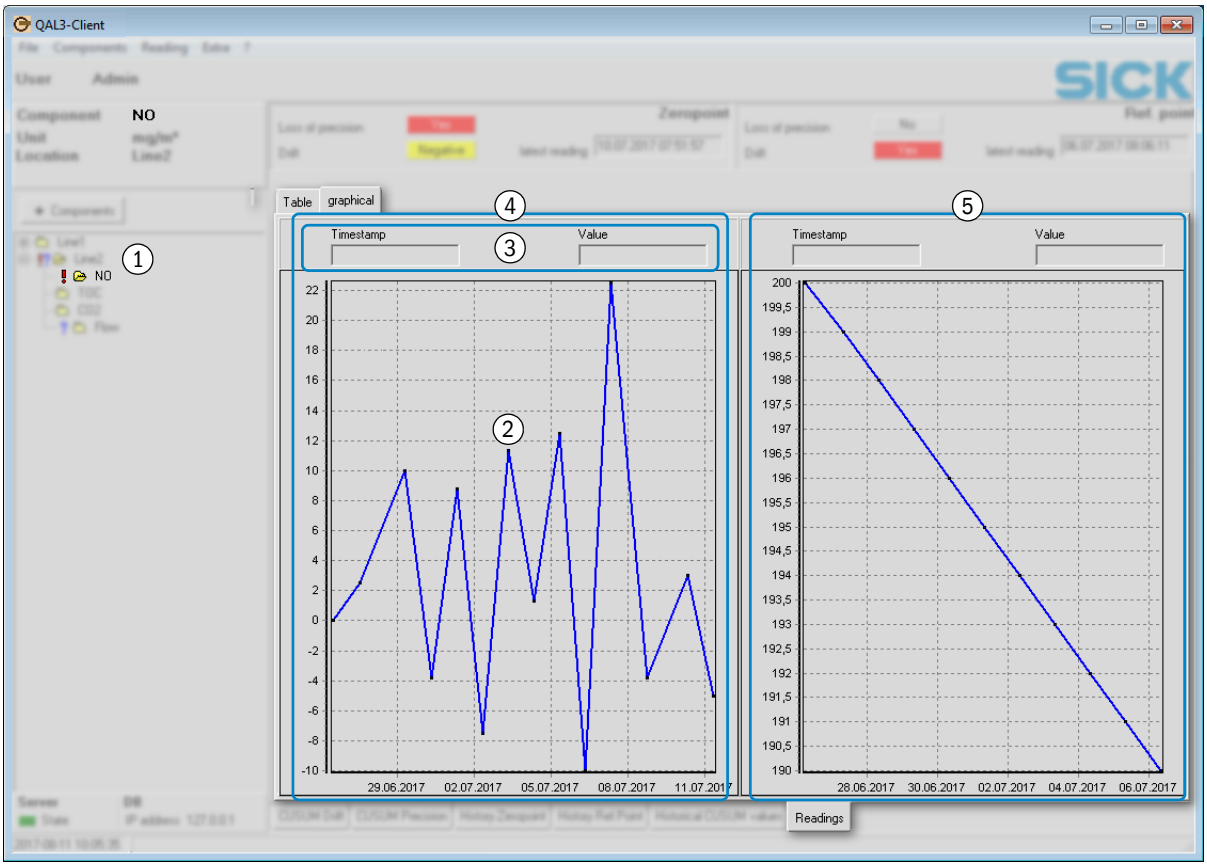
1	► Select a QAL3 Component.
2	► Change reference material/nominal value (see “Managing reference material/determining nominal values (as required)”, page 44). [1]
3	► Edit marked readings (see “Editing stored readings”, page 41).

[1] *When several readings are marked:* Valid for all marked readings.

Printing displayed values, see “Printing Control Cards/readings”, page 31.

7.3.6 CUSUM: Viewing readings - as graph

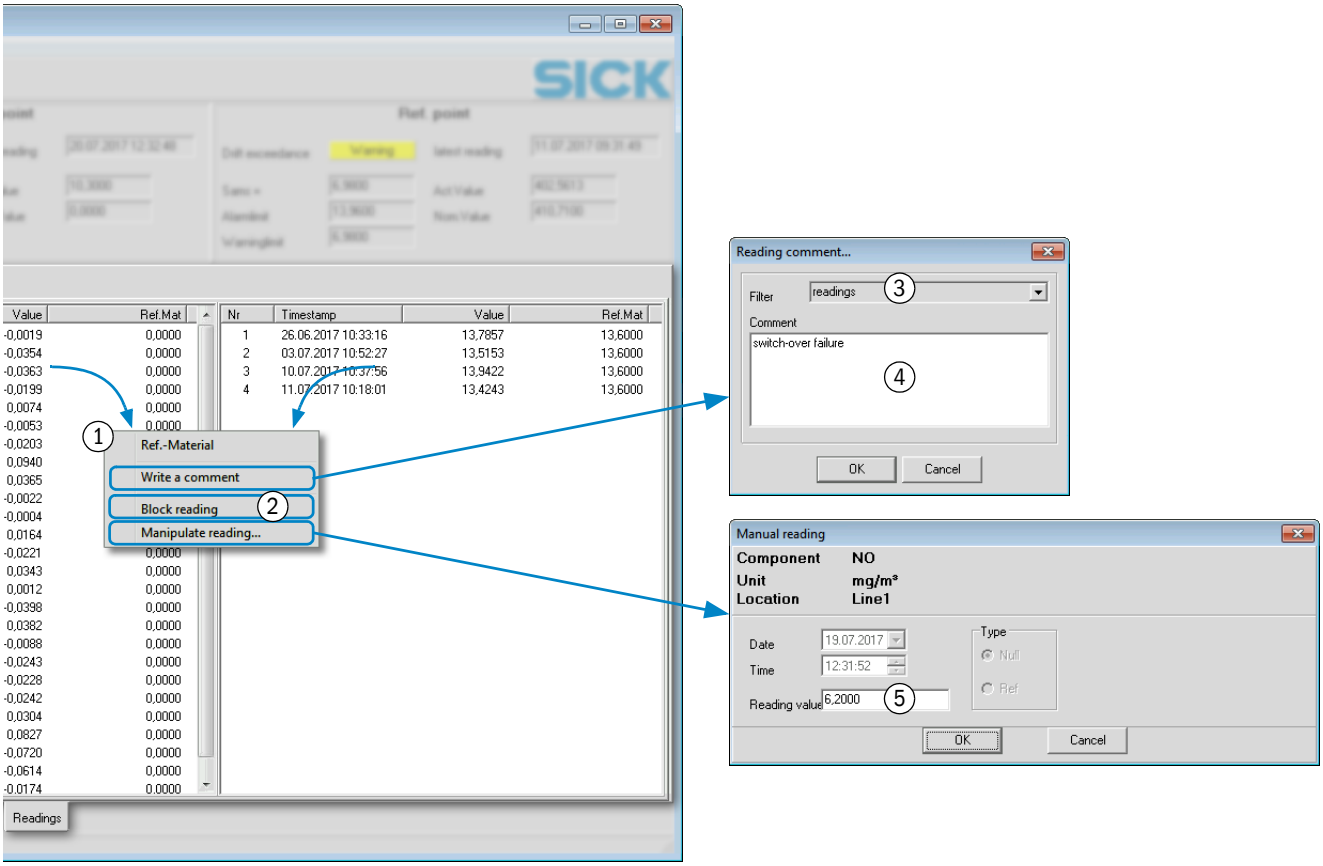
Fig. 28: CUSUM: Viewing readings - as graph (with example data)



