s::can
Intelligent. Optical. Online.

Manual

moni::tool V1.5

July 2012 Release

New Features of moni::tool V1.5b

- All features of the two tabs *Menu* and *Service* are merged into the tab *Service*. An overview of the new menu structure is displayed on the following pages. A new tab *Help* is available.

- con::cube connectivity: *Service / Terminal / Network* for easy setup and configuration of LAN adapter, WLAN, 3G modem, virtual private network (VPN).

- Improved event detection: *Alarm / Alarm History* to view and enter feedback for events that will be used to improve the event detection.

- Probe and sensor calibration procedure improved and more user friendly.

- Calibration History: *Service / Sensor / Calibration / History* to see and re-use historical calibration results.

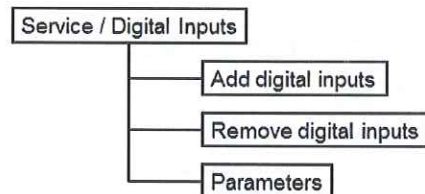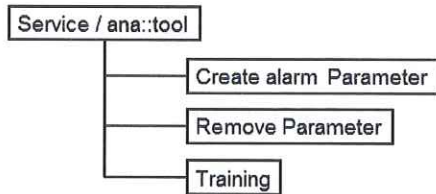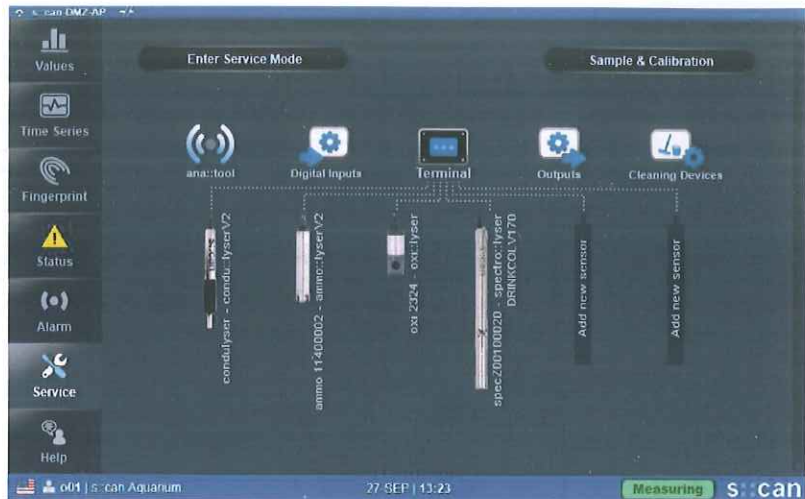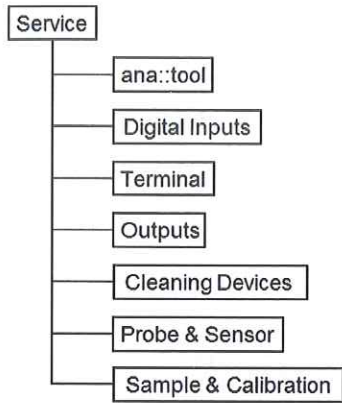- Sample Export: *Service / Outputs / File Outputs / Manual Download / Samples* to download sample data and entered laboratory values.

- Automatic USB drive detection: moni::tool automatically detects a new USB stick / drive connected to the con::cube and copies all generated files to the drive.

- Improved data export: *Service / Outputs / File Output / Files* up to 20 times faster file export. Data export can now create separate files for each day or even for each measurement.

- Auto-Export with Logbook: *Service / Outputs / File Output / File Generation* to configure the auto exporter to include the logbook in the generated files.

- System Information: *Service / Terminal / Extra / System Info* displays information about runtime and memory consumption of the terminal.

- ammo::lyser: Configure the potassium compensation and other advanced features of the ammo::lyser.

- oxi::lyser: parameter unit can be changed from ppm to %.

New Menu Structure of moni::tool V1.5b

Status
- In / Out Status
- Terminal
  - Logbook
- Probe / Sensor
- Status History

Alarm
- Confirm
- Reject
- Clear
- Create Event
- Training
- Alarm History

Help
- Version Info
- Software License
- License Agreement
- New Features

www.s-can.at

```
Service
   ├── ana::tool
   ├── Digital Inputs
   ├── Terminal
   ├── Outputs
   ├── Cleaning Devices
   ├── Probe & Sensor
   └── Sample & Calibration
```



```
Service / ana::tool
   ├── Create alarm Parameter
   ├── Remove Parameter
   └── Training
```

```
Service / Digital Inputs
   ├── Add digital inputs
   ├── Remove digital inputs
   └── Parameters
```

```
Service / Outputs
   ├── Analog Outputs
   ├── Digital Outputs
   ├── Fieldbus Outputs
   └── File Output
          ├── File Generation
          ├── FTP Transfer
          ├── SSH Transfer
          ├── Files
          └── Manual Download
                 ├── Parameter
                 ├── Fingerprints
                 ├── Samples
                 ├── Logbook
                 ├── Log Files
                 └── Database Dumps
```

```
Service / Probe & Sensor
   ├── Sensor Settings
   ├── Remove Sensor
   ├── Replace Sensor
   ├── Parameters
   ├── Global Calibration
   ├── Calibrate Sensor
   ├── Function check
   └── Firmware Update
```

Service / Terminal
- Measurement
  - Measurement Interval
  - Measurement Mode
- con::cube
  - Internal Modules
  - Power Ports
- Network
  - LAN
  - Wireless LAN
  - Modem
  - VPN
  - Host Settings
- Settings
  - Station
  - User Accounts
  - System Error Configuration
  - Templates
- Parameters
- Date & Time
- Terminal Language
- Display
- Security
- Extras

Service / Terminal
- Measurement
- con::cube
- Network
- Settings
- Parameters
- Date & Time
  - Time Configuration
  - System Time
- Terminal Language
- Display
  - Timeseries Settings
  - Calibrate Touchscreen
- Security
  - Firewall
  - TML Access
  - Web-Browser Authentification
- Extras
  - Windows Task Manager
  - ana::pro
  - System Info
  - Save & Reboot
  - Software Update
  - Restore Factory Settings

Table of Contents

1 General

This manual contains, firstly, general information (chapter 1) and safety guidelines (chapter 2). The next chapter (chapter 3) provides a technical description of the s::can product itself as well as information regarding product updates. In further chapters the installation (chapter 4) and the initial startup (chapter 5) are explained. Furthermore information regarding operation of the software (chapter 6) , data management (chapter 7), how to perform a functional check (chapter 8) and trouble shooting (chapter 9) can be found in this manual.

Each term in this document that is marked *italic and underlined*, can be found on the display of your controller or as lettering on your s::can product.

In spite of careful elaboration this manual may contain errors or incompletion. s::can does not assume liability for errors or loss of data due to such faults in the manual. The original manual is published in English and German by s::can. This original manual serves as the reference in case discrepancies occur in versions of the manual after translation into third languages.

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This manual, at the time of its publication (see release date printed on the top of this document), concerns the s::can products listed in chapter 3. Information and technical specifications regarding these items in s::can manuals from earlier release dates are herewith replaced by this manual.

2 Safety Guidelines

Installation, electrical connection, initial operation, operation and maintenance of any s::can product as well as complete s::can measuring systems must only be performed by qualified personnel. This qualified personnel has to be trained and authorised by the plant operator or by s::can for these activities. The qualified personnel must have read and understood this manual and have to follow the instructions contained in this manual.

For proper initial operation of complete s::can measuring systems, the manuals for the controller (con::lyte, con::stat, con::cube or PC / notebook with con::nect), the operating software (ana::lyte, ana::pro or monit::tool) as well as the connected probes and sensors have to be consulted.

The operator has to obtain the local operating permits and has to comply with the joint constraints associated with these. Additionally, the local legal requirements have to be observed (e.g. regarding safety of personnel and means of labour, disposal of products and materials, cleaning, environmental constraints). Before putting the measuring device into operation, the operator has to ensure that during mounting and initial startup – in case they are executed by the operator himself – the local legislation and requirements (e.g. regarding electrical connection) are observed.

All s::can products are leaving our factory in immaculate technical and safety conditions. Inappropriate or not intended use of the product, however, can cause danger! The manufacturer is not responsible for damage caused by incorrect or unauthorised use. Any kind of manipulation of the instrument is strictly prohibited - except for the activities described in this document. Conversions and changes to the device must not be made, otherwise all certifications and guarantee / warranty become invalid. For details regarding guarantee and warranty please refer to our general conditions of business.

2.1 Special Hazard Warning

Because the s::can measuring systems are frequently installed in industrial and communal waste water applications, one has to take care during mounting and demounting of the system, as parts of the device can be contaminated with dangerous chemicals or pathogenic germs. All necessary precautions should be taken to prevent endangering of one's health during work with the measuring device.

3 Technical Description

3.1 Intended Use

The software moni::tool is intended for operation of s::can monitoring stations. This station management software is designed as an open, innovative, location-independent architecture. It uses a local database for collecting all data and a web server for visualisation and operation. moni::tool supports the following functions:

- All sensor and monitoring station management tasks (e.g. initialisation, configuration, calibration)
- Automatically restart and continuation of measurement after interruption of power supply
- Data management, visualisation and export of results (values, time series, UV/Vis-spectra in 2D)
- Indication on sensor status and performance
- Advanced system for quality assurance and quality control (QA/QC)
- Logging and tracking of all maintenance actions performed on the monitoring station
  (e.g. changes of sensor settings or components, calibration and any other activities)
- Automatic feedback to the operator using the incoming and logged information
- Online calculation of customized parameters on the terminal
- Support of all terminal interfaces
- PLC functions

For the moni::tool basic module the following add-ons are available:

- vali::tool - advanced module for real time data validation
- ana::tool - advanced module for real time event detection
- advanced features - advanced module for data export (Auto-Export, TML), extended visualisation (UV/Vis-spectra in 3D, delta spectrum, calibration history), advanced parameter calculation (WQI).

3.2 Functional Principle

3.2.1 moni::tool

The moni::tool software package consists of several components. The central component of the system is a PostgreSQL database, where all data as well as all configurations and settings are stored. Measurement data are obtained from all s::can probes and sensors through specific drivers that comunicate with the devices using the Modbus protocol or using a mA signal. The data is presented to the user on webpages that are generated by a webserver on the s::can controller (con::stat or con::cube). Over these webpages measurement results and status information can be viewed and all configurations can be changed and service actions can be performed. When the s::can controller is connected to a network, the webpages can be accessed from any computer that has access to the controller. In this way, true remote control of the station is possible.

All tools are programmed in Java and the platform independent client runs on any Java enabled web browser. This means that sensors and stations can be accessed from any suitable device that is connected to the internet.

Tools, devices and protocols can easily be integrated or customized at any time.

3.2.2 vali::tool

vali::tool is s::can's data validation module. It has the task to automatically detect, mark and (optionally) correct untrustworthy data. This data evaluation provides information on the functioning of individual measurements / sensors in the system. The results from this online validation are utilized in various ways, for example to provide the user with indications that a sensor requires maintenance and automatic detection of malfunctions. Furthermore, marking of questionable results allows the alarm tool (ana::tool) to ignore data of insufficient quality. The use of automatically corrected results is available mainly for process control, where loss of signal can lead to incorrect settings in the process. Correction allows the controls to continue to work properly. For the validation a number of simple but robust statistical methods have been applied: outlier detection, detection of discontinuities, noise detection.

3.2.3   ana::tool

ana::tool is s::can's event detection module. ana::tool evaluates data that have been cleaned by the validation module, and determines the normality of these data. ana::tool triggers an alarm when a significant deviation from normality is detected. It has been optimized for the utilization of multi-dimensional spectral data, but will work just as well with single or multiple one-dimensional inputs from conventional sensors. However, the integration of spectral data provides a much more complete picture of water quality than can be obtained through single parameters. The methods for the calculation of alarms in this approach consist of the following types: static thresholds, dynamic thresholds, pattern recognition, spectral alarms, cumulative alarms.

3.3   Product

The following versions and extension packages of the moni::tool software are available. Regarding detailed information of the software version please refer to the s::can homepage www.s-can.at.

Type	Specification
S-11-04-moni	moni::tool software for operation of monitoring stations with up to 4 parameters
S-11-08-moni	moni::tool software for operation of monitoring stations with up to 8 parameters
S-11-08-moni + S-14-08-vali	all above plus vali::tool software for validierung of up to 8 parameters
S-11-08-moni + S-14-08-vali + S-15-08-ana	all above plus ana::tool software for evemt detection of up to 8 parameters
S-11-24-moni	moni::tool software for operation of monitoring stations with up to 24 parameters, incl. advanced features (see section 3.1)
S-11-24-moni + S-14-24-vali	all above plus vali::tool software for validierung of up to 24 parameters
S-11-24-moni + S-14-24-vali + S-15-24-ana	all above plus ana::tool software for evemt detection of up to 24 parameters

Annual support and carefree packages are available. Please ask your s::can Sales Partner regarding this products.

3.4   Scope of Delivery

Immediately upon receipt, please check the received consignment for completeness on the basis of the delivery note and check for any possible damage incurred during shipping. Please inform the delivering dispatcher and s::can immediately in case of any damages in transit.

The following parts should be included in the delivery:

- s::can moni::tool, already pre-installed on you controller (item-no. S-11-xx-moni)
- s::can manual moni::tool

The following parts could be included in the delivery if ordered as an option:

- s::can vali::tool and ana::tool, already pre-installed on you controller (item-no. S-14-xx-vali and S-15-xx-ana)

In case of incompleteness please contact your s::can sales partner immediately!

3.5   Product Updates, Other

The manufacturer reserves the rights to implement, without prior notice, technical developments and modifications in the light of continuous product care.

Software updates will be made available in the form of update packages that can be downloaded and installed on the s::can controller. The access to software updates including new features may depend on ordering the s::can support package for moni::tool (S-19-xx-support). When ordering the s::can carefree package (S-19-xx-carefree) the annual software update will be performed automatically via remote control.

4   Installation

The software moni::tool was especially developed for use on the s::can controller. For proper operation of moni::tool you will need one of the following controller.

Controller	Type	Specification
con::stat	D-314	1 GB RAM and 2 GB Flash
con::cube	D-315	all versions

moni::tool has already been installed on any controller supplied and no seperate installation of the software is required. Update or recovery packages are available on the s::can portal. Also refer to the manual delivered with the s::can controller.

4.1   Requirements Web Browser

The local browser on your s::can controller is preinstalled and fullfills all needed requirements for optimal usage. For remote use of moni::tool the browser on your PC / notebook has to meet the following specifications:

- Mozilla Firefox >= V3.6 (no compatibility mode)
- Google Chrome >= V14
- Opera >= V8.9 (equates V11.5)
- MS Internet Explorer >= V9 (no compatibility mode)
- Apple Safari >= V5

4.2   Requirements Spectrometer Probe

For operation with moni::tool the spectrometer probe has to be equipped with firmware V1.x.x or higher. s::can recommends to use the most actual firmware version always.

4.3   Conditions for Use / Licensing Terms and Conditions

For each controller an individual license file is needed which is already installed at delivery. If you want to upgrade the moni::tool software (see section 3.3) a new license file can be downloaded to the controller.

The license text can be found in moni::tool under _Menu / Help / License Agreement_. They are deemed accepted when an s::can product is used.

5   Initial Startup

Your s::can controller is delivered with the operating software moni::tool pre-installed. After supplying power to the controller (please refer to the manual of your controller) moni::tool will start automatically. Depending on the type of your controller it will require 1 - 2 minutes before moni::tool has been started.

To configure the monitoring station and install your probes and sensors, the following actions are required:

- Set the language of the operating system (use flag symbol)
  (see section 6.9.1.3 - *Menu / Settings / Station / Controller Language*)

- Logon by pushing the *Menu* tab on the left side (see section 6.3 - *User Login / Logout*)

- Set the correct timezone (see section 6.9.1.5 - *Menu / Settings / Station / Date & Time / Time Configuration*) [1]

- Set the date and time (see section 6.9.1.6 - *Menu / Settings / Station / Date & Time / System Time*)

- When the controller will be integrated in a network, set the computer name and network configuration
  (see section 6.9.1.2 - *Menu / Settings / Station / Network Settings*) [1]

- Set the station name and the name of the measurement location
  (see section 6.9.1.1 - *Menu / Settings / Station / Details*)

- Install all probes and sensors that will be operated by the controller
  (see section 6.10.3 - *Service / Sensor / Installing New Sensor*)

- Configure the digital inputs, if needed (see sections 6.10.7 - *Service / Digital Input*)

- Configure the automatic cleaning devices (see section 6.10.5 - *Service / Cleaning Device*)

- Configure the measurement interval (see section 6.10.6.1 - *Service / Terminal / Measurement interval*)

- Configure the order in which parameters are displayed (see section 6.10.1.12 - *Menu / Settings / Parameter*)

- Configure vali::tool (see section 6.10.1.12 *Menu / Settings / Parameter*)

- Configure ana::tool (see section 6.10.1.17 - *Menu / Settings / Parameter / Add Parameter / Alarm Parameter*)

- Check the readings from the sensors and calibrate your sensors if necessary
  (see section 6.10.4.7 - *Service / Sensor / Calibrate sensor*)

- Configure the outputs
  (see sections 6.10.6.2, 6.10.6.3 and 6.10.6.5 - *Service / Terminal / Analog Outputs*, *Service / Terminal / Digital Outputs* and *ervice / Terminal / Fieldbus Outputs*)

- Configure the Data Export (see section 6.9.2 - *Menu / Data Export*)

[1] Reboot of the s::can controller is necessary. You can do all steps needing reboot at once and do reboot after the last step.

6 Operation of moni::tool

moni::tool can be operated directly on the touch screen of your controller using your fingers and / or a touch pen without the need for a keyboard or mouse. When connecting to moni::tool using a remote web browser, mouse and keyboard can be used to operate the software.

6.1 Main Menu Tabs

The seven tabs for the different views can not only be used for navigation through the moni::tool software. They also present information on the status of the monitoring station, as shown for the _Status_ tab below. The currently selected tab is highligthed, as shown for the _Values_ tab below.

Values (default display)
displays current readings of all parameters
(see section 6.4)
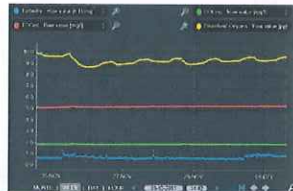
Time Series
displays time series of parameter results
(see section 6.5)
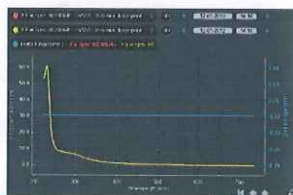
Fingerprint
displays absorbance spectra of spectrometer probe
(see section 6.6)

Status
provides actual status information,
icon blinks yellow if any status error is reported
(see section 6.7)

Alarm
provides actual Alarm,
icon blinks yellow if an alarm is not confirmed or rejected
(see section 6.8)

Menu
User login is needed
(see section 6.9)

Service
User login is needed,
icon blinks yellow if monitoring station is in Service mode
(see section 6.10)

6.2   Information and Navigation

The lower frame of moni::tool, which in visible in all tabs, provides actual information about the station.

1   Language flag: the flag symbol indicates which language is selected.

2   User icon: clicking on this item will open the login window or logout window (see section 6.3).

3   Name of the monitoring station (see section 6.9.1.1)

4   Current system date and time: clicking on this icon will display date / time of the last measurement also.

5   Current system status: shows the current action the system is performing.

6   s::can logo: clicking on the logo will show information about the controller and moni::tool (see section 6.9.5.1).

The moni::tool software uses two main levels of information. The upper level, which is accessible using the tabs on the left hand side of the screen, provides quick access to the most important information on results and system status. This information will be available by clicking on the tabs *Values*, *Time Series*, *Fingerprint*, *Status* and *Alarm*. The deeper level, which is accessible using the tabs *Menu* and *Service*, is used for configuration, calibration and maintenance.