1	► Select a QAL3 Component.
2	Course in current campaign
	► *To mark a timepoint:* Drag the time cursor with the mouse.
3	Data at marked timepoint
4	Data for zero point
5	Reference point data

7.4 Editing stored readings

Fig. 29: Changing/commenting a reading (with example data)



To exclude or re-include readings in QAL3 processing:	
1	► Mark at least one reading. ► Call up the Context menu (right mouse button).
2	► Select block reading or manipulate reading. [1]

[1] All following readings in the current campaign are then re-evaluated. The action is effective for all marked readings when several readings are marked.

To enter a comment for a reading:	
1	► Call up the Context menu for a reading (right mouse button).
3	► *If desired:* Select a keyword. [1]
4	► Enter the new comment text.

[1] Explanation see “Viewing/commenting the Maintenance Manual (protocol)”, page 46.

To modify a reading value:	
1	► Call up the Context menu for the reading concerned (right mouse button).
5	► Enter the new value.

7.5 Using semi-automatic readings

Only valid when QAL3 Master runs in a scenario with semi-automatic readings (see "Guideline: Connecting the analyzers", page 16).

7.5.1 How semi-automatic readings function

Semi-automatic readings are used when reference measurement results cannot be retrieved as digital values via Modbus. The reference measurement course is recorded instead.

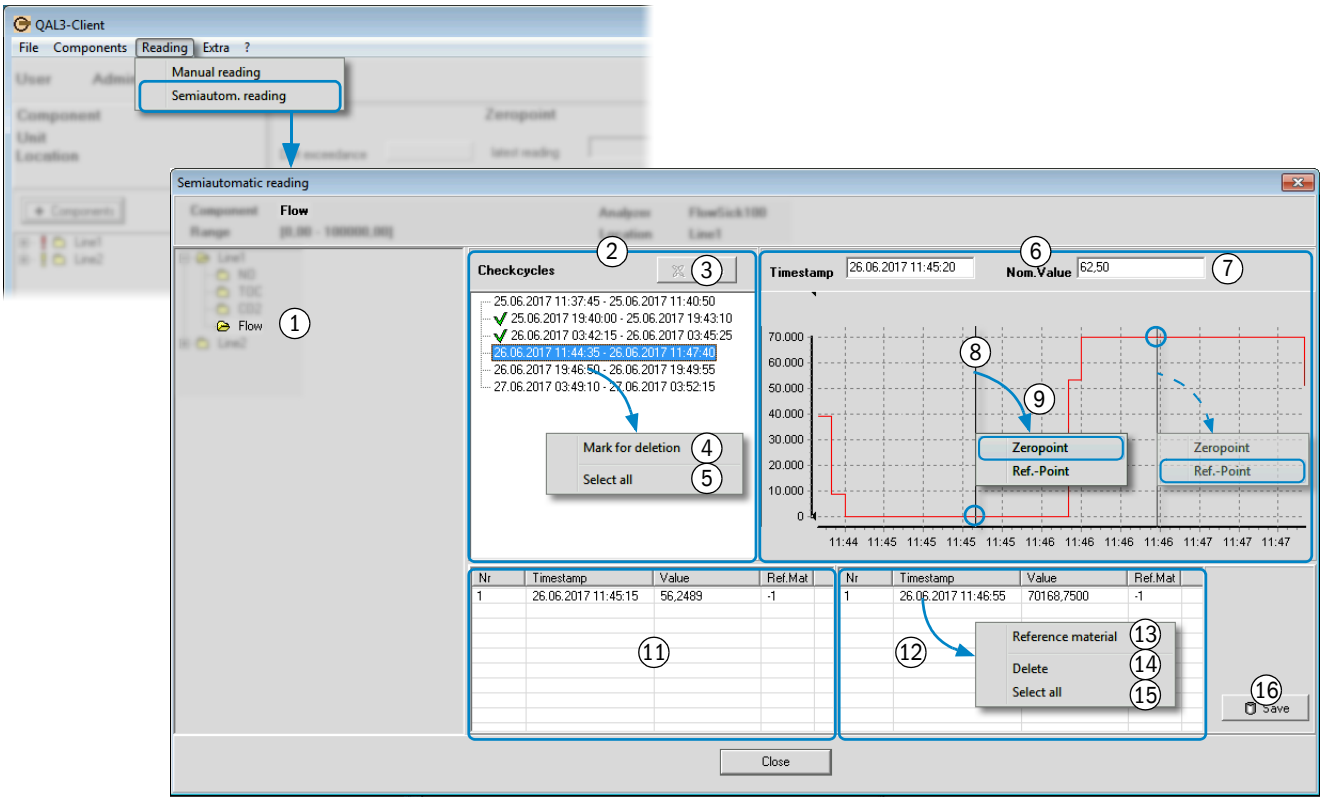
An analyzer must signal status "Reference measurement running". The MEAC system records the course of the measured values as long as this status is active. These data are transferred into the QAL3 Database.

A user must then call up these data in QAL3 Client and mark the timepoint in the graph at which the measured value is to serve as an actual value. This must be normally done for each of the zero point and reference point.

This work is principally required (for each QAL3 Component) when a new reference measurement has been carried out. The user must decide how often readings should be determined using this method.

7.5.2 Evaluating semi-automatic readings

Fig. 30: Semi-automatic reading (with example data)



1	► Select a QAL3 Component.

2	List of stored reference measurements (calibration cycles) [1]
	No marking: No value has been selected yet from this reference measurement. *Green marking:* A value has been selected from this reference measurement. *Red marking:* Marked for deletion.
3	► Delete reference measurements marked for deletion.
4	► Mark for deletion.
5	► Mark all.

[1] Setting option, see “Additional functions”, page 27.

6	Measured value course of selected reference measurement
7	Data at marked timepoint
8	► *To select reading timepoint:* Drag the time cursor with the mouse.
9	*To create a reading at marked timepoint:* ► Call up the Context menu (right mouse button). ► Select Zero or Ref. point.

11	Selected actual value for zero point
12	Selected actual value for reference point
13	► Select reference material/nominal for marked reference measurement.
14	► Delete marked reference measurement.
15	► Mark all reference measurements in this list.

16	► Save the status shown.

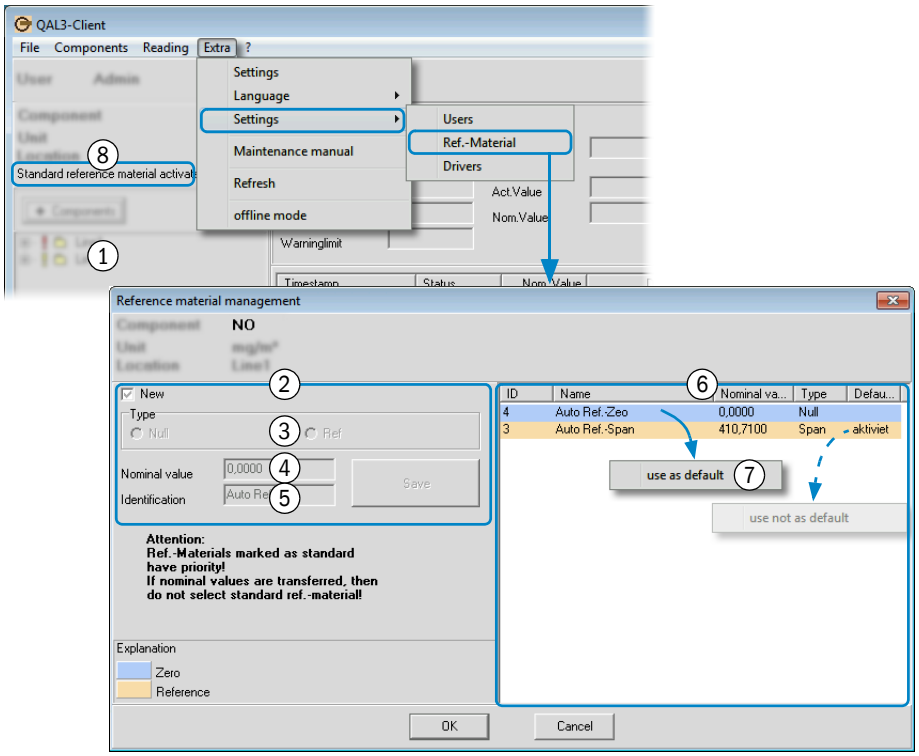
Stored evaluations cannot be modified. Evaluated reference measurements no longer appear in the list of reference measurements.

7.6 Managing reference material/determining nominal values (as required)

When readings for a QAL3 Component do not include nominal values:

▶ Define the reference materials for zero point and reference point for this QAL3 Component (see Fig. 31).

Fig. 31: Menu for reference materials (with example data)



1	▶ Select a QAL3 Component.
2	▶ *If required:* Set up a new reference material.
3	▶ Specify if the new reference material is valid for the zero or reference point.
4	▶ Enter nominal value for new reference material.
5	▶ Enter desired name for new reference material.
6	List of reference materials stored for this QAL3 Component [1]
7	▶ *If required:* Use this reference material as standard reference material for all readings of this QAL3 Component (nominal value for zero or reference point). [2]
8	Status display for QAL3 Component when a standard reference material is activated

[1] Stored reference material cannot be modified.
[2] Status display in this list: “Activated”.

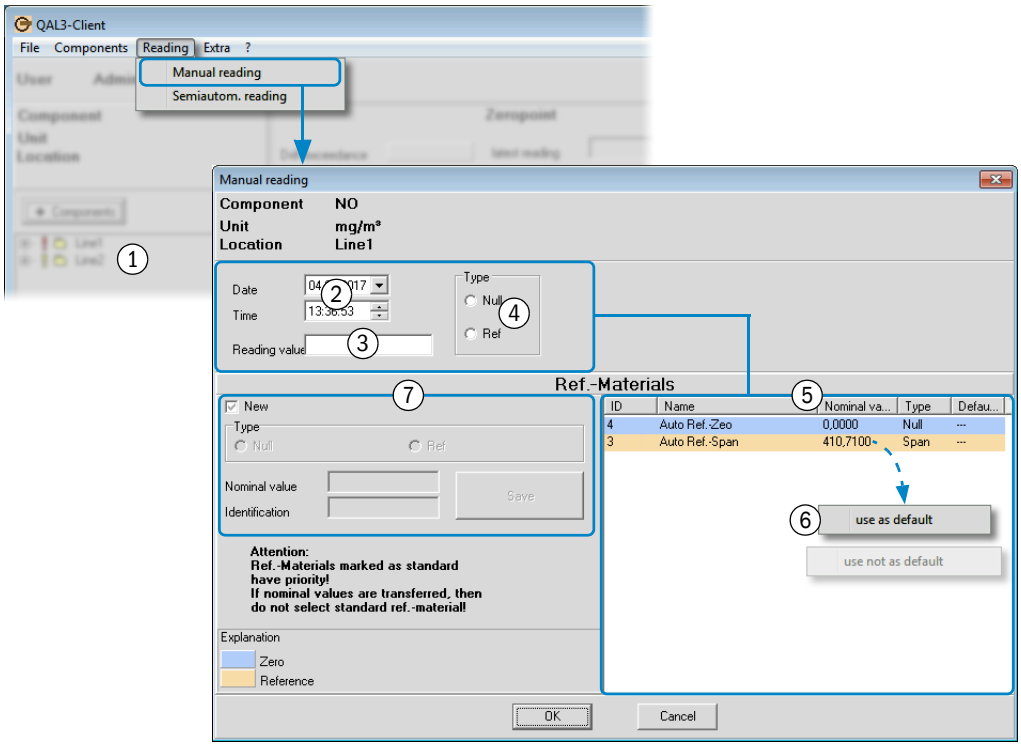
NOTE: Consequences of a standard reference material