It is possible to navigate through moni::tool in different ways. To change between views, the tabs on the left hand side of the screen can be used. By pushing / clicking on a tab, the view will change to the corresponding display.

Within a tab various elements allow navigation to deeper layers in moni::tool. At the top of the screen the navigation line shows the current level and all levels above. Clicking on the layer names bring you directly to the view belonging to that layer.

Scrolling up or down can be done using the scrollbar on the right-hand side of the screen and by swiping vertically across the screen, i.e. by dragging a finger from the bottom to the top on the touch screen or left-clicking on the bottom and then dragging the mouse upwards while keeping the left button depressed.

6.3 User Login / Logout

Logon to moni::tool is necessary to perform service activities, change configurations or install / remove probes. Each user requires a *Username* and a *Password* to log on.

The Login screen can be called up by clicking on the user icon in the lower left of the moni::tool screen. Also, when a menu is opened that requires a login, the Login view is opened automatically and the user is required to logon before being able to proceed to the requested menu.

Default settings after moni::tool installation are:

- *Username*:   Administrator
- *Password*:   admin1
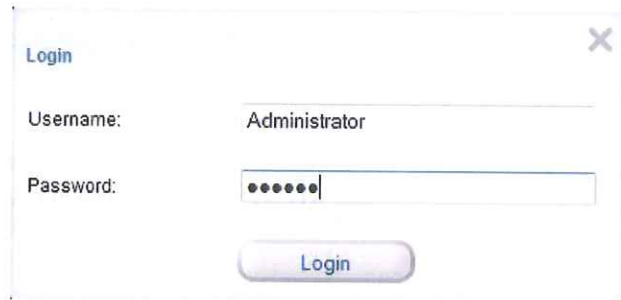
Further user accounts can be created under *Menu / Settings / Station / User accounts*. Password changes can also be made here.

Logout will be performed automatically after 20 minutes of inactivity or can be performed manually be clicking on the username. When clicking on the user name, a window as displayed below will appear.

Reboot is to be used when the controller needs to be restarted.

Shutdown ends all software components correctly and will shut down the controller.

⚠ A restart can only be performed by disconnecting and reconnecting the power supply of the controller.

Logout will end the login of the current users, but will not trigger any other changes.
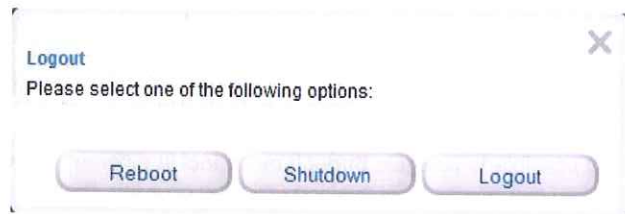
6.4 Values

The *Values* screen provides an detailed overview of the current parameter results as well as status information from all configured sensors. The results for up to eight parameters can be displayed simultaneously. In case more than eight parameters are monitored, it is necessary to scroll down to view the other parameters. The order in which the parameters are presented on the *Values* screen can be customised (please refer to section 6.9.1.12).

A click on the upper part of the single parameter display leads you directly to the *Time Series* screen of this parameter and will display the time series of the last day, for the selected parameter only. Please refer to section 6.5 for more details.

A click on the lower part of the parameter display will pop up additional information of the parameter.

The results of each parameter are shown in a seperate display providing the following information:

1   Parameter name (*Dissolved Oxygen*)

2   Non-corrected parameter value (*9.32*)
(shown if corrected value is active only)

3   Current reading of the parameter (*9.34*)

4   Unit of the parameter (*mg/l*)

5   Timestamp of the displayed reading

6   Name of the probe or sensor (*oxi 2324*)

7   non-corrected parameter value (*Raw value*), measuring range of the parameter (*Limits*), limits for static alarm (*Alarm limits*)

8   Status as readable text

9   Button to activate vali::tool

10   Alarm status (*inactive*, *active* or *alarm*)

11   Button for changing between display of non-corrected or corrected parameter results

12   Button to call up sensor information *Values / Sensor view* (see figure on the right hand side)
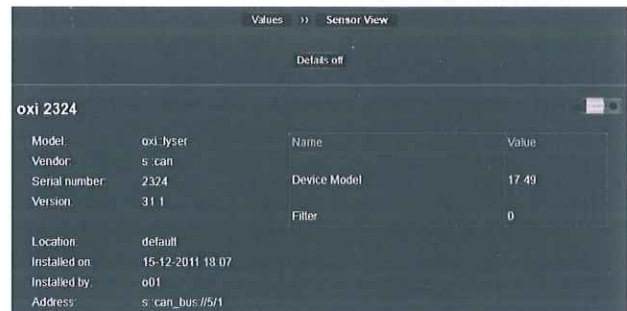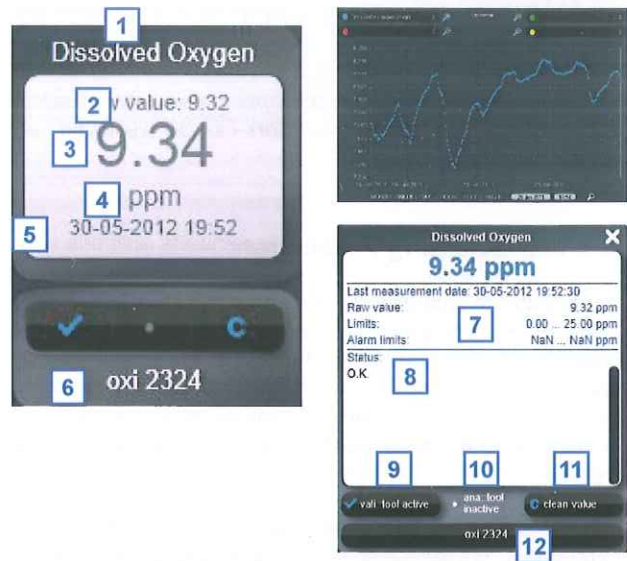
The background colour of the single parameter display provides information on the status of the parameter.

- White: „O.K.“

- Grey: „Too old“ - the most recent result is more than 3 measurement intervals old.

- Red: „Error“ - any kind of error related to the parameter is reported.

15   Blue checkmark if vali::tool is installed and activated

16   If ana::tool is installed and a parameter is configured in such a way that it can generate an alarm, the status of the parameter is indicated by the alarm symbol in the advanced settings indication. If the alarm symbol is grey, the parameter status is normal (OK). If the symbol is yellow and blinking, the parameter is in alarm.

17   When non-corrected values are displayed, this is indicated by the *C* in grey on the right hand side of the advanced settings indication. When validated and corrected results are shown, this is indicated by a *C* in blue. When vali::tool is installed, non-corrected and validated results are both stored in the database at all times. Furthermore, virtual parameters can be created. These are indicated with a blue *V*.

6.5   Time Series

The *Time Series* screen provides the historical parameter results in graphical form. The default view presents the last 24 hours of results for the first four parameters. Using the various elements in the screen the data can be rescaled (see section 6.5.2) and other parameters can be displayed (see section 6.5.1).

6.5.1   Selecting Parameters

It is possible to change the parameters that are displayed in a single graph. A parameter can be selected by clicking on the parameter name in the legend on top of the graph. This will open a selection list, from which the desired parameter can be selected. The parameter that will be replaced is marked in the list with a marker identical to the marker shown in the legend.

This selection list not only includes all currently active parameters, but also historical parameters, i.e. parameters that have been removed.

A parameter can be remove from the timeseries display temporarily. This is done by clicking on the coloured marker of the parameter in the legend. If this is done, the marker will change into a red and white symbol and the parameter will be blended out. It can be blended in again by clicking on the marker symbol once again.

6.5.2   Scaling Timeseries Screen

"Overview button" - will undo all Y-axis (value axis) zoom and scroll functions performed in the actual graph.

"Back in zoom history button" - clicking on this button will undo the previous zoom action.

"Forward in zoom history button" - once the back button has been used, the forward button will appear. The forward button can be used to redo a zoom action that was just undone by clicking the back in zoom history button.

For zooming in or rescaling the time series diagram the following tools can be used:

"X+Y-axis zoom" - click on the magnifying glass found at the lower right of the screen to activate the rectangle zoom (background turns to lightgrey when active). Touch the touchscreen on the s::can controller and drag a finger or touch-pen across the screen to draw a rectangle. After breaking contact with the screen, the graph will be zoomed in to the data inside the rectangle. The same zoom function is available when working in moni::tool on a remote browser, in which case the rectangle tool is used by dragging the mouse across the screen while keeping the left mouse button pressed down.

"Y-axis zoom" - use the magnifying glass shown next to the parameter name in the legend (see figure on top of this section). Clicking on the magnifying glass will expand the zoom in such a way that the minimum and maximum values for the parameter are used as the limits in the Y-axis. The zoom level obtained after pushing the magnifying glass remains fixed when the X-axis is changed. The zoom can be released by pushing again on the magnifying glass or by pushing overview.

„X-axis zoom" - the default view in *Time Series* shows the results collected over the previous 24 hours (1 day). Other time windows are activated by clicking on *HOUR* (1 hour), *DAY* (24 hours), *WEEK* (7 Days), *MONTH* (30 Days).

Directly entering a date and time in the field on the right. Once a data and time are entered this will be the newest result in the display and the total period of results shown is determined by the selected time window.

◀ „X-axis move" - clicking on the *LEFT* or *RIGHT* button once will move the window half an interval in the indicated direction
▶ (e.g. clicking the *LEFT* once when in *DAY* view will shift the time window 12 hours into the past).

⚠ In all *Time Series* views, except in *HOUR*, the data displayed are aggregated data. This means that the number of data points shown has been reduced. The larger the time window displayed, the fewer datapoints are shown per time interval. When zooming in far enough every single measurement will become visible again. As a result of this data aggregation, not all dynamics in the data might be visible when looking at the *MONTH* or *WEEK* views.

6.6   Fingerprint

The *Fingerprint* screen provides the most recent absorption or transmission spectrum („fingerprint") measured by the spectrometer probe. On the horizontal axis (x-axis) the wavelengths in nm and on the vertical axis (y-axis) the measured absorbance values in Abs/m are presented.

Two fingerprints can be displayed simultaneously. The second fingerprint can be either from another time stamp or from another spectrometer probe. Once a second fingerprint is selected the difference (*Delta Fingerprint*) between the two fingerprints is shown as a blue line scaled on its own y-axis (right y-axis).

A fingerprint can be selected by clicking on the icons in the legend on top of the graph. This will open a selection list where a spectrometer probe can be selected. The fingerprint from the selected probe will be displayed.

To display fingerprints with another time stamp the following options can be used:

- Entering a date and time in the field on the right hand side of the legend directly.

- Clicking on the blue arrow shaped back and forward buttons. Clicking this button once will move to the previous or next fingerprint.

It is also possible to temporarily remove fingerprints from the screen. This is done by clicking on the coloured marker of the fingerprint in the legend. If this is done, the marker will change into a red and white symbol and the fingerprint will be blended out. It can be blended in again by clicking on the marker symbol once again.

6.6.1 3D Fingerprint

Additionally it is possible to show the fingerprints from one spectrometer probe in a 3 dimensional graph. This view is activated by clicking one of the *3D* buttons in the legend. Each button will link to a 3D graph of the fingerprints from the spectrometer probe indicated in legend next to it.

The 3D graph always displays the fingerprints of 6 hours previous to the entered time stamp.

To switch back to the normal fingerprint display click on the button *2D* in the 3D-view or click the *Fingerprint* tab.
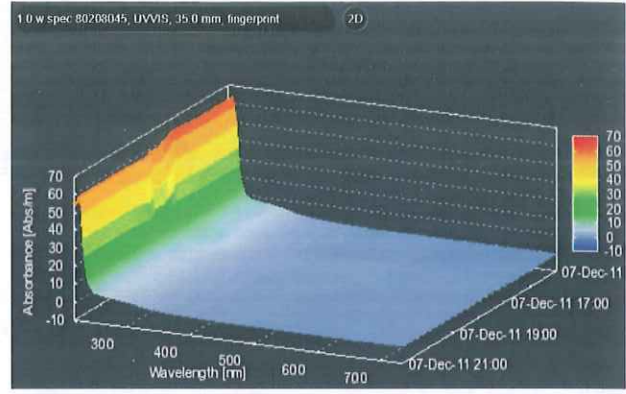
6.7 Status

The *Status* screen provides an overview of the controller and all probes, sensors and devices that are configured in moni::tool. Within this station overview a red circle indicates if any component connected to moni::tool reports an error or a fault. A red connection between the controller and the sensor together with a red sensor symbol indicates no communication is possible with the sensor. A white circle above a device indicates status Ok.

On the upper side of the controller symbol the remaining time until the next measurement will be performed is displayed.

By clicking on one of the symbols (controller or sensor) all status messages belonging to that device will be listed. Each message provides the following information:

- Origin of the error (e.g. the related parameter of the sensor)
- Timestamp indicating when the error occurred.
- General description of the error.
- An error code, which can be used to communicate the error with your s::can sales partner (see section 9.3).

⚠ Clicking on the general description will provide additional information and suggestions on how to resolve the problem.

Clicking on the button *Logbook* in the Status of the terminal opens a list with all logbook messages and enables you to download the Logbook via the button *Export all*.

A click on the button *Status History* in the upper left part of the *Status* screen will open a graph that shows the history of both the system status and the vali::tool status, in case it is activated. The status history shows, for each parameter, whether a status error message was received (*Status* displayed in red) and whether vali::tool reported that data quality was suspect (*vali::tool* displayed in yellow). The default view shows the status history for the previous day, but the interval shown can be adjusted using the x-axis scaling tools. For detailed information on how to use these, refer to section 6.5.2.

6.8 Alarm

The *Alarm* screen provides an overview of all current warnings and alarms. A warning / alarm can be set by a spectral alarm parameter on the spectrometer probe or by the alarm parameters in ana::tool or by parameter limits (see section *Menu / Settings / Parameter*).

Each entry description provides the following information:

- Timestamp when the warning / alarm was first detected (*Pending since*)
- Description of the warning / alarm (*Alarm*), sensor name and parameter name of alarm source.

Whenever one or more alarms are pending, the system status will be alarm. All alarms must be confirmed before the overall system status is set back to OK and the alarm symbol stops blinking. An alarm can be confirmed by clicking on the alarm and then selecting *Confirm* (to confirm the alarm was correct) or *Reject* (to indicate an incorrect or false alarm). When selecting *Confirm* or *Reject*, a new page will appear where further details about the alarm can be entered. To select all alarms at once, click the button *Select all*.

Logging alarms or warnings that were not detected by ana::tool is possible using the entry *Create* in the *Alarm* screen. When clicking on *Create* a window opens where the following information has to be provided:

- Alarm or warning source, i.e. which parameter triggered the alarm
- Start and end date and time of the alarm or warning
- Additional description (*Remarks*)

Clicking on *Save* will store the customer created alarm or warning.

The entry *Alarm History* provides a graphical overview of the alarm status of the parameters. When *Alarm History* is selected, a graph showing the history of the status of ana::tool is shown for each parameter. Yellow indicates a parameter was in the state of *Warning* and red indicates that the parameter was in a state of *Alarm*.

The timeseries on the right will explain the effect of handling the pending alarms for the next training of ana::tool.

A   This historical alarm was a real one, *Confirm* this alarm, these data will be set to alarm for the next training.

B   This historical alarm was a false alarm, *Reject* this alarm, these data will be set to normal status for the next training.

C   This historical event was not detected as an alarm, *Create* this alarm, these data will be set to alarm for the next training.

⚠️ Only confirmed alarms will be considered at the next training. Confirmed warnings won't have any effect on the training. Try to confirm alarms as soon as possible. Only spectral alarms of ana::tool will be trained. Alarms caused by excess of parameter limits cannot be trained. They can be configured in *Menu / Settings / Parameter / Alarm*.
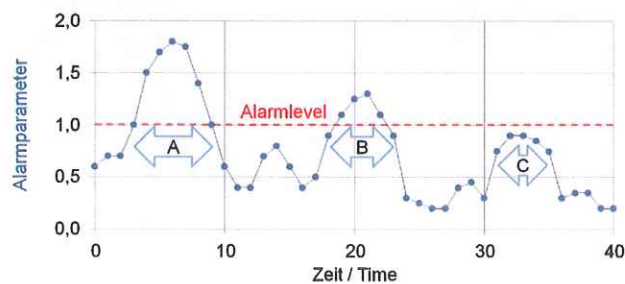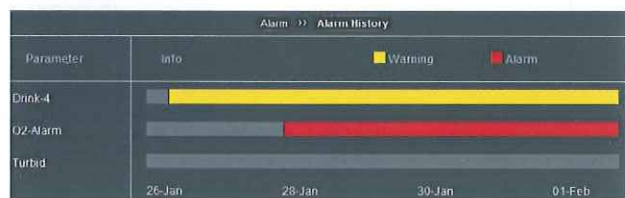
6.9   Menu

The _Menu_ screen provides access to selection of advanced settings. It is necessary to login when entering the _Menu_ tab (see section 6.3). The general settings and configuration of issues directly related to the functioning and maintenance of the monitoring system can be found in the _Service_ tab (see section 6.10).

The figure below provides an overview of all entries that can be accessed via the _Menu_ screen. A detailed explanation of each entry can be found in the following sections.


```
Settings
    └── Station
            ├── Details
            ├── Network Settings
            ├── Controller Language
            ├── User accounts
            ├── Date & Time
            │       ├── Time Configuration
            │       └── System Time
            ├── Display
            │       └── Calibrate Touchscreen
            ├── Security
            │       ├── Web-Browser authentication
            │       └── Door contact
            └── Software
    ├── Sensor
    ├── Parameter
    │       ├── Add Parameter
    │       └── Remove Parameter
    ├── Service
    │       ├── Restore Factory Settings
    │       ├── Windows Task Manager
    │       └── anapro
    └── Templates
```

```
Data Export
    ├── Parameter Result File
    ├── Fingerprint Result File
    ├── Logbook
    ├── Database Dumps
    ├── Auto-Export
    ├── Generated Files
    ├── FTP Transfer
    ├── SSH Transfer
    ├── Update Logs
    └── Database Size

ana::tool
    ├── Training
    └── Edit TML Settings

Add-ons

License
    └── Enter license

Help
    ├── Version Info
    ├── License Agreement
    └── New Features
```

6.9.1   Menu / Settings

6.9.1.1   Menu / Settings / Station / Details

This menu item provides more detailed information about the station. Included in the information are station name and ID, as well as the network settings, software release and database settings. Clicking on *Edit station* will call up an interface to edit the parameters that can be changed by the user, including *Name of station*, *Location*, *Longitude*, *Lattitude* and *Description*.

- vali::tool

General activation and deactivation of vali::tool is performed within this menu item. The actual used version is indicated at the entry *Validation library* of the *Data table* screen (only one version of vali::tool can be active at any time). Changing the actual used vali::tool version, if multiple versions are available, can be done in the field *Validation library* of the *Edit station* screen.

The *Validation Library* should always be vali::tool.
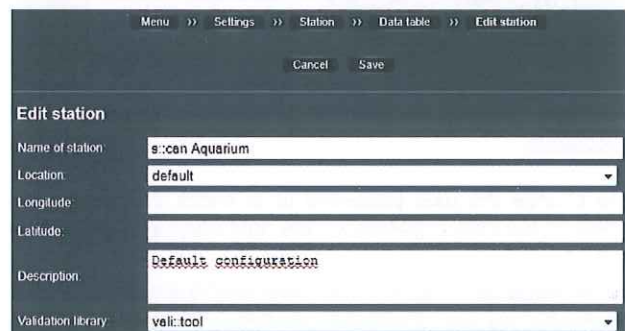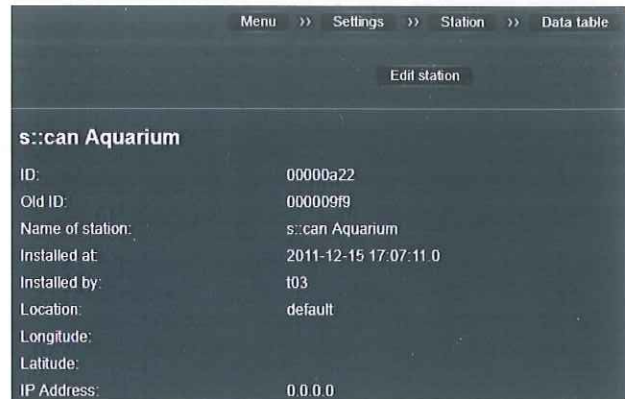
6.9.1.2   Menu / Settings / Station / Network Settings

When selecting this menu item the IP settings of the s::can controller LAN interface (RJ45 plug) can be configured. The default settings of the s::can controller are

IP Address	0.0.0.0
subnet mask	0.0.0.0
Gateway	0.0.0.0
DHCP	activated.