- When a standard reference material is activated, this reference material is used for all new QAL3 evaluations in the active campaign of the associated QAL3 Component. This is also valid when a different reference material or nominal value is specified in the original readings.
- The standard reference material is also used retroactively when all readings of the active campaign are re-evaluated. This can occur, for example, when readings of the active campaign are blocked or released.

7.7 Manual entry of readings

Manual entry of readings is also possible. This is also valid when readings are imported fully automatic or semi-automatic.

Fig. 32: Manual reading (with example data)



1	► Select a QAL3 Component.
2	► Enter timepoint at which this reading is valid. (*Standard value:* Current time.)
3	► Enter the actual value.
4	► Specify if reading valid for zero or reference point.
5	► Select reference material for reading.
6	► *If required:* Define standard reference material.
7	► *If required:* Set up a new reference material.

Consequences of a standard reference material, see “Managing reference material/ determining nominal values (as required)”, page 44.

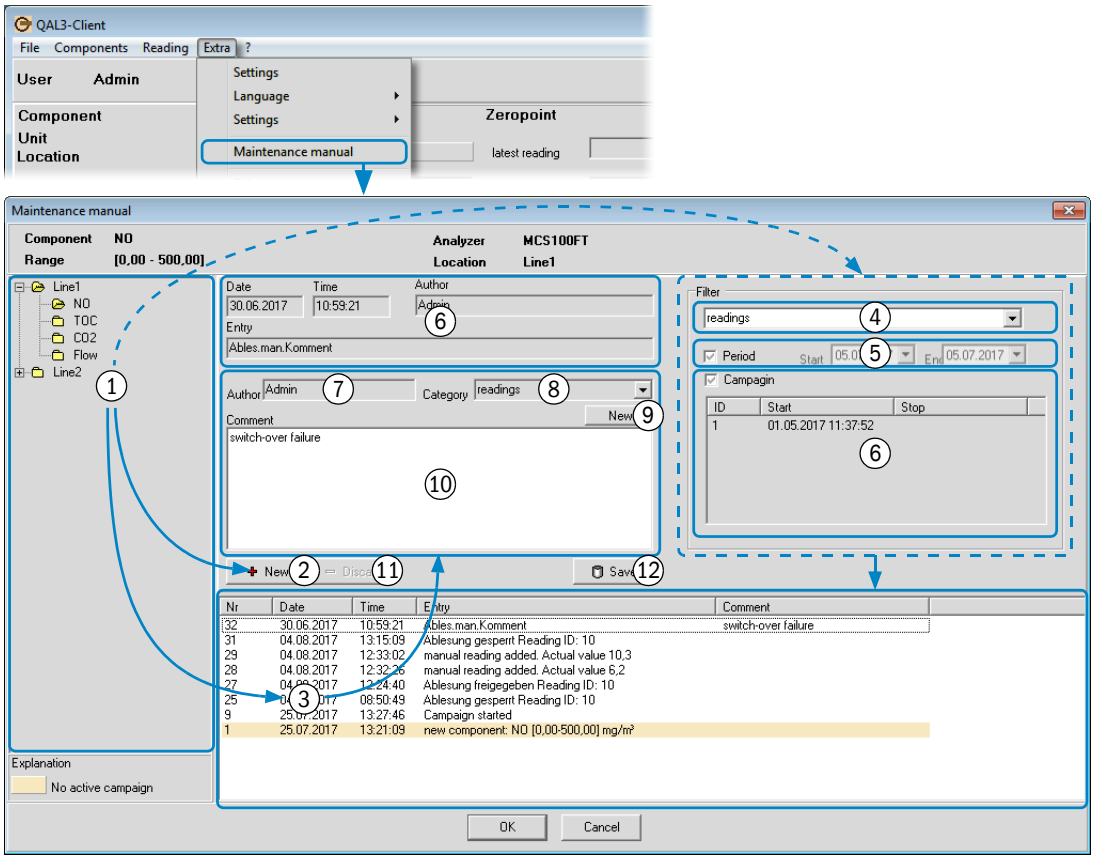
8 Maintenance functions

8.1 Viewing/commenting the Maintenance Manual (protocol)

QAL3 Master records all user actions automatically - without time limit and separately for each QAL3 Component.

- A comment can be entered for each protocol entry. Comments can have a keyword (“Category”). Keywords can be used as filter criteria.
- Comments can also be added as independent protocol entries.

Fig. 33: Function “Maintenance Manual” (with example data)



1	► Select a QAL3 Component.
2	► *To write a new comment as additional protocol entry:* Click here.
3	► *To add or change a comment for an existing protocol entry:* Mark the protocol entry involved (mouse click)
4	► Restrict list [3] to entries containing the selected keyword (category).
5	► Restrict list [3] to the time period entered.
6	► Restrict list [3] to the selected campaign.
6	Date of marked protocol entry
7	Current user (automatically author of new/changed comment)
8	► Select keyword for marked protocol entry.
9	► Create new keyword.
10	Comment text for marked protocol entry ► Enter the new comment text here or change the existing comment text.
11	► Discard changes.
12	► Save changes.

8.2 Backing up data

8.2.1 Using Backup functions

The QAL3 Master Backup functions access the QAL3 Database. All QAL3 data and all program configuration settings are contained therein. The program modules are not saved during a backup.

The QAL3 Master Installation program can be used to replace a damaged QAL3 Database by a backup or to use a saved QAL3 database during a new installation.

Recommendation:
- ▶ Perform regular QAL3 Database backups.
- ▶ Configure automatic backups.

Requirement for Backup functions:
The PC on which the QAL3 Database is installed must be in operation.

8.2.2 Starting a manual backup

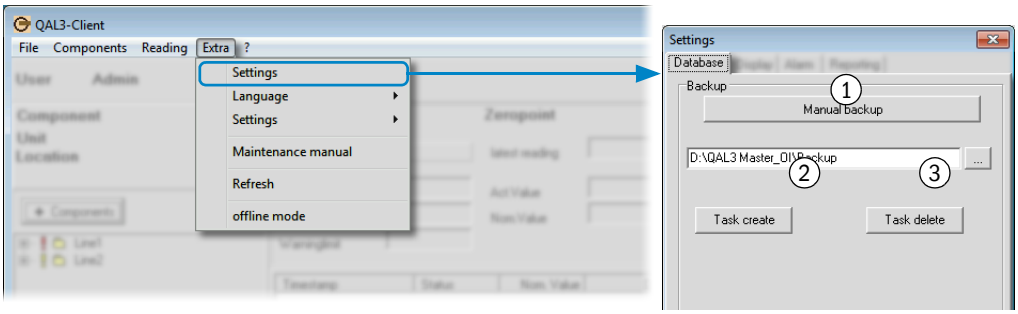
1 Start a manual Backup (see Fig. 34).
2 Enter the folder path in which the backup is to be stored.

8.2.3 Configuring automatic backups

- ▶ *To be able to configure automatic backups:* Start a QAL3 Client with Administrator rights on the PC on which QAL3 Database is installed.

1 Call up Backup function “Task create” (see Fig. 34).
2 To create a backup control task in the Windows Task Scheduler:
  – Enter the folder path in which the backup is to be stored.
  – Set the desired task time settings.

Fig. 34: Backup functions



1	▶ Start a manual backup.
2	▶ Call up the Windows Task Scheduler to configure automatic backups.
3	▶ Delete the task configured for automatic backups.

8.2.4 Restoring a backup

1 Start the QAL3 Master Installation program on the PC on which QAL3 Database is installed (see “Installing the QAL3 Master”, page 14).
2 Select “Import QAL Database”.

The backups do not include the configuration for automatic backups.
- ▶ Recreate the configuration for automatic backups separately when necessary.

9 Troubleshooting

9.1 Errors during QAL3 evaluation

9.1.1 A warning/alarm display is not correct

Possible cause	Corrective measures	Notes for Service
Warning and alarm limits are not correct for active campaign.	*Shewhart:* ► *Incorrect warning limit:* Correct while active campaign is running. ► *Incorrect alarm limit:* Terminate active campaign. Start a new campaign with corrected alarm limit.	► Check stored readings: Exceptions? Discrepancies?
	CUSUM: ► Terminate active campaign. ► Start a new campaign. Recalculate CUSUM parameters when starting.	

9.1.2 Some QAL3 values are clearly wrong

Possible cause	Corrective measures	Notes for service
Mapping not correct.	Check/correct mapping (see “Configuring Mapping (assigning data sources)”, page 24).	
Incorrect Modbus register specified.	► Check/correct (in “Universal Modbus” Configuration program).	► Analyze Modbus registers and data types.
Incorrect reference material specified.	► Check/correct reference material (for QAL3 Component involved) (see “Managing reference material/determining nominal values (as required)”, page 44).	► View actual and nominal values in previous readings.
If readings entered manually: Entries were (partially) incorrect.	► *If correct values are known:* Correct the reading. ► *Otherwise:* Block the reading involved. → see “Editing stored readings”, page 41.	
For semi-automatic readings: Zero point and reference point swapped for some readings.	► Block incorrect readings. ► Replace these readings with manual entries.	

9.1.3 Connection to QAL3 Database not present

Possible cause	Corrective measures	Notes for service
Incorrect IP address of the PC on which QAL3 Database is running specified in QAL3 Master.	► Check and correct the IP address (see “Starting the program (QAL3 Client)”, page 19).	► Use static IP address or host name.
For dynamic IP addresses: IP address changed.		
Incorrect internal name of QAL3 Database used specified in QAL3 Master.	► Check and correct name of QAL3 Database used (see “Starting the program (QAL3 Client)”, page 19).	
There is a general problem in the network.	► Check all devices belonging to the QAL3 Network are in operation. ► Check hardware connections (plug connections, cables, switches). ► Check if other network malfunctions exist.	► Check that the PC on which QAL3 Database is running is generally accessible in the network.
Incorrect port specified in QAL3 Master.	► Check and correct the IP port (see “Starting the program (QAL3 Client)”, page 19).	
Specified IP port not released.	► Check IP port/arrange IP port release.	► Check ports, e.g., with “Telnet”.
Network connection blocked in a firewall.	► Release all QAL3 Master program modules in the firewall.	

9.2 Malfunctions in program functions

9.2.1 Printing not functioning

Possible cause	Corrective measures	Notes for service
Printer used not ready.	► Visually check current operating state of printer used.	► Check current/temporary blocks/authorizations.
Connection to printer interrupted.	► Check hardware connections (plug connections, cables, switches).	
If printer is connected via network: Printer not accessible or blocked.	► Check if other network malfunctions currently exist.	► Check printer is generally accessible in the network.

9.2.2 E-mail alarm not functioning

Possible cause	Corrective measures	Notes for service
Incorrect E-mail Server connection configuration.	► Check/correct (see “Activating e-mail alarms”, page 25).	
Incorrect e-mail address (receiver address).	► Check/correct (see “Setting up/managing users”, page 20).	
QAL3 Server not running.		
Alarm driver not running.		
E-mail Server not in operation.	► Check for temporary Server restrictions.	