This means the s::can controller can be connected to an existing network and a IP address will be allocated automatically. Please refer to the con::cube manual regarding changes of the LAN and WLAN network settings.

The *IP Access control list* can be used to restrict access to the TML server (see section 6.9.3.2) to a list of specific IP addresses. Default configuration is not access restrictions (*).
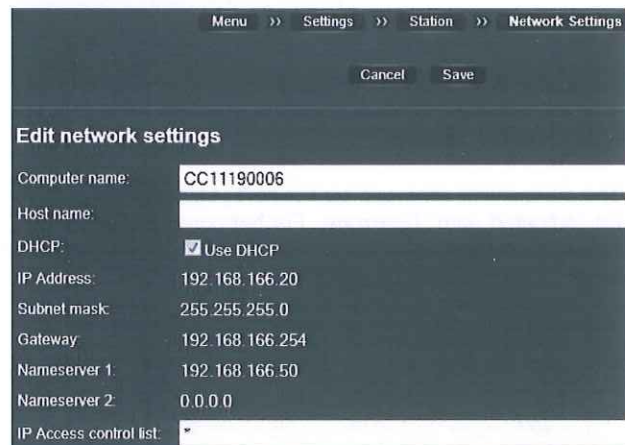
6.9.1.3   Menu / Settings / Station / Controller Language

When selecting this menu item the language in which all text in menus and graphic is provided can be changed. The available languages are: _English_, German (_Deutsch_) and Chinese.

⚠️ When using a web browser the language of the browser can be set independent of the used language on the controller by using the language flag in the main frame.

6.9.1.4   Menu / Settings / Station / User Accounts

When selecting this menu item it is possible to manage the users and their access rights. First an overview of all actual users is displayed. A new user can be added by clicking _New User_, defining a _User name_, _Password_ and selecting the _Privileges_ for the new user.

A user can be deleted by any user with access rights to _User Management_. A user is deleted by clicking on the user name and then pushing the button _Delete User_ in the screen _User accounts_.

To change the user password or to check the user rights, click on the blue cogwheel on the right-hand side of the user name.
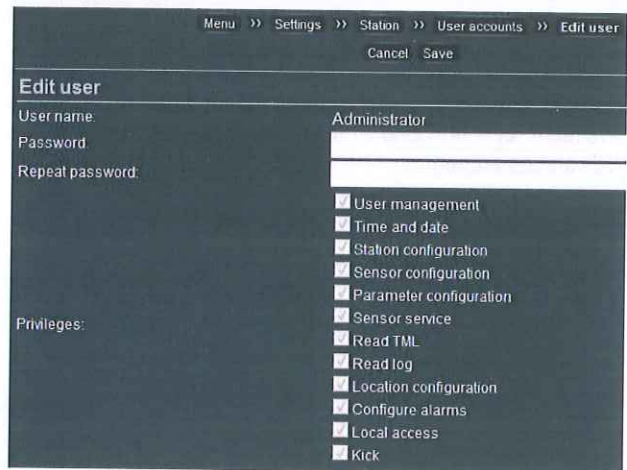
6.9.1.5   Menu / Settings / Station / Date & Time / Time Configuration

This menu item provides the possibility for configuration of an NTP (Network Time Protocol). When an NTP server address is entered here and the s::can controller is connected to the internet, the system will automatically synchronise the time with this server using NTP.

The correct timezone can be set here, using the drop down list indicated with _Timezone_. Furthermore, the entry _DST_ allows activation / deactivation of the use of Daylight Saving Time.
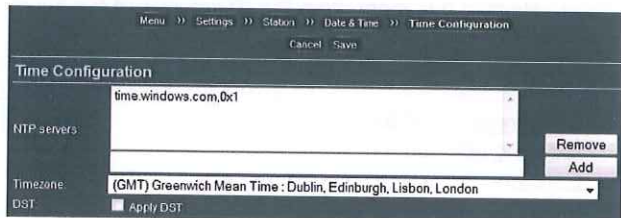
6.9.1.6   Menu / Settings / Station / Date & Time / System Time

This menu item provides the possibility to set the current time and date.

6.9.1.7 Menu / Settings / Station / Display / Calibrate Touchscreen

When selecting this menu item the system will ask you to touch the screen in four corners (red points). Based on these inputs the screen will be recalibrated. When the calibration process is not started within 10 seconds the calibration of the touch screen is terminated and the old settings will be used without change.

All s::can controllers are delivered with calibrated screens. Recalibration can sometimes become necessary due to environmental impacts (e.g. after the controller is exposed to strong variations in temperature during operation).

⚠️ In case the s::can controller can no longer be operated via its touch screen, the calibration procedure can be started via a remote browser, using VNC-Viewer or via USB, using mouse / keyboard and the calibration can be carried out on the touch screen of the controller.

6.9.1.8 Menu / Settings / Station / Security / Web-Browser authentication

This menu item provides the possibility to set a password for a user operating the s::can system via web browser. If a user name and password are set here, connection to moni::tool from a remote computer is only possible after the correct username and password have been entered.

⚠️ Once authentication is activated, access to the system locally needs a USB keyboard connected to the con::cube.

6.9.1.9 Menu / Settings / Station / Security / Door contact

This menu item provides the possibility to configure the settings for the door contact alarm. This door contact function activates a timer every time the door contact is triggered. The user needs to logon within the *Time to logon* has passed. If no logon occurs within this time, an alarm will be triggered and the system status will change to alarm (see section 9.3.1).

The *Door contact mode* is *disabled* by default and can be set to *HIGH = closed* or *HIGH = open*. The time frame to logon to the system after door has been opened before an alarm will be triggered can be set in the entry field *Time to logon before alarm [sec.]*.

6.9.1.10 Menu / Settings / Station / Software

This menu item provides the possibility to update the moni::tool software. In the entry field *Install file* the update file can be selected. Pushing the button *Update* will start the software guided upgrade procedure.

6.9.1.11   Menu / Settings / Sensor

This menu item provides an overview of all installed sensors and their device status. Details on each individual sensor can be called up by clicking on the sensor name and then pushing the blue cogwheel on the right. Included in the information are the sensor type, data of installation and its address. Regarding sensor settings refer to section 6.10.4.1.

6.9.1.12   Menu / Settings / Parameter

Using this menu item all active parameters will be listed. The order in which they are listed is the order in which they are displayed in the *Value* and *Time Series* screens. The order can be changed by clicking on the parameter name to select the parameter (more names can be selected at the same time) and then pushing *Up* to move the parameter up in the list or *Down* to move it down in the list. A parameter selection is cancelled by clicking on the parameter a second time.

Clicking on the blue cogwheel symbol on the right of table opens the screen *Edit Parameter*. Within this screen the settings for each parameter can be customised.

Those settings that can be edited by the user are displayed in an entry field (e.g. *Parameter name* and *Unit* in the *Value* display). In case calibration settings are stored on the sensor itself they will be shown also.

Clicking on the blue checkmark symbol on the right of table opens the screen *Configure vali::tool*.

Within this screen the vali::tool settings for each parameter can be customised. Selecting *Basic*, *Advanced* and *Expert* calls up increasingly detailed settings. Clicking on the orange and blue arrows right next to the various settings calls up information describing the effect of a particular setting on the workings of vali::tool as well as a suggestion on what can be entered.

A specific vali::tool configuration file exists for each parameter from any s::can sensor and for each specific application (drinking water, effluent waste water, etc.) on your controller. In order for vali::tool to work with highest efficiency, the appropriate configuration file needs to be selected. This is done as follows:

- Operate the s::can controller using the touch screen or VNC Viewer.
- Open the *Configure vali::tool* window for the parameter that needs to be configured.
- Click on *Upload config file*.
- Click on *Browse* and select the file. The files are stored in the following directory: d:\ s-can \ vali-tool \ vali-tool \ STANDARD \
- Select the correct application, the used spectrometer probe and the needed parameter.
- Open the file *config.txt* within the selected folder.
- Push *Save* to store the configuration.
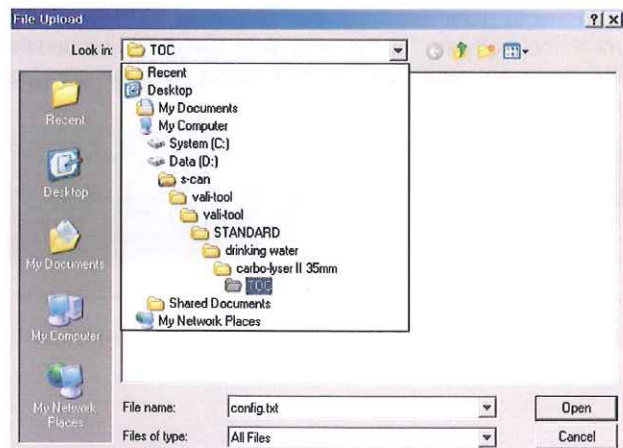
In the lower part of the screen the vali::tool settings predefined by the loaded configuration file can be adapted. For user level _Basic_ the _sensitivity_ can be set only. For all other settings the user level _Advanced_ is needed.

Name	Possible Settings	Effect	Function
smoothingPeriod	0 sec. - infinitely Default = 1500	500 = weak smoothing 1500 = normal smoothing 4500 = strong smoothing	Length of the time window used for the smoothing of clean data.
rangeCheckUpper	any Default = Infinity	Measurement results above this limit will not be used.	Upper limit for physical / chemical plausible measuring results.
rangeCheckLower	any Default = -Infinity	Measurement results below this limit will not be used.	Lower limit for physical / chemical plausible measuring results.
sensitivity	0 - 1 Default =0,5	0,25 = tolerant setting 0,50 = neutral setting 0,75 = strict setting	Defines sensitivity of vali::tool in general.
NOISEinstrumentNoise Threshold	0 - infinitely Default = 1000,0	The smaller the value the more sensitive the quantification of noise detection.	Upper limit for normal noise level of the parameter.
NOISEminimumNoise Level	any Default = 0	0 = typical setting -1 = setting for very stable input values	Lower limit for normal noise level of the parameter.

For the virtual alarmparameters the configuration screen of vali::tool offers the possibilty to modify the automatic training of the alarm parameter. This is only possible for user level _Advanced_.

By default the automatic training (_trainAuto_) is activated (_true_). To start the training manually the entry has to be changed to _false_. Please refer to section 6.9.3.1 regarding automatic training also.
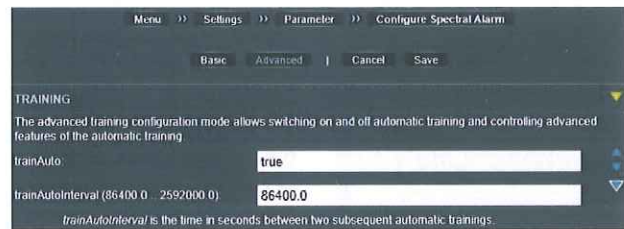
The entry field below (_trainAutoInterval_) enables the possibility to set the frequence of the automatic training in seconds. The default setting is _86400_ which means one training per day is perfomed. This value can be increased up to _2 592 000_ which corresponds to one training every 30 days.

Clicking on the blue bracket symbol on the right of table opens the screen _Configure Alarm_.

Within this screen the static alarm thresholds can be configured for any parameter. When activated, the parameter status will change to alarm when the measurement result is above entered value (_alarmLimitUpper_) or below the enetered value (_alarmLimitLower_). Both upper and lower limit can be active at the same time. To deactivate the alarm the corresponding limit has to be set to NaN. The settings are equal for both user level _Basic_ and _Advanced_.
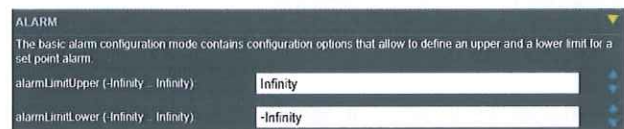
For the virtual alarm parameters (see section 6.9.1.17) the following configuration settings can be used to manually customise the pattern alarm. For user level *Basic* the *sensitivity* can be set only. For all other settings the user level *Advanced* is needed.

Name	Possible Settings	Effect	Function
sensitivity	0 1 2 (default) 3	Alarm switched off Low sensitivity Medium sensitivity High sensitivity	Used to control the sensitivity of the alarm parameter.
trainAuto	0 1 (default)	OFF ON	Used to switch automatic training on and off.
trainAutoInterval	21 600 - 2 592 000 sec. 86 400 sec. (default)	equal to 6 hours - 30 days equal to 1 day	Time interval between automatic trainings.
trainDataInterval	0 - 2 592 000 sec. 1 209 600 sec. (default)	equal to 0 hours - 30 days equal to 14 days	Demermines amount of historical data used for the training. Interval is defined in seconds.
AutoSelectAlarmLimit	0 1 (default)	Upper alarm limit is controlled by option *upper AlarmLimit*. Upper alarm limit is determined automatically depending on the selected sensitivity	Determines whether the sensitivity settings override the settings for the upper alarm limit.
upperAlarmLimit	-infinity < upperAlarmLimit < +infinity 3 = default		When the alarm value exceeds the *upperAlarmLimit* the parameter sets an alarm.
upperWarningLimitFactor	0 ≤ upperWarningLimitFactor ≤ 1 0.9 = default		When the alarm value exceeds the *upperWarning LimitFactor* the parameter sets a warning.

6.9.1.13   Menu / Settings / Parameter / Add Parameter

This menu item provides the possibility to configure additional parameters. There are different types of parameter, that are explained in the following sections:

■ Parameters already installed but removed from display:

When installing a probe or sensor all parameters provided by this instrument will be installed. Single parameters can be deactivated using the *Remove Parameter* button (see section 6.9.1.18). All these removed parameters are displayed in the *Add Parameter* screen and can be reactivated by clicking on the blue plus sign in the column *Add* on the righ hand side.

6.9.1.14 Menu / Settings / Parameter / Add Parameter / Analog Input Parameter

If the system is equipped with an analog input module, a parameter can be allocated to that input. On the right hand side of *Create Parameter* the *Address* of the used analog input has to be selected. After clicking on the blue plus sign, a new window as on the right hand side opens. Here the name of the parameter (*Parameter name*), the *Unit* that is reported as well as the *Upper limit* (corresponding to 20 mA) and *Lower limit* (corresponding to 4 mA) can be defined. Also the *Resolution* used for displaying the result is defined here (0 meaning no decimal places, 1 a single decimal place, etc.).

6.9.1.15 Menu / Settings / Parameter / Add Parameter / Digital Input Parameter

If the system is equipped with an digital input module, a parameter can be allocated to that input. On the right hand side of *Create Parameter* the *Address* of the used digital input has to be selected. After clicking on the blue plus sign, a new window as on the right hand side opens. Here it is possible to define a *Parameter name* as well as a text that will be displayed when the input is low or high. This is done behind *Text for value =*. The text is then displayed in the single parameter display instead of the value.

The state of the input is also indicated by an icon in the upper right corner of the single parameter display. This icon is grey when the digital input is low (0) and green when the input is high (1).

6.9.1.16 Menu / Settings / Parameter / Add Parameter / Calculation Parameter

The menu item Menu / Settiings / Parameter / Add Parameter always provides the possibility to *Create virtual Parameter*. Virtual parameters are derived parameters that are either predefined in the software (e.g. water quality index *WQI*) or can be configured individually by the customer. A virtual parameter takes readings of other sensors as inputs and performs calculations within the moni::tool software. It will be created as following:

- Click on the blue plussymbol on the hight hand side of the entry *Create virtual Parameter*.

- In the new window as on the right hand side enter a *Parameter name* (e.g. *SAC254*) and select the *Parameter type* (*Free Formula (Version 1.0)*).

- Push the button *Create* on top of the screen.

- Within this window all input parameters, that will be needed to calculate your individual parameter have to be selected. This can be done by selecting the _Sensor name_ in the left column, then selecting the parameter or wavelength in case of a spectrometer probe in the column _Channel_ and finally clicking on the blue plussymbol on the right. After all needed input parameter have been selected push the button _Save_ on top.

- In the next window the _Formula_ how to calculate your individual parameter can be entered. The list of all available input parameters starting with variable _a_ is displayed below the entry field for the formula. As an example the parameter _SAC254_ will be calculated with the formula _0.4*a+0.6*b_ as displayed on the right hand side.

- Finally push the button _Save_ to store the new defined parameter.

Clicking on the blue and yellow triangles on the right hand side of the screen will pop up additional information.
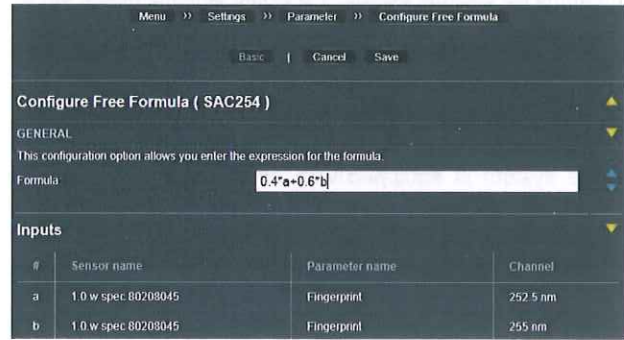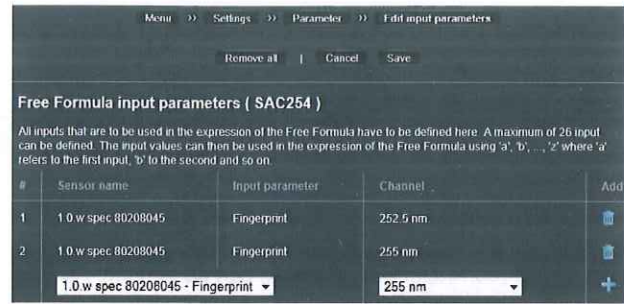
6.9.1.17   Menu / Settings / Parameter / Add Parameter / Alarm Parameter

The menu item Menu / Settings / Parameter / Add Parameter also provides the possibility to create Alarm Parameters when clicking on the blue plussysmbol on the right hand side of the entry _Create virtual Parameter_.

To create an alarm parameter either the ana::tool function for pattern recognition in time series (Parameter Type = _Pattern Alarm_) or the ana::tool function of spectral alarm in fingerprints (Parameter Type = _Spectral Alarm_) can be selected.

The single steps to create an alarm parameter are listed below, whereas instuction for pattern alarm can be found in the left column and instruction for spectral alarm can be found in the right column:

Pattern Alarm	Spectral Alarm
■ Click on the blue plussymbol on the hight hand side of the entry _Create virtual Parameter_.	■ Click on the blue plussymbol on the hight hand side of the entry _Create virtual Parameter_.
■ Enter an individual name for the alarm parameter in the entry field _Parameter name_.	■ Enter an individual name for the alarm parameter in the entry field _Parameter name_.
■ Select the algorithm _Pattern Alarm (Version 1.2)_ in the drop down list _Parameter Type_.	■ Select the algorithm _Spectral Alarm (Version 1.0)_ in the drop down list _Parameter Type_.
■ Push the entry _Create_ (no _Configuration_ file needs to be selected).	■ Push the entry _Create_ (no _Configuration_ file needs to be selected).
■ Select the parameters that will be used as inputs for the pattern alarm.	■ Select the spectral source (fingerprint) that will be used as input for the spectral alarm.
■ For each selected input parameter either the original value (_Raw value_) or the value corrected by vali::tool (_Clean value_) needs to be selected as well in the column _Channel_. The selected parameter is added to the list by clicking on the blue plussymbol in the column _Add_.	■ The fingerprint consists of 220 wavelenghts. If the entire spectrum is required, the option _All_ can be selected. When _All_ is checked, all wavelengths will be added when _Add_ is used. At least 5 wavelength have to be selected
■ Push the button _Save_ to store the new defined parameter.	■ Push the button _Save_ to store the new defined parameter.