9.2.3 Backup not functioning

Possible cause	Corrective measures	Notes for service
Connection to storage medium on which backups are to be stored is interrupted.	► Check electrical connection. ► Check storage medium is recognized by Windows.	
Insufficient free storage capacity on storage medium on which backups are to be stored.	► Check storage medium status. ► Check if older backups can be deleted.	
Program “MySQLDump.exe” missing in the folder in which QAL3 Database is installed.	► Reinstall MariaDB Server.	
Automatic backups: Task deleted by mistake.	► Reconfigure automatic backups.	
The PC on which QAL3 Database is installed is/was not in operation.	► Check.	

10 Shutting down/interrupting operation

10.1 Information on interrupting program operation

- Automatic E-mail alarm (option) only functions when at least one -“QAL3 Client” is running.
- Automatic processing of QAL3 Data (store new data in QAL3 Database and calculate QAL3 Values) only functions when program module “QAL3 Server” and the QAL3 Drivers which transfer automatic readings to QAL3 Database are running.
- After program operation has been interrupted, readings not transferred during the interruption are subsequently automatically retrieved by QAL3 Master. This only functions for readings that remain stored in the analyzers or MEAC system during the interruption.

Some current readings could be lost when the interruption in program operation exists for a long time.
This is not the case when all readings are stored in a MEAC system.

QAL3 Data continue to be stored in a running MEAC system when the MEAC driver does not run temporarily. The QAL3 Data are then transferred to QAL3 Database when the MEAC driver is running again.

10.2 Preparing to interrupt program operation

▶ Make a backup (see “Starting a manual backup”, page 47).

10.3 Checking/clearing data gaps

After an interruption in program operation:

▶ Call up the list of readings and check if any are missing based on the timestamp.

If readings are missing:

▶ Check whether data for missing readings can be determined (e.g., visually on the analyzers). *If this is the case:* Enter missing readings (see “Manual entry of readings”, page 45).

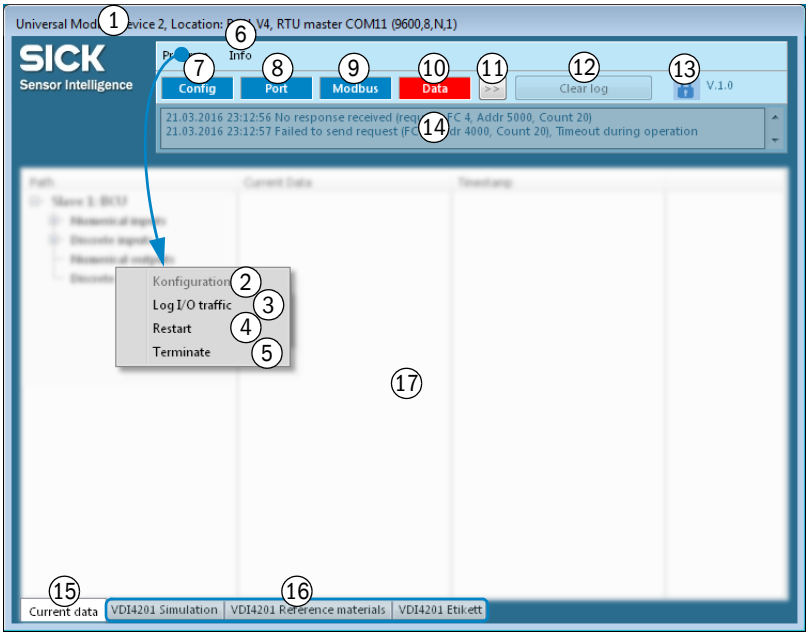
All user actions are automatically recorded (see “Viewing/commenting the Maintenance Manual (protocol)”, page 46).

11 Using the “UniversalModbus” software

11.1 Modbus program window: Operating functions

- The Modbus program window is displayed permanently when the -“Universal Modbus” software or MEAC Add-on “MEAC Universal Modbus” is running.
- The Modbus program window is applicable for just one Modbus variant. Several Modbus program windows exist when several Modbus variants run at the same time.

Fig. 35: Modbus program window: Operating functions



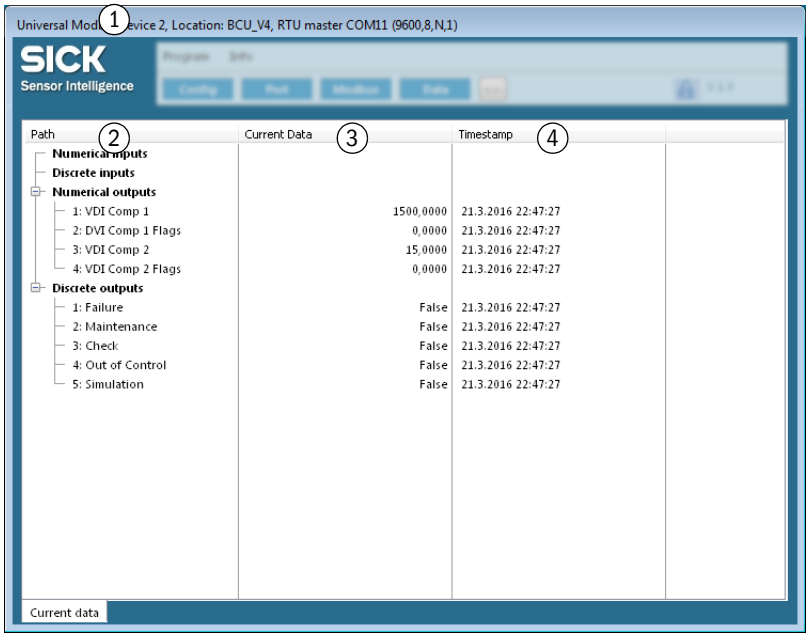
1	Modbus variant identification
2	► Call up configuration functions for this Universal Modbus variant. [1]
3	► Record data transfers of this Modbus variant. [2][3]
4	► Terminate and restart data transfer of this Universal Modbus variant.
5	► Terminate this Modbus variant.
6	► Call up information on Universal Modbus.
7	Status display for Modbus configuration [4]
8	Status display for hardware interfaces used [4]
9	Status display for Modbus data transfer [4]
10	Status display for values transferred [4]
11	► Activate/deactivate display of Log messages (14). [5]
12	► Clear the Log. [5]
13	Symbol for current user access rights [6]
14	Log messages
15	Standard function
16	Special functions for Guideline VDI 4201 [7]
17	Lists and display depending on function selected