6.9.1.18   Menu / Settings / Parameter / Remove Parameter

This menu item provides the possibility to delete a parameter from the parameter list. After selecting one or several parameters and pushing the button *Remove Parameter* a query is displayed if you realy want to *Delete* the parameter.

When pushing *Delete* the parameter will be removed from *Value* and *Time Series* and no new results will be stored in the database.

Delete selected objects and dependencies   ✕

Objects that will be deleted:

  • [Parameter] SAK254

You are about to delete the selected objects and objects that are dependent on it. Are you sure you want to continue?

          Cancel   Delete

6.9.1.19   Menu / Settings / Service / Restore Factory Settings

This menu item provides the possibility to reset the internal moni::tool database to factory default (original settings the controller was delivered with).

This includes measurement results, all settings related to parameters and sensors, etc. Restoring to the factory settings will lead to loss of all data in the database and loss

Menu ›› Settings ›› Service ›› Restore Factory Settings
Attention
Restore Factory Settings
The station will be reset to the factory defaults. We strongly recommend to dump your database before you proceed
⚙
Proceed

of all sensor information. After the restore is completed, the s::can controller should be rebooted before any configurations are performed.

General system settings (e.g. network settings, time zone and NTP settings) will not be changed.

⚠ It is recommended to perform a database dump before a restore to factory settings is performed (see section 6.9.2.4).

6.9.1.20   Menu / Settings / Service / Task Manager

Selecting this menu item will start the task manager on the controller itself.

⚠ The windows task manager will only be visible on the screen of the s::can controller or when using a remote desktop programme (VNC Viewer). It will not be visible in the web browser. It will block the other applications from view on the screen of the s::can controller. Therefore, this function should only be used during maintenance on site.

Menu ›› Settings ›› Service

The task manager has been started on the server.

Restore Factory Settings   Windows Task Manager

6.9.1.21 Menu / Settings / Service / anapro

This menu item, only visible on the screen of the s::can controller or when using a remote desktop programme (VNC Viewer), provides the possibility to start the ana::pro software. This might be necessary to configure advanced settings on the spectrometer probe. When ana::pro is started the moni::tool software will be shut down and after finishing the service task the complete monitoring system has to be rebooted.

When selecting this menu item a screen will be displayed showing all service tasks that are running in the background.

Selecting the entry *Continue* on top of the screen will pop up a warning that all services will be stopped.

This message has to be confirmed by pushing *Yes*.

⚠️ Pushing the button *Permanent* will change the start-up sequence of your controller. It will deactivate moni::tool and will make ana::pro the active operating software. For undoing this setting the file *D:\Programme\s-can\monitool.bat.disabled* has to be renamed to *monitool.bat*.

Now the ana::pro software will start the searching procedure for the spectrometer probe. Please don't touch the screen during this process. When the prope has been found the *Address* and the serial number (*SN*) will be displayed.

A further user message will pop up that informs you that the spectrometer probe is still running in Mode *LOGGER*. Push the button *ONLINE* to enable operation of the probe with ana::pro.

As soon as all service task in ana::pro has been finished *Exit* the ana::pro software using the option *Exit windows and reboot*. Now the complete system will be rebooted and the moni::tool software will start up automatically.
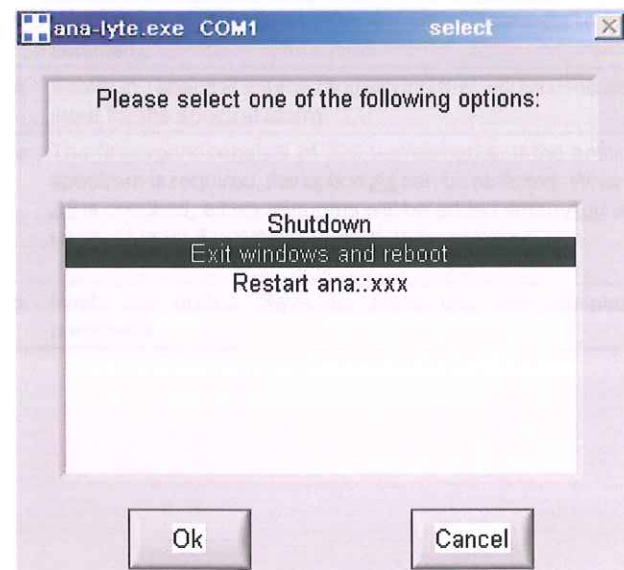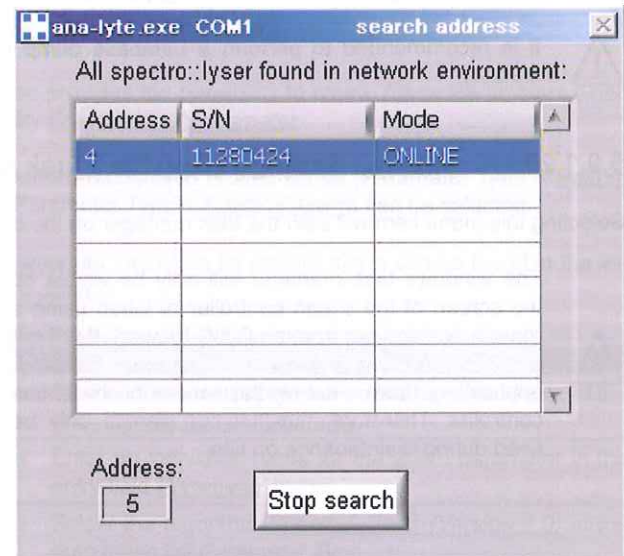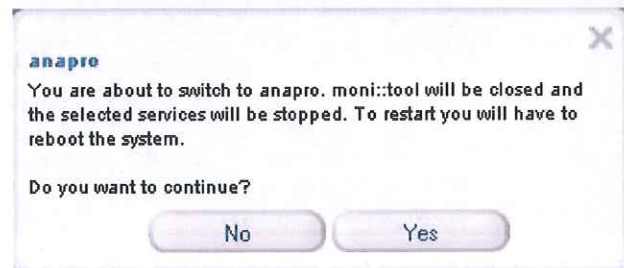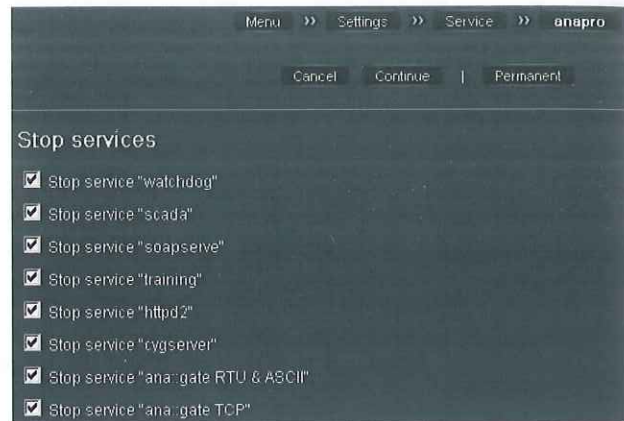
6.9.2   Menu / Data Export

The *Data Export* function provides the possibility to extract data from the moni::tool database and store it in a file format so that it can be downloaded / copied from the s::can controller.

In the lower part of the according selection screen the file specification can be selected. In the entry field *Export profile* you can either use the presettings *CSV* or *ana::pro* or define a *Custom* profile.

In the entry fields below the following specifications can be selected:

Date format (*ISO 8601* or *ana::pro*), *Separator* between the columns (tab, comma or semicolomn), the decimal separator (*Number format* dot or comma) and the maximum file size of a single file (*1MB*, *2MB*, *8MB*, *No limit*).

Four different items for download of parameter, fingerprint, logbook and complete database are available. Furthermore, it is possible to set up periodical data export as well as automatic transfer of these files using FTP or SSH transfer protocols (see section 7.2). All available features are explained in the following sections.

6.9.2.1   Menu / Data Export / Parameter Result File

This item can be used to export parameter results from the database to a text file. After clicking on the item *Parameter Result File* a selection screen will be displayed where the following steps have to be performed:

Select the amount of the data you want to download by entering start (*From:*) and end date of the period. This can be done by entering the date and time in the entry fields or by using the calendar function (the last month is selected by default).

Select the parameters you want to download using the button *Select all* or selecting each parameter individually in the tick box on the left side of the name.

Regarding details for file format configuration in the lower part of the selection screen refer to section 6.9.2.

When ticking *Detailed Header* also the calibration coefficients will be included in the header, which means a new file will be created whenever any coefficient has changed.

Clicking on the *Download* button on top of the screen will open a download window in the web browser. After selecting the target drive the file will be compiled and transferred.
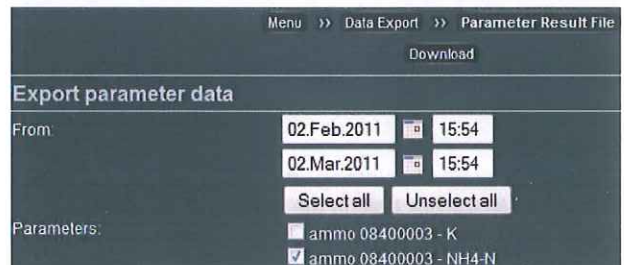
⚠   Please note that depending on the amount of selected data this process might last several minutes.

6.9.2.2   Menu / Data Export / Fingerprint Result File

This item can be used to export fingerprints from the database to a text file. After clicking on the item *Fingerprint Result File* a selection screen will be displayed where the following steps have to be performed:

Select the period of the data you want to download (*From:*) by entering start and end date (*To:*) of the period in the fields or by using the calendar function (the last month is selected by default).

Select the spectrometer probe from which the fingerprints need to be downloaded using the button *Select all* or marking each probe individually.

Regarding details for file format configuration in the lower part of the selection screen refer to section 6.9.2.

Clicking on the *Download* button on top of the screen will open a download window in the web browser. After selecting the target drive the file will be compiled and transferred.

Menu >> Data Export >> Fingerprint Result File	
Download	
Export fingerprint data	
From:	31-Dec-2011 12:21
To:	31-Jan-2012 12:21
	Select all Unselect all
Parameters:	☑ 1.0.w spec 80208045 - Fingerprint
Historic parameters:	
Export profile:	ana::pro
Date format:	yyyy.MM.dd HH:mm:ss (ana::pro)
Separator:	Tabulator
Number format:	### ## (Dot)
Maximum size of contained files:	8 MB

⚠ Please note that depending on the amount of selected data this process might last several minutes.

6.9.2.3   Menu / Data Export / Logbook

This item can be used to export the logbook. After clicking on the item *Logbook* a selection screen will be displayed where the following steps have to be performed:

Select the amount of the data you want to download by entering start (*From:*) and end date (*To:*) of the period. This can be done by entering the date and time in the entry fields or by using the calendar function (the last month is selected by default).

Select the type of messages you want to download using the button *Select all* or selecting each type (explained below) individually in the tick box on the left side of the name.

Menu >> Data Export >> Logbook	
Cancel Download	
Export Logs	
From:	13-12-2010 18:36
To:	13-01-2011 18:36
	Select all Unselect all
Levels:	☐ System
	☐ User
	☐ Critical
	☐ User-Interface
	☐ TML
	☐ Training
Separator:	;
Maximum file size:	2 MB

- *System*:   Information regarding the   complete system (SW maintenance and integrity checks).
- *User*:   Information regarding user login and logout (see section 6.3).
- *Critical*:   Information regarding errors in measurements, configuration and security related issues.
- *User-Interface*:   Information regarding the user interface (frontend).
- *TML*:   Information regarding data transfer using TML (see section 6.9.3.2).
- *Training*:   Information regarding training of alarm parameters in ana::tool (see section 6.9.3.1).

Finally select the correct column *Separator* (tab, comma or semicolomn) and the maximum file size of a single file (*1MB*, *2MB*, *8MB*, *No limit*).

Clicking on the *Download* button on top of the screen will open a download window in the web browser. After selecting the target drive the file will be compiled and transferred.

6.9.2.4   Menu / Data Export / Database Dumps

This item can be used to generate a dump of the current database status. This is done by clicking the button _Dump now_ on top of the screen.

After the dump has been produced, it can be downloaded to a remote computer (when connected using a remote browser) or a USB stick that is connected directly to the USB-port of the s::can controller (drive E:\). To download a database dump, click on the _Download_ symbol behind the name of the dump that needs to be downloaded.

Menu ›› Data Export ›› Database Dumps			
Dump now			
File name	Size	Copy to	Download
dump_v11_UTC20110104_000001.gz	108 KB		◉
dump_v11_UTC20110112_000001.gz	641 KB		◉
dump_v11_UTC20110113_000000.gz	1.48 MB		◉

The Database dump is a dump of the entire SQL database on the s::can controller. Regarding detailed information about the database, please refer to section 7.1.

6.9.2.5   Menu / Data Export / Auto-Export

Besides triggering data export from the database manually as explained in the former sections, it is also possible to generate results files in moni::tool automatically. When this function is activated, the software will automatically write the measurement results into files. This ensures that the latest results are available for immediate download and data transfer.

Within the menu item _Auto-Export_ the button _Edit_ provides the possibility to select which data will be exported (_parameter data_ and / or _fingerprint data_), as well as the amount of data; all available data (_All data_), from a certain date (use the calendar to pick the date), or only from the current point in time (_From now_).

Regarding details for file format configuration in the lower part of the selection screen refer to section 6.9.2.

When ticking _Detailed Header_ also the calibration coefficients will be included in the header, which means a new file will be created whenever any coefficient has changed.

Once the configuration is stored by pushing _Save_ the writing of the files will start. New results will be checked and added to the file in a 60 seconds cycle. The automatic export function can be stopped via the button _Disable Export_.

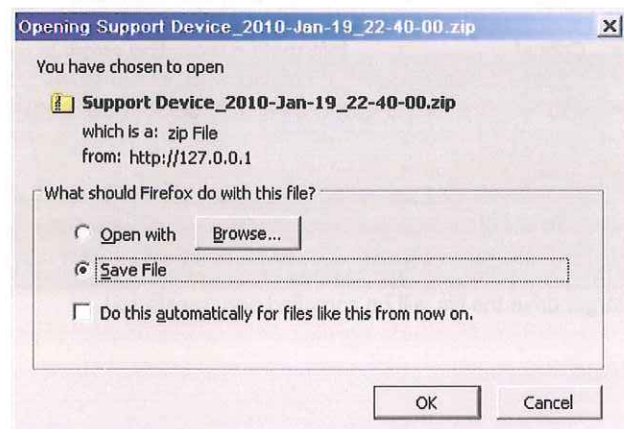| Menu ›› Data Export ›› Auto-Export ›› Setup		
Cancel Save		
Automatic File Generation		
Export Settings:	☑ Export parameter data	
	☑ Export fingerprint data	
Oldest data:	04-Jan-2012 12:36	
Already exported until:	31-Jan-2012 16:20	
Export data from:	31-Jan-2012 [📅] 16:20	From now All data
Export profile:	Custom	▾
Date format:	yyyy.MM.dd HH:mm:ss (ana::pro)	▾
Separator:	Tabulator ▾	
Number format:	###.## (Dot) ▾	
Maximum size of contained files:	8 MB ▾	
Detailed Header:	☑ Include coefficients in header	

⚠ In order to use automatic transfer of results using FTP or SSH, the Auto-Export must be activated (button _Enable Export_) which is also the default setting.

6.9.2.6   Menu / Data Export / Generated Files

When selecting this menu item all files generated up to now for export are displayed. All Files (by pushing the button _Select all_) or single files (by clicking on them) can be selected for download (_Download Files_) to an external medium (connected USB-stick or local PC when using a remote browser) or can be deleted (_Delete Files_).

When pushing the button _Refresh_ the information on the screen will be actualized. The generated files are stored on the controller in the folder D:\ s-can \ transfer.

Menu ›› Data Export ›› Generated Files			
Refresh | Select all Unselect all | Delete Files Download Files			
From	To	Content	Size
2012-01-31 15:08	2012-01-31 15:16	FP 1.0 w spec 80208045	8 KB
2012-01-31 15:08	2012-01-31 15:16	Parameter values	8 KB
2012-01-31 06:44	2012-01-31 15:08	Parameter values	192 KB
2012-01-30 21:32	2012-01-31 15:08	FP 1.0 w spec 80208045	680 KB

6.9.2.7   Menu / Data Export / FTP Transfer

This menu item provides the possibility to configure the FTP transfer process that will transfer results in file format to another computer. When using this function for automatic FTP transfer the _Automatic-Export_ must be activated (see section 6.9.2.5).

The screen provides several entry filed to enter the needed data for login on the target FTP server (_Host_ IP address, _Username_ and _Password_). Furthermore a _file prefix_ can be entered to add a fixed textblock to the filename. This can be used to make it possible to recognise the origin of the files when data is being transferred from multiple stations to the same FTP server. If all data are set up correctly, the connection can be tested by pushing the button _Test connection_.

The entry field _Interval time_ enables to set the time how often files will be transfered. If this time is smaller that the measuring intervall of the controller, moni::tool will ignore this setting and use the measuring interval as transfer interval.

Menu ›› Data Export ›› FTP Transfer
Cancel   Save
Automatic FTP transfer settings
Enable service: ○ Aktiviert ● Deaktiviert
Host
Port   21
Username
Password
File prefix
Interval time [sec]:   60
Test: Test connection

Pushing the button _Save_ will store all settings and start the automatic FTP transfer. The FTP Transfer can be interupted by selecting _Deaktiviert_ on top of the screen.

6.9.2.8   Menu / Data Export / SSH Transfer

This menu item provides the possibility to configure the SSH transfer process that will transfer results in file format to another computer. When using this function for automatic SSH transfer the _Automatic-Export_ must be activated (see section 6.9.2.5).

The screen provides several entry filed to enter the needed data for login on the target SSH server (_Host_ IP address, _Username_ and _Password_). Furthermore a _Remote directory_ to which the result files will be transfered can be entered. If all data are set up correctly, the connection can be tested by pushing the button _Test connection_.

The entry field _Interval time_ enables to set the time how often files will be transfered. If this time is smaller that the measuring intervall of the controller, moni::tool will ignore this setting and use the measuring interval as transfer interval.

Menu ›› Data Export ›› SSH Transfer
Cancel   Save
Automatic SSH transfer settings
Enable service: ○ Aktiviert ● Deaktiviert
Host   192.168.166.74
Port   22
Username   rsync
Password   rsync1
Remote directory
Interval time [sec]:   60
Test: Test connection

Pushing the button _Save_ will store all settings and start the automatic SSH transfer. The SSH Transfer can be interupted by selecting _Deaktiviert_ on top of the screen.

6.9.3   Menu / ana::tool

The *ana::tool* function provides access to the training of the ana::tool software. The training will consider the feedback of the user to the historical alarm events. After the training ana::tool will be more selective with smaller limits and therefore less events will be missed.

6.9.3.1   Menu / ana::tool / Training

The virtual parameters that are used as alarm parameters have the ability to be trained on historical data (see section 6.9.1.17 for more information on configuration of virtual alarm parameters). It is necessary to train alarm parameters in order to adapt the alarm response to a particular application.

Click *Training* to display an overview of all currently installed alarm parameters that can be trained is provided. Furthermore, for each parameter the time and date of the last successful and as well as that of the next scheduled training are shown. Also, a training can be started manually.