[1] Not present on a PC with MEAC300. In this case, call up the corresponding configuration function in MEAC300 (description, see “Technical Information MEAC300 Add-ons”).
[2] In text file <Installationsordner>\log\MBxx.log (xx = Modbus variant number in Interface list).
[3] Only available with extended access rights (see [13]).
[4] BLUE = operating state. RED = Modbus operation is possibly interrupted.
[5] Only available with the highest access rights (Supervisor).
[6] “Open padlock”” = the logged in user has the extended access rights for the Modbus operating functions.
[7] Only when corresponding program configuration present.

11.2 Modbus program window: Modbus Status

▶ Select the tab for current data in the Modbus window.

Fig. 36: Modbus program window: Current data (example)



1	Modbus variant identification
2	Configured Modbus inputs and outputs of this Modbus variant
3	Last values transferred
4	Timestamp of last values transferred

12 Printed data examples

12.1 Printed Control Cards

Fig. 37: Printed Shewhart Control Card (example)

Shewhart - Control card (EN14181)

AMS-Type	MCS100FT
Manufacturer:	SICK
Component	NO
Location	Line1
Unit	mg/m³
Range:	0 - 500
Campaign Start:	01.05.2017 11:37:52

Zeropoint		Ref.point	
Sams	5,0080	Sams	6,9800
Nom.value	0,0000	Nom.value	410,7100
Act.value	10,3000	Act.value	402,5613
Drift	10,3000	Drift	-8,1487
Test:	**Warning limit**		
|Drift| >	5,0080 ?	|Drift| >	6,9800 ?
Test results:	**Warn. limit exceedance**	**Test results:**	**Warn. limit exceedance**
Test:	**Alarm limit**		
|Drift| >	10,0160 ?	|Drift| >	13,9600 ?
Test results:	**Alarm limit exceedance**	**Test results:**	**No exceedance**

Date

Technician

Signature

Date 04.08.2017 1 / 3

Fig. 38: Printed CUSUM Control Card (example)

QAL3 Ref. Point: Line2 NO

SICK

Active campaign (start on: 26.06.2017 10:48:01)

NR	Timestamp	Value	Drift	Sum(pos)p	Sum(pos)	Sum(neg)p	Sum(neg)	SP	ST
0	27.06.2017 07:56:29	199,0000	1,0000	-2,7575	0,0000	-4,7575	0,0000	-103,5625	0,0000
0	28.06.2017 07:56:42	198,0000	2,0000	-1,7575	0,0000	-5,7575	0,0000	-103,5625	0,0000
0	29.06.2017 07:56:50	197,0000	3,0000	-0,7575	0,0000	-6,7575	0,0000	-103,5625	0,0000
0	30.06.2017 07:58:18	196,0000	4,0000	0,2425	0,2425	-7,7575	0,0000	-103,5625	0,0000
0	01.07.2017 07:58:31	195,0000	5,0000	1,4850	1,4850	-8,7575	0,0000	-103,5625	0,0000
0	02.07.2017 07:58:45	194,0000	6,0000	3,7275	3,7275	-9,7575	0,0000	-103,5625	0,0000
0	03.07.2017 07:59:04	193,0000	7,0000	6,9700	6,9700	-10,7575	0,0000	-103,5625	0,0000
0	04.07.2017 08:04:51	192,0000	8,0000	11,2125	11,2125	-11,7575	0,0000	-103,5625	0,0000
0	05.07.2017 08:05:12	191,0000	9,0000	16,4550	16,4550	-12,7575	0,0000	-103,5625	0,0000
0	06.07.2017 08:06:11	190,0000	10,0000	22,6975	22,6975	-13,7575	0,0000	-103,5625	0,0000

Date: 11.08.2017 10:07:47 3 / 4

12.2 Printed course of readings as graph

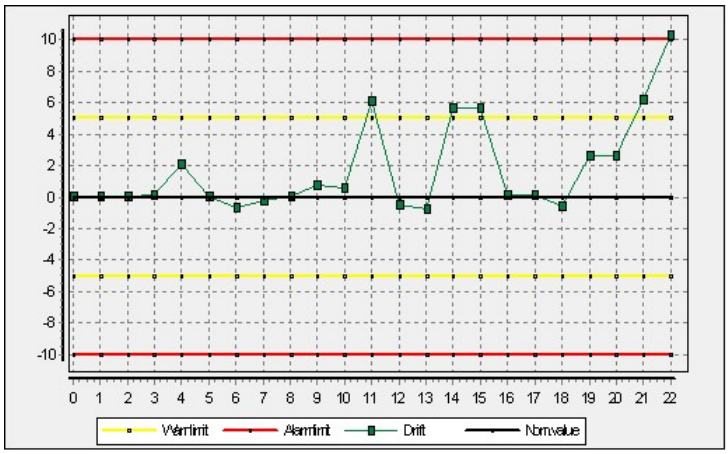
Fig. 39: Readings of a Shewhart campaign as printed graph (example)