Per default all algorithms are automatically trained once a day. If automatic training is disabled for an alarm parameter, the field for the date and time of the next scheduled training will not show a date but only a dash and in the column under *Auto* it will be marked with *Off*. The training frequency can be modified using the item *Menu / Settings / Parameter* (see section 6.9.1.12).

To manually initiate training, click on the button *Start* in the row of the alarm parameter you want to train. Parameters that are currently being training are marked with *running now* in the *Next Training* column.

6.9.3.2   Menu / ana::tool / Edit TML Settings

TML is a protocol which can be used to transfer all data from the database on the s::can controller to another database or server. Only data request from external is supported, that means the s::can controller responds to an external request for data by sending an appropriate TML stream. To be able to communicate via TML port 8083 is needed.

TML data can be obtained by http (https) requests using the GET or PUT method. A CGI script prepares the requested static data (system configuration) and dynamic data (measured parameters) for a specified interval defined by start and end timestamp (ISO8601). A data request has the form:

https://<station>/cgi-bin/data?start=2008-08-01T10:35:00Z&end=2008-08-01T11:35:00Z&hash=0123456789abcdef0123456789abcdef

6.9.4   Menu / License

The Software moni::tool consists of basic functionalities that are available to all users and advanced features that are only available after the appropriate license has been obtained, which unlocks these features. In the License window the advanced functions are listed as well as the information on whether they are unlocked and until when.

It is also possible to select (button *Browse*) and upload (button *Enter license*) a new license key in this window. Once the key has been loaded, the additional features are immediately unlocked.

The license keys are specific for the serial number and MAC address of your controller. They can be found in the License window right about the *Choose License file field*. If you want to acquire a new license key, these IDs need to be provided to your s::can sales partner.
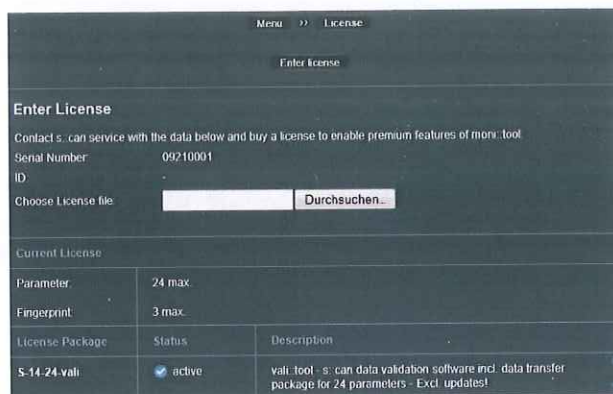
6.9.5   Menu / Help

The menu item *Help* provides following information:
- exact version of the actual monitoring system (*Menu / Help / Version Info*)
- license agreement for the moni::tool software (*Menu / Help / License Agreement*)
- the most important modifications of the actual moni::tool version (*Menu / Help / New Features*).

6.9.5.1   Menu / Help / Version Info

Clicking on *Version Info* will open a window showing information on the version of the software that is installed (*Version*) as well as information on how to contact s::can (*Contact*).

On the right hand side the *Model* and the *Serial number* of the controller (*Terminal*) and the *Status* as well as the *IP address* of the *LAN* and *Wireless LAN* connection are displayed.

6.9.5.2   Menu / Help / License Agreement

Clicking on *License Agreement* will open a window showing the license agreement.

6.9.5.3   Menu / Help / New Features

Clicking on *New Features* will open a window showing all modifications of the actual version of moni::tool. Via the button *View full changelog...* the complete history of the versions can be downloaded.

6.10   Service

The _Service_ screen provides access to all functions related to service and maintenance of the complete monitoring station. The main screen provides an overview of all devices that are configured in moni::tool (i.e. the controller itself, probes, sensors, cleaning valves and I/O devices). If more than 6 measuring instruments are installed, the additional once are listed on a second page (see section 6.2 for navigation). Furthermore the multiple calibration procedure (see section 6.10.8.3) and the manual measuring mode (see section 6.10.2) can be started directly from this screen.

1	Information if Service Mode is activated
2	Start multiple calibration procedure
3	Cleaning devices
4	Controller (Terminal)
5	Digital input modules
6	Actual installed probes and sensors
7	Installation of new probes and sensors
8	Change from automatic to manual measuring mode
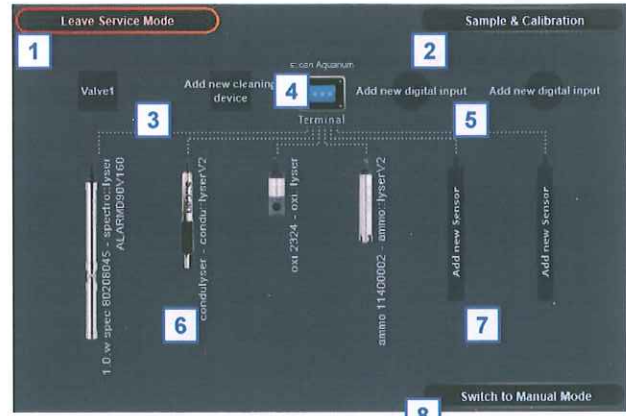
Each device is shown as a combination of: picture, name, sensor model and, in case of spectrometer probe, used global calibration.

New sensors, cleaning devices and I/O modules can be added by clicking on empty fields indicated by _Add new..._

Clicking on one icon of an already installed device will open a new screen which enables further configuration of the specific device. Depending on the selected device type the following menu items will be available (see figure on the right).
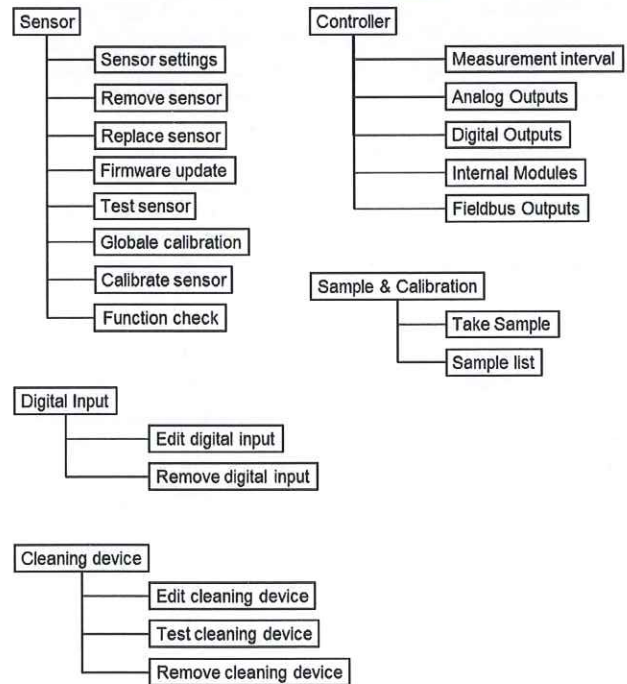
6.10.1   Service Mode / Interruption of Automatic Measurements

If any of the configured devices is selected or the installation of a new device is started, the system will change to service mode. In service mode the automatic measurements of all sensors are interrupted and no results will be stored. Measurement can be resumed by clicking on the _Leave Service Mode_ button or on the _Measurements stopped_ button (see figure on the right). Measurements are also resumed after _Logout_ of the user, which happens at the latest after 20 minutes of inactivity (see section 6.3).

As long as the monitoring system is in service mode, the _Service_ symbol in the main navigation bar will blink yellow (see figure on the right).
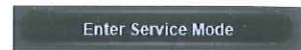
6.10.2   Manual Mode of Measurements

In normal (automatic) mode moni::tool triggers a new measurement in a regular interval. The measuring intervall (120 seconds by default) can be set via the menu item _Service / Controller / Measurement Interval_ (see section 6.10.6.1).

If you want to perform single measurements, triggered manually by the operator, it is possible to deactivate the automatic mode by pushing the button _Switch to Manual Mode_ in the lower right edge of the _Service_ screen. After confirming the user message (_Switch to Manual Mode_) with _Yes_ all measurements will be stopped.

Instead of the information display in the lower right edge you will see the button _Start Measurement_. Whenever this button is pushed a new window will pop up where the user has to decide if only a measurement (_Only Measure_) or also a cleaning procedure (_Clean + Measure_) shall be executed.

Perform Manual Measurement

You are about to initiate a single measurement. You can choose whether or not a full cleaning cycle should be performed prior to the measurement.

Only Measure   Clean + Measure

If you want to set moni::tool back to normal (automatic) mode push the button _Switch to Automatic Mode_ and confirm the user message (_Switch to Automatic Mode_) with _Yes_.
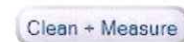
6.10.3   Probe / Sensor Installation

The installation of a new sensor is initiated by clicking on one of the empty sensor symbols on the main _Service_ screen. moni::tool will automatically initiate a search for any connected device. Once the search is completed, a list with all connected sensors will appear, and the sensors that need to be installed can be added using the blue plus symbols in the table. Detected new sensors can be ignored / not installed by clicking on the recycle bin icon. The search can be interrupted using _Cancel Search_. Manual search can be accessed by pushing _Advanced Search_.

After the sensor is found, a page with information about the sensor is displayed. If necessary the _Sensor name_ and the _Location_ of the installation can be entered by the user individually. Furthermore the identification of the _Cleaning device_ as well as date of the purchase (_Purchase date_) and warranty (_Warranty expiry date_) can be entered (please refer to section 6.10.3.1).

⚠ In general it is possible to install several probes and sensors at the same time if they are of different types. When installing two probes or sensors of the same type (e.g. two ammo::lyser) you have to install each sensor seperately.

6.10.3.1   Installation of s::can Probes / Sensors

After connecting the probes and sensors to the appropriate plugs on the controller, the installation is performed by the following steps:

- Click the *Service* tab of the moni::tool screen and logon as *Administrator* (see section 6.3).

- Click on an empty sensor icon (*Add new Sensor*) to initiate the automatic initialisation process.

- A new screen with progress bar as shown on the right side will pop up while moni::tool is searching for all connected probes and sensors. This procedure can be stopped using the button *Stop Search* or you can switch to the manual initialisation by pushing the button *Advanced Search*.

- As soon as moni::tool has searched all COM-ports and all addresses a screen lists up all connected probes and sensors. The *Status* column informs you if the *sensor is already installed* or if it a new one (*Found new sensor*).

- Click either on the blue plus sign (±) on the right side of the new sensor to install this new sensor or on the button *Install All* to install all new sensor.

- moni::tool will finish initialisation of the new sensor (*Status: Installing sensor, please wait...*) and switch back to the *Service* tab showing the new sensor in the system overview.
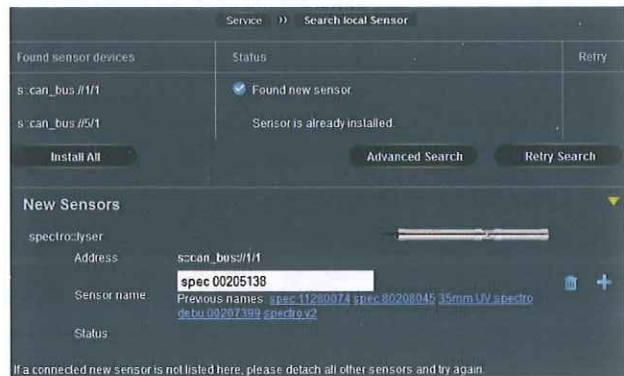
The automatic sensor installation of moni::tool will search for all probes and sensors connected to COM 1 (plug for spectrometer probe), to COM 4 (sys-plugs) or to COM 5 (terminal connection).

If you want to perform the installation manually or if sensor has not been found during automatic installation procedure a manual / advanced installation is performed by the following steps:

- Push the button *Advanced Search*.

- Select the correct connection (*Connection method*). In case of s::can probes / sensors this will be the default setting (*via sensor cable plug to terminal (s::can Bus)*).

- Enter correct *COM-Port* and *Address*. If unknown moni::tool will search the complete range as indicated on the screen.

- Click the button *Start search*.

6.10.3.2   Installation of Analog Sensors

Analog sensors need to be connected to an analog input module of the con::cube. This can either be an internal module (D-315-in-mA) or an external analog input module (D-322-8) connected via COM-port. If multiple analog input devices need to be installed the following steps have to be repeated for each device:

- Click the *Service* tab of the moni::tool screen and logon as *Administrator* (see section 6.3).

- Click on an empty sensor icon (*Add new Sensor*) and push the button *Advanced Search*.

- Select the correct connection (*Connection method*). Either *via internal analog-in module to controller* when using D-315-in-mA or *via external analog-in module to controller (ICPCON)* when using external modules.

- Select either the correct *Channel* of the internal module or enter the correct *COM-Port* and *Address* of the external module. If no channel is displayed please check if internal module is installed via the menu item *Service / Controller / Internal Modules*.

- Click the button *Install Sensor*.

- Enter a *Sensor name* in the entry field that will be displayed and push the button *Save*.

- The parameter that displays the data from the analog sensor needs to be configured using the menu item *Menu / Settings / Parameter / Add Parameter* (see section 6.9.1.14).

6.10.3.3   Installation of Sensors via TCP

Up to 8 parameters from other stations (e.g. another con::cube) which use the s::can protocol can be can be installed to the s::can controller over an Ethernet (TCP) connection by the following steps:

- Click the *Service* tab of the moni::tool screen and logon as *Administrator* (see section 6.3).

- Click on an empty sensor icon (*Add new Sensor*) and push the button *Advanced Search*.

- Select the *Connection method* *via Ethernet to terminal (s::can Bus TCP)*.

- Enter the *address* of the sensor. A correct address for TCP communication always contain an IP address and a port number.

- Click the button *Start search*.

- Enter a *Sensor name* in the entry field that will be displayed and push the button *Save*.

6.10.3.4   Installation of Third Party Modbus Sensors

It is also possible to connect third party sensors to the s::can controller either via Modbus RTU or via Modbus TCP. In both cases the protocol of the sensor has to be configured manually by the customer. The installation itself will be performed by the following steps:
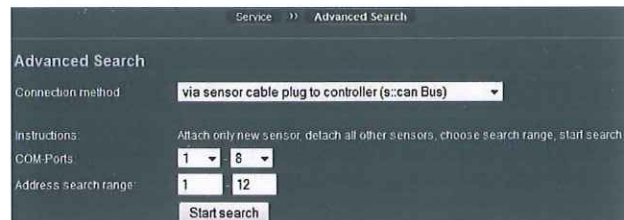
- Click the *Service* tab of the moni::tool screen and logon as *Administrator* (see section 6.3).

- Click on an empty sensor icon (*Add new Sensor*) and push the button *Advanced Search*.

- Select the correct connection (*Connection method*). Either *via sensor cable plug to terminal (Generic Modbus RTU)* when using Modbus RTU or *via Ethernet to terminal (Generic Modbus TCP)* when using TCP.

- Enter correct *COM-Port* and *Address* of the sensor for RTU connection or the correct *Address* of the sensor for TCP connection. A correct address for TCP communication always contain an IP address and a port number.

- Select the correct *Template* for sensor communication. Note that templates can be selected, created or uploaded using the menu item *Menu / Settings / Templates*. All templates are stored onto the controller in the folder *D: \ s-can \ templates*.

- Click the button *Install Sensor*.

- Enter a *Sensor name* in the entry field that will be displayed and push the button *Save*.
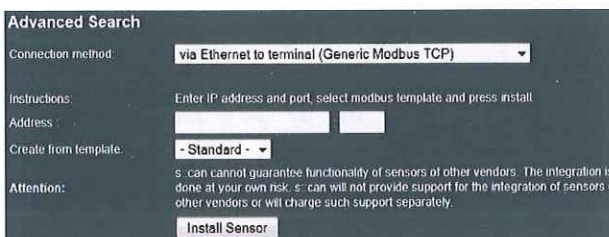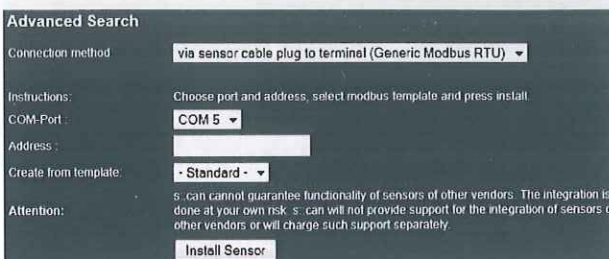
6.10.4   Service / Sensor

After selecting an already installed probe / sensor by clicking on the icon, a selection of the following menu items will be available; the selection depends on the sensor type.

- Sensor settings (see section 6.10.4.1)
- Remove sensor (see section 6.10.4.2)
- Replace sensor (see section 6.10.4.3)
- Firmware update (see section 6.10.4.4)
- Test sensor (see section 6.10.4.5)
- Global calibration (see section 6.10.4.6)
- Calibrate sensor (see section 6.10.4.7)
- Function check (see section 6.10.4.8)
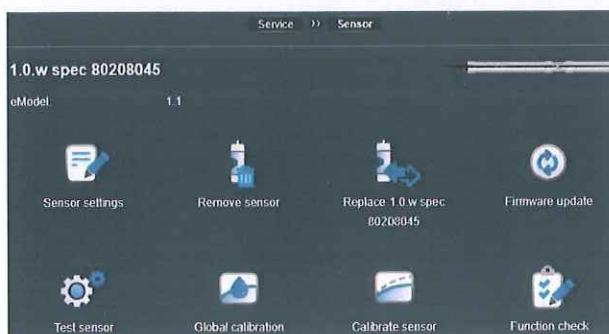
6.10.4.1 Service / Sensor / Sensor Settings

This menu item provides the possibility to edit the sensor settings that can be modified by the user. Changeable settings include *Sensor name*, *Location*, *Cleaning device*, *Purchase date*, *Warranty expiry date*.

Fixed sensor settings will also be displayed as information.

If spectrometer probe is used in combination with a con::nect, which has it's own cleaning valve, enter a text in the field cleaning device. Doing this you can create a new cleaning device (see 6.10.5.1.) using the URL from this sensor.

Service ›› Search sensor ›› Install sensor

Cancel Save

Install sensor

URL	modbus_rtu://4/3
Sensor name	ammo 08400002
	Previous names: ammo 08400002
Location:	default
Vendor:	s::can
Model:	ammo::lyserV1
ID:	
Serial number:	08400002
HW Version	0105
SW Version	010D
Parameter count:	4
Service actions:	196,0;197,0;198,0;199,0;200,0;201,0;202,0;203,0;204,0
Cleaning device:	
Purchase date:	2000-01-01
Warranty expiry date:	2000-01-01
Entered by:	

6.10.4.2 Service / Sensor / Remove Sensor

This menu item removes the sensor and all associated parameters from the monitoring station configuration. Data collected by this sensor remain stored in the database and can still be displayed in *Time Series* and *Fingerprint*.

After selecting the menu item a user message will be displayed that has to be confirmed with *Delete all* to remove the sensor.

Delete selected objects and dependencies   ×

Objects that will be deleted:

- [Parameter] Dissolved Oxygen
- [Parameter] Temperature
- [Sensor] oxi 2350

You are about to delete the selected objects and objects that are dependent on it. Are you sure you want to continue?

Cancel   Delete all

6.10.4.3 Service / Sensor / Replace Sensor

This menu item supports exchange of a sensor with the same type of instrument. When using *Replace sensor* all settings that can be configured in moni::tool remain identical to those from the replaced sensor.

Time series of readings will be continued after sensor replacement, because sensor name and parameter name are identical.

If it is not possible to exchange sensor, moni::tool will display the differences between the old and the new sensor and offers the possibility to install the replacement sensor as a new one (button *Install as new Sensor*).

Service ›› Sensor ›› Search sensor

Search sensor

Driver	Modbus RTU
Instructions:	Attach only new sensor, detach all other sensors, choose search range, start search.
COM-Ports:	1 - 1
Address search range:	1 - 8
	Start search

Change sensor

You can not replace the existing sensor with the newly found one as eModel and/or parameter count differ. You can still decide to install the found sensor as a new one.

	Old sensor	Newly installed sensor
Sensor name	G-De 00404273	
eModel	2.1	1.1
Model	G-Debug	debug::lyser
Serial number	00404273	00404273
Parameter count	4	5

Install as new Sensor

6.10.4.4 Service / Sensor / Firmware update

This menu item supports the firmware update of a sensor. The update can be performed by the following steps:

- Disconnect all sensores.

- Push the button *Connect*.

- Connect the sensor you want to update while searching screen as displayed on the right side is visible.

Establish Connection

[===================   ] 20%

⚡ Trying to connect to probe...

- After the connection to the sensor has been established a screen will display all sensor information.

- *Select firmware image* by pushing the button *Browse...* in the middle of the screen.

- Push the button *Update Firmware*.
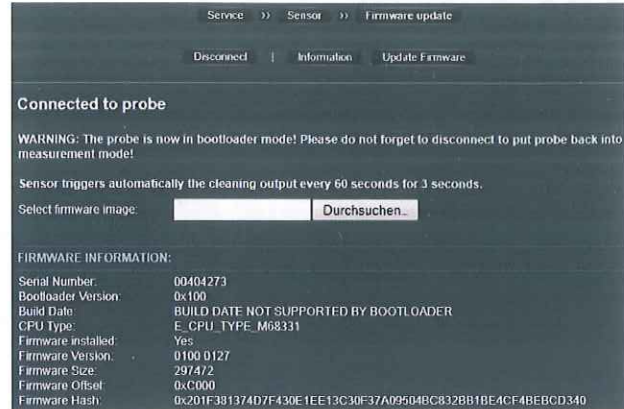
6.10.4.5 Service / Sensor / Test sensor

When selecting this menu item the actual *value* of the parameter readings as well as the *status* information of the sensor itself (first line) and of each parameter will be displayed on the screen. The information of one parameter can be actualised by pushing the icon *Retry* on the right side.

6.10.4.6 Service / Sensor / Global Calibration

This menu item - only available when spectrometer probe is selected - provides the possibility to change the global calibration used by the spectrometer probe. All global calibrations actually stored onto the probe will be displayed and the one actually used will be marked with *(Currently used)*. Simply select the new global calibration by clicking on the blue triangle symbol on the right side.

Furthermore within this menu item new global calibrations can be uploaded to the spectrometer probe. Push the button *Browse...* to search for the new global calibration and then push the button *Install GC*.
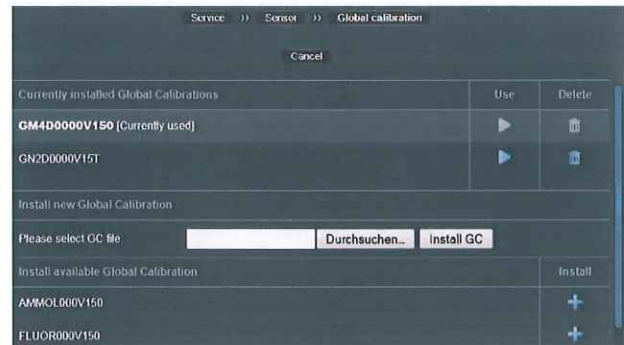
Global calibrations that are available on the s::can controller will be displayed in the lower part of the screen and can be uploaded to the spectrometer probe by pushing the blue plus symbol on the right side.

6.10.4.7 Service / Sensor / Calibrate Sensor

When selecting this menu item the invidivual calibration screen of the sensor will be opend. Please refer to section 6.10.8 of this manual and to the manual of the specific probe or sensor for detailed information.

6.10.4.8 Service / Sensor / Function Check

This menu item - only available when spectrometer probe is selected - provides the possibility to perform a function check of the spectrometer probe. Push button *Execute check* to start the procedure or push *Cancel* to leave without any activities. Please refer to manual of spectrometer probe regarding further details on possible results of functional check (Quality number).

6.10.5   Service / Cleaning Device

The cleaning devices manage the automatic cleaning of the probes and sensors. All existing cleaning devices can be configured, each with its own cleaning settings. The cleaning processes are performed in sequence before the start of the measurement. The process will start with the cleaning device that is displayed on the left icon of the *Service* screen. The cleaning icons are ordered alphabetically depending on the *Name* (see section 6.10.4.1) of the cleaning device from the left to the right. I.e. the *Name* of the cleaning device defines which cleaning device will be activated at first.

A complete cleaning cycle is displayed below. The process actually performed is displayed in the lower right part of the moni::tool screen (e.g. *Waiting*, see section 6.2).

Duration A-Cleaning   →   Waiting A-Cleaning   →   Duration B-Cleaning   →   Waiting B-Cleaning   →   Measurement

If the total duration of all single actions displayed above (cleaning + measurement) is longer than the measurement interval, the next cycle will not be started immediately but the beginning will wait until the next measuring time point has been reached. This means that fewer measurements are performed than specified by the measurement interval. The window for setting the *Measurement Interval* (see section 6.10.6.1) will display whether this can occur.

After selecting an already installed cleaning device by clicking on the icon, the following menu items will be available.

- Edit cleaning device (see section 6.10.5.2)
- Test cleaning device (see section 6.10.5.3)
- Delete cleaning device (see section 6.10.5.4)

6.10.5.1   Service / Cleaning Device / Installing Cleaning Device

The installation of a new cleaning device is initiated by clicking on one of the empty field labelled with *Add new cleaning device* on the main Service page. This opens the *New cleaning device* page, where the *Name* of the device and an individual *Description* can be entered. Below these entries the *Location* and the address (*URL*) can be selected (constat_do://3/33/6 for Valve 1 and constat_do://3/33/7 for Valve 2).

The cleaning settings themselves will be configured in the following entry fields.

- *Interval [sec]* — Time how often (i.e. in which time interval) cleaning is performed.
- *Duration [sec]* — Time how long the cleaning is active (cleaning valve is open).
- *Waiting time [sec]* — Time between end of cleaning cycle and start of next process (second cleaning process or measurement).

All settings and modifications will be stored when pushing *Save*. Regarding the electrical connection of the cleaning device please have a look to the s::can manual of your controller.

6.10.5.2   Service / Cleaning Device / Edit Cleaning Device

Selecting this menu item provides the possibility to check and / or modify the settings (*Name*, *Description*, *Location*, *Interval*, *Duration*, *Waiting time*).

6.10.5.3   Service / Cleaning Device / Test Cleaning Device

This menu item provides the possibility to test the cleaning function. When pushing the button *Clean now* the automatic cleaning will be activated for the time entered in the filed *Duration*.

Service ›› Cleaning Device ›› Test Cleaning Device
Test cleaning device Valve1
Duration [sec]:	1
Test:	Clean now
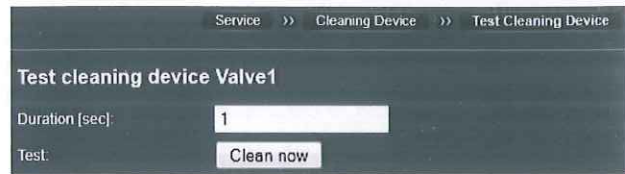
6.10.5.4 Service / Cleaning Device / Delete Cleaning Device

Selecting this menu item removes the cleaning device and all associated parameters from the monitoring station configuration.

6.10.6   Service / Terminal

After selecting the s::can controller by clicking on the icon in the *Service* main screen the following menu items will be available:

- Measurement interval (see section 6.10.6.1)
- Analog Outputs (see section 6.10.6.2)
- Digital Outputs (see section 6.10.6.3)
- Internal Modules (see section 6.10.6.4)
- Fieldbus Outputs (see section 6.10.6.5)

Service ›› Terminal
Measurement interval	Analog Outputs	Digital Outputs
Internal Modules		Fieldbus Outputs
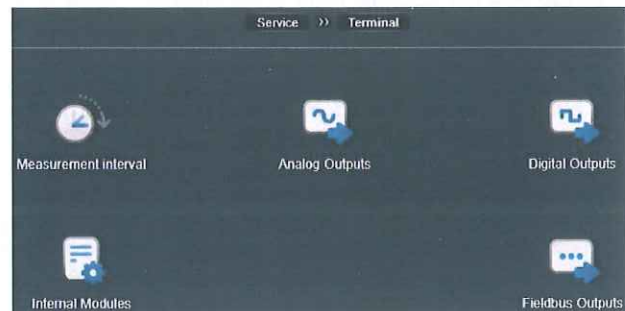
6.10.6.1   Service / Terminal / Measurement interval

This menu item provides the possibility to change the time interval between measurements (*Measurement interval*), which is set to 120 sec. by default. Changes will be stored when pushing *Save*.

Furthermore the user will be an information if the total time of the measuring process and the cleaning process should be longer than the measurement interval.

When the *Measurement interval* is changed, all vali::tool and ana::tool functions will be re-initialised. This may cause them to be unavailable until a new run-in period has been completed.

Service ›› Terminal ›› Measurement interval
Cancel   Save
Measurement interval
Warning:	After changing the measurement interval vali::tool and ana::tool will require a new run-in period.
Warning:	Measurements might be skipped! Measurement interval (30 sec.) < cleaning durations (30 sec.) + estimated measurement duration (50 sec.). Rise measurement interval or change cleaning times.
Suggested measurement interval	120 seconds
Measurement interval (seconds)	30
	To manually trigger measurements (manual mode), the measurement interval must be set to 0. Measurements can than be initiated in the service tab

6.10.6.2   Service / Terminal / Analog Outputs

This menu item provides all the configuration options related to the alalog outputs. When selecting *Analog Outputs* an overview is displayed that shows all available analog output channels. To each channel a single parameter can be assigned.

The s::can controller can either be equipped with internal analog outputs or an external analog output module can be connected to it.

Additional outputs can be added by selecting *New output*. In the configuration screen the needed *Protocol* has to be selected. Use *con::stat_ao://* for internal modules and *icpcon_ao://* for external modules. Furthermore the *COM Port*, the *Address* and the *Channel* have to be entered. Please note the information provided with the external output module for the correct settings.

An outputs can be deleted by selecting the output in the overview and pushing the button *Delete Output*.

If the internal analog output modules of the con::cube are not detected automatically please click on the controller icon and use the menu entry *con::cube / Internal modules / Search internal modules*.

Parameters can be assigned to the output channels by clicking on the edit icon (blue cogwheel) on the right hand side of the channel.

The following configuration settings must be made:

The *Parameter* defines which signal is being linked to the analog output. Available parameters can be selected from a drop down selection list.

The *Channel* defines which type of the parameter is being linked to the analog output (e.g. *Raw value* or *clean value*).

In the field *Description* an additional information can be entered. It is not necessary to fill this out.

The appropriate *Mode* of the analog output channel can be selected here. Available modes are *0..20 mA* and *4..20mA*.

In the field *Error Mode* the mA signal for reporting an error can be selected. Possible settings are: *0 mA*, *3.5 mA*, *4 mA*, *20 mA* or *Hold*.

The parameter results that corresponds to an output of *0/4 mA* and *20 mA* can be set in the following two fields.

Finally for testing the functionality of the analog data transmission a mA value can be set in the filed *Test*. When pushing the button *Send value* this mA value will be transfered.

All settings and modifications will be stored when pushing *Save*.

The assignment can be cancelled by clicking *Delete assignment*.

6.10.6.3   Service / Terminal / Digital Outputs

This menu item provides all the configuration options related to the digital outputs. When selecting *Digital Outputs* an overview is displayed that shows all available digital output channels.

The s::can controller can either be equipped with internal digital outputs or an external digital output module can be connected to it.

Additional outputs can be added by selecting *New output*.
In the configuration screen the needed *Protocol* has to be selected. Use *con::stat_do://* for internal modules and *icpcon_do://* for external modules. Furthermore the *COM Port*, the *Address* and the *Channel* have to be entered. Please note the information provided with the external output module for the correct settings.

An outputs can be deleted by selecting the output in the overview and pushing the button *Delete output*.

Status functions can be assigned to the output channels by clicking on the edit icon (blue cogwheel) on the right hand side of the channel.

To each channel one of the following function (*Mode*) can be assigned which will be used to set the status of the digital output. The status can be either high or low:

Mode	Output = LOW	Output = HIGH	moni::tool screen
System error	any error reported, system status error Error	Status of all devices (controller, sensors, parameters) is Ok	*Status* tab blinking when status = LOW
Service mode	Service mode of monitoring system is active and measurements are interrupted	Query of readings is running	*Service* tab blinking when status = LOW
Alarm	no alarms are pending	at least one alarm is pending	*Alarm* tab blinking when status = HIGH
Cleaning	cleaning not active (i.e. cleaning valve closed)	cleaning active (i.e. cleaning valve open)	
Time control	during interval time	during duration time, 1. cycle starts when settings are stored	
Value	value within accepted range	value outside accepted range	

Below the selected *Mode* an additional *Description* can be entered by the user.

For testing the *LOW* and *HIGH* functionality of the digital output the desired status can be selected on the right side of the entry *Test*. Clicking on the button *Send value* will transfer the selected status to the digital output.

When selecting the mode *cleaning* also the used *Cleaning device* has to be selected.

If *time control* is selected, the output will be triggered after a repeating *Interval* which has to be entered in seconds. The *Interval* has to be set to at least 60 seconds. After every such interval, the output will be set to HIGH for a specified *Duration* (in seconds) and then it is set to LOW again during the next interval. Pushing the button *Save* will store the settings and the time control will start immediately with the 1. *Duration* cycle.

The function mode *value* assigns the digital output to a parameter result. If the value of the parameter transgresses a set limit, the state of the output will change in response to that. The following properties have to be set:

In the selection field *Parameter* the parameter, the output is assigned to, will be selected.

The entry *Channel* specifies if the raw measurement result (*Raw value*) or the corrected result (*Clean value*) will be used. The last option requires vali::tool.

The entry *Limit* specifies the threshold of the parameter result that triggers the state. If the result is above this limit the output is HIGH, if the result is below this limit, the output is LOW.

The digital output channel will switch to HIGH as soon as the limit is exceeded. The output will switch back to LOW again when the limit is no longer exceeded. To avoid multiple switching of the digital output if the value is fluctuating nearby the limit a *Hysteresis* can be entered. This causes the digital output switching back to LOW only if value is falling below the threshold limit incl. hysteresis (see figure on the right hand side).

The entry *Negation* defines if the set limit is an upper limit or a lower limit (checkbox marked sets the limit as lower limit). When the limit is an upper limit, the states are as described above and in the figure on the right hand side. If it is a lower limit, then the output is HIGH if the current measurement is below this limit and it is low when the measurement value is above the limit.

All settings and modifications will be stored when pushing *Save*.

The assignment can be cancelled by clicking *Delete assignment*.

Upper limit = 100 and Hysteresis = 5
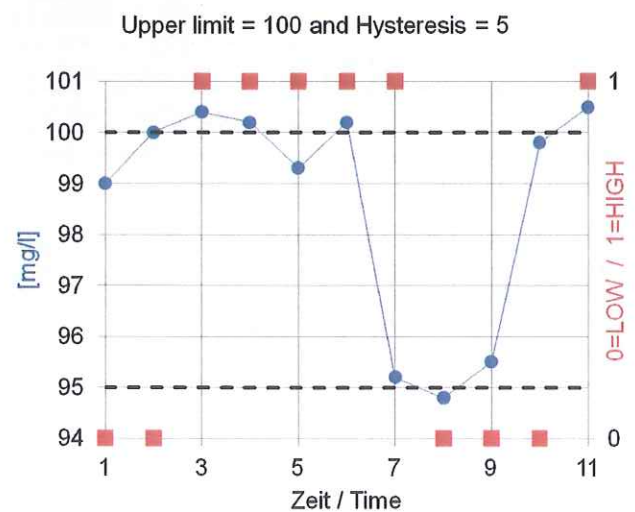
6.10.6.4   Service / Terminal / Internal Modules

The *Internal Modules* function is only available on the con::cube. In this window, all installed modules (analog input, analog output and digital output) are shown. The *URL* informs you to which COM-port, which address and which channel this input or output is allocated.

The ordered modules are already configured during the assembly of the controller. When additional modules are installed afterwards, it is necessary to configure the new modules. This is done by pushing the button *Search Internal Modules*.

Service	>>	Terminal	>>	Internal Modules

Search internal modules

Name	URL
digitalOut1	constat_do://3/33/0
digitalOut2	constat_do://3/33/1
digitalOut3	constat_do://3/33/2
digitalOut4	constat_do://3/33/3
digitalOut5	constat_do://3/33/4

6.10.6.5   Service / Terminal / Fieldbus Outputs

moni::tool supports a Modbus slave function that makes it possible to transfer up to 32 parameter readings and status information to an external receiver. Both Modbus TCP and Modbus RTU (RS485) are supported.

On the con::cube, Profibus and SDI-12 are also supported to transfer up to 8 parameter readings. Only one protocol (file ana-gate.ini) is supported at a time, so when Profibus or SDI-12 is activated, Modbus RTU is deactivated. Please refer to the manual of your controller how to configure the file ana-gate.ini.

The *Fieldbus Outputs* menu item provides the possibility to configure the assignment of the parameters to the Fieldbus channels. All available parameters are listed in the selection field on the left side. Furthermore it can be defined whether raw (*Raw value*) of corrected measurement (*Clean value*) will be transferred. After selecting the parameter you want to add to the list of parameters transferred by the fieldbus slave, click on the blue plus sign on the right. Now the new parameter will be listed in the display below.

To change the position of an already selected parameter the buttons *Up* and *Down* can be used after selecting the parameter by clicking on it's name.

To remove a parameter from the list, click on the trash icon on the right side of the parameter name.

Service	>>	Terminal	>>	Fieldbus Outputs

Up   Down | Cancel   Save

Ana::gate supports the following number of parameters for each protocol:
- Modbus: 1-32 parameters + 1 fingerprint
- Profibus: 1-8 parameters
- SDI12: 1-8 parameters

#	Sensor	Parameter	Channel	
	spectro::lyser - TOCeq		Clean value	+
FP				
1	spectro::lyser	NO3-Neq	Raw value	🗑
2	spectro::lyser	TOCeq	Clean value	🗑
3				

6.10.7 Service / Digital Input

The s::can controller can either be equipped with internal digital inputs or an external digital input module can be connected to it. Each digital input can be used as independent sensor. If internal digital inputs are available on the s::can con::cube, they will be initialized automatically during the initial start up and can be found on the right hand side of the controller icon in the *Service* screen. When using an s::can con::stat or external digital input modules they have to be initialized manually by clicking on an empty field marked with *Add new digital input*.

Service ›› Digital Input ›› **Edit digital input**	
	Cancel Save

Edit digital input

Name:	digitalIn0
Protocol:	constat_di://
COM Port:	COM 3
Address:	1
Channel:	0
Test:	Get current value ● 0
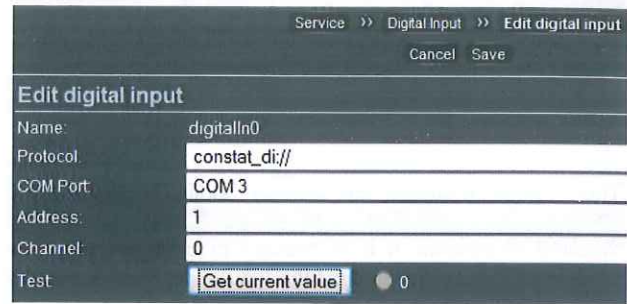
When configuring a digital input module manually the needed *Protocol* has to be selected. Use *con::stat_di://* for internal modules and *icpcon_di://* for external modules. Furthermore the *COM Port*, the *Address* and the *Channel* have to be entered. Please note the information provided with the external input module for the correct settings.

All settings and modifications will be stored when pushing *Save*.

Once the digital input has been configured, it is possible to test the current state of the device by pushing the button *Get current value*. When this is done the state of the input is signalled by the LED icon and the number next to it. Grey and *0* mean state is LOW, bright green and *1* mean state is HIGH.

If the internal digital input modules of the con::cube are not detected automatically please click on the controller icon select the menu entry *Internal modules* and push the button *Search Internal Modules*.