Diagram

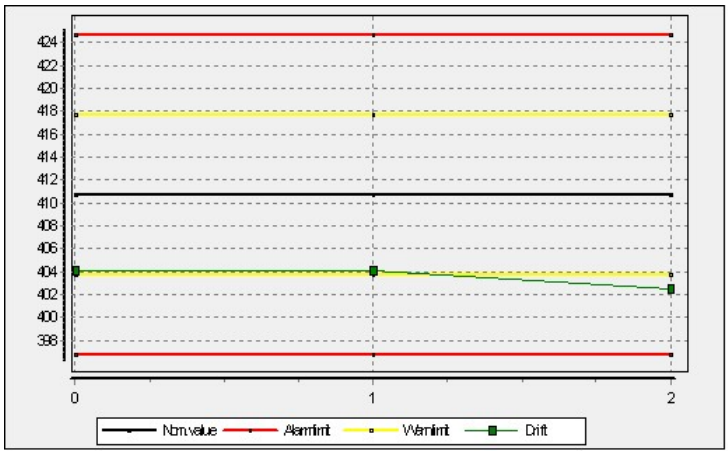
SICK

Component NO

Zeropoint



Ref.point

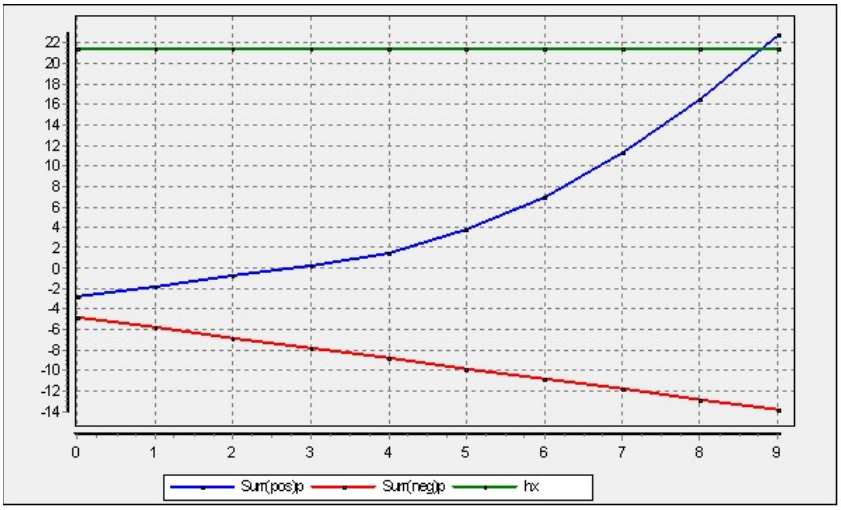


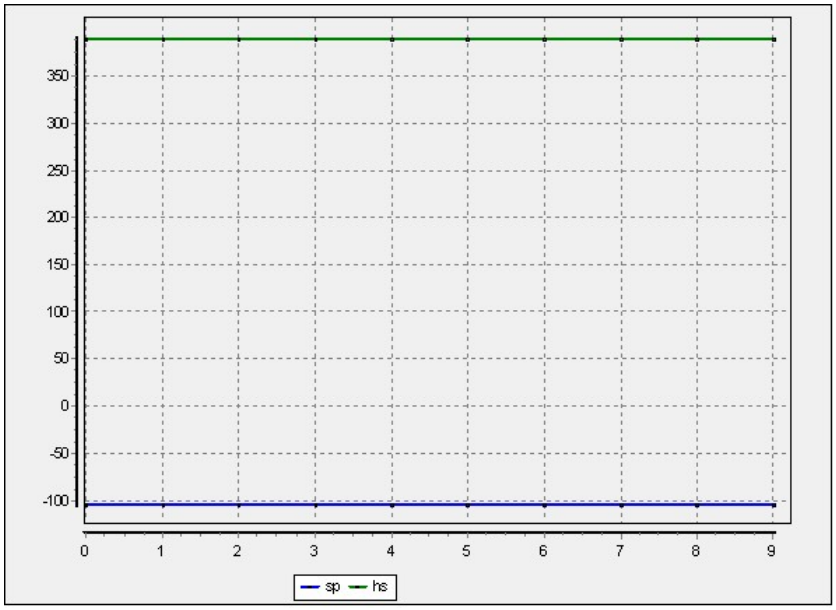
Date 04.08.2017 2 / 3

Fig. 40: Readings of a CUSUM campaign as printed graph (example)

QAL3 Ref. Point: Line2 NO

Active campaign (start on: 26.06.2017 10:48:01)





Date: 11.08.2017 10:07:47 4 / 4

12.3 Printed Readings Table

Fig. 41: Readings of a Shewhart campaign as Table (example)

Overview Readings

SICK

Component	NO	Location	Line1
Campaign	01.05.2017 11:37:52		

Zeropoint

Reading date	Status	Act.Value	Drift
27.06.2017 10:59:27	ok	0,0097	0,0097
28.06.2017 10:59:28	ok	0,0097	0,0097
29.06.2017 09:59:07	ok	0,0097	0,0097
01.07.2017 10:03:35	ok	0,1683	0,1683
02.07.2017 10:07:04	ok	2,1144	2,1144
03.07.2017 10:06:08	ok	0,0175	0,0175
04.07.2017 10:03:28	ok	-0,6165	-0,6165
05.07.2017 09:59:04	ok	-0,1944	-0,1944
06.07.2017 09:59:12	ok	0,0343	0,0343
07.07.2017 09:58:58	ok	0,7468	0,7468
08.07.2017 09:59:03	ok	0,5840	0,5840
09.07.2017 09:59:19	Warning	6,0756	6,0756
10.07.2017 09:59:10	ok	-0,5202	-0,5202
10.07.2017 12:11:54	ok	-0,7322	-0,7322
11.07.2017 10:02:37	Warning	5,6803	5,6803
12.07.2017 10:03:39	Warning	5,6803	5,6803
13.07.2017 10:06:32	ok	0,1019	0,1019
14.07.2017 09:17:20	ok	0,1019	0,1019
15.07.2017 09:17:31	ok	-0,6089	-0,6089
17.07.2017 07:10:25	ok	2,6306	2,6306
18.07.2017 08:14:39	ok	2,6306	2,6306
19.07.2017 12:31:52	Warning	6,2000	6,2000
20.07.2017 12:32:48	Alarm	10,3000	10,3000

Ref.point

Reading date	Status	Act.Value	Drift
26.06.2017 10:06:53	ok	404,1310	-6,5790
03.07.2017 10:25:17	ok	404,1310	-6,5790
11.07.2017 09:31:49	Warning	402,5613	-8,1487

Date 04.08.2017 3 / 3

8021274/V1-0/2018-01

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