6.10.8 Probe / Sensor Calibration

The calibration window can be reached via the *Service* Tab by clicking on the icon of the sensor you want to calibrate and selecting the menu item *Calibrate Sensor*.
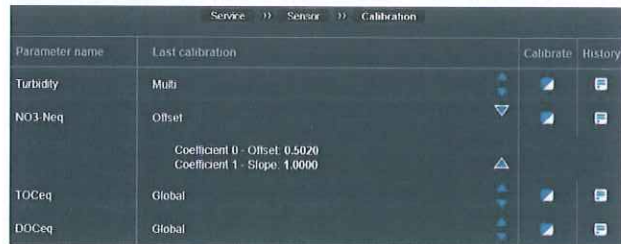
Now the screen will show a list of all parameters being measured by this probe (see upper figure on the right). Clicking on the blue triangles will open more information about actual used calibration coefficients for this parameter. Clicking on the blue *Calibrate* icon opens the calibration window, which will be explained in section 6.10.8.2.

Furthermore a click on the *History* icon rightmost opens a logbook showing date and time of all performed calibration procedures up to now including the used sample readings and the laboratory values (see lower figure on the right).

Depending on the used probe or sensor different types of calibration can be performed. A generall overview of possible calibration types are explained in the following section. Regarding detailed information about the calibration of a specific probe / sensor please refer to the s::can manual of this measuring device.

Service ›› Sensor ›› Calibration			
Parameter name	**Last calibration**	**Calibrate**	**History**
Turbidity	Multi		
NO3-Neq	Offset		
	Coefficient 0 - Offset: 0.5020 Coefficient 1 - Slope: 1.0000		
TOCeq	Global		
DOCeq	Global		

Service ›› Sensor ›› Calibration ›› History				
Timestamp	**Type**	**Raw**	**Lab**	**Coefficients**
29-Feb-2012 17:21	Unknown			Coefficient 0 - Offset: 0.4877 Coefficient 1 - Slope: 0.5975
29-Feb-2012 16:54	Linear	0.021 FTUeq 2.531 FTUeq	0.50 FTUeq 2.00 FTUeq	Coefficient 0 - Offset: 0.4877 Coefficient 1 - Slope: 0.5975
29-Feb-2012 16:52	Offset	0.021 FTUeq	0.50 FTUeq	Coefficient 0 - Offset: 0.4794 Coefficient 1 - Slope: 1.0000
29-Feb-2012 16:50	Global			Coefficient 0 - Offset: 0.0 Coefficient 1 - Slope: 1.0000

6.10.8.1 Types of Calibration

Calibration Type	Samples [1] / Laboratory [2]	Offset / Slope	Remarks
Offset	One sample measurement (*Raw 1*) and one laboratory result (*Lab 1*) are needed.	Offset will be changed and slope will be unchanged.	In case of spectrometer probes, slope will be set back to global slope.
Linear	Two sample measurements (*Raw 1* and *Raw 2*) and two laboratory results (*Lab 1* and *Lab 2*) are needed.	Offset and slope will be changed.	In case of ammo::lyser global calibration curve will be changed.
Multi	More than two samples and the according number of laboratory results are needed.	Offset and slope will be changed.	Performed calibration is a linear fit with smallest possible deviation.
Zero (Offset with laboratory result = 0)	One sample measurement in zero medium is needed.	Offset will be changed, slope will be unchanged.	
Span	One sample measurement and one laboratory result are needed.	Offset will be unchanged and slope will be changed.	Sample should be taken in upper measuring range.
Global	No sample measurements or laboratory results needed.	Offset and slope will be set back to default.	Not available for all sensors.
Unknown (Local calibration with unknown calibration type is active)			e.g. when calibration was performed on another controller.

[1] Sample measurements can either be directly in the medium, grab samples or standard solutions (please refer to the manual of the sensor for the respective recommendations).

[2] Either results of laboratory analysis, values of standard solutions or readings of a validated reference device.

Select calibration type (Offset)

An offset calibration changes the offset of the calibration curve. The offset calibration does not change the slope of the calibration curve. For an offset calibration one sample and one laboratory value are required.

Select calibration type (Linear)

A linear calibration changes the offset and slope of the calibration curve. For a linear calibration two samples and two laboratory values are required. For the best calibration result the samples should be taken at the upper and lower measurement range of the sensor.

Select calibration type (Multi)

The multi calibration performs a linear calibration based on more than two samples. A linear fit is performed to obtain a calibration curve with the smallest possible error between sensor results and laboratory results.

Select calibration type (Span)

A span calibration changes the slope of the calibration curve. A span calibration uses a fixed zero point. The sample recorded corresponds to the upper concentration of the calibration range.

6.10.8.2   Calibration with 1 or 2 Samples

As soon as the calibration window is displayed (*Service / Sensor / Calibration / Calibrate Parameter* - see section 6.10.8) the calibration is performed by the following steps:

[1] Select the *Calibration type* you want to perform (see section 6.10.8.1).

[2] The current readings of the parameter will be displayed numerically and graphically. This graph can be used to assess stability of the measurement. If a quality number of the sensor is available additionally (e.g. ammo::lyser) this will also be displayed as a number and in a yellow time series.

[3] A new measurement of the sensor will be performed whenever you push the button *Trigger measurement*.

[4] Push the *Sample* icon to perform a new measurement and store the reading onto the probe. Please note that the displayed value is the *Raw* value (e.g. mV in case of electrodes) or based on the global calibration (in case of spectrometer probes), respectively.

[5] Enter the result of the laboratory analysis into the entry field *Lab* and

[6] push the button *Save* to store this value onto the probe.

[7] Push the button *Perform Calibration* to start the calibration procedure based on the selection (*Calibration type*) you have done.

[8] After the calibration procedure is finished a user message will inform you, if the local *calibration of parameter* was *successful*. In case of an error the reason will be displayed to the user in red letters (e.g. *Please enter at least lab values for 2 samples*).

[9] The coefficients of the new local calibration will be displayed in the column *Value*. It is also possible to write coefficients directly onto the probe by pushing the button *Edit* (see figure on the right). Please ensure that none of the coefficient is *NaN*.

Enter new values for coefficients

Coefficient 0 - Offset	-0.0966
Coefficient 1 - Slope	0.8577
Coefficient 2	0.0
Coefficient 3	0.0
Coefficient 4	0.0
Coefficient 5	0.0

Only edit the values of the coefficients if you exactly know the calibration function of the sensor and know how to interpret the coefficients.

Cancel   Okay

6.10.8.3 Multiple Sampling

The *Sample & Calibration* button in the *Service* window provides access to advanced sampling and calibration features; storing results for calibration on multiple sensors at once and administration of the *Sample list*. All samples collected and stored using *Sample & Calibration* are stored in the sample list and will be available for multilinear calibration. Using the *Take sample* function, it is also possible to store results directly on a probe, so the data can be used for other calibration types as well.

Multiple sampling will be started by the following steps:

- Click the *Service* tab of the moni::tool screen and logon as *Administrator* (see section 6.3).

- Click the button *Sample & Calibration* located top right in the shown overview of the monitoring system.

- A user message will pop up where you can select whether you want to perform a new sample measurement (button *Take sample*) or edit the existing samples (button *Sample list*).

- After selecting *Take sample* the screen for *Sample Configuration* will be displayed. In the entry field on top a *description* can be entered.

- When clicking on the button next to the sensor picture the *Select calibration type* window will be opened.

- When clicking on the yellow triangle on the right side of the sensor picture all parameters measured by this sensor will be displayed.

- Either for the probe itself or for each single parameter the intention for sampling can be selected.

None:	Sample will not be stored.
Offset - Index 1:	will be stored in the database of moni::tool and on the probe as sample 1.
Linear - Index 1:	will be stored in the database of moni::tool and on the probe as sample 1.
Linear - Index 2:	will be stored in the database of moni::tool and on the probe as sample 2.
Multi:	will only be stored in database of moni::tool and not on probe.

- After all settings have been done push the button *Take Sample* to start the measurement. The progress and the result of the measured parameters will be displayed on a seperate screen.

Sample & Calibration

You can either take a new sample of all installed sensors or you can manage samples that were already taken and add laboratory result values.
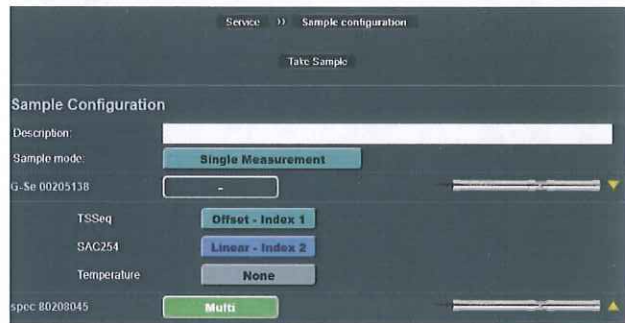
Select calibration type
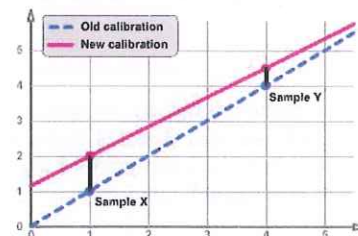
A linear calibration changes the offset and slope of the calibration curve. For a linear calibration two samples and two laboratory values are required. For the best calibration result the samples should be taken at the upper and lower measurement range of the sensor.
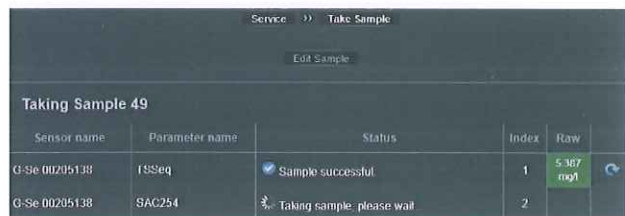
■ As soon as the sampling process is finished all _raw_ values are displayed. In the column _Lab_ the results of laboratory analysis can be entered. Clicking on the entry field on the right hand side of the _raw_ value will open a new window, which is explained below. Pushing the _Calibrate_ icon will directly open the calibration window (see section 6.10.8.2).

Sample 49	18-Oct-2011 13:27				
Sensor name	Parameter name	Raw	Lab	Index	Calibrate
G-Se 00205138	TSSeq	5.387 mg/l	NaN mg/l	1	
G-Se 00205138	SAC254	0.152 Abs/m	NaN Abs/m	2	
spec 80208045	Turbidity	0.280 FTUeq	NaN FTUeq	-	
spec 80208045	NO3-Neq	13.533 mg/l	NaN mg/l	-	

■ Within this window all information regarding this sample are displayed. The result of laboratory analysis can be entered and stored (button _Save_) or deleted (button _Clear_).

Sample 49

Sensor name:	**G-Se 00205138**
Parameter name:	**TSSeq**
Timestamp:	**18-Oct-2011 13:27**
Raw:	**5.39 mg/l**
Lab:	NaN **mg/l**
Sampled:	**Sampled on Sensor, index 1.**

Please enter a lab value for this sample.

Cancel   Clear   Save

When selecting _Sample list_ in the first user meassage (see beginning of this section) an overview of all samples stored up to now in the database will be displayed. When clicking on one sensor icon from the top of the list, a detailed view lists all sample results collected for that one sensor.

■ A click on the _ID_ number on the left hand side opens the information screen of this sample.

■ A click on the trash icon on the right hand side will delete the complete sample.

ID	Timestamp	G-Se 00205138	spec 80208045	cond 2412	oxi 2324	
1	25-Jul-2011 15:05					🗑
2	25-Jul-2011 16:51					🗑
46	13-Oct-2011 18:16					🗑
47	17-Oct-2011 17:17					🗑
48	18-Oct-2011 13:20					🗑
49	18-Oct-2011 13:27					🗑

ID	Timestamp	Conductivity	Temperature	
50	28-Oct-2011 09:04	328.142 NaN		🗑
52	12-Dec-2011 12:19	328.439 NaN		🗑
55	07-Feb-2012 15:09	349.776 NaN		🗑
56	13-Feb-2012 09:59	355.392 NaN		🗑

6.10.8.4   Calibration with more than 2 Samples

The multilinear calibration type (*Multi*) offers the possibility to use several samples for calibration. Whereas the calibration types explained in section 6.10.8.2 use measurement results stored directly on the sensor itself and are therefore limited to two samples only and sample results are lost once overwritten, the multilinear calibration uses results stored in the sample database (Sample list) of moni::tool.

When more than 2 samples have been recorded and the corresponding lab values have been entered, the calibration type *Multi* can be activated. This calibration type performs a linear fit to obtain a calibration line with the smallest possible error between the sensor readings and the laboratory values.

The calibration screen of moni::tool (see section 6.10.8.2) offers some additional features when performing a linear calibration with several samples. They are explained in the figure below.

1 *ID* of all stored samples is displayed. Clicking on the ID number brings you directly to the information screen of this sample.

2 Tick the box *Use* if this samples shall be used for calibration. Single samples can be removed from the calibration fit by unchecking the *Use* mark.

3 Correlation between laboratory results and raw values is displayed and updated automatically.

4 Mean error and confidence Interval is displayed and updated automatically.
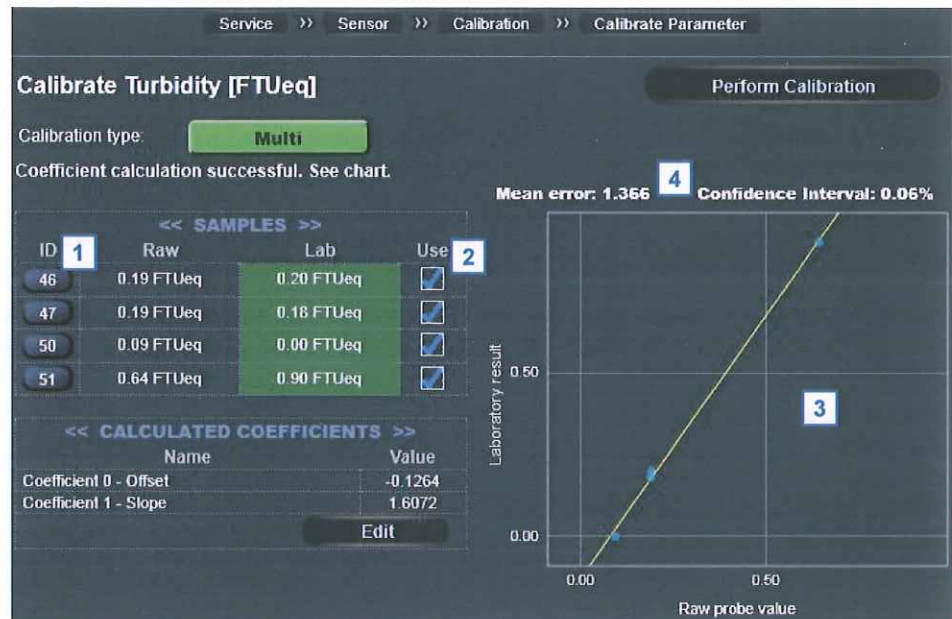
The calibration result will immediately be recalculated after any modification, so that the effect of removing a sample from the dataset is clearly visible. Unchecking a sample in this list does not delete it, it only removes it from the fit currently performed. It will remain available for future calibrations. It is also possible to edit the laboratory result directly from the calibration window by clicking on the *Lab* value, which will bring up the window for entering a lab value. Please note that only spectro::lyser probes support multilinear calibration.

7   Data Management

7.1   Data Storage

moni::tool uses an SQL database for data storage. In this database, all information regarding the monitoring station and the sensors operated is stored. This includes measurement results, but also all information related to sensor and station status, data validation and event detection. Also, all maintenance activities that are logged using moni::tool are stored in the database.

The data storage capacity of the s::can controller (con::stat, con::cube) is of a limited size. This means that only a limited amount of results can be stored in the database and in the Auto-Export transfer folder. Depending on the used controller type with the typical standard configuration (1 spectrometer probe, 3 other probes, 120 sec. measurement interval) following amount of results can be stored:

- con::stat: 2 months
- con::cube: 4 months

Once the maximum size of the database is reached, the measurments do NOT stop, the oldest data will be removed to create space for new measurement results. This is done by the garbage collector, which automatically checks the database size and removes data to bring the database size down to within allowed limits.

7.2   Data Transfer

The monitoring station system con::cube with moni::tool provides several possibilities to transfer measurement results and other data and information to external devices. Depending on the specific type of the used controller moni::tool supports several services of data transfer.

7.2.1   Transfer of Current State Measurement Results and Status Information

- via analog outputs (optional D-315-out-mA, please refer to section 6.10.6.2)
- via relay outputs (optional D-315-out-relay, please refer to section 6.10.6.3)
- via Modbus TCP/IP interface (Ethernet RJ45, please refer to manual con::cube)
- via Modbus RTU interface (COM-5, please refer to manual con::cube)
- via Profibus DP interface (optional D-315-out-Profibus, please refer to manual con::cube)
- via SDI12 interface (optional D-315-out-SDI12, please refer to manual con::cube)

7.2.2   Transfer of Logged Measurement Results and Status Information

- via USB memorystick directly connected to con::cube or to a connected computer (please refer to sections 6.9.2.1 until 6.9.2.6)
- via SSH client transfer (please refer to section 6.9.2.8)
- via FTP client transfer (please refer to section 6.9.2.7)
- via TML server (please refer to section 6.9.3.2)

7.2.3   Content of Result Files

When the _AutoExport_ function is activated (see section 6.9.2.5) the generated result files will be stored on the hard disk of the controller in the folder d: \ s-can \ transfer and can be downloaded via the menu item _Menu / Data Export / Generated Files_ (see section 6.9.2.6).

The file name is created out of the controller name (_NAME_) and the time stamp of the first measurement (_YYYY-MM-DD hh-mm-ss_). Furthermore files containing the fingerprint results of a spectrometer probe are marked with _fp_ and files containing the loogbook entries are marked with _Log_ at the end of the name.

Every time any entry of the header, which is explained in the following section, changes a new file will be generated.

7.2.3.1 Fingerprint Result Files

The fingerprint result files contain in their first line the serial number (always 8 places) as well as the identifier for the length of the optical path (see table on the right) of the spectrometer probe used. Also the type (format 0xXXXX) and the type name (max. 20 places) and the used Global Calibration are noted. Further the probe name is displayed.

Optical path length	Identifier in file
0.5 mm	_5
1.0 mm	_10
2.0 mm	_20
5.0 mm	_50
35 mm	_350
100 mm	_1000

The second line states the names of the columns (date, time, status, wavelength).

Readings (fingerprints) are stored in the third line and lower. The first column states the time of the measurement (format as defined by the customer in *AutoExport* function), the second column the probe status during

```
09210311_350_0x1.1_spectro::lyser_EFFLUCOLV150   spec 09210311
Timestamp              Status_0    200     202,5   205     207,5   210     212,5
2011.11.25 13:30:00 Ok            47,518  48,989  48,711  47,804  46,559  45,393
2011.11.25 13:30:54 Ok            47,518  48,989  48,711  47,804  46,559  45,393
2011.11.25 13:32:54 Ok            47,904  49,09   49,016  47,99   46,635  45,558
2011.11.25 13:34:54 Ok            47,509  48,964  48,73   48,041  46,933  45,342
2011.11.25 13:36:54 Ok            47,133  48,796  48,802  48,249  46,885  45,216
2011.11.25 13:39:47 Ok            47,497  48,89   49,1    48,235  46,682  45,298
2011.11.25 13:41:07 Ok            47,497  48,89   49,1    48,235  46,682  45,298
```

the measurement (system status - see section 9.3.1 and sensor status - see section 9.3.2) from the third column on, the absorbance values for the respective wavelengths. The column separator can be defined by the customer in the *AutoExport* function.

7.2.3.2 Parameter Result Files

The parameter result file contains in its first line the name *Timestamp* and the name of the sensor that measures the displayed parameter.

The second line states the names of the parameters that were selected for export in the *AutoExport* function. For each parameter up to four columns are reserved. The first label contains the name of the parameter (e.g. *CSBeq*) the unit (e.g. *[mg/l]*) the upper and lower measuring range and the precision of display. The second column contains the *STATUS* of the parameter and four numbers. These numbers are the coefficients (offset and slope) used for the parameter in case of a local calibration. If the parameters are not local calibrated the values are 0.0000 and 1.0000. The third column contains the result of the parameter calculated by vali::tool (clean reading) and the fourth column contains the *STATUS* of the validated parameter. In case the parameter status is not *Ok* the error code will be displayed.

Readings (parameter values) are stored in the third line and lower. The first column states the time of the measurement (format as defined by the customer in *AutoExport* function). From the second column on the values for the parameters and the parameter status (see section 9.3) are stored.

Timestamp	spec 09210311 CSBeq [mg/l]57,143-0_2	spec 09210311 STATUS [CODeq 0.0,1.0,0.0,0.0]	spec 09210311 CODeq-VT [mg/l]+Infinity--Infinity_2	spec 09210311 STATUS [CODeq-VT]
25.11.2011 13:30	14,467	Ok	14,467	Ok
25.11.2011 13:30	14,467	Ok	14,467	Ok
25.11.2011 13:32	14,468	Ok	14,467	Ok
25.11.2011 13:34	14,493	Ok	14,467	Ok
25.11.2011 13:36	14,573	Ok	14,472	Ok
25.11.2011 13:39	14,453	Error 0x0000.0000.0000.0000.1001.0010	14,482	Error 0x1001.0010
25.11.2011 13:41	14,453	Ok	14,487	Ok
25.11.2011 13:42	14,474	Ok	14,484	Ok
25.11.2011 13:44	14,521	Ok	14,483	Ok
25.11.2011 13:46	14,551	Ok	14,487	Ok
25.11.2011 13:49	14,555	Ok	14,492	Ok
25.11.2011 13:51	14,555	Ok	14,498	Ok
25.11.2011 13:52	14,563	Ok	14,502	Ok

7.2.3.3 Log File

The log file contains in its first line the name of the colums (_Timestamp_, _Log level_ and _Log message_). The logbook entries are stored in the second line and lower (please refer to section 6.9.2.3 for further information regarding _Log level_).

```
Timestamp             Log level    Log message
2012-02-29 09:38:42 SYSTEM       s::can watchdog service started.
2012-02-29 09:38:44 SYSTEM       s::can soap service started.
2012-02-29 09:38:44 SYSTEM       s::can training service started.
2012-02-29 09:38:48 TRAINING     Started auto-training of parameter Saxitox.
2012-02-29 09:38:54 SYSTEM       s::can scada service started with Version V1.5a_REL_111114.
2012-02-29 09:38:58 SYSTEM       CMeasurementLoop::GetModelAndSerial(): serialNo= 3132303230303035 (12020005).
2012-02-29 09:38:58 SYSTEM       CMeasurementLoop::GetModelAndSerial(): Model= D-315.
2012-02-29 09:39:33 TRAINING     Training of parameter Saxitox has finished
2012-02-29 09:40:04 SYSTEM       UpdateStationThread(): Thread started.
2012-02-29 09:40:07 SYSTEM       UpdateStationThread(): Thread stopped.
2012-02-29 09:44:15 CRITICAL     CSecurity::CheckPassword(): User "" not found.
2012-02-29 09:44:49 USER         CSecurity::GetLock(): User "Administrator" logged in (read-write access).
```

7.3   Data Visualisation

All actual results of the parameters being monitored by the installed probes and sensors are displayed on the _Value_ screen of the controller. Historical results are displayed on the _Times Series_ screen and the _Fingerprint_ screen provides 2 and 3 dimensional display of absorbance spectra.

All moni::tool screens can be viewed directly on the controller or everywhere with a web browser or a VNC client.

8   Functional Check

A functional check might be required for one of the following reasons:

- Initial startup
- Routine functional check
- Suspicion of monitoring system malfunction
- Modification of monitoring system (e.g. integration of additional sensor or device)
- Change of measuring location

Depending on the application (water composition), the probes and sensors connected and the environmental conditions a regular functional check (weekly to monthly) is recommended. The following sections provide an overview of all the actions that have to be performed to check the monitoring system quickly (see section 8.1), to check the plausibility of the collected readings (see section 8.2) and to check the integrity of a single probe or sensor (see section 8.3).

8.1   Check of System

Check	Remark
Power supply	LED on housing cover is on? moni::tool screen is displayed after touching the screen?
System running (up-to-date)	Click on system clock at the bottom of the screen shows current time and time of last measurement. Both are current? Actual activity will be displayed on the right of the system clock.
System status	LED of con::cube is blue and *Status* icon of moni::tool is not blinking yellow? If *Status* icon is blinking, open the tab and select symbol of the affected sensor for more information.
Alarm status	If *Alarm* icon is blinking, open the tab and confirm or delete pending alarms (see section 6.9).
Service mode	If *Service* icon is blinking, measuring process is interrupted (see section 6.10.1).
Function of automatic cleaning	Use function *Test cleaning device* or wait for next cleaning cycle. Watch for air bubbles when cleaning is activated or listen if cleaning brush is rotating.
Compressed air supply for automatic cleaning	All tubes and fittings are tight?
Function of compressor and storage tank	Drain condensed water from storage tank of compressor (not necessary for s::can compressor B-32). Check pressure.
Monitoring station (by-pass)	All tubes and fittings are tight and all probes and sensors are supplied with medium? No air bubbles within the tubes?
Submersed Installation (in-situ)	Mounting equipment of all devices is ok and all probes and sensors are submersed?
Data transfer	Check if displayed readings on local controller are equal with displayed readings on customer display system.

8.2   Check of Results

Please check each single displayed parameter for background colour and additional information (see section 6.4)

8.3   Check of Probe - Sensor Integrity

When there is any doubt regarding the integrity of a probe or sensor please refer to the manual of this instrument (section Sensor Integrity).

9 Troubleshooting

9.1 Typical Error Pattern

Reason	Removal
Screen saver has been activated.	■ Touch the screen with your finger or the mouse pointer to activate moni::tool display again.
Another user is logged in actually (maybe directly on the controller itself).	■ Try to login later (after 10 minutes). ■ If you are allowed to kick out the existing user tick the check box and push *Login*.
There is a con::cube using the same IP address for the internal WLAN connection nearby.	■ Push the *Ok* button to close the error message. ■ If the con::cubes will operated for longer time nearby, set each con::cube to a seperate IP address. Otherwise the error message will always appear after a reboot.
Web browser on local controller did not start up properly (Error message: *unable to connect to the server at 127.0.0.1*).	■ Don't use the button *Try again* but restart controller. ■ If still same error message, close error message. ■ Switch to Windows Task Manager which is running in the background. ■ Open the Explorer via *New Task...* button. ■ Start the browser (*D:\ Programme \ MozillaFirefox \ FirefoxPortable.exe*) manually.

9.2 Error Messages directly on the Display

When an error occurs during operation of moni::tool a text message will be displayed on the screen in red lettering. The message contains the reason for error and also recommendations for the removal.

On the right hand side two typical error messages are displayed. The upper one indicates that a sensor was not found during installation of a new sensor and the lower one will be shown if an user entry was incorrect.

In some cases a detailed error report will be displayed on the moni::tool screen, that can also be downloaded by pushing the button *Report*.
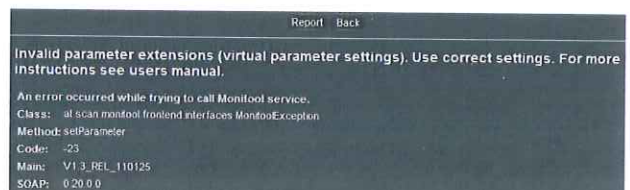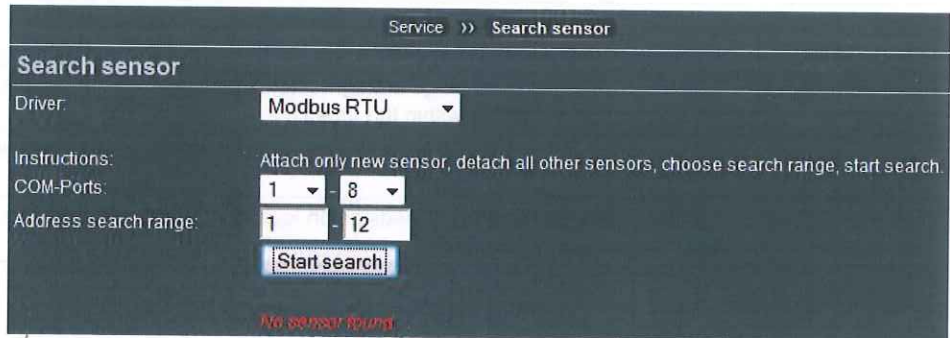
9.3 Error Messages / Status Messages

During execution of a measurement or a parameter calibration the status of the monitoring system (system status), the measuring device itself (device status) and the result (parameter status) will be checked for possible errors and for plausibility. The device and the parameter status are seperated into a general part (valid for all measuring devices) and an individual part (valid for the respective measuring device). In case of an error or a faulty calibration a user message will be displayed to the operator (status bit will be set from 0 to 1).

That means in total the following status information might be available on your s::can monitoring system:
- TTTT   System status (see section 9.3.1)
- SSSS   Sensor status / device status general (see section 9.3.1)
- ssss   Sensor status / device status individual (see section 9.3.2 or manual of the specific sensor, resp.)
- PPPP   Parameter status general (see section 9.3.3)
- pppp   Parameter status individual (see section 9.3.3 or manual of the specific sensor, resp.)
- VVVV   vali::tool status (see section 9.3.4)
- vvvv   vali::tool status advanced (see section 9.3.4)

Depending on the type of the parameter reading, different status information will be displayed in the *Status* tab and in the downloaded logfile.

Device / Parameter	Format of Status Code
System	0xTTTT
Sensor	0xTTTT.SSSS.ssss
Parameter	0xPPPP.pppp.VVVV.vvvv
Virtual parameter	0xTTTT.SSSS.PPPP
Fingerprint	0xTTTT.SSSS

Depending on the used controller these messages will be shown on the display (*Logbook* in case of con::lyte, *Show Context Help* and *System-Status* in case of ana::xxx and *Status* tab in case of moni::tool). Additional to the general error reason the detailed status code will be displayed in binary form (0000, 0001, 0010, 0011, 0100, etc.) or as a hex number (0001, 0002, 0004, 0008, 0010, etc).

If several errors occur at the same time the con::lyte and moni::tool will add up all the status codes (status code 8000 means that only error bit b15 is active whereas status code 4011 means that error bits b0 (0001), b4 (0010) and b14 (4000) are active at the same time).

9.3.1 System Status

The table below shows all possible errors regarding system status (TTTT) when moni::tool is installed incl. the user message, the reason of the error and notes for trouble shooting. If the error can't be removed although the suggested procedure was executed several times please contact your s::can sales partner.

Status System (Statusbit / binary / Hex)	System message	Reason	Removal
b0 0001 xxx1	*No communication between probe and controller* or	Communication between sensor and controller failed.	Check probe cable and connector. Dis- and reconnect sensor.
	Virtual parameter reports an error in case of system sensor or		Check if DLL is installed. Delete and reinstall virtual parameter.
	Door is open in case of system sensor and system parameter	Door contact has been activated.	
b1 0010 xxx2	*Invalid Sensor* or	Serial number of sensor has changed.	Disconnect new sensor and connect the original sensor or install the new sensor.
	Service mode is active - all measurements are stopped in case of system sensor	Service mode is active and measurements are stopped.	Quitt Service mode.

Status System (Statusbit / binary / Hex)	System message	Reason	Removal
b2 0010 xxx4	*Dependencies error* or *Door is open and login period expired* in case of system sensor and system parameter	There was no logon to the system after door contact has been activated.	For further information see logbook.
b3 0011 xxx8	*Manual measurement* or *ALARM*	Measurements are triggered maually. At least one unconfirmed alarm is active.	Switch to automatic mode. Confirm all pending alarms.
b4 0100 xx1x	*System error* (only in case of system sensor and system parameter)	At least one check failed.	For more information see all additional status messages. After activating or deactivating vali::tool the effect will be visible after the next measurement intervall.
b5 0101 xx2x	*Validation results are not available* or *Update DB is running* in case of system sensor and system parameter		Activate vali::tool. Check if vali::tool settings are correct. Wait until the database update is completed.
b6 0110 xx4x	*mA inputsignal is outside of the allowed input range* or *Left free disk space is below ALARM limit* in case of system sensor and system parameter	Polling is stopped.	Check the functionality of the input device. Check the selected input range. Check and free disks-space or perform database maintenance.
b7 0111 xx8x	*Left free disk space is below WARN limit* (only in case of system sensor and system parameter)	Maybe polling will be stopped automatically, soon.	Check and free diskspace or do database maintenance.
b8 1000 x1xx	*Invalid measurement interval* (only in case of system sensor and system parameter)	The current measurement interval is too short for the current system configuration. Measurements might be skipped.	Raise the measurement interval in order to ensure continuous measurement.
b9 1001 x2xx	*Feature not included*	This feature is not included in the current license of moni::tool.	Please contact your s::can sales partner and acquire a license in order to use this feature.
b15 1111 8xxx	*Test alarm has been activated* or *System status could not be calculated* in case of system sensor and system parameter		Deactivate test alarm Wait for the next measure-ment, if error persists, reboot controller.

9.3.2 Sensor Status / Device Status

All possible errors regarding the device status (SSSS and ssss) incl. the user message, the reason of the error and notes for trouble shooting can be found in the manual of the specific probe or sensor.

9.3.3 Parameter Status

The table below shows all possible errors regarding the general parameter status (PPPP) when moni::tool is installed incl. the user message, the reason of the error and notes for trouble shooting. If the error can't be removed although the suggested procedure was executed several times please contact your s::can sales partner.

All possible errors regarding the individual parameter status (pppp) incl. the user message, the reason of the error and notes for trouble shooting can be found in the manual of the specific probe or sensor.

Status Parameter (Statusbit / binary / Hex)	System message	Reason	Removal
b0 0000 xxx1	*General parameter error*	At least one internal parameter check failed. For details see additional status messages below.	In case no further messages are shown, note the error code and contact s::can sales partner.
b1 0001 xxx2	*Parameter error, hardware error*	Probe / sensor signal not ok. Maybe an electrode is missing, too old or defect.	Perform a function check for further information.
b2 0010 xxx4	*Parameter error, configuration error*	Invalid parameter configuration	Change local calibration or switch back to global calibration. Select another global calibration.
b3 0011 xxx8	*Parameter error, medium error*	The sensor is outside of the medium or in incorrect medium.	Check water supply und check whether the probe is fully submersed. If medium is ok, perform functional check for further information.
b4 0100 xx1x	*Parameter error, incorrect calibration*	At least one of the calibration coefficients is invalid (NaN)	Check readings and lab values, repeat local calibration, restart the sensor by disconnecting and reconnecting.
b5 0101 xx2x	*Parameter not available or not ready*	Parameter not activated on the sensor or sensor still warming up.	Activate parameter on sensor or wait until start-up is completed.
b11 1011 x4xx	*Maintenance necessary*	Sensor / installation needs to be checked or sensitivity of vali::tool is set incorrectly.	Check sensor and installation according to the instruction in the manual. Perform maintenance if necessary. If sensor / installation is ok, adapt the sensitivity of vali::tool.
b12 1100 x8xx	*Marked as not full trust by data validation algorithm*	Do not use this measurement for calibration!	

Status Parameter (Statusbit / binary / Hex)	System message	Reason	Removal
b15 1111 8xxx	*Reading out of measuring range*	Readings are outside the calibrated measuring range.	Check water supply and medium. Check if readings are ok. Perform functional check and / or recalibrate sensor using samples with higher and / or lower concentrations.

9.3.4   vali::tool Status

The table below shows all possible errors regarding the status of the data validation tool (VVVV) when vali::tool is activated in moni::tool incl. the user message, the reason of the error and notes for trouble shooting. If the error can't be removed although the suggested procedure was executed several times please contact your s::can sales partner.

Status vali::tool (Statusbit / binary / Hex)	System message	Reason	Removal
b0 0000 xxx1	*vali::tool reports an error*		In case no further messages are shown, note the error code and contact s::can sales partner.
b2 0010 xxx4	*vali::tool configuration error*	Failure in the configuration of vali::tool.	Check vali::tool configuration.
b6 1100 xx4x	*vali::tool not ready*	vali::tool needs several measurement results for calculation.	Wait until initialisation of vali::tool has completed.
b11 1011 x8xx	*Maintenance necessary*	Sensor / installation needs to be checked or sensitivity of vali::tool is set incorrectly.	Check sensor and installation according to the instruction in the manual. Perform maintenance if necessary. If sensor / installation is ok, adapt the sensitivity of vali::tool.

The table below shows all possible errors regarding the advanced status of vali::tool (vvvv) when vali::tool is activated in moni::tool incl. the user message, the reason of the error and notes for trouble shooting. If the error can't be removed although the suggested procedure was executed several times please contact your s::can sales partner.

Status vali::tool advanced (Statusbit / binary / Hex)	System message	Reason	Removal
b0 0000 xxx1	*Configuration error*	Wrong configuration setting of vali::tool.	Reinstall parameter
b1 0001 xxx2	*Abnormally high noise level*	Verify possible reason for high noise of the validated parameter. Can indicate device or installation problems. Do not use this value for calibration!	If the noise level is ok, adjust the vali::tool configuration. Either increase the value for allowed noise (*NOISE instrument Noise Threshold*) or decrease the sensivity of vali::tool.

Status vali::tool advanced (Statusbit / binary / Hex)	System message	Reason	Removal
b2 0010 xxx4	*Abnormally low noise level*	Verify possible reason for low noise of the validated parameter. Can indicate device or installation problems. Do not use this value for calibration!	If the noise level is ok, adjust the vali::tool configuration. Decrease the value for allowed noise (*NOISE minimum Noise Level*). If this value is already set to 0 increase the values of *NOISE threshold Ratio* and / or *NOISE evaluation Period*. If problem still exists check for low noise level can be deactivated by setting the *NOISE minimum Noise Level* to a negative number.
b3 0011 xxx8	*No results available*	vali::tool needs several measurement results for calculation.	Wait until vali::tool startup has finished.
b4 0100 xx1x	*Outlier detected*	Sporadic outliers are normal in a parameter time series, due to real fluctuations in the medium. Nevertheless, higher frequency or clusters of outliers usually indicate an installation problem.	If this message appears, although the current measurement should not be seen as an outlier, adjust the vali::tool configuration. Increase the value of the tolerance with respect to outliers (*OUTLIER tolerance Factor* and / or *OUTLIER absolute Tolerance*) or decrease the sensivity of vali::tool.
b5 0101 xx2x	*Input was NaN*		Check the raw value of the parameter.
b6 0110 xx4x	*Static alarm*		Check the medium.
b7 0111 xx8x	*Maintenance recommended*	Verify the overall quality of the validated parameter. This message is displayed as vali::tool assesses the overall quality of the validated parameter as not sufficient. Do not use this value for calibration!	If this message is displayed although the overall quality of the validated parameter is OK, adjust the vali::tool configuration. Decrease the value of *sensitivity* to decrease the overall sensitivity of vali::tool.
b8 1000 x1xx	*Out of reasonable range*	Parameter readings out of a reasonable range are often due to a sensor malfunction or due to a bad calibration. Do not use this value for calibration!	If this problem persists, please check sensor and calibration.

Status vali::tool advanced (Statusbit / binary / Hex)	System message	Reason	Removal
b9 1001 x2xx	*Too many NaN in input history*		Check if actual value is still NaN.
b10 1010 x4xx	*Static warning*		Check the medium.
b12 1100 1xxx	*Processing input value failed*		Wait for next measuring interval.
b13 1101 2xxx	*Retrieving output value failed*		Wait for next measuring interval.
b14 1110 4xxx	*Minor non-vali::tool error status*		Wait for next measuring interval.
b15 1111 8xxx	*Non-vali::tool error status*		Wait for next measuring interval